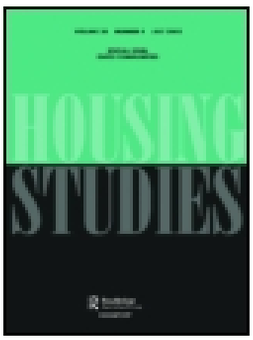

Housing Studies

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/chos20

Measuring residential satisfaction over time: results from a unique long-term study of a large housing estate

Sigrun Kabisch, Janine Poessneck, Max Soeding & Uwe Schlink

To cite this article: Sigrun Kabisch, Janine Poessneck, Max Soeding & Uwe Schlink (2021): Measuring residential satisfaction over time: results from a unique long-term study of a large housing estate, Housing Studies, DOI: 10.1080/02673037.2020.1867083

To link to this article: https://doi.org/10.1080/02673037.2020.1867083

HOUSING STUDIES
https://doi.org/10.1080/02673037.2020.1867083

Measuring residential satisfaction over time: results from a unique long-term study of a large housing estate

Sigrun Kabisch, Janine Poessneck, Max Soeding and Uwe Schlink

Department of Urban and Environmental Sociology, Helmholtz Centre for Environmental Research – UFZ, Leipzig, Germany

ABSTRACT

Although much knowledge and debates about residential satisfaction exist, there is little evidence regarding its fluid nature and its influencing factors. Therefore, we suggest an analytical framework to investigate the dynamics of residential satisfaction by using data from a unique long-term study. Many previous studies have generally examined residential satisfaction using cross-sectional data at one point in time. But long-term observations are indispensable for discovering changes and/or continuity over time. For our analysis we utilized data from a study that was carried out over four decades and involved ten questionnaires. The study looks at a large housing estate (LHE) in East Germany. Our results concerning satisfaction with the estate and the apartments show the continuously high impact of residential comfort and sound insulation, and the declining impact of apartment size. Beyond that, the results reflect the development of this estate and also exemplify the political turbulence that this housing segment faced in East Germany.

ARTICLE HISTORY
Received 30 August 2019
Accepted 16 December 2020

KEYWORDS
Residential satisfaction; long-term study; household surveys; large housing estates; logistic regression

1. Introduction

A key component of livable cities is the residential satisfaction of their inhabitants. To achieve, maintain and improve residential satisfaction, it is essential to gather detailed insights regarding opportunities and obstacles at the district, neighborhood and apartment level. Appropriate study results deliver arguments, recommendations and proposals that enable municipal and planning institutions and housing providers to make targeted and tailored decisions.

Residential satisfaction as a positive evaluation of both the physical conditions and intangible elements of the residential environment is an often debated concept in urban and housing studies. A number of residential satisfaction studies have focused on cross-sectional data - the analysis of influencing factors at a fixed point in time

CONTACT Uwe Schlink uwe.schlink@ufz.de; Sigrun Kabisch sigrun.kabisch@ufz.de Department of Urban and Environmental Sociology, Helmholtz Centre for Environmental Research – UFZ, Leipzig, Germany

Supplemental data for this article is available online at https://doi.org/10.1080/02673037.2020.1867083.

(Dekker *et al.*, 2011; Lu, 1999; Parkes *et al.*, 2002; Wang & Wang, 2016). Such factors include socioeconomic characteristics, housing and neighborhood attributes, environmental amenities, as well as the relationship between resident preferences and objective conditions. To gain deeper insights into the dynamics of determinants that influence residential satisfaction, the analytical approach needs to include a temporal dimension, that is, the use of longitudinal data (Dekker *et al.*, 2011). But this methodological approach (Lynn, 2009; Rajulton 2001) is quite rare. Its execution requires appropriate material and financial resources as well as personal engagement over time which is difficult to guarantee.

In our paper we present and discuss research results from a long-term survey conducted over four decades that deals with residential satisfaction. Within a number of the topics tackled (e.g. place attachment, moving intentions, demographic changes), we measured people's perceptions of the housing and living conditions ("feeling comfortable") in a large housing estate (LHE). By using our methodological approach, we can explain and prioritize the factors that influence residential satisfaction over a long period of time. Although the influence of several factors is known (e.g. Dekker *et al.*, 2011; Kabisch & Grossmann, 2013; Lu, 1999), there is not much evidence regarding which factors are constant and long-lasting and which fluctuate or decline over time. At this point, we see a research gap, because "the results of any assessment are but a snapshot taken at a specific moment" (Francescato *et al.*, 1989, p. 195). Thus, residential satisfaction is framed by temporal changes concerning spatial differences, building alterations, socio-demographic population oscillations, as well as diverse political and urban planning decisions. These factors can only be adequately considered through repeated surveys over time. In our study we focus on the residents' perspective.

