URBAN SHRINKAGE IN A POST-SOCIALIST CONTEXT: THE IMPACT OF SHRINKAGE AND REGROWTH ON RESIDENTIAL SEGREGATION IN THE CITY OF LEIPZIG

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Robert Grahn (2021). Hochhäuser im Wohngebiet einer industriell gefertigten Plattenbau-Siedlung im Ortsteil Grünau in Leipzig im Bundesland Sachsen, Deutschland. *Available at: euroluftbild.de/Robert Grahn*

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Contents

Abstract

Urban shrinkage is not a new phenomenon, having been researched across multiple different disciplines and contexts. The post-socialist transition resulted in several, simultaneous transformations, causing extensive shifts in the socio-economic and demographic structure of CEE cities. This was particularly exacerbated in the case of East Germany, as a result of German reunification. Grounded in a post-socialist theoretical perspective, this dissertation investigates the phenomenon of shrinkage, examining the implications of long-term population decline and subsequent resurgence in the city of Leipzig in East Germany. Utilizing a quantitative methodology, this study delves into the emergence of residential segregation, particularly within the Leipzig-Grünau socialist-era Large Housing Estate (LHE). The methods employed include spatial and descriptive statistics, alongside the Index of Dissimilarity (ID) and Location Quotients (LQ), to reveal socio-spatial disparities across Leipzig over time. The research findings highlight significant demographic shifts toward an ageing population, and reveal evidence of social fragmentation within the LHE, marked by socio-spatial differentiation between districts. The results highlight the complexity of addressing urban shrinkage in a context where the legacies of population decline are intertwined with the challenges and opportunities of urban regrowth. The discussion of this dissertation draws on literature on the decline and persistence of LHEs in East and Western Europe, to evaluate the development of Leipzig-Grünau. It is concluded that the estate exhibits evidence of fragmentation rather than a total decline, revealing the continuing 'bipolar' urban landscape of 'shrunken' and shrinking cities. Finally, this thesis underscores the necessity for an intersectional and context-specific approach to urban policy and planning, requiring innovative strategies to reduce inequalities in vulnerable neighbourhoods.

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List of Figures

List of Tables

Abbreviations

CEE – Central and Eastern Europe

GDR – German Democratic Republic

LHE – Large Housing Estate

SGB (II) – Social Book II (basic income support for jobseekers)

Chapter 1: Introduction

Urban shrinkage is broadly conceptualised as a significant and continuous population loss experienced in an urban area, concurrent with economic and structural transformations (Haase et al., 2016). Cities can experience a decline in population due to multiple, overlapping processes entangled with the socio-economic, political and historical contexts of a city (Sroka, 2022: 2). The term 'shrinking city', originates from the German phrase 'schrumpfende Städte', first presented by Häußermann and Siebel (1988) (*cited in* Martinez-Fernandez et al., 2012), concerning decreasing populations in East German cities after German reunification in 1989 (Haase et al., 2014). The consequent, "shock therapy" (Bontje, 2004: 14), through the removal of subsidies and privatisation of state industries, resulted in the collapse of many CEE cities (Mykhnenko and Turok, 2008). Following a review of past literature, this dissertation argues the lasting impacts of a long-term shrinking population after the transition to re-growth, are understudied, mainly due to the relative novelty concerning the resurgence of post-socialist cities (Turok and Mykhnenko, 2007). Therefore, grounded in a post-socialist theoretical perspective, this thesis delineates the extended effects of long-term shrinkage on the social fabric of a 'shrunken' city (Cortese et al., 2014: 2056).

Within the post-Soviet context, the case of East Germany is particularly interesting, as it was the only former state-socialist country to merge with an existing market economy (West Germany) (Huntington, 2021; Bontje, 2004). Leipzig, located in the East German state of Saxony, suffered huge and extended population losses, starting during the GDR period, and exacerbated by the post-socialist transition. The imprint of population loss has continued to severely implicate Leipzig's social and demographic structure (Cortese et al. 2014). This thesis further situates these changes within the framework of a socialist-era LHE, portraying it as a site of contention marked by narratives of both decline and resilience. Furthermore, social implications will also be investigated through the lens of residential segregation, to establish whether socio-spatial polarisation between various socio-economic groups, justified in the methodology, has developed in Leipzig.

To reveal Leipzig's evolving socio-spatial structure amid urban shrinkage and regrowth, this dissertation examines three key aspects: first, the extent of demographic and socio-economic changes to Leipzig's population; second, the emergence of residential segregation due to population shrinkage; and finally, indicators of social deterioration in the LHE, Leipzig-

Grünau. These three points were developed using relevant themes in the literature and form the basis of the research questions this thesis aims to answer. This dissertation adopts a quantitative methodology framework, utilising spatial and descriptive statistics, complemented by calculations of the Index of Dissimilarity (ID) and Location Quotients (LQ) to uncover levels of socio-spatial disparities across the city. Graphical representations and mapping techniques are employed to illustrate these spatial variations over time. The discussion highlights the emerging patterns of social polarisation in Leipzig, signalling a fragmentation of the LHE as opposed to a uniform decline. To conclude, this dissertation suggests directions for future research and policy interventions aimed at alleviating inequalities in 'shrunken' cities.

Chapter 2: Literature Review

There is no commonly accepted definition of urban shrinkage (Haase et al., 2014), however, this literature review attempts to uncover the core aspects of a shrinking city identified in the literature to achieve a cohesive understanding of the term. This literature review argues that existing research around the phenomenon has frequently failed to highlight the intersectional and divergent nature of shrinkage and its impacts (Haase et al., 2016), often attributing social changes only to population decline. Subsequently, this review explores research on residential segregation, delving into the debate around post-socialist trajectories of social transformation, contextualised through the example of Leipzig in East Germany.

2.1 Theoretical Debates Around Urban Shrinkage

The historical discourse of urban shrinkage is rooted in the deindustrialisation and consequent urban decline of cities in the Rust Belt (United States) and the Ruhr region (Western Germany) (Sroka, 2022). The phenomenon of shrinkage is conceptualised in many ways, for example, neoclassical economic interpretations by scholars such as Berry (1977) and Van den Berg et al. (1982) frame population loss as a natural phase of urban development (*cited in* Haase et al., 2014). Other scholars, such as Martinez-Fernandez et al. (2012: 215) criticise this model, also known as the ‘cycle theory’ of economic development, arguing it fails to capture the multiple dimensions of shrinkage in cities.

The absence of a verified definition of a shrinking city has led to multiple contesting classifications of cities with contracting populations. Sroka contends that existing literature frequently employs problematic terminology such as "decay, decline, and erosion" (2022: 1), exacerbating the stigmatisation around shrinking cities. These perceptions can be misguiding, highlighting the need for a more accurate, commonly accepted definition of a shrinking city.

While scholars have interpreted the nature of shrinkage, and what a 'shrinking city' encapsulates, in several different ways, some cohesion exists in its overall conceptualisation, broadly categorising shrinkage as a net decline in urban population (Haase et al., 2014). The *Shrinking Cities International Research Network* (SCIRN), developed a quantitative definition, denoting a city experiencing a net decline in population over two years, linked to economic transformations or structural crises, to be shrinking (*cited in* Sroka, 2022: 2). Turok and Mykhnenko (2007) also highlight the interdependent relationship between economic conditions and population change. However, such conceptualisations often centre solely around the economic and population dimensions of shrinkage. Conversely, scholars emphasise the problematic consequences of such an oversimplification.

> "A shrinking city loses *more* than inhabitants; *all* of its components are clearly breached, starting with labour market (unemployment), investments, quality of life, space, and housing (urban blight)" [emphasis added] (Sroka, 2022: 8).

Aligned with this quotation, Haase et al. emphasise the importance of examining a "pluralist world of shrinkages" (2014: 1521), advocating for a model of shrinkage that considers its cross-contextual nature, linking causes, consequences, and policy solutions. Additionally, the context-dependent nature of shrinkage is frequently emphasised in urban shrinkage discourses (Huntington, 2021; Grossmann et al., 2015; Haase et al., 2016). Hence, this dissertation characterises shrinkage beyond just population decline, to highlight its multiplicity, acknowledging experiences of shrinkage are multi-dimensional and multi-scalar.

2.2 The Post-Socialist Debate

Scholars of urban shrinkage primarily attribute its origins to global macro-processes, notably globalisation and deindustrialisation (Rink et al., 2012; Huntington, 2021). Studies of mono-functional regions, such as the Ruhr basin in Germany, have outlined the consequences of the shift to post-Fordism, also called the "new global economic order" (Cunningham-Sabot et al., 2013: 2). This process was particularly exaggerated through the period of political

transformation in CEE (Sroka, 2022), where former state-socialist countries, characterised by high homogenisation and little or no competition (Huntington, 2021), were rapidly forced into the global market economy (Haase et al., 2016). Consequent institutional, social, and urban transformations (Grossmann et al., 2017), caused vast socio-structural changes, including mass unemployment, suburbanisation, and demographic shifts (Martinez-Fernandez et al., 2012).

The diverse, intersecting transformations underway in former state-socialist cities highlight the complexity of analyses of shrinkage in these regions. The conceptual framework utilised by Grossmann et al. delineates the post-socialist transition as "multiple, overlapping, institutional, social and urban post-socialist transformations" (2017: 143). Hence, this theoretical perspective will be adopted, to uncover the implications of shrinkage and regrowth through a post-socialist lens.

2.3 Characterising Leipzig's Shrinkage

At reunification, East Germany experienced an accumulation of issues, notably, vast population losses due to the internal out-migration of around 1.7 million people in the decade following 1989 (Florentin, 2010). The subsequent lack of appeal to new investors, who preferred more productive West German cities, intensified the region's economic struggles (Bontje, 2004). Additionally, natural demographic changes after reunification exacerbated population decline, with the GDR birth rate dropping by 25% during the transition (Sroka, 2022).

The City of Leipzig in East Germany, is a pertinent example of urban shrinkage, having experienced a declining population from the 1930s until the late 1990s (Cortese et al., 2014). Before the Second World War, Leipzig's population peaked at 750,000 inhabitants (Garcia-Zamor, 2012), and, with the city being a central hub for industry, it was expected to exceed 1 million people by 2000 (Bontje, 2004). However, under state-socialism, Leipzig experienced population decline, predominantly attributed to internal out-migration; low fertility rates; and GDR planning measures such as "redistributive growth policy", that curbed Leipzig's development (Florentin, 2010: 85). By the end of state-socialism, the city consisted of a sunken population of around 530,000 people, dereliction in housing estates, and a highly polluted environment (Bontje, 2004).

Following 1989, the socio-economic conditions in Leipzig worsened, with 75% of industry shutting down within two years, resulting in extensive job losses (Sroka, 2022; Bontje, 2004). This, combined with a dramatic fall in the birth rate, led to a population loss of around 20% in the decade following 1990 (Cortese et al., 2014). Therefore, despite Leipzig already shrinking before reunification, the subsequent transformations exacerbated these ongoing processes, leading to an acceleration in decline (Florentin, 2010).

2.3.1 Leipzig's Regrowth

Since 2000, Leipzig has exhibited evidence of 'regrowth' (Rink et al., 2012) or 'resurgence' (Turok and Mykhnenko, 2007), due to its transition from an extended period of shrinkage, to one of growth. In the literature on shrinkage response, Leipzig has been acknowledged for its achievement in reversing shrinkage (Rink et al., 2012*)*, by embracing population decline early on and shifting away from growth-oriented planning (Wiechmann and Pallagst, 2012).

Investments in East German cities were extensive after reunification, with almost $785 billion raised for their reconstruction (Garcia-Zamor, 2009). The main challenge facing the city was the surplus of housing and a staggering vacancy rate of 26% by 2000 (Cortese et al., 2014). Hence, Leipzig's planning strategies concentrated on the housing market and city revitalisation. Local strategies such as STEP (Stadtentwicklungsplan 2000), and its successor SEKO (Stadtentwicklungskonzept 2010), aimed to foster competitiveness and growth between local mini-centres, with a focus on housing vacancies in specific areas such as Leipzig-Grünau, a socialist era LHE in the West (Ivanov, 2021). On the federal level, the main intervention was Urban Redevelopment East (Stadtumbau Ost), which intended to demolish 350,000 empty dwellings nationally (Garcia-Zamor, 2009). Consequently, between 2001 and 2012, the city successfully demolished around 13,740 housing units (Rink, 2022), 7000 of which were in Leipzig-Grünau (Kabisch and Grossmann, 2013). However, the focus on demolishing abandoned and underused buildings has since been contested, as this merely addresses the symptoms, sidelining the underlying issues of demographic and economic decline (Wiechmann and Pallagst, 2012; Glock and Häussermann, 2004).

Although the city is no longer shrinking, the long-term impacts of shrinkage persist and will do so for decades to come (Rink et al., 2011). Rink et al. highlight that cities experience re-growth in different ways, and no two areas of a city are equally affected; hence, a "bipolar city" may emerge, with growth in some regions and shrinkage in others (2012: 174). Finally,

issues of natural population decline are also pressing, with an ageing population threatening significant shifts in the city's demographic landscape (Cortese et al., 2014), potentially triggering a new wave of shrinkage. Therefore, this dissertation aims to address these emerging theories, which remain under-researched in urban development circles, to establish whether the resurgence in Leipzig has enabled a recovery from the effects of shrinkage.

2.4 Conceptualising Residential Segregation

Massey and Denton offer a widely accepted definition of residential segregation, which will be applied in this dissertation: "the degree to which two or more groups live separately from one another" (1988: 282). Residential segregation is identified in literature as a consequence of urban shrinkage, particularly in Western cities due to suburbanisation. The concept was initially explored in the 1920s by the Chicago School of Sociology, where sociologists like Ernest Burgess observed the irregular allocation of groups of the same ethnicity (Hanslmaier et al., 2023). Subsequently, studies in the US often focus on the racial dimension of segregation. For example, Grossmann et al. (2015: 553), highlight the phenomenon of "white flight" in US cities, producing poverty clusters of minority groups in inner-city areas, a phenomenon likewise observed by Beauregard and Haila (2000).

Nevertheless, most of the literature surrounding residential segregation is situated around the context of 'global cities', characterised by population growth, and a more gradual transition to post-Fordism, typical of large Western cities (Cortese et al., 2014). The intricate dynamics of the post-socialist transition outline the risk of extrapolating explanations of segregation from a Western context. Hence, this investigation aims to bridge this theoretical and empirical gap, by exploring residential segregation as a result of the neo-liberal transformation.

2.4.1 Residential Segregation in the Post-Socialist Context

Grossmann et al. (2015) identify the macro-level processes and political trends that exacerbate segregation, emphasising the role of the welfare state as a driver of spatial polarisation. This draws on post-socialist conceptualisations of residential segregation, outlining the diverging trajectories of social cohesion between Western and Eastern Europe (Haase et al., 2016). State socialist housing policies, it is theorised, encouraged the social mix

of neighbourhoods, due to high levels of control over local planning and housing (Huntington, 2021; Grossmann et al., 2015). Similarly, Harth et al. highlight that GDR policy prioritised the "convergence of classes and strata" (1998: 422), inhibiting socio-spatial differentiation. "Voluntary segregation" arises from differential access to housing due to economic disparities, causing low-income households to cluster in less desirable neighbourhoods (Grossmann et al., 2015: 551). Thus, by restricting the capacity of wealthier households to choose housing based on preference, these policies obstructed the primary mechanism of residential segregation (Daskalova and Slaev, 2015). This research project aims to discern the extent of these theories, to establish whether evidence supports the notion of sustained social mixing in post-socialist cities, diverging from trajectories based on Western experience.

LHEs in Eastern Europe are of particular interest when comparing the trajectories of change experienced in the East and West. Kovacs and Herfert (2012), underscore that before the political transformations, LHEs in socialist countries were largely unaffected by social decline, leading to different pathways in their development. Unlike in Western Europe, where post-war LHEs became stigmatised as "urban sores", following the concentration of immigrant and lower-income populations within them, Eastern European LHEs remained popular (Grossmann et al., 2017: 143). Furthermore, Nuissl et al. (2005) highlight that urban sprawl in CEE cities produced different suburban areas than in Western cities, as socially mixed suburban apartment houses remain, contrasting the assumptions of social segregation and suburbanisation in other literature.

In contention with the two aforementioned studies, Harth et al. (1998) explored three predictions of East German urban development following reunification: gentrification, the downgrading of LHEs, and suburbanisation. The authors conclude that LHEs are at risk of decline, due to socio-structural problems and resultant selective out-migration, causing income-based segregation (Harth et al.,1998). Additionally, the authors warn of gentrification resulting in social stratification based on age, as the older, lower-class, longstanding residents are surpassed by younger, more educated, higher-income residents. This highlights the debate in the literature around trajectories of urban development and segregation in housing estates.

Leipzig-Grünau, built between 1976 and 1989, is a LHE on the western periphery of Leipzig, extending over 10 square kilometres. Grünau was the third largest estate in the former GDR (Grossmann et al., 2017), its size outlining the significant impact it has on the social fabric of

the city. In the decades following reunification, Grünau lost over half its population, resulting in unprecedented vacancy rates within the estate (Grossmann et al., 2017: 148). The impact of housing vacancies in East Germany has been identified as a major driver of socio-spatial segregation within literature (Grossmann et al., 2017; Huntington, 2021). Grünau has been subject to numerous studies surrounding the impacts of shrinkage, for example, Grossmann et al. (2015) determine oversupply as the cause of fragmentation within the estate, attributed to vast out-migration revealing pockets of derelict housing in unattractive neighbourhoods. Similarly, Huntington (2021) emphasises the propensity of capitalist housing markets to establish desirable neighbourhoods for affluent residents, simultaneously creating "pockets of poverty" (Grossmann et al., 2015: 553) in which lower-income communities reside, with inferior access to education and employment, exacerbating social segregation.

Therefore, this dissertation will expand on these assumptions, looking at Leipzig-Grünau, to establish whether symptoms of decay and deterioration are identifiable in the socio-economic characteristics of Grünau's population, attributed to the enduring imprint of urban shrinkage.

Chapter 3: Methodology

3.1 Research Design

3.1.1 Research Questions (RQ)

1. How has Leipzig's socio-economic and demographic landscape been influenced by its transition from shrinkage to regrowth?
2. To what extent have patterns of socio-spatial segregation developed as a result of shrinkage in Leipzig?
3. Is there evidence to suggest decay in the social fabric of the Leipzig-Grünau housing estate, and if so, to what degree?

3.1.2 Quantitative Research Methodology

Albers emphasises the use of quantitative analysis as a "critical thinking process" (2017: 217). Hence, employing this analytical approach, a quantitative methodology was adopted in this study to effectively reveal "patterns, trends, and relationships" within the data, and derive

meaningful conclusions in response to the research questions (Albers, 2017: 215). This involved employing quantitative positivist epistemology, postulating that "objective reality exists independent of human perceptions" (Slevitch, 2011: 76). Hence, causal relationships and effects are investigated, grounded in statistical analysis, to answer the research questions (Slevitch, 2011). This methodology was suitable due to the breadth and depth of data available, particularly given the temporal frame of this dissertation, as patterns of change are studied over time.

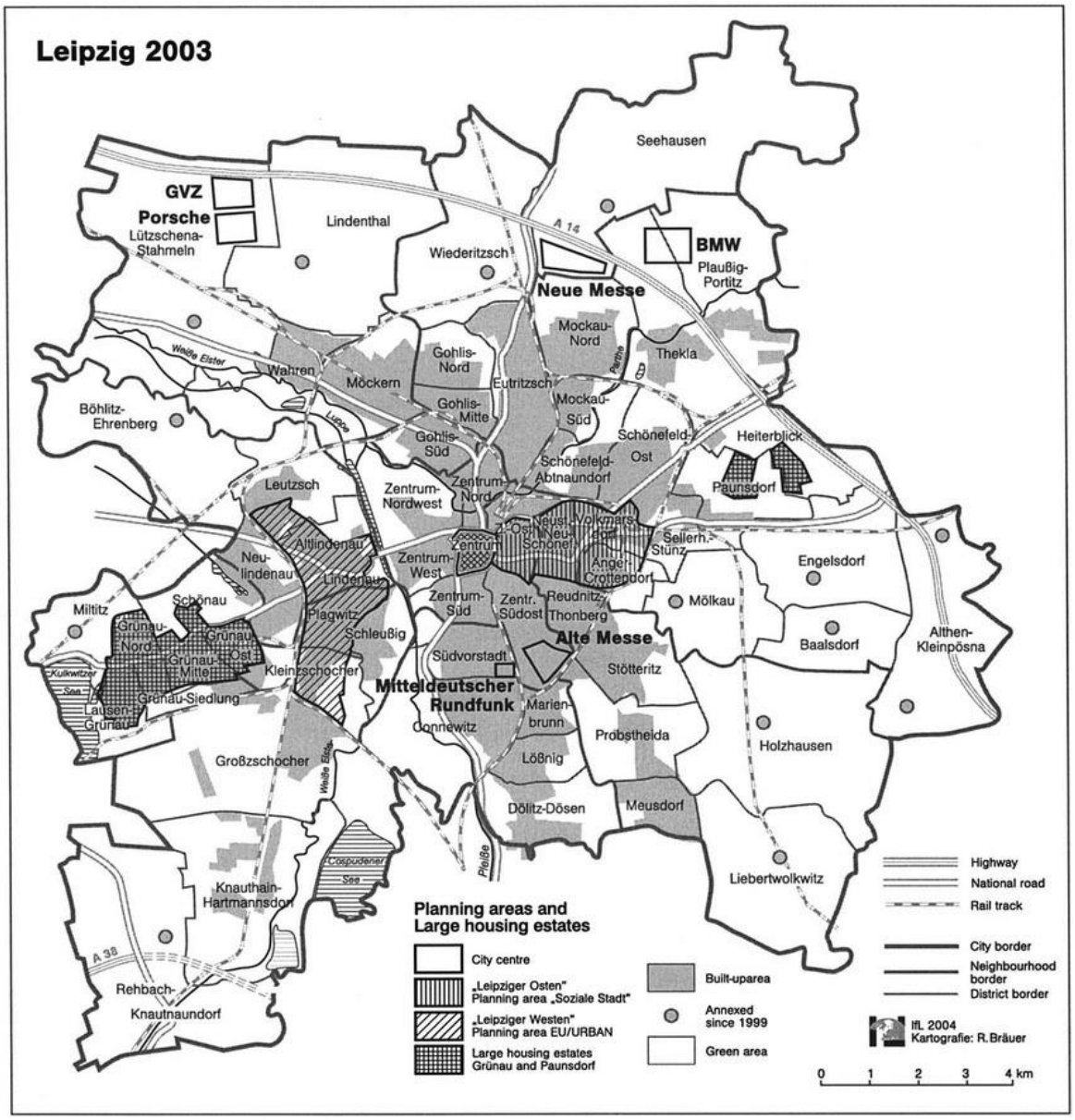


Figure 1 *- Map of Leipzig including neighbourhoods and housing estates (Source: Bontje, 2004)) See Appendix for a more recent map.*

3.1.3 Justification of the Study Area

The city of Leipzig was chosen due to its contextual suitability, as detailed previously. Furthermore, the presence of the socialist-era LHE, Leipzig-Grünau, located in the West, was an important methodological feature of this dissertation. The city was also chosen due to the readily available intra-urban data at the district level, which was used to uncover evidence of socio-spatial segregation.

3.2 Sources of Statistical Data

The secondary datasets utilised in this dissertation were obtained through the Leipzig Information System (LIS). Here, municipal survey and statistical data are published by the Amt für Statistik und Wahlen (Office for Statistics and Elections). Boundary data, used for spatial representations, was also obtained through the LIS, and uploaded into R-Studio. The primary spatial units used in this study were the district and city-district level, where Leipzig consists of 63 administrative districts, and 10 city-districts, not homogenous in size or population, as seen in Figure 1. At the city-district level, the Leipzig-Grünau housing estate dominates the 'West' (see Appendix A). LIS data is collected through various mediums and collated by local and national government offices, the largest source being the German census. This is completed approximately every 10 years, the last nationwide census being in 2011, due to delays to the 2022 census. To supplement census data, Germany conducts a population register, producing a centralised database updated regularly by municipal registration offices (Grossmann et al., 2017). Therefore, municipal data was available for years up to and including 2023, assuring this study remained up to date.

Despite this, housing vacancy data was only publicly available through the 2011 census, but upon contacting the Office for Statistics, additional data was acquired for 2021. This data was collected from housing and population registers, utilizing vacant addresses and the count of flats within them as an approximation for housing vacancies. Whilst not as reliable as census data, this still offered a general overview of vacancies in Leipzig.

Due to inconsistencies in data availability across the years, this investigation focused on the years 2001, 2011, and 2021, to reduce gaps in the analysis and still provide a representation of Leipzig's social structure over time. This spotlights the period following the transition to regrowth, aiming to explore the enduring effects of population decline on the city's social composition.

3.3 Justification of Variables

3.3.1 Demographic

Population and migration data were investigated, supplemented by district-level analyses to highlight intra-urban migration dynamics. This established differences in migration patterns between districts, to determine whether Leipzig is becoming a 'bipolar' (Rink et al., 2012) or 'perforated' (Garcia-Zamor, 2009) city because of selective out-migration.

Demographic changes are identified as key indicators of shrinkage in literature; for example, Cortese et al. discovered "continuous ageing" (2014: 2054) due to a shrinking population in Ostrava, Czech Republic. Hence, average age was investigated, supplemented by the district-level variations of the Old Age Dependency Ratio (OADR). To establish natural population change, the ratio of live births to deaths was also explored.

3.3.2 Economic

The variables chosen to indicate economic change were employment status and income data. The former is a percentage indicating the proportion of unemployed persons against employed for each district. Grossmann et al. (2017) conducted a similar analysis, comparing the economic transformations in Grünau to the rest of the city. Additionally, income, a continuous variable, represented as the median monthly income, was analysed to compare neighbourhood-level incomes, establishing any differentiation between districts.

3.3.3 Social

To determine social differences within Leipzig this study utilised two socio-economic variables, first, the number of working-age residents receiving social assistance benefits. Secondly, the number of recipients of unemployment benefits was used as another indicator of socio-economic status.[1] Huntington (2021) also uses these variables to determine whether their concentrations are over- or underrepresented in different districts in Schwerin, another East German city. Hence these variables were selected to characterise socio-economically deprived groups for the analysis of segregation, to answer RQ2. Additionally, educational

[1] SGB (II) is classed under Book II of the German Social Code (SGB II), as social assistance payments for individuals and households. Whilst unemployment insurance (Arbeitslosengeld) covers basic income support for jobseekers (Bundesagentur für Arbeit, 2018).

attainment was investigated by exploring the district-level percentages of Abitur (A-level equivalent) qualification holders.

3.3.4 Neighbourhood characteristics

Finally, neighbourhood attributes, including crime rates and housing vacancies, were delineated. This sought to profile Leipzig's districts, establishing differences in neighbourhood living environments as supported by the literature. Furthermore, rent prices, a valuable indicator of the housing market, were explored to assess an area's desirability and affordability, whilst housing vacancies were used to highlight neighbourhoods most impacted by shrinkage (Huntington, 2021).

3.4 Spatial and Descriptive Statistics

This dissertation utilised descriptive statistics in order to answer the first RQ and form a baseline for further analysis. Most commonly used to display the characteristics of a population, descriptive statistics uncover patterns or trends in the dataset, and are classified according to the scale of their measurement (Nick, 2007). In this study, examples of categorical data are binary, limited to two outcomes, such as employment status (Unemployed or Employed). On the other hand, numerical data was also presented, looking at discrete variables, such as population and age. Here, summary statistics of location and spread are employed, such as mean and standard deviation (Nick, 2007), highlighting the variability across districts.

In addition, spatial statistics were also a key method used in this dissertation, whereby the spatial location attached to the data plays an important role in the analysis (Unwin, 2009). Maps were constructed in R-Studio to depict the spatial distribution of variables, such as median income and age, at the district level. This was important to visualise spatial relationships in the data, forming the basis from which spatial differentiation within the city was investigated. As the spatial component points to any variability between districts, this speaks to both RQ2 and RQ3.

3.5 Indices of Segregation

This dissertation aims to uncover the extent and pattern of segregation among various socio-economic groups within the available data (RQ2), utilising the variables justified in the preceding section.

The paper by Massey and Denton (1988), identifies the five dimensions of segregation: evenness, exposure, concentration, centralisation, and clustering. The Index of Dissimilarity (ID) was first used by Duncan and Duncan (1955), as a measure of evenness and is now the standard segregation measure (*cited in* Massey and Denton, 1988). ID measures the uneven distribution of two population groups across a city, highlighting any differences between city and neighbourhood demography (Harth et al., 1998). The value is presented as a number between 0 and 1, indicating the proportion of minority members that would have to move under conditions of maximum segregation (Massey and Denton, 1988). Constraints emphasised in methodology literature underscore that ID only provides a rough estimate of segregation levels and does not execute effectively in multi-group cases (Massey and Denton, 1988). Nevertheless, it is a simple and highly comparable index that produces a single measure of segregation, lending itself to easy analysis and interpretation, which was suitable for this study. Several scholars investigating shrinkage and segregation have utilised the ID, for example, Harth et al. (1998) used the index to compare levels of socio-spatial differentiation between cities in East and West Germany.

However, ID is an aspatial index, which is problematic as districts in Leipzig are not homogenous in population or size (Massey and Denton, 1988). Therefore, an adjusted value, ID(s), was calculated, to account for tract area and boundary length, following the methodology proposed by Wong (1993). Therefore, this allowed for a more accurate representation of segregation between districts of different sizes.

3.6 Location Quotient (LQ)

To compare the spatial concentration of deprived socio-economic groups, this dissertation utilised the Location Quotient. This is a local index, first used by Walter Isard (1960) to map the relative concentrations of a group in a neighbourhood compared to the whole city, producing one value for each district (*cited in* Benassi et al., 2022). A value below 1 indicates underrepresentation, whilst a value above 1 implies overrepresentation. The spatial representation of this quotient was calculated using the software Geo-Segregation Analyser

(Apparicio et al., 2013), and maps were produced using R-Studio. While it doesn't follow any of the dimensions of segregation, LQ determines the relative concentration of a group, allowing for comparison between districts. Hence, it can be inferred as a measure of *evenness.* Nevertheless, Location Quotients have no upper or lower bound, and the establishment of cut-offs and categorisation of levels of representation are important caveats of this method (Benassi et al., 2022). Therefore, these classifications, shown in Table 1, were established after an initial review of the quotients and assessments of other scholars' use of the method, namely Huntington (2021).

Table 1 *- Location Quotient Scale*

Location Quotient Range	Level of Representation
<0.2	Severe Underrepresentation
0.2 - 0.5	Significant Underrepresentation
0.5 - 0.8	Moderate Underrepresentation
0.8 - 1.2	Mixed
1.2 - 1.5	Moderate Overrepresentation
1.5 - 2.2	Significant Overrepresentation
2.2 <	Severe Overrepresentation

3.7 Correlation Coefficients

To determine the relationship between the LQs of the social deprivation indicators chosen and shrinkage, calculations were also carried out to establish their correlation. A similar approach to that used by Grossmann et al. (2017) was adopted, through the operationalisation of housing vacancies to represent urban shrinkage. This is commonly used under shrinkage research, as oversupply is an important indicator of urban decline, as outlined in the literature review. Due to the high number of outliers present in the housing vacancy data for 2021, Spearman's Rank Correlation Coefficient was calculated. This uses the ranks of variables rather than their actual values, decreasing the coefficient's sensitivity to outliers (Schober et al., 2018). The relationship between the Location Quotients and district-level housing vacancies was then tested to establish the extent to which social disparities are the result of the lasting effects of shrinkage.