In contrast to numerous studies worldwide, which rely on surveys conducted at a certain point in time, we can build on the results of repeated surveys (in total 10) from 1979 onwards. At the core of the study is a questionnaire survey. Wherever possible, we compare the results over the entire time span; for specific interpretations we use data from selected surveys. By doing so, we can provide insights into the challenges of a long-term observation, reflecting its advantages and its limitations.

Our investigation looks at the Grünau LHE in the City of Leipzig in East Germany. LHEs are embedded in the international debates on mass housing in densely built ensembles and questions of residential satisfaction. Furthermore, the long-term observation focuses particularly on the comparison between the former state-socialist conditions and the consequences of the social change and transformation that occurred following German reunification in 1990.

Our questionnaire results were evaluated statistically. We defined socio-demographic features of the estate's population as factors influencing residential satisfaction. In addition, we considered some building and dwelling characteristics, as well as landscape diversity, to provide a more precise picture of the housing conditions.

We pursued the following research questions:

Q1 What particular findings and insights can we obtain concerning the dynamics of residential satisfaction by conducting a long-term study over several decades?

Q2 By using our long-term design, which influencing factors can we identify that have either a consistent or fluctuating/declining impact on residential satisfaction?

In the following section, we will discuss the residential satisfaction concept with particular attention to methodological approaches. Subsequently, we will draw attention to LHEs in a European comparison. We then shed light on our case study, the East German estate Grünau in Leipzig and our long-term observation. The perceived level of residential satisfaction as well as the effects of various predictors are presented in the results. After that, we discuss and interpret the results by considering the particular historical and local context. This is followed by our concluding remarks.

2. Residential satisfaction - Understanding and measurement over time

Residential satisfaction is a multidimensional and very complex construct. It represents one important domain of the general quality of life (Campbell *et al.*, 1976; Lu, 1999). Elaborate sociological, psychological and geographical approaches, as well as mixed designs, exist to define and measure residential satisfaction in several ways (Amerigo & Aragones, 1997; Parkes *et al.*, 2002). Many frameworks are based on the conception of residential satisfaction as the perceived difference between the actual and the individuals' aspired-to residential environment (Campbell *et al.*, 1976; Galster, 1987; Lu, 1999).

Following Weidemann and Anderson (1985), there are two general approaches to residential satisfaction that result in different measuring methods. First, residential satisfaction is considered as a criterion for evaluating the residential quality (e.g. Galster & Hesser, 1981; Parkes *et al.*, 2002). Second, residential satisfaction serves as predictor of residents' behavior (e.g. Speare, 1974). Some authors use an integrated model and combine both approaches (e.g. Francescato *et al.*, 1989; Weidemann & Anderson, 1985). Our analysis aims to define important determinants of residential satisfaction over the long term "by measuring the effect of perceptions and assessments of the objective environment upon satisfaction" (Weidemann & Anderson, 1985, p. 157). Therefore, residential satisfaction is operationalized as a dependent variable (Amerigo & Aragones, 1997).

A very common way to measure satisfaction is to use self-assessment questionnaires (Smrke, 2018). Given that single item measures including questions like "How satisfied are you with living in this neighborhood?" are not very reliable (Francescato *et al.*, 1989), multivariate statistics are used in most studies to examine the effects of household characteristics and specific features of the environment on overall residential satisfaction (Adriaanse, 2007; Lu, 1999). In order to find out people's level of satisfaction with different aspects of the residential environment, respondents are usually (but not exclusively) asked to choose an answer on a 5-point Likert scale (1–5) from "very satisfied" (1) to "very dissatisfied" (5) (Adriaanse, 2007; Smrke, 2018).

The variety of possible predictor variables is very large. One group of factors includes the socio-demographic characteristics of the residents, e.g. age, gender, income, marital status, education, tenure and length of residence. Many authors found that age, income and homeownership are positively associated to residential satisfaction (Campbell *et al.*, 1976; Galster & Hesser, 1981; Lu, 1999).