3.8 Reflection of Methods

Criticisms of the LQ outline its aspatial nature, for example, Benassi et al. (2022) propose an alternative Locational Differential Index (LDI) to account for the population density of each district. Nevertheless, the LQ remains a relevant indicator for spatially depicting intra-urban patterns between groups; hence, it was employed, taking into consideration the inherent limitations. Similarly, the adjusted ID used in this dissertation, despite accounting for tract area and boundary length, does not account for population density, so it can be sensitive to large differences in density between districts. Despite its limitations, the ID remains the preferred metric for assessing evenness due to its widespread use in shrinkage studies. In addition, Massey and Denton (1988) emphasise the importance of analysing more than one of the five dimensions before concluding that segregation has occurred. ID and LQ both operate as measures of evenness; therefore, this could lead to a misleading interpretation of the extent of segregation, marking a notable limitation in this methodology.

Constraints also exist with correlation coefficients, notably, Schober et al. (2018) emphasise that a correlation analysis is not sufficient to conclude a causal relationship. To prevent any misconceptions surrounding the relationship, scatter plots were examined to visualise the correlation, and the results were supported with literature to avoid reaching inaccurate conclusions about correlation. Spearman's Rank was selected due to its robustness against outliers, and independence from assumptions of normality and homoscedasticity.

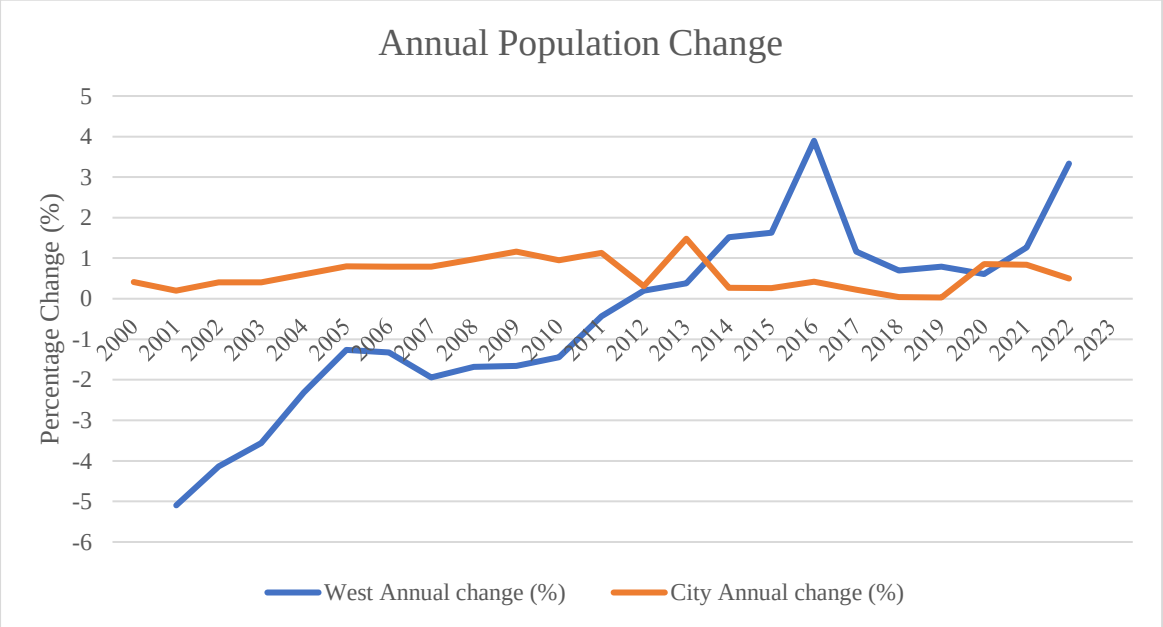
Despite the chosen methodology being a quantitative one, previous scholars have also applied qualitative methods to issues of residential segregation. For example, Matyushkina (2023) used in-depth interviews with local governments and NGOs to discuss cultural strategies in shrinking cities, and Grossmann et al. (2017) analysed long-term surveys to monitor housing satisfaction in Leipzig-Grünau. However, these methods are less suitable for this study, as the research aims to focus more on the extent to which the phenomenon contributes to segregation and decay in the city, necessitating a spatial, quantitative approach.

Chapter 4: Results and Analysis

4.1 Demographic characteristics

4.1.1 Population Change

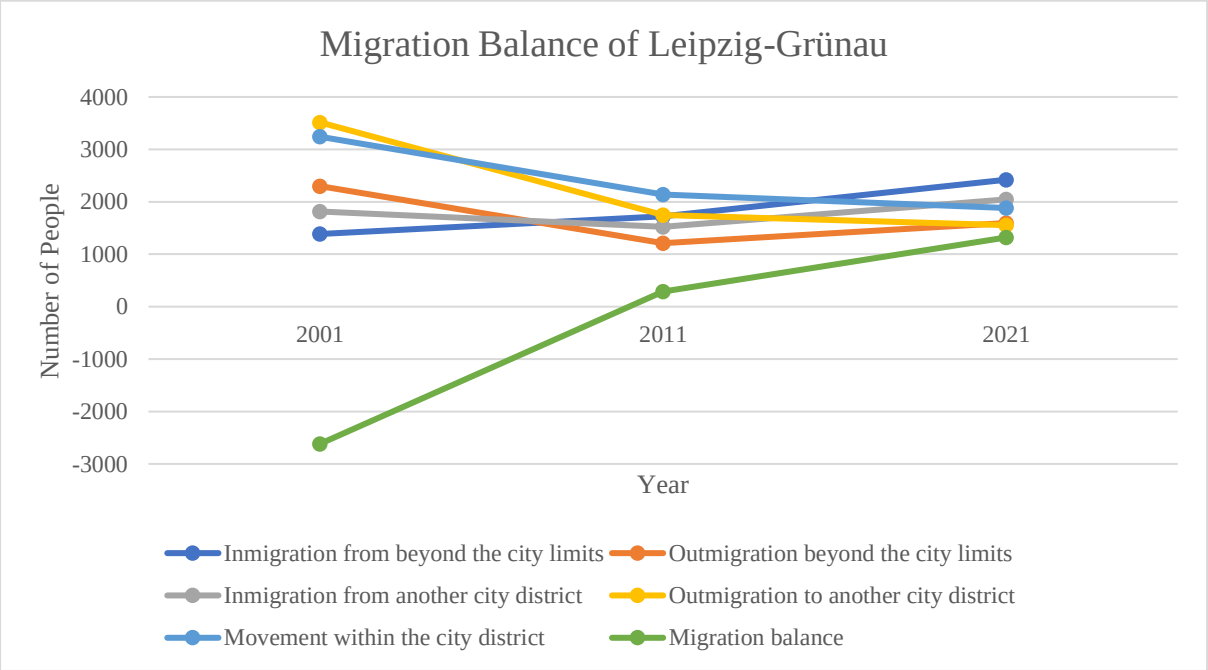
Figure 2 *– Annual Population Change, (Source: Authors own, Data Source: City of Leipzig (2023))*



The city's regrowth, outlined in the literature review, has not been felt to the same extent across all Leipzig's districts. The city district 'West' experienced a net decline in population between 2000 and 2023 of almost 9.5%, reaching a minimum population in 2011. Nevertheless, as shown in Figure 2, a resurgence has occurred since then, with the LHE exhibiting a fluctuating but positive annual change, indicating a transition away from shrinkage.

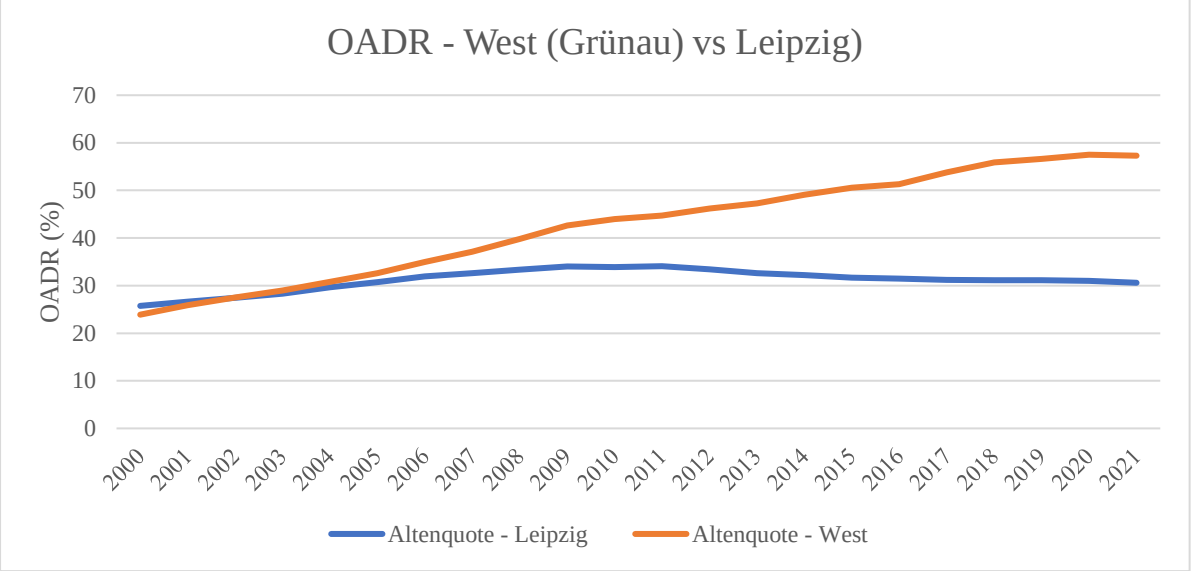
Leipzig's migration patterns have also undergone a drastic change this century. In 2001, city-wide net migration was below 1500, however, since then, in-migration has increased dramatically, reaching a peak of over 50,000 in 2022. Focussing on the LHE, the West gained its highest population influx in 2021 from outside the city, culminating in a positive net migration, shown in Figure 3. Despite a few peaks, Grünau's population has remained relatively static, with the second lowest migration balance in Leipzig (2021). Additionally, Leipzig-Grünau still exhibited a negative migration balance in 2001, only reaching a net positive in 2011. However, by 2021, the city district had exhibited a 150% increase net migration. This suggests that the LHE has managed to resurge, albeit at a slower pace compared to the rest of the city, which will be uncovered in the discussion.

Figure 3 *- Migration Balance of City District West (Source: Authors Own, Data Source: City of Leipzig (2023))*



4.1.2 Ageing Population and Natural Population Decline

Figure 4 *- Old Age Dependency Ratio (OADR), West vs Leipzig (Data Source: City of Leipzig (2023))*



The OADR (Altenquote), depicted in Figure 4, has considerably increased in the West, reaching almost 60% in 2021, emphasising the rapidly ageing population of the housing estate. Contrastingly, Leipzig as a whole has not seen a large change in the ratio of elderly to working-aged people, as this remained around 30%. The almost double figure for Grünau suggests that ageing is a particular issue in the LHE. Moreover, the standard deviations of district-level OADRs increased from 7.3% to 17.5%, emphasising the higher differentiation of elderly people between districts in 2021 compared to 2001. These disparities are noteworthy within the LHE, as Grünau-Siedlung and Grünau-Ost carry a much higher burden of the elderly, reaching 90% and 80% respectively, in 2023. Moreover, a district level comparison of average age highlights that the districts comprising the Grünau LHE have aged significantly, with Grünau-Siedlung averaging 54.8 years old, exhibiting an increase of above 7 years (see Appendix B), whilst the inner-city remains younger with an average mainly between 35 and 40. These findings will be uncovered further under the segregation analyses, to determine whether the elderly populations are spatially segregated from the working-age population.

Overall, the results identified an increasing elderly population across the city, mirroring observations in the broader literature. Kabisch and Grossmann (2013: 233) recognise a strong relationship between ageing and population decline, caused by low fertility rates and a longer life expectancy, linked with the out-migration of younger people. The district-level variation

in age is particularly significant, as enhanced ageing was observed in the Grünau housing estate, with districts such as Grünau-Siedlung and Grünau-Ost exhibiting significant ageing. The rapidly ageing demography of Grünau is attributed to the ageing of its initial residents, as well as the substantial out-migration and deficient in-migration of younger residents following reunification, exacerbating city-wide ageing trends (Grossmann et al., 2017). In comparison, inner-city districts in Leipzig have a much younger demographic, as these regions benefitted most from reurbanisation schemes in the early 2000s, attracting younger, more educated residents (Rink et al., 2012).

Finally, results suggest natural population decline is occurring across the city, but particularly in the Grünau housing estate. No districts within the LHE exhibited a positive birth-death ratio across the years 2001, 2011 and 2021, consistently exhibiting the lowest ratios in Leipzig. This is particularly evident in Grünau-Mitte and Grünau-Ost, both displaying much lower values than the rest of the city. This is evidence of a low fertility rate and ageing population, contributing to the natural population decline in these districts. Mykhnenko and Turok outline how worsened socio-economic conditions following the post-socialist transition, led to a reduction in fertility rates below the replacement rate in Eastern Europe (2008: 315). This is sometimes referred to as the "birth strike", where women refused to reproduce due to uncertainties around the new system (Glock and Häussermann, 2004: 922). Nevertheless, Bontje (2004) highlights that the sharp and rapid fall in birth rate was exaggerated in East Germany, due to the overlapping impacts of reunification and the neoliberal transition (Fol, 2012), exacerbating the uncertainty felt among residents. The observed "demographic shock" (Cunningham-Sabot et al., 2013: 8), has continued to present itself in the population structure of Leipzig, becoming an imprint of prolonged shrinkage. Furthermore, the impact of an ageing population has been problematised in literature, due to the potential for a second wave of shrinkage (Kovacs and Herfert, 2012). Hence, these demographic imbalances could be problematic for the future socio-economic development of the LHE.

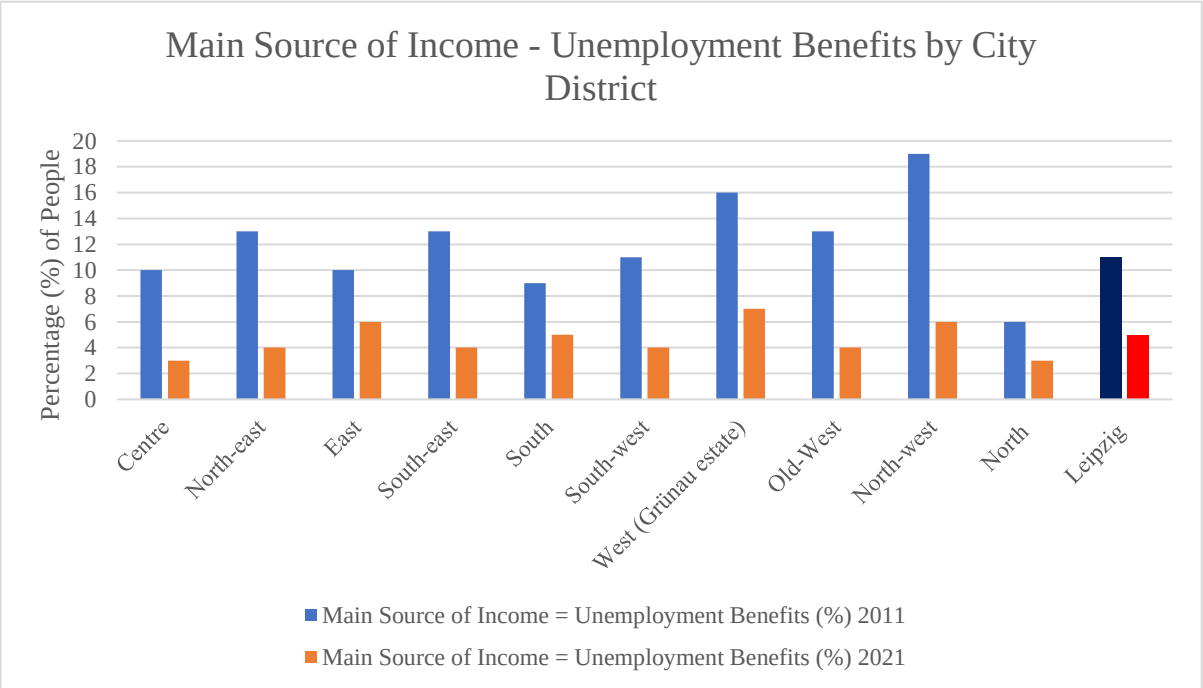
4.2 Socio-economic characteristics

Initial analyses of median incomes show a considerable increase in personal and household incomes between 2011 and 2021. In 2011, there was little variation between districts in the city, as the median personal incomes in Grünau were comparable to those in the rest of the city (see Appendix C). Nevertheless, by 2021, incomes in the West were lower relative to the

other districts, particularly in the Centre and North-East. Moreover, a greater differentiation of incomes is observed within the housing estate, as some districts such as Millitz and Grünau-Siedlung had higher earnings between 1800-1999€, whilst others, such as Grünau-Mitte, presented lower median monthly incomes between 1200-1399€. Additionally, the spread of incomes has increased greatly, as the standard deviations almost doubled for both household and personal incomes between 2011 and 2021, suggesting a greater economic differentiation between districts in Leipzig.

Educational attainment was also investigated, revealing the greatest percentages of people with higher education in the inner-city (generally exceeding 60%), whilst the peripheral districts had lower rates, mostly between 11 and 40% (2021) (see Appendix D). The Grünau housing estate exhibited some of the lowest percentages of people with an Abitur qualification, with only 11-20% in Grünau-Mitte in 2021. Grünau-Siedlung had the highest rate within the estate at 31-40%, however, this was still considerably lower than the inner-city districts. This coincides with the other results indicating the lower social status of estate residents, as well as the wider literature. For instance, Grossmann et al. (2017) identified the influx of lower-educated residents into the LHE, as a part of the second wave of residents.

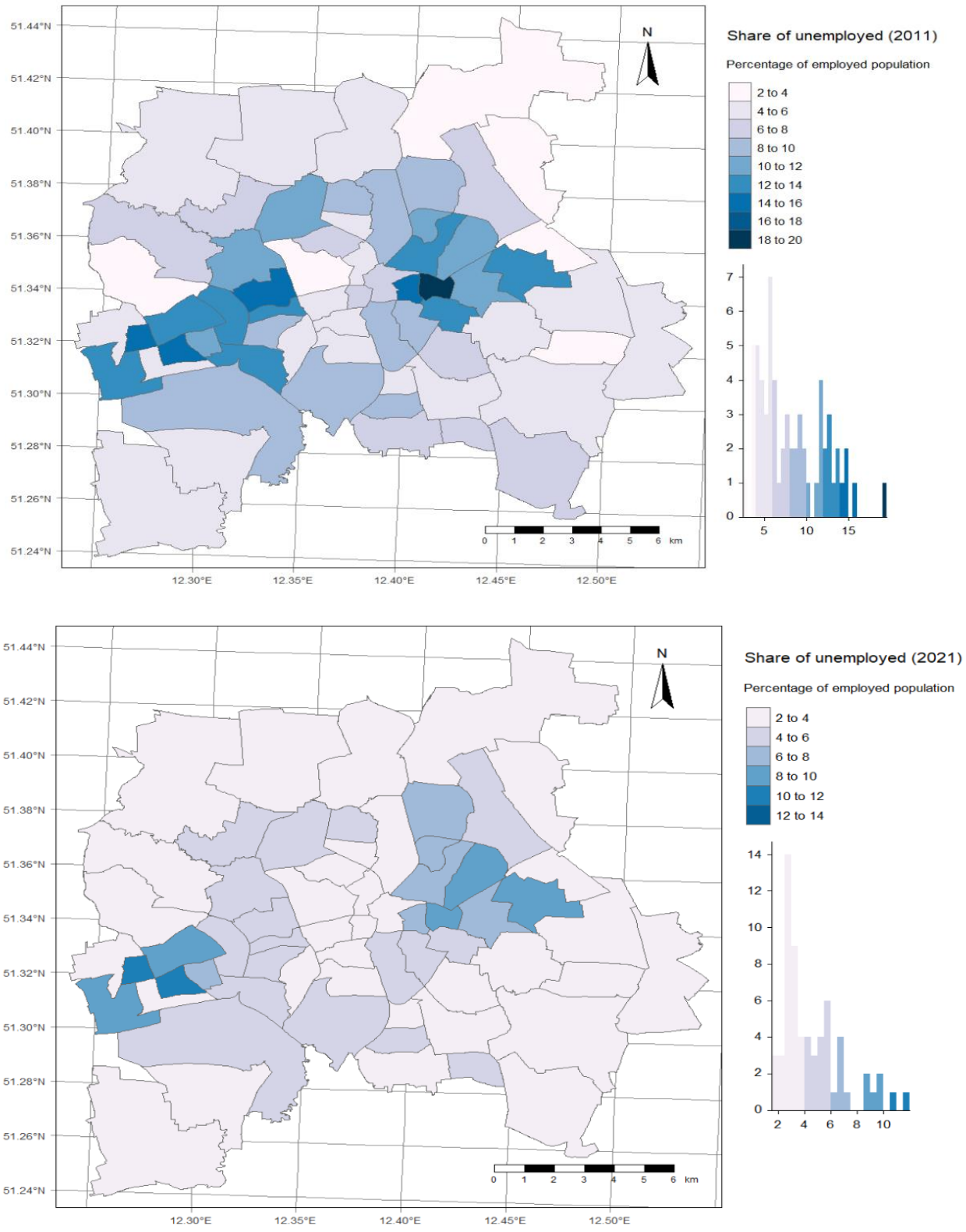
Figure 5 - *Percentage of Unemployment Beneficiaries by City District (2011, 2021). Source: Author's Own, Data Source: City of Leipzig (2023)*



The absolute number of social assistance beneficiaries and unemployment benefit recipients declined since 2011, with both decreasing in spread, presenting a 36.7% and 17.6% reduction in standard deviation respectively. This suggests a higher homogeneity across districts, with a more consistent distribution of unemployment insurance beneficiaries. SGB (II) recipients, however, are more varied at the district level, highlighting that some areas in Leipzig have much higher concentrations of SGB recipients than others. Similarly, city-district level variation of unemployment beneficiaries exists, with the West displaying the second highest proportion of 16% in 2011, and the highest in 2021, displayed in Figure 5. Thus, indicating a greater proportion of lower status individuals in the LHE. Moreover, Grünau-Mitte, identified previously as having a lower median income, had one of the highest percentages of unemployed people in 2021, along with Grünau-Nord, displaying an over 10% unemployment rate (Figure 6). Therefore, despite city-wide unemployment rates declining considerably between 2011 and 2021, particularly in the inner-east and western districts, higher rates persist in the LHE.

To address the first research question based on these findings, Leipzig's demographic structure has notably changed, exhibiting a significant increase in elderly people, particularly in the LHE. Amidst a natural population decline due to decreasing fertility rates, the city offsets this trend with significant in-migration, mainly in inner-city districts, although this is not as pronounced in Grünau. Additionally, despite an overall decrease in unemployment beneficiaries, certain districts in the estate, such as Grünau-Mitte, exhibit higher proportions of socio-economically deprived individuals, highlighting intra-estate as well as intra-city differentiation.

Figure 6 *- Share of unemployed persons as a percentage of total employed (2011 and 2021) Source: Authors Own, Data Source: City of Leipzig (2023)*

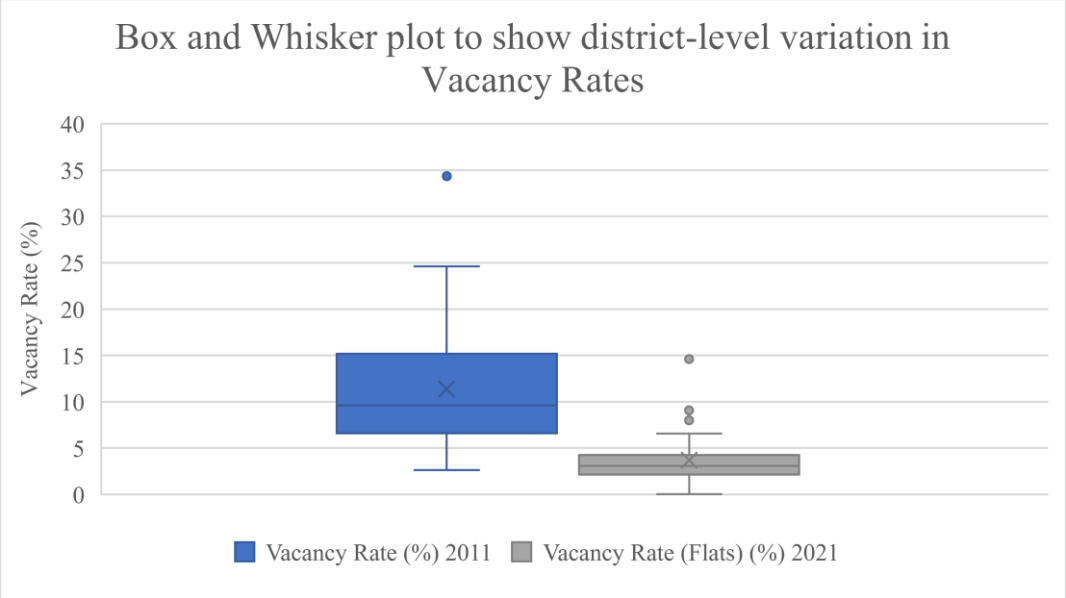


4.3 Neighbourhood characteristics

At the city level, housing vacancies in Leipzig have declined significantly, falling below 5% in 2019, which represents an 83% decrease since its peak in 1998. In 2021, almost all the districts in the West displayed vacancy rates below 5%, compared to rates between 15 and 20% in 2011. Figure 7 outlines the vast decrease in vacancy rates, and their spread, showing the success of urban policy and planning in alleviating the immediate manifestation of shrinkage, an explanation for which will be properly delineated in the discussion.

An analysis of neighbourhood crime rates reveals that the Leipzig-Grünau housing estate has some of the lowest crime rates in the city, remaining at 87 crimes per 1000 people in 2011 and 2021. This highlights a potential reason why the housing estate remains a desirable place to live, providing a small explanation for the low out-migration in recent years.

***Figure 7** - Spread of Vacancy rates across Leipzig's districts (2011 vs 2021), Source: Author's Own, Data Source: City of Leipzig (2023)*



In terms of rental prices, Leipzig has experienced a steady increase, however, on the district level, there is a clear differentiation between inner-city and peripheral regions. The averages for inner-city rents in 2011 and 2021 were €7.82 and €9.96 per m^2 per month, compared to the West, which had an average of €6.61 and €7.96 respectively. The lower rent and smaller increase in rent (20%) in the LHE, highlight it as a more affordable housing option for lower-income groups, contrasted to the inner-city, which increased by 27% and comprises higher-

income residents. These factors, combined, outline possible reasons for the increase in Grünau's population since 2011, which will be delineated further in the discussion section.

4.4 Segregation Analyses

4.4.1 Segregation Indices

Table 2 - *Segregation Indices: ID and ID(s) for various social indicators (Source: Author's own, calculated using Geo-segregation Analyser (Apparicio et al., 2013), Data Source: City of Leipzig (2023)*

Variables	**2001**		**2011**		**2021**	
Index	**ID (s)**	**ID**	**ID (s)**	**ID**	**ID (s)**	**ID**
Unemployed vs Employed Persons subject to Social Security Contributions	0.0952	0.1163	0.1954	0.2075	0.1944	0.2058
Working Age SGB (II) recipients vs Employed Persons subject to Social Security Contributions	n/a	n/a	0.2333	0.2455	0.2754	0.2867
Unemployment Beneficiaries vs Employed Persons subject to Social Security Contributions	n/a	n/a	0.2375	0.2497	**0.4360**	**0.4474**
Elderly Persons (over the age of 65) vs Working Age Persons (15-65 years)	0.0887	0.0965	0.1614	0.1747	0.2135	0.2267
Elderly Persons (over the age of 65) vs Young People (under the age of 15)	0.1376	0.1496	0.1975	0.2159	0.1937	0.2110

The Index of Dissimilarity (ID) and adjusted ID(s) were calculated for various socio-economic indicators as justified in the methodology section. The results, shown in Table 2, suggest there is little evidence of segregation between unemployed and employed persons or SGB (II) recipients and employed persons, as the adjusted ID values were low, where 0 is no segregation and 1 is complete segregation. Nevertheless, an increase over time was observed in both cases, with the segregation of unemployed against employed persons exhibiting a 104% increase (ID(s)). A noteworthy degree of segregation was established between those on unemployment benefits and employed persons, with the adjusted ID suggesting that approximately 43.6% of people relying on unemployment benefits as their main source of income, would have to move to achieve an even dispersal of that group among employed people in Leipzig. Additionally, this represents an 83.6% increase since 2011, indicating a significant rise in the spatial differentiation between these groups. Furthermore, residential

segregation of people aged over 65 has increased according to the ID(s) calculations, reaching 0.21 with working-aged people and 0.19 with young people (under the age of 15) in 2021, representing a 141% and 41% increase, respectively. As demonstrated in the preceding results, Leipzig has an increasing elderly population, suggesting that with ageing, this group will become progressively more spatially separated from younger groups, increasing the potential for residential segregation by age in the future.

4.4.2 Location Quotients

The first map of LQs depicted in Figure 8 represents the relative concentrations of people reliant on unemployment benefits in 2021. Certain districts in the West exhibit an overrepresentation of this group, notably Grünau-Mitte, as well as Schönau and Grünau-Nord. Nevertheless, other districts in the West are characterised by a severe underrepresentation of this group, such as Grünau-Siedlung and Millitz, outlining differentiation within the LHE. Contrastingly, in 2011, there was less variation between LQ values in Grünau, emphasising an increase in polarisation between districts by 2021. This reinforces the ID result, hence both methods imply that unemployment beneficiaries are increasingly unequally distributed around the city and are therefore becoming spatially segregated from the rest of the population. Similarly, the concentrations of working-age SGB (II) recipients increased in the West between 2011 and 2021, particularly in Grünau-Nord, which exhibited a 29% increase in concentration, transitioning from moderate to significant overrepresentation.[2]

Finally, the distribution of people aged over 65 has changed due to increases in the elderly population of Leipzig. In 2001, their distribution was still relatively even, as most districts exhibited a mixed-age demographic. However, by 2011, elderly people were underrepresented in the central and inner-western districts, but moderately overrepresented in the peripheral districts. By 2021, this pattern had solidified, as the peripheral districts, particularly around the North-West and West, displayed a significant or severe overrepresentation of people aged over 65. The districts in Grünau exhibit particularly high levels of overrepresentation, with Grünau-Siedlung and Grünau-Ost demonstrating the highest concentrations in the city. Neighbourhoods with a severe overrepresentation of the

[2] For maps showing the LQ of SGB (II) recipients and additional years for the other indicators, please refer to the appendix.