Other important influencing factors encompass objective characteristics and subjective assessments of the residential environment. Dwelling size is shown to be a

strong determinant of residential satisfaction (Dekker *et al.*, 2011; Wang & Wang, 2016). Furthermore, Pinquart and Burmedi (2003) emphasize the strong association between housing satisfaction and perceived pleasantness and aesthetics. Nice and helpful amenities in the apartment are a source of residential comfort. Dekker *et al.* (2011) found that individual opinions concerning problems in and around the estate (e.g. crime, hygiene, noise) have higher impacts on estate satisfaction than the residents' opinions on services (e.g. public transport, shopping facilities, playgrounds for children). Neighborhood satisfaction is particularly strongly associated with perceived safety (Cao & Wang, 2016; Parkes *et al.*, 2002; Pinquart & Burmedi, 2003).

Lu (1999) points out that the residents' "perception rather than the actual configuration of residential conditions" (p. 268) plays an important role in determining residential satisfaction. Subjective measures (perceptions) are often stated to be stronger predictors of residential satisfaction than objective ones (Francescato *et al.*, 1989; Parkes *et al.*, 2002; Weidemann & Anderson, 1985).

With regard to the geographical scale, some studies focus on just one level of residential satisfaction: either the dwelling (Galster, 1987) or the neighborhood (Parkes *et al.*, 2002; Temelová & Slezáková, 2014). However, both levels should be considered together and not separately (Lu, 1999). The "individual housing unit is situated in the context of the neighborhood" (Campbell *et al.*, 1976, p. 249). Besides the geographical scale, the temporal dimension also needs to be considered in order to grasp the respective societal and environmental context over time. This requires longitudinal approaches. Although various authors emphasize the importance of longitudinal studies in residential satisfaction research (Campbell *et al.*, 1976; Dekker *et al.*, 2011;), they are scarce (e.g. Varady & Carrozza, 2000). Temelová and Slezáková (2014) include the temporal dimension in their study by asking retrospective questions to examine the residents' time-comparative perceptions.

This short summary of theoretical and methodological approaches provides some insights into the variety of understandings and measurements of residential satisfaction. However, "[d]ifferences in model specification and data type collected preclude a direct comparison of the empirical results" (Lu, 1999, p. 268; see also Francescato *et al.*, 1989). There are only a few cross-country analyses based on a common methodological design (e.g. Dekker *et al.*, 2011; Herfert *et al.*, 2012). Other studies examined residential satisfaction by using the same methodology in different sites within one country (USA—Amerigo & Aragones, 1997; Poland—Gorczyca & Grabiński, 2018) or within one city (Prague—Temelová & Slezáková, 2014).

The examples from Poland and Prague as well as the cross-country analyses by Dekker *et al.* (2011) and Herfert *et al.* (2012) focus on mass housing respectively LHE. Because our case study is located in a LHE, in the next section, we outline the concept behind LHEs and their development in the European context.

3. Large housing estates

3.1. The large housing estate concept

According to the British urbanist Anne Power (1997), estates are "groups of housing built in a defined geographical area that are recognized as distinct and discrete

entities" (p. xx). LHEs first appeared in the decades after World War II. An immense housing shortage made housing construction a prioritized political and economic task. The extremely high concentration of buildings in a single estate and the provision of a large number of apartments led to so-called "large housing estates". In some cases, LHEs were also labeled "mass housing" (Pereira, 2017; Rowlands et al., 2009). Other descriptions mainly used in Eastern Europe include "prefabricated panel housing estates" (Kährik & Tammaru, 2010) and "high-rise panel housing estates" (Temelová & Slezáková, 2014). These terms refer to industrial housing construction using uniform and prefabricated panels that facilitate clearly intensified housing construction in large quantities. Musterd and van Kempen (2005) also add that LHEs are state-planned or state-supported developments. Therefore, they differ substantially from traditional, organically developed urban areas (Kohout et al., 2016; Wassenberg, 2018). Dekker *et al.* (2005) describe LHEs as "[c]arefully designed urban landscapes" (p. 3). LHEs are considered functional, independent residential settlements of more or less standardized building structures. They are mostly located in urban fringe areas and offer affordable rental housing. The scale and size of LHEs can vary within a country or even within a city (Altrock *et al.*, 2018; Dekker *et al.*, 2005; Wassenberg et al., 2004). For instance, in Germany, official numbers indicate that LHEs contain around 2,500 apartments, however, the largest estate, located in Berlin, encompasses around 59,000 apartments (BMBau, 1991, p. 13).

3.2. The development of large housing estates in a European comparison

When LHEs first appeared in Western Europe in the 1960s and 1970s, they were welcomed by residents as the new buildings and apartments significantly improved their living conditions. This perception changed in the following decades. In many LHEs, the projected social and technical infrastructure was either not provided or delayed. Many residents felt there was a lack of urbaneness, i.e. the urban amenities and opportunities found in cities such as places of employment as well as shopping and leisure facilities. As a consequence, many affluent residents decided, after a certain time, to leave such estates. People with low socio-economic status and respective incomes could then afford the apartments. The concentration of this group of residents lead to a social downgrading of parts of LHEs or entire estates, and the exclusion of marginalized social groups (Turkington *et al.*, 2004, for an overview, see Rowlands *et al.*, 2009). Many residents feel socially trapped in this environment (Musterd & van Kempen, 2007; Pereira, 2017). Besides this generally negative perspective, some studies provided evidence for multiple and differentiated development pathways of and within large housing estates (Rowlands *et al.*, 2009). The studies revealed high acceptance of the housing and living conditions inside and outside the apartments. In particular, older residents who had lived in these estates for decades expressed quite high residential satisfaction (Dekker *et al.*, 2011).

In state-socialist Eastern Europe, large-scale housing construction started in the late 1960s and was massively intensified in the 1980s. The building structure of mass housing projects often appeared monotonous and all LHEs seemed to be quite similar. Nevertheless, LHE living and housing conditions did not develop in a linear way,

nor is there evidence of a uniform development of all parts of a single LHE (Altrock *et al.*, 2018; Grossmann *et al.*, 2017; Monclus & Medina, 2016). Although many estates lacked timely technical and social infrastructure facilities in their early stages, residents were glad to move into their own, well-equipped apartments. Such residents continued to live in LHEs due to the improved living conditions and because they had no better alternative. But most importantly, the privatization strategy in these countries was directed towards the conversion of rented apartments into owner-occupied dwellings. The residents viewed their apartments as private assets that provided a safe and stable value portfolio (Kohout *et al.*, 2016; Szafranska, 2018). As a consequence, this decision led to a stabilization in the structure and number of residents. Furthermore, younger people moved in because the privately owned apartments could be bequeathed to the next generation. Nevertheless, LHEs faced very different challenges depending on which Eastern European country they were located in and the specific prevailing conditions. Those which were embedded in economically prosperous cities experienced upgrading and enlargement (e.g. the example of Lódz, Szafranska, 2018). Others had to deal with decay and social tensions (Altrock *et al.*, 2018; Kohout *et al.*, 2016; Kovacs & Herfert *et al.*, 2012; Skrivankova *et al.*, 2017).

3.3. The particular challenges of large housing estates in East Germany

In contrast to the LHEs found in other former state-socialist Eastern Europe countries, those in East Germany (former German Democratic Republic) followed a different trajectory. The socio-economic transformation triggered by German reunification in 1990 had major impacts on the LHEs. The closure of many enterprises and subsequent mass unemployment - a completely new phenomenon for the East Germans - meant that LHEs became the central location of the residents' entire day. Whereas previously people had travelled to their workplaces and leisure facilities outside the estate, now they were staying at home. The lack of essential facilities and offers in the LHEs affected residential satisfaction. Many residents, particularly those who were young and well-educated, decided to move to more prosperous regions (mostly to West Germany) to find a job. Those who could afford it moved to newly built suburban areas. The birth rate dropped to a very low level. The immense population decline (Bernt, 2019, p. 178 ff.) during the 1990s was publicly interpreted as a clear signal that people were rejecting these residential locations, which were viewed as symbols of state-socialism (Kabisch & Rink, 2015).

Nevertheless, extensive investments based on European and federal state programs were simultaneously channeled into the estates to renew the housing stock and upgrade and complete the infrastructure facilities. Furthermore, a law was passed (*Altschuldenhilfegesetz*) to promote intensive privatization efforts. Initially, the idea was to sell the dwellings to the occupants - the same strategy that was being pursued in neighboring Eastern European countries. But this strategy failed: Residents lacked the necessary financial resources, or they intended to move out in order to find a job elsewhere or to settle in suburbia. Thus, in order to fulfill the legal requirements, the privatization strategy changed. Private companies and investment funds appeared and bought entire blocks for comparatively low prices. They pursued purely profit-

oriented strategies that involved quickly reselling their housing stock, and several became insolvent because of financial miscalculations. Some companies targeted fully occupied low-standard apartments inhabited by disadvantaged residents who depend on the social security system, as this meant guaranteed rent payments (for a detailed description see Bernt *et al.*, 2017; Bernt, 2019). As a result of privatization, the LHEs experienced a very turbulent period during the 1990s. The consequences of this for homeownership, respective rental strategies, and socio-spatial differentiation can still be witnessed today.