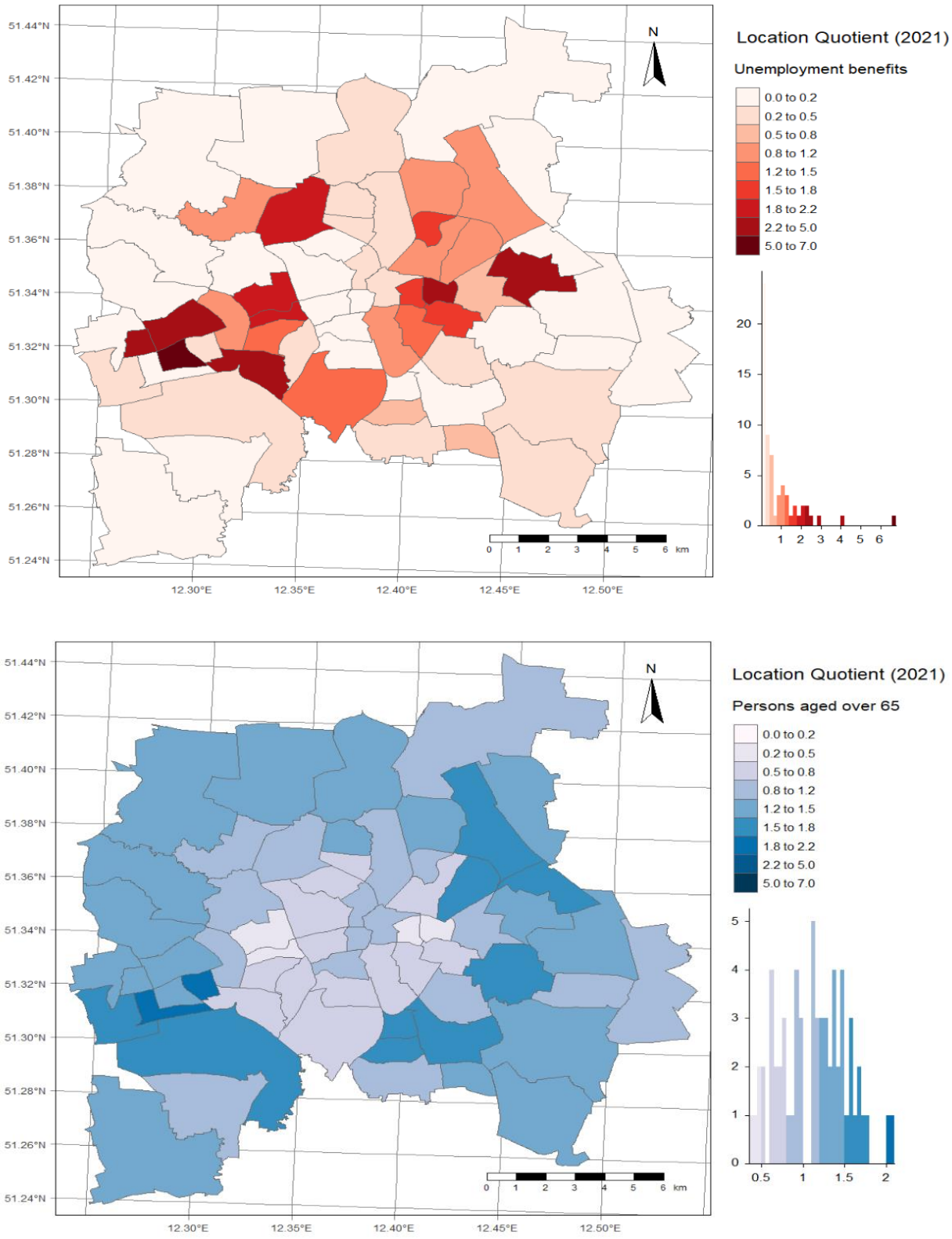
elderly also display an underrepresentation of unemployment beneficiaries, which is expected, as a large portion of the population is not of working age.

Both the ID and LQ identify an increase in dissimilarity between 2011 and 2021 across all indicators. The Location Quotients reveal a severe overrepresentation of people with lower social status in the West, outlining the LHE as a site of gradual social decline, with an increasingly higher proportion of social assistance and unemployment insurance recipients. Nevertheless, as identified in the methodological limitations, the aspatial nature of the LQ could have contributed to an over-prediction of the quotients, as population density was not considered.

These results provide evidence of segregation between unemployment beneficiaries and employed persons in Leipzig and increasing levels of dissimilarity across the other social variables. Literature around segregation postulates that the effects of shrinkage, such as selective out-migration, and the consequent strategies by cities to reduce shrinkage, often lead to increased socio-spatial problems (Florentin, 2010). The economic transformations of post-socialism triggered vast unemployment and high vacancy rates in Leipzig, and whilst the absolute value of unemployment has now decreased, the distribution of unemployed persons remains uneven throughout the city. Housing oversupply in Leipzig may have helped reduce segregation, by keeping rental prices low at the upper end of the housing market, allowing lower-income households to remain in affluent areas (Nuissl et al., 2005). However, the literature more widely argues that increased residential mobility aggravates the social polarisation of the most disadvantaged people, such as those on unemployment benefits, trapping them in the least attractive parts of the city (Nuissl et al., 2005; Kovacs and Herfert, 2012). Furthermore, increasing rental prices following demolitions and regeneration to tackle shrinkage, meant any social mix was short-lived, explaining the increasing segregation identified in the results. These findings validate the hypothesis by Harth et al. (1998), outlined in the literature review, which postulated that gentrification, and the resultant displacement of lower-income, elderly residents in favour of younger residents would result in social stratification by age. This pattern is emerging in Leipzig, with elderly residents clustering in less desirable areas, while younger groups remain in wealthier inner-city regions.

Therefore, these findings, supported by the wider literature, provide sufficient evidence to conclude that patterns of socio-spatial segregation have developed in Leipzig, however, the

Figure 8 *- Maps to show Location Quotients for unemployment beneficiaries and elderly people in 2021 (Source: Author's own, Data Source: City of Leipzig (2023))*



attribution of this to shrinkage is slightly more complex, and will be discussed in later sections.

4.5 Correlation Coefficients

Spearman's Rank (ρ) was calculated to establish the relationship between each Location Quotient and housing vacancy rates. As the results show in Table 3, a statistically significant positive correlation was observed between the LQ of unemployment insurance beneficiaries and vacancies in 2011. This demonstrates the grouping of more deprived households in neighbourhoods most affected by shrinkage. Despite this, for 2011, no correlation was found between the other LQs and vacancies. A statistically significant yet moderate correlation was found with SGB (II) recipients in 2021, suggesting a positive relationship between neighbourhoods with overrepresentations of SGB recipients and high vacancies.

Table 3 - *Correlation Coefficients (Spearman's Rank (ρ), *p<0.05, **p<0.01) Source: Author's Own, Data Source: City of Leipzig (2023))*

Variable	Vacancy Rate 2011	Vacancy Rate 2021
LQ of Persons over 65 years	-0.192	0.064
LQ of Unemployment Insurance Beneficiaries	0.718**	-0.015
LQ of SGB (II) Recipients	0.160	0.324**

The strong correlation in 2011 highlights that unemployment insurance recipients were still highly concentrated in areas characterised by the consequences of urban shrinkage. This result is supported by other research, as Huntington (2021) established a positive correlation between welfare recipients and housing oversupply in Schwerin. Additionally, there was a weak positive relationship between SGB (II) recipients and vacancies in 2021, compared to none in 2011, suggesting this group is becoming increasingly concentrated in areas with higher dereliction rates, due to cheap rents in affected neighbourhoods. The absence of a correlation between the LQ of elderly persons and shrinkage is supported by literature that recognises Grünau's elderly population as a key factor in maintaining the LHE's social stability (Grossmann et al., 2017), as will be elaborated in the discussion section. Hence, the areas displaying the worst impacts of shrinkage, do not exhibit large concentrations of elderly people.

Following the massive decrease in housing vacancies, due to demolitions and revitalisation strategies such as Stadtumbau Ost, the correlation calculations for unemployment beneficiaries in 2021 displayed no significant relationship. This highlights Leipzig's success in alleviating the city's primary manifestation of shrinkage, emphasised in literature as housing oversupply (Grossmann et al., 2015). Nonetheless, high rates of socially deprived persons were still observed in the LHE, and this is expected to increase as elderly populations decline (Harth et al., 1998), indicating that future research must go beyond explanations of the housing market to justify these growing socio-economic disparities.

Chapter 5: Discussion

5.1 Evidence of social decline

This section synthesises arguments in the wider literature around the socio-economic development of LHEs, compared with the observations in Leipzig-Grünau, to address the final RQ. There are two main findings that point towards a slight decline in the socio-economic composition of the estate: firstly, the dramatic ageing experienced in the LHE; and secondly, the rising disparities between the LHE and the rest of the city.

Ageing presents a challenge for the future social mix of Grünau, as declining elderly populations could facilitate the influx of households with lower social status (Harth et al., 1998). Additionally, it is argued that the elderly population of Grünau, who are mainly first-wave residents, are the cause of social stability in the estate, therefore, with their decline comes the inevitable decay of the estate, as will be elaborated on later (Grossmann et al., 2017). Furthermore, Harth et al. (1998), predicted social stratification by age due to gentrification in post-socialist contexts, which is also observed in the results of this study, through the overrepresentation of elderly persons in certain districts in Grünau.

Moreover, the persistent negative migration balance in Grünau in 2001, as well as the higher out-migration and vacancy rates in 2011, illustrate the estate's delayed resurgence relative to the city. Internal migration to West Germany, triggered by reunification, formed a positive feedback loop, whereby population decline created proliferate housing vacancies. This in turn exacerbated out-migration, due to the unattractive nature of dereliction, particularly in vulnerable areas such as LHEs (Grossmann et al., 2017). Out-migration from Grünau was

particularly exaggerated, as many of its working-age population left in search of employment following the closure of the Plagwitz industrial complex (Bontje, 2004).

Furthermore, after the fall of socialism, the incursion of western perceptions of LHEs led to their increased stigmatisation. Western political voices denounced LHEs as a symbol of the socialist regime, contributing to their neglect in urban planning and regeneration schemes (Kabisch and Pössneck, 2022). Thereby contributing to the formation of new patterns of social polarisation (Haase et al., 2016), as corroborated by the increasing segregation identified in the results. The delayed emergence of these socio-spatial disparities is supported by literature, as socio-economic changes can be slow to materialise in cities' social structures, particularly when preceded by a long period of transformations, as evident with Leipzig's shrinkage (Huntington, 2021).

Finally, privatisation, a key component of the post-socialist transition, is highlighted in literature as a contributor to LHE decline. Kovacs and Herfert (2012) examined different housing estates in CEE, noting that, initially, privatisation offered residential stability and reduced turnover. However, in Leipzig's rental-dominated market, the privatisation of housing cooperatives contributed to social polarisation (Rink, 2022). By allowing profit-driven companies to accumulate housing stock, the municipality's provision of affordable housing was reduced, subsequently concentrating households of low social status in declining areas where social housing remained (Kabisch and Pössneck, 2022). In Leipzig, municipal stock declined by around 100,000 flats, through demolitions and privatisation, and the remaining stock is largely in Grünau, explaining the higher concentration of socio-economically deprived groups there (Rink, 2022).

In summation, there are several explanations for the observed decline in the LHE, supported by the wider literature. Notably, socio-spatial disparities exist due to stigmatisation and the resultant neglect of LHEs in policy, as well as the lasting implications of capitalist privatisation schemes following reunification.

5.2 Narratives of Persistence

Whilst there is evidence pointing to a gradual social decline of the Leipzig-Grünau housing estate, literature also contends for its endurance, particularly in comparison to other LHEs in CEE. This relative persistence is supported by the results, noticeably, the low crime rate, and

stability in population across the LHE, as well as the underrepresentation of unemployment and SGB beneficiaries in some districts, such as Grünau-Siedlung.

Scholars emphasise that social stability is maintained by the sense of belonging and satisfaction felt by residents in Eastern European LHEs (Kovacs and Herfert, 2012). In Grünau, this security is retained by the first wave of residents, who were mainly middle-class, ageing with the estate (Grossmann et al., 2017). Although this type of stability is not viable in the long-term, the place attachment of these residents explains the social mix that continues in some parts of the LHE, where there are lower numbers of unemployment and welfare beneficiaries, but an ageing population, like in Grünau-Siedlung and Grünau-Ost.

Additionally, it is postulated that the extent of shrinkage experienced in Leipzig enabled some social mix to be maintained in Grünau. Low rental prices at the height of oversupply, meant there was no huge displacement in other parts of the city, so Grünau saw no sudden influx of low-income residents into social housing. Instead, this process was more gradual, preventing a total decline of the estate (Grossmann et al., 2017). Equally, the supply of good quality, inexpensive social housing, has maintained the estate's popularity as a stepping stone into the housing market (Kovacs and Herfert, 2012).

Finally, successful policy responses facilitated the resilience of Leipzig-Grünau compared to LHEs in other post-socialist cities. Kovacs and Herfert (2012) exemplify other CEE estates that did not have the resources to carry out renovations, for example, Havanna in Budapest, which has maintained a poor-quality living environment due to a lack of investment. Contrastingly, strategies such as 'Stadtumbau Ost' and 'Soziale Stadt' in Leipzig, concentrated on neighbourhoods affected by poor social status and low-quality housing, thus, facilitating a reduction in stigmatisation, and increasing social integration in the LHE (Cortese et al., 2014).

5.3 Spatial Fragmentation

Despite a significant difference in the concentrations of welfare recipients and elderly groups between Grünau and the rest of the city, there are also notable variations *within* the estate. The previous two sections highlight how narratives of decline and persistence circulate the LHE. Conversely, this section argues that there is sufficient evidence supporting an increase in social differentiation within the estate, a conclusion also reached by Grossmann et al. (2017). For a more detailed analysis, Figure 9 outlines the Housing Complexes (HCs) into which the Grünau estate is divided.

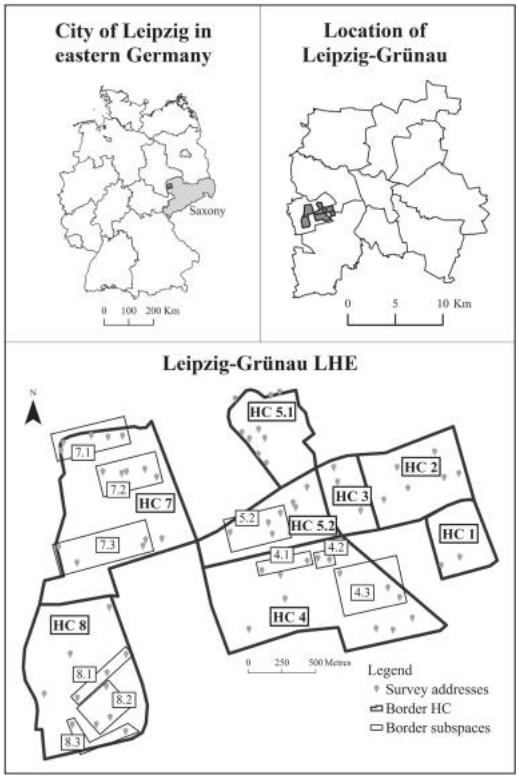


Figure 9 - *Location of Leipzig in Germany (top left), location of the Leipzig-Grünau housing estate (top right), map of the housing estate with 8 HCs (Source: Kabisch and Pössneck, 2022)*

Grünau-Mitte, identified in the results as a more socially deprived district, exhibits a low birth-death ratio, lower income, and a high unemployment rate. The district contains HCs 4 and 5.2, both newer HCs, characterised by larger, predominantly un-refurbished buildings reaching up to 11 stories (City of Leipzig, 2018). Grossmann et al. (2017) note that the newer HCs, constructed in the 1980s to a lower standard, accommodate residents with a lower social status compared to those in the older HCs, located in Grünau-Ost and Schönau. Furthermore, strategic planning strategies by cooperatives privatised after reunification concentrated

renovations and demolitions only in specific parts of the housing estate, further contributing to social fragmentation between HCs. For instance, HC 5.1 was replaced with single-family homes to attract wealthier families (Grossmann et al., 2017: 154), while social housing carried the burden of demolitions (Rink, 2022). Lelevrier (2021) highlights the problematic nature of such strategies, enabling social polarisation, as affordable housing is demolished in favour of more expensive options, pushing socio-economically deprived households into less desirable locations within the housing estate or elsewhere. This polarisation contributes to the stigmatisation of certain HCs, exacerbating their social decline, as seen in HC 4 in Grünau-Mitte.

Local-level differentiation is often overlooked when conducting large-scale spatial analyses; however, this dissertation's result aligns with literature theorising shrinking and 'shrunken' cities as 'bipolar', marked by both development and decay (Rink et al., 2012: 174). This highlights the significance of theorising the multifaceted manifestations of shrinkage and regrowth, as the outcome is often a complex intersection of persistence and decline, as evident in the Grünau LHE (Haase et al., 2016). Therefore, addressing RQ3, this dissertation concludes that there is evidence of a gradual deterioration in the socio-economic fabric of the LHE however, this has manifested as spatial perforation, rather than uniform decline.

5.4 Future recommendations

In urban planning literature, East Germany is frequently commended for its shift from a growth focus towards embracing shrinkage (Wiechmann and Pallagst, 2012). This kind of future planning is rare, as many cities, particularly in the West, continue to plan based on economic or population growth. Hence, Leipzig's approach to shrinkage, particularly its emphasis on refurbishing or demolishing underused housing instead of constructing costly new buildings, should serve as a blueprint for other shrinking (or shrunken) cities (Rieniets, 2009). This section will explore how the findings of this research could influence future policy and urban planning initiatives.

As outlined previously, the ageing population in Grünau poses forthcoming challenges for the estate's social fabric. Furthermore, this thesis has revealed developing social segregation in Leipzig, highlighted through the fragmentation of Leipzig-Grünau, thus requiring innovative planning solutions. Cortese et al. (2014) advocate for a multidimensional approach to 'social cohesion', promoting place attachment, civic involvement, and the cultivation of social

capital among residents to counteract social exclusion and segregation. Similarly, Matyushkina (2023) illustrates how culture-led regeneration, through the mobilisation of local knowledge in Riga, Latvia, encouraged participation, and reduced stigmatisation, promoting a stronger identity in socially deprived areas. Hence, a similar strategy could be effective, to replicate the social mix established by the satisfaction of ageing residents in Grünau (Grossmann et al., 2017).

Therefore, based on these findings and previous literature, a civil society approach is recommended, employing an intersectional lens to respond to the multiple dimensions of segregation and shrinkage (Haase et al., 2016). To address this, municipal funds should be directed into regenerating lower-quality HCs, as found in Grünau-Mitte, while ensuring social housing remains affordable under municipal ownership. Additionally, allocating funds to provide more affordable housing options across the city will help prevent the concentration of deprived groups in specific neighbourhoods, such as Leipzig-Grünau, reducing the LHE's stigmatisation.

5.5 Reflections

As East German cities globalise, a convergence in the trajectories of segregation and socio-economic development with the West becomes more apparent, especially as the period since reunification grows longer. Natural population decline, evident across Germany, is underscored by Wiechmann and Pallagst as the "uncoupling of economic wealth and population growth in Europe" (2012: 264). With more Europeans opting out of traditional family lifestyles, the effects of population shrinkage are increasingly intertwined with factors not exclusive to post-socialism.

Additionally, the lack of correlation between the LQs of unemployment beneficiaries and the direct consequences of shrinkage in 2021, signals the decoupling of the two. Due to constraints in the data available, other factors, such as ethnicity, or race, could not be investigated. These, along with class-related influences such as occupation, could be continuing the social differentiation brought about by shrinkage, as observed in US cities (Beauregard and Halia, 2000). Therefore, an expansion of this research project would be beneficial to establish a more detailed comparison of the trajectories of development between the East and West. Hence, a continuation of this investigation could explore the relationship between social polarisation and additional factors, to determine whether residential

segregation has been sustained by other socio-economic or demographic variables. Employing a longitudinal qualitative analysis or a case study approach, would be effective in highlighting new causal patterns and intersectional dynamics of socio-spatial differentiation. This could be done by incorporating interviews or surveys with residents and urban planners, to shape urban planning responses.

Chapter 6: Conclusion

In summary, this dissertation has revealed the multifaceted consequences of the post-socialist transition on the socio-economic dynamics of Leipzig. Despite the city's successful transition towards regrowth, the enduring effect of population decline on its socio-demographic structure highlights the complexity of urban development in a post-socialist context. The results have spotlighted the long-term impacts of shrinkage and its complex dynamics with regrowth, resulting in the creation of a 'bipolar' city in the case of Leipzig (Rink et al., 2012). The findings also demonstrate a significant shift in demography towards an ageing population, which is especially pronounced in the LHE. The conclusion of this research, emphasises the housing estate as a site of socio-economic fragmentation, accentuated through the emergence of socio-spatial segregation between districts within the estate.

Despite the relative successes of policy and resurgence in Leipzig, the persisting spatial disparities indicate that the root causes have evolved outside the legacies of shrinkage, becoming ingrained in the city's urban fabric, illustrating the need for a nuanced, context-specific, and intersectional approach to shrinkage response and policymaking. This necessitates further investigation into the relationship between increased residential segregation and other causal variables, beyond shrinkage and the housing market. Therefore, building on literature around social cohesion, this dissertation advocates for a participatory approach to urban policy, directing strategies at the most vulnerable neighbourhoods, and reducing their stigmatisation and socio-spatial fragmentation.

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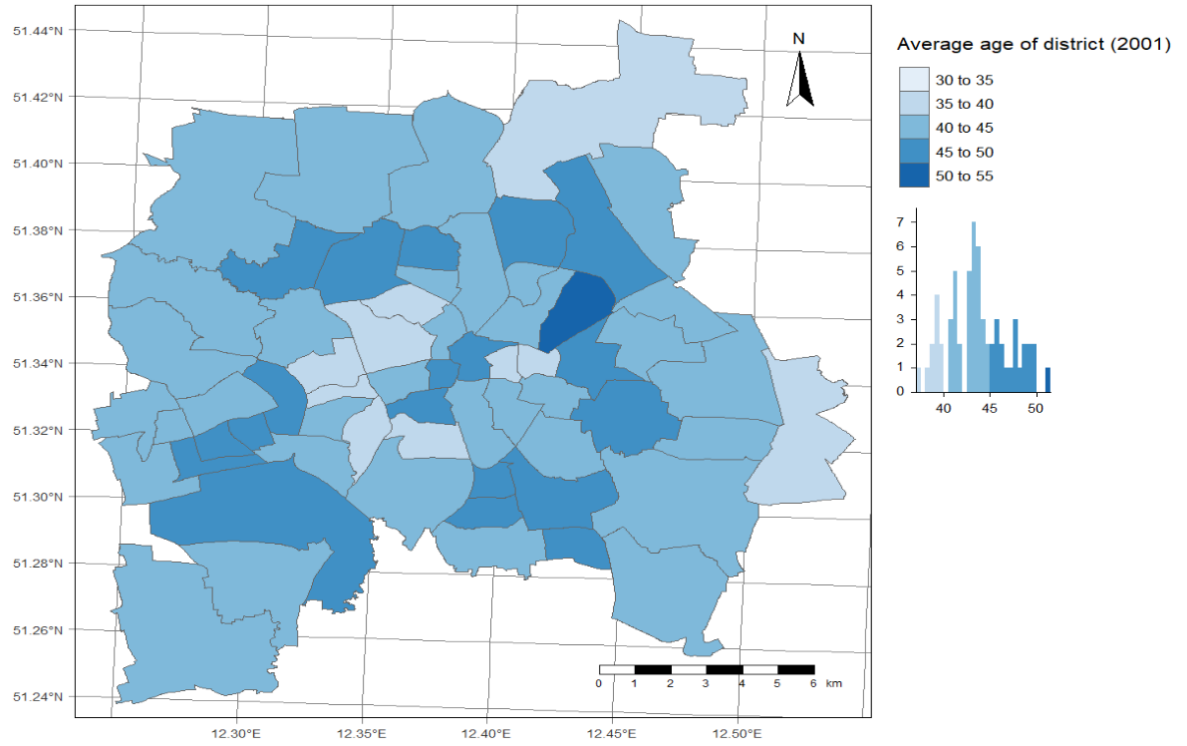
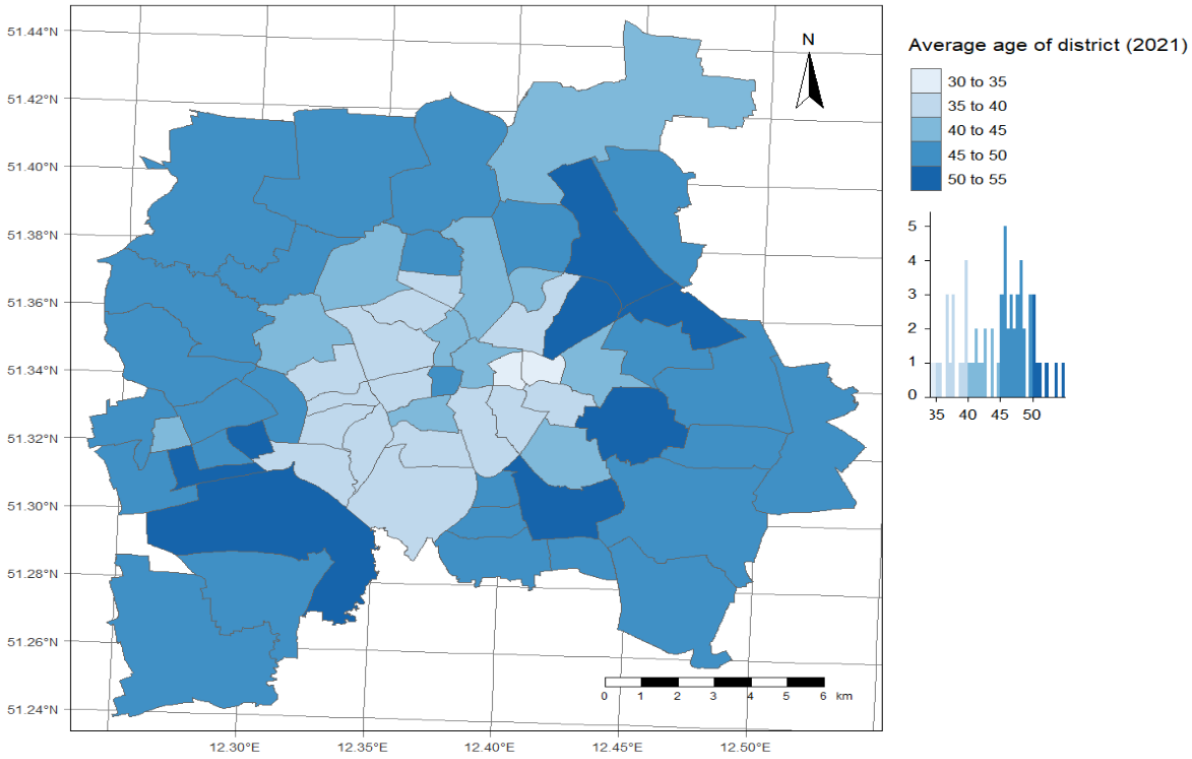
Appendix

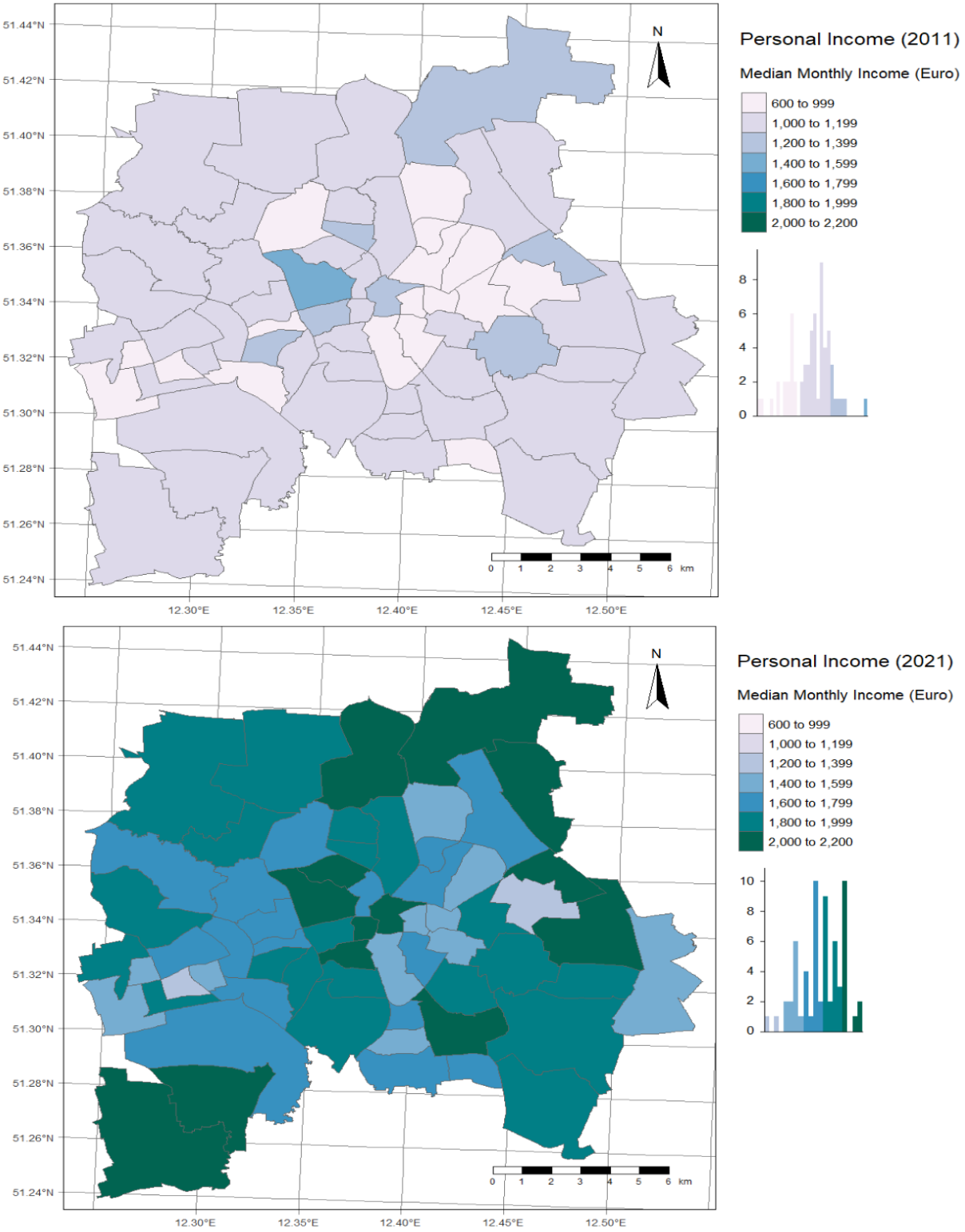
Appendix A – Map of Leipzig's districts and city-districts. Source: Stadt Leipzig (2024), Amt für Statistik und Wahlen

Appendix B – Maps depicting the average age of districts**.** Source: Authors own, Data Source: City of Leipzig (2023), Bürgerservice Leipzig (Einwohnermelderegister) (Residents' Register).

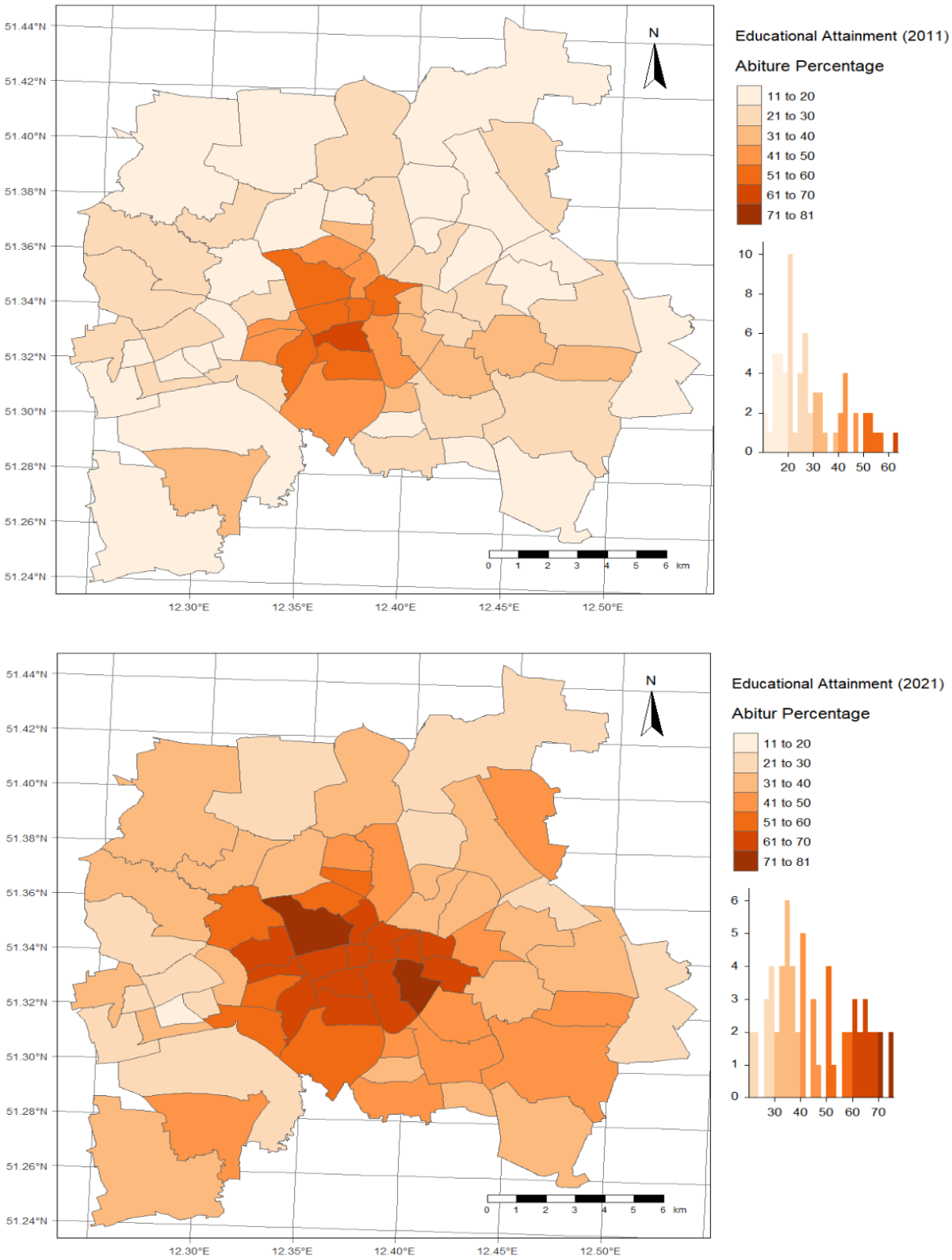




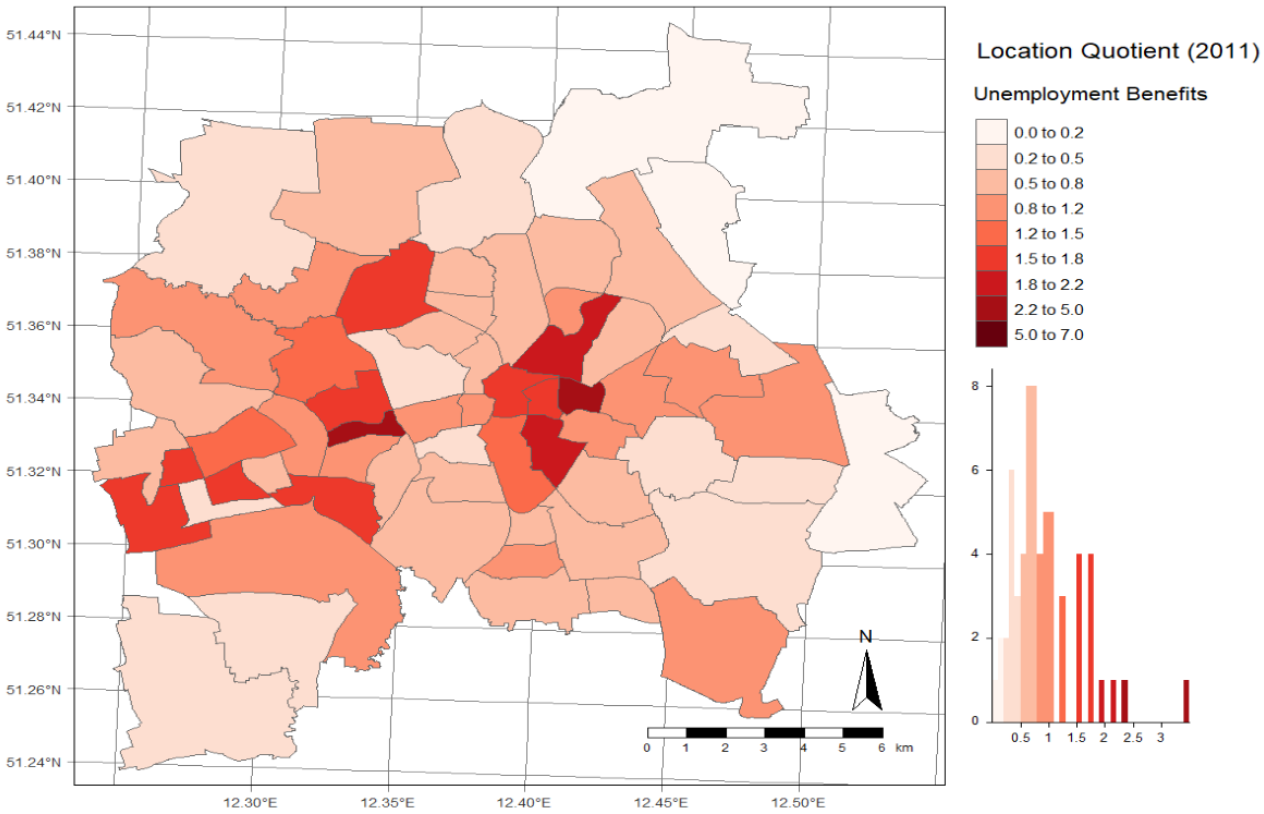
Appendix C – Maps to show the median monthly personal income by district. Source: Authors own, Data Source: City of Leipzig (2023) Office for Statistics and Elections, Municipal Citizen Survey,



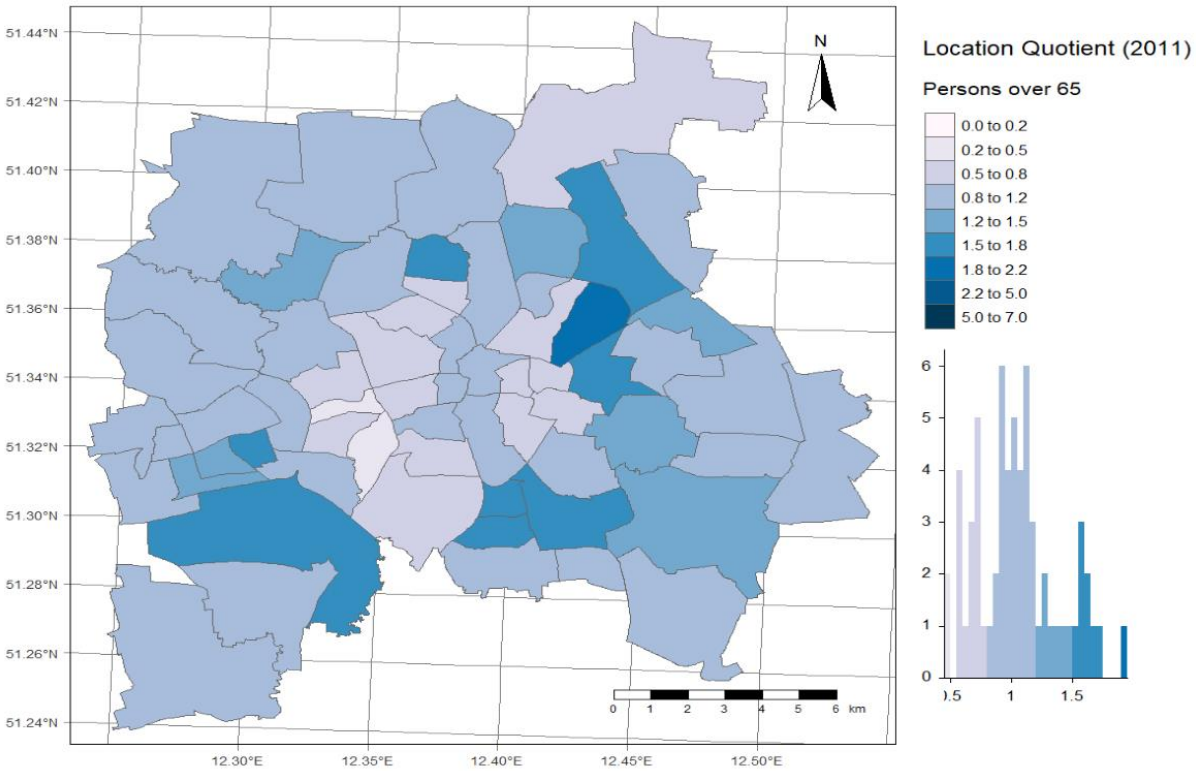
Appendix D– Maps to show Higher Education Percentage by district Source: Author's Own, Data Source; City of Leipzig (2023)



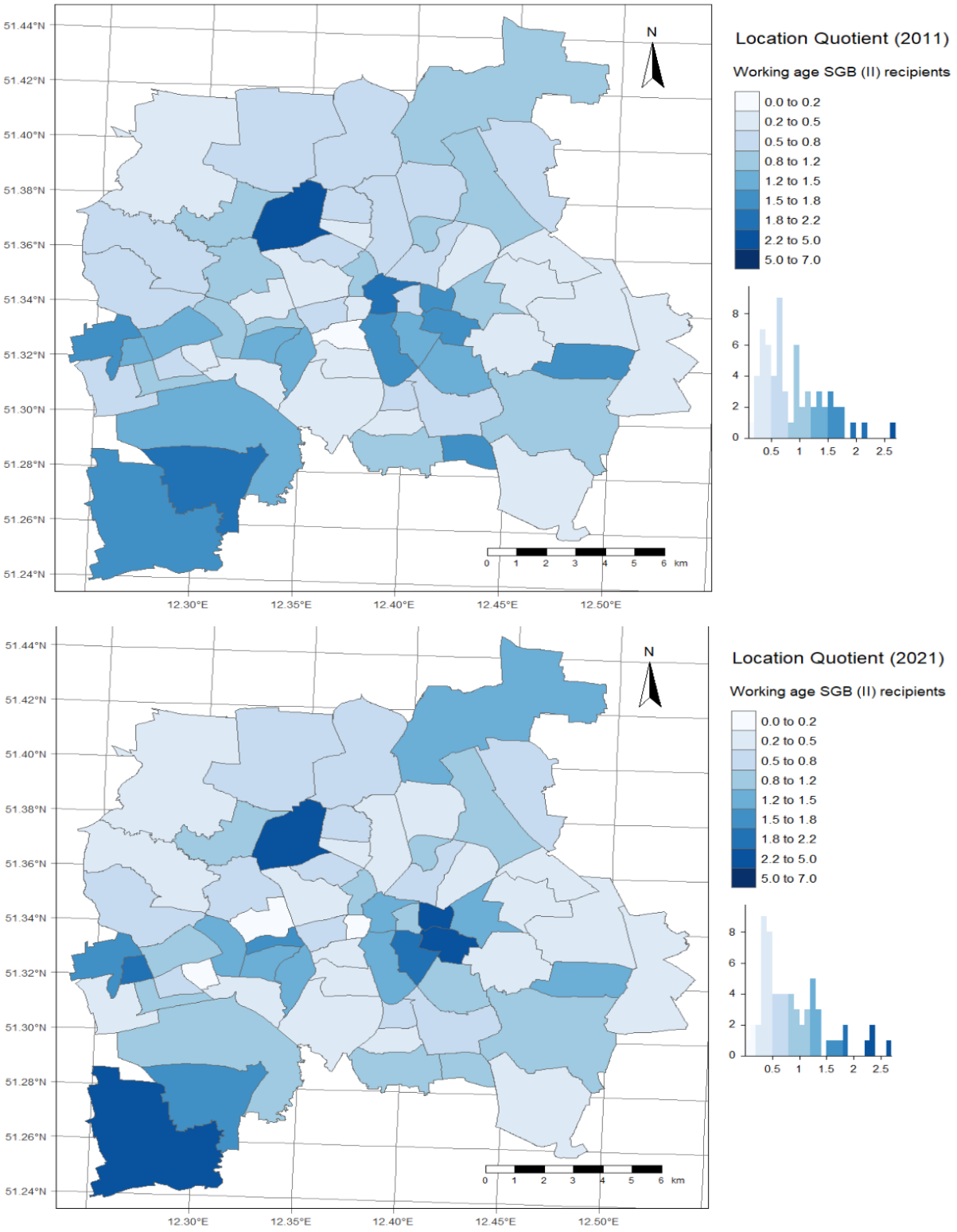
Appendix E-Map of LQ of unemployment beneficiaries (2011) Source: Author's Own calculations, Data Source: City of Leipzig (2023) Office for Statistics and Elections, Municipal Citizen Survey,



Appendix F– Map to show LQ of elderly persons (2011) Source: Author's Own Calculations, Data Source: City of Leipzig (2023) Statistics of the Federal Employment Agency.



Appendix G – Maps to show the LQ for SGB (II) recipients (2011, 2021) - Source: Author's Own Calculations, Data Source: City of Leipzig (2023) Statistics of the Federal Employment Agency



University of Bristol Research Ethics Application

Investigator information

Application Submitter Details

Title

Miss

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Faculty

Science

School / Department / Centre

School of Geographical Sciences

Are you a student submitting this ethics application as part of your degree qualification?

Yes

Please declare your level of study

Undergraduate

Supervisor Contact Details

Title

Ms

First Name

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Basu

Department

Human Geography

Faculty

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Are you an academic member of staff submitting an ethics application on behalf of a student(s) as part of their degree qualification?

No

Supervisor Details (if external to the University of Bristol)

Please provide their name, organisation details, email address and telephone number.

Please provide details of any other researchers/collaborators involved in the study.

Are you submitting this ethics application on behalf of another researcher?

No

Ethics Committee Review

Has or will your research be submitted to another research ethics committee for research involving human participants, their tissue and or data?

- ☐ Yes
- ☑ No

Important Information - Please note:

It is extremely important that you select the **correct Research Ethics Committee (REC)** to review your research ethics application.

The REC selected, will determine the questions you are asked to complete on this online form and the research ethics committee that will review your research ethics application.

Please note, if you select the incorrect ethics committee, this may delay the review of your ethics application as your ethics application will need to be returned to you so that you can select the correct REC and complete the relevant questions on the online form.

If you are unsure of the correct research ethics committee to select please contact research-ethics@bristol.ac.uk

Please select the Research Ethics Committee (REC) to review your research ethics application:

School of Geographical Sciences Research Ethics Committee

To proceed to the next page select 'Next' in the Actions tiles.

To save your application for completion and submission at a later date please select 'Save' in the Actions tiles.

Brief study outline

Brief Project Outline (up to approximately 300 words in plain English)

My dissertation will look at the changing dynamics of shrinking cities, through the context of a post-socialist city in former East Germany: Leipzig. After the collapse of the Soviet Union, cities in East Germany experienced vast changes, due to their rapid assimilation into the capitalist market economy, opening the industry to global competitive markets, and exposing the vulnerabilities left behind by the socialist leadership. Subsequently, cities in East Germany experienced population decline, due to out-migration into West Germany and falling birth rates. This, along with rapid deindustrialisation, left a vast number of vacant dwellings and decaying infrastructure, characterising cities such as Leipzig as 'schrumpfende Stadte' (shrinking cities).

The aim of this dissertation is to outline the root causes of this shrinkage, and then analyse urban planning initiatives that have been implemented by local administrations and policymakers. I will be particularly focussing on the implications of housing oversupply, how this affected social cohesion and residential segregation, and the ways in which policy has been applied to tackle this multidimensional issue. Leipzig is an example of a city that has managed to turn around this shrinkage, so I will be reviewing the approaches that stabilised the economy and allowed the city to evolve towards a regrowth of population.

The main methods I will use include a site visit, interviews with policymakers and urban planners, and a review of past literature on the topic.

To proceed to the next page select 'Next' in the Actions tiles.

To save your application for completion and submission at a later date please select 'Save' in the Actions tiles.

Checklist questions

Checklist Questions Does your research involve any of the following? Tick all that apply

The following list is the standard University Checklist of common areas of ethical concern. If your research involves any of these issues you must ensure that you expand upon them in the sections that follow and if you are an inexperienced researcher (undergraduate/ taught masters) you are unlikely to receive a favourable ethical opinion.

☐ Participants who are particularly vulnerable or unable to give informed consent

* Examples of vulnerable participants are children, people with learning difficulties, patients, people experiencing emotional distress or mental illness, people living in care or nursing homes, and people recruited through self-help groups, participants in a dependent or unequal relationship with the researcher(s) or research supervisor.

☐ Participants to take part without their knowledge and consent at the time

* Examples include the covert observation of people or incidental recording of others.

☐ Actively deceiving participants

* Examples include deliberately falsely informing participants, withholding information from participants or misleading participants in such a way that they are likely to object or show unease when debriefed about the study.

☐ Discussion or collection of information on sensitive topics or considered special category status under GDPR

* Special Category Status under GDPR include:

- personal data revealing racial or ethnic origin;
- personal data revealing political opinions;
- personal data revealing religious or philosophical beliefs;
- personal data revealing trade union membership;
- genetic data;
- biometric data (where used for identification purposes);
- data concerning health;
- data concerning a person's sex life;
- and data concerning a person's sexual orientation.

If the research is in relation to any of the sensitive topics listed then the legal issue requiring such scrutiny in such cases that 'explicit consent' must be obtained and the consenting process reviewed by the ethics committee

☐ Invasive procedures

* Invasive procedures may include:

- Administration of drugs placebos:
- Other substances (e.g., drinks, foods, food or drink constituents, dietary supplements) to study participants;
- Biological samples from participants be obtained;
- Pain or more than mild discomfort likely to result from the study.

☐ Scans (e.g. MR, CT, PET) or x-rays of research participants

☐ Photographs, videoing, recording or similar of research participants without their consent

☐ Financial inducement (other than reasonable expenses and compensation for time)

☐ The use or storage of information about living people whose personal identity could be discovered from that information

☐ Funds received from politically or culturally sensitive funding sources

*Examples include the defence sector, projects with potential environmental effects and other internationally regulated or protected industries. For more information, please follow the link to the 'Research Governance and Integrity Policy'

☑ None of the above

To proceed to the next page select 'Next' in the Actions tiles

To save your application for completion and submission at a later date please select 'Save' in the Actions tiles.

Study design and background

Geographical Sciences Ethics Application Form

All dissertation projects require a completed, reviewed and approved ethics application. In order for your research ethics application to be reviewed by your supervisor and Geography's Ethics Committee, you must complete all elements of the form and ensure that all relevant documentation has been uploaded.

Is this a multi-stage ethics application? (eg Are you seeking ethics approval for an initial stage of your project and will seek further approvals when required.)

- ☐ Yes
- ☑ No

Methods - Tick any of the methods you are proposing to carry out. Tick all that apply.

- ☑ Methods that involve human participants
- ☑ Archival methods and/or qualitative secondary data e.g. text or images
- ☑ Analysis of quantitative secondary data
- ☑ Numerical modelling
- ☑ Field and/or laboratory work

Please select the method of data collection relevant to your research. Tick all that apply

- ☐ Questionnaire / Survey method
- ☑ Interviews method
- ☐ Focus group discussion
- ☐ Other (Please specify)

Who will be recruited to participate in the interview?

Policy makers and Urban planners in Leipzig, with knowledge of any projects and social housing policies aimed to tackle social cohesion and dereliction in the city. In addition, I aim to interview development practitioners that could provide me with a more macro-policy angle to the issue of shrinking cities.

How many participants will be recruited to take part in an interview? Provide justification for the sample size.

I will be completing key informant interviews with a sample size of less than 10. The aim is to carry out in-depth interviews, hence I plan on keeping the sample size small.

How will the participants be identified and recruited to take part in the interviews?

I will be contacting participants via email.

How will you ensure that your participants invited to interview are neither vulnerable nor under the age of 18?

I will only be interviewing adults who are involved in policy or urban planning, as this would require experience none of the participants will be under the age of 18.

How will you conduct your interview(s)?

Online

Online - Please provide details of the online platform and if any research permissions are required:

Microsoft Teams

Copy and paste the text of all your interview recruitment material here:

Dear [Policy Maker's Name],
I hope this email finds you well. My name is Clara Hinde, and I am a dedicated undergraduate student pursuing a degree in Geography (BSc) at the University of Bristol, England.
My dissertation title is: "Shrinking cities: a case study of Leipzig in a post-reunification context", which will focus on urban shrinkage in Leipzig, and the implications of this for social cohesion in the city. I intend to focus on social housing policy initiatives that alleviated the effects of housing vacancies and residential segregation exacerbated by the population shrinkage.

As someone who has been deeply involved in shaping policies and making decisions that affect the community in Leipzig, your experience and perspective would be invaluable for my study.

I would like to invite you to participate in an interview as part of my research. The interview will be conducted in a manner that is convenient for you, via Microsoft Teams. The interview process is expected to take approximately 45 minutes.

If you are interested in participating or require more information about my study, please do not hesitate to contact me at lq21965@bristol.ac.uk.
Thank you for taking the time to read my email, and I look forward to the possibility of working together on this exciting project. Your input will be invaluable, and I am eager to hear your insights on the policies that impact Leipzig.

Sincerely,
Clara Hinde
School of Geographical Sciences, University of Bristol
Lq21965@bristol.ac.uk

Please provide any recruitment material used to recruit potential participants to take part in your interview.

Copy and paste the Participant Information Sheet (PIS) wording for your interviews here:

I would like to invite you to take part in my undergraduate dissertation research project. Before deciding to participate, please read this information sheet, to understand the purpose of this research and what is involved with participation. After you have had 48 hours to read this information sheet, I will send you the consent form. Please feel comfortable asking any questions if you would like more information or are unclear about aspects of the process.
WHO AM I AND WHAT IS THE PURPOSE OF THIS PROJECT?
I am a geography Student from the University of Bristol in the United Kingdom, currently working on my UG dissertation.
This research project aims to explore the challenges and opportunities of urban shrinkage within the city of Leipzig, in the context of East German as a post-socialist state. I am interested in processes of urban decay because of population decline and how urban planning and policy has been implemented to alleviate the effects of this and reduce out-migration.
WHY HAVE YOU BEEN SELECTED TO TAKE PART?
As you are a person who has experience in this topic area, and therefore would hopefully have an insight into urban projects in Leipzig that would benefit my research.
DO YOU HAVE TO TAKE PART?
Participation is voluntary, and you are free to withdraw at any time without providing a reason and any material will immediately be deleted/destroyed.
WHAT WILL TAKING PART INVOLVE?
The format of the research is an interview. This involves open-ended questions designed to lead to conversation and discussion. I am looking for insight of your experience, rather than directing you to a specific response. The interviews of around 45 minutes will take place via Microsoft Teams, whereby an invite will be sent to you.
HOW WILL THE INTERVIEWS BE RECORDED?
I will record the audio for the purpose of writing a transcript of the interview. As soon as the audio recordings are converted to written transcripts the audio will be deleted, this will be within 7 days of the interview. Quotes from the interview will be analysed in my project to present perspectives on urban planning and policy making.
WILL I HAVE AN OPPORTUNITY TO VIEW THE TRANSCRIPTS?
On request I will email you a copy of the transcript within 72 hours of completing the interview. You will have the opportunity to check for any factual or transcription errors should you wish. If you wish to make a modification to the quote, a record of this will be made in the appendix of the dissertation. You may also request a summary of project results. If you would like to do so, the consent form requests permission to keep your contact details for longer, until after the analysis is complete. When the summary has been sent to you, your contact details will be deleted.
HOW IS CONFIDENTIALITY MAINTAINED?
Names will be anonymized and any details that might identify participants, such as job titles will not be included in the project, to avoid identifying details of participants. The transcripts will refer to participants using an anonymised code. The key for this code will be secured as a hard copy in a separate location from the data to enhance security.
WHAT HAPPENS AT THE END OF THE PROJECT?
The data from the anonymised transcripts will be deleted once the project is complete.
WHAT ARE BENEFITS OF TAKING PART?
While there are no immediate benefits or rewards for participation, your insight and personal experience provides an opportunity for others to learn more about the topic.
WHAT ARE THE RISKS OF TAKING PART?
It is not anticipated that participating will cause disadvantages or discomfort. If at any point the questions make you feel uncomfortable, you may withdraw at any time without giving a reason.
If you wish to make a complaint or raise any concern about the ethics of this research project, please contact me or the School of Geographical Sciences Ethics Committee (geog-ethics@bristol.ac.uk:).
Thank you very much for your time.

Upload copies of all Participant Information Sheets (PIS) for your interviews

Documents

Type	Document Name	File Name	Version Date	Version	Size
Participant Information Sheet	Participant info form template	Participant info form template .docx	25/10/2023	1	180.3 KB

Clearly outline how informed consent will be obtained from all participants prior to individuals taking part in your interviews?

Stakeholders will be identified through reviewing administrations that have played a part in social or housing policy within the city, for example policy thinktanks or the ministry of housing in Leipzig, and contacting them via email to establish interest. I will also be using snowballing techniques through contacts that I already have in institutions within Leipzig.
I will be contacting participants through email to establish their interest and send them the consent forms. I will also confirm their consent at the start of the interview and clarify that they are welcome to withdraw at any point during the process.

Copy and paste the consent form wording for your interviews here:

1. I confirm that I have read the information sheet dated..... for the investigation. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and that all material will be destroyed/deleted.
3. I agree to the interview being audio-recorded.
4. I understand that information I provide will be treated confidentially.
5. I wish to have the opportunity to check the transcript for any factual or transcription errors. I understand that if I wish to qualify the transcript that this will be recorded in an appendix to the Dissertation.
6. I agree to take part in this research project.
7. I wish to receive a summary of the research and agree to my contact details being retained until this point.

Upload copies the blank consent forms you will use for your interviews

Documents

Type	Document Name	File Name	Version Date	Version	Size
Consent Form	Consent form template	Consent form template .docx			178.3 KB

What is the copyright status of the information/image/data you will use?

All the information/images/data I plan to use is open access e.g. Creative Commons

Specify what data you will be using and why no copyright restrictions for its use exists. Provide the URL to substantiate this where appropriate.

I will be using mainly census data and data from journal articles that are accessible on the public domain and therefore do not require any copyright permissions. I will be capturing my own images on the field visit so will not be using any images that could be copyright.

What is the copyright status of the information/image/data you will use?

All the information/images/data I plan to use is open access e.g. Creative Commons

Specify what data you will be using and why no copyright restrictions for its use exists. Provide the URL to substantiate this where appropriate.

I will be using mainly newspaper articles, journal articles and websites that are accessible on the public domain and therefore do not require any copyright permissions. I will be capturing my own images on the field visit so will not be using any images that could be copyright.

Is the dataset you are using about people e.g. census datasets?

Yes

Please clarify if you are using the following datasets (tick all that apply):

- [x] Fully anonymised dataset
- [ ] Participant identifiable dataset
- [ ] Anonymised dataset, but when linked with other data sets could render the data identifiable
- [ ] Other (please specify)

What is the copyright status of the model/software you will use?

The model and/or software I plan to use is open access e.g. Creative Commons

Specify what model or software you will be using and why no copyright restrictions for its use exists. Provide the URL to substantiate this where appropriate.

Any numerical modelling will be completed through R studio software, which is available through university devices, and no copyright permissions are required.

List the field and/or laboratory methods you will undertake.

I will complete a site visit, which will include a transect walk in which I will take photos of areas of interest within the city and walk to sites of interest, recording my insights.

Please provide details of the location of any fieldwork and specify any access permissions required to carry out your research.

I will complete research within the city of Leipzig in Germany, but do not require any access permissions as all research will be carried out in public spaces.

Please upload copies of any access permissions received and upload any requests you have made to gain access.

Is this research funded?

No

Do you or your supervisor(s) have any actual or potential conflict of interest in this study?

No

Participant and Researcher Safety

Describe potential risks to **research participants** (physical, psychological, legal, social) arising from the research:

There will be no risks to research participants as I will not be discussing any topics that are of a sensitive nature.

Describe potential risks to the **researcher** (physical, psychological, legal, social) arising from the research:

There are potential risks to visiting a foreign city, for example, traffic accidents or being approached by strangers. However, this risk is mitigated as I am fluent in the local language and will make sure to stay alert and aware of my surroundings. I will also not be traveling alone, which enhances my safety.

Data management and information security

Will your participants be anonymised?

Yes

What arrangements have been put in place to ensure confidentiality and security of data gathered in the study? Will the data be stored in hard copy or electronically, and where will it be held? Will the codes to anonymity be held in a separate location from the data?

Please see research data management and open data policy for more guidance.

The data will be stored electronically, and all interview recordings will be deleted within a week of the interview. I will be storing all data safely on my University of Bristol OneDrive and will only be sending the interview transcripts to the participants upon request, no one else will receive the data or information acquired.

Research outputs

How will you offer participants the opportunity to be informed about the outcome of this study?

I will email them to ask whether they would like to receive the outcomes, and I will ask them during the interview if they would like to stay informed. If they choose to be updated, I will send them copies of their own interview transcripts after the interview.

How will the results of your study be disseminated?

It is unlikely that my results will be published on any public forums

Please outline how you will undertake this research with good research integrity principles in place.

I will clearly outline my research aims and questions and develop a clear research plan, this will allow me to keep on top of the research and remain in good research practice. I will also follow the ethics guidelines and update anything on the ethics form should I want to change my research methods or approaches. I will be sure to obtain consent from all participants and make it clear to them that they are welcome to withdraw at any point in the research process. I will protect the anonymity of my participants and ensure the data is safely stored to maintain their privacy and the confidentiality of their responses. In the data analysis stages I will maintain detailed records of the analytical process, allowing for transparency and potential replication, and I will avoid biases in my analysis. All references will be cited correctly to avoid plagiarism. I will adhere to any legal and ethical guidelines pertaining to copyright laws or data protection laws.

Supporting Information

Supporting information Please provide any additional information in relation to your study that you think may be relevant.

Any other information Please upload any other documents that you think may be relevant to your research. There is no limit to the number of documents you can upload.

To proceed to the next page select 'Next' in the Actions tiles.

To save your application for completion and submission at a later date please select 'Save' in the Actions tiles.

Signatures

Submission Declaration

- ☑ I confirm that my responses are complete and accurate.
- ☑ I understand that any errors or omissions may cause a delay in the processing of my application.

Supervisor Signature

Once you have completed your ethics form and uploaded all related documents ask your supervisor to review your ethics application by clicking this button.

Signed: This form was signed by Ms Ritwika Basu (ritwika.basu@bristol.ac.uk) on 07/11/2023 15:00