This turbulence was particularly intensified by the increasing number of vacant apartments. In consequence, a number of housing cooperatives, private companies and municipal housing enterprises were confronted with the growing threat of insolvency. At that point, there was a clear call for political support and decisions. An expert commission (2000) revealed this East German "housing market of extremes", which consisted of new housing construction and refurbishment on the one hand, and huge vacancy rates on the other. Based on this report, the government introduced the state-financed "Urban Restructuring East" program that lasted from 2003 to 2009 and was subsequently extended until 2016. For the first time in German history, the government decided to demolish housing stock without replacing it and even subsidized the demolition work (Bernt, 2019). During the program approximately 360,000 apartments were demolished, most of which were in LHEs (BMI, 2019, p. 10). As a result, vast numbers of East German LHE apartments disappeared and large parts of the remaining estates became privatized. Nowadays, private companies and investment funds act as housing providers, next to municipal companies and cooperatives. Their particular shares vary across the several estates.

Population numbers in LHEs have slowly stabilized since the 2010s, albeit at a lower level. In particular, economically prospering cities and university cities such as Leipzig have experienced population regrowth after a long period of shrinkage (Haase *et al.*, 2018). The LHEs have also benefited from this population gain. But in smaller and economically weak cities, LHEs are still under pressure from vacancy and shrinkage, and demolitions are ongoing.

4. Leipzig-Grünau case study

The Leipzig-Grünau LHE is an urban district in the East German City of Leipzig with about 40,000 residents. 8% of Leipzig's population (600,000 inhabitants) live in this estate. The case study area is located at the western fringe of the city, encompassing an area of 4 km x 2.5 km (see supplemental material, Figure S1). During the four-decade period of our study, the district has faced many ups and downs in relation to its built, infrastructural as well as socio-spatial appearance (Grossmann *et al.*, 2017).

The construction of the estate's industrial, prefabricated panel buildings began in 1976. The aim was to provide housing for approximately 90,000 residents by 1990. The estate grew from east to west. The initial construction phase in Eastern Grünau consisted of mostly 5-storey apartment blocks that were well equipped with infrastructure facilities and green spaces. During the 1980s, the persistent housing shortage led to a political decision to increase the building density with 6-storey buildings

(without an elevator) and 9-, 11-, and 16-storey blocks. That led to a very high residential density of up to 10,000 residents per km^2. The estate thus became one of the most densely populated areas in the City of Leipzig (City of Leipzig, 2019). In the second half of the 1980s economic resources became seriously restricted, which resulted in lower-quality construction, and the delayed and reduced provision of infrastructure—particularly in Western Grünau. At the end of the construction phase in 1989, when Germany was on the verge of reunification, the estate encompassed approximately 36,000 apartments for around 85,000 residents.

During the political change in East Germany and the process of reunification in the 1990s, the Grünau LHE experienced a huge population decline of up to 50%. All the housing companies were affected and some of them faced a vacancy rate of 30%. Particularly those located in the western part faced the threat of insolvency. In Western Grünau the variety of private housing companies was particularly high due to the legal privatization obligations imposed on the municipal housing enterprises and the cooperatives, which already existed before German reunification. Due to the unprecedented level of vacant apartments, the municipal council came up with a new development strategy for this estate that included a restructuring belt and a core area (City of Leipzig, 2007, p. 8). The restructuring belt that encompassed all blocks of Western Grünau and the northern part of Central Grünau with the highest share of empty apartments should be demolished. This decision additionally fueled the out-migration process and was protested by the remaining residents, thus the plans could not be realized. But in the meantime, the "Urban Restructuring East" program had been implemented. Although the program consisted of upgrading and demolition measures, the major part was used for demolition. Between 2003 and 2010 about 6,800 apartments (5% of the entire stock) in several parts of the estate were torn down. Residents whose blocks were demolished had to move to different apartments. Other residents who lived in close proximity to the demolished sites were frightened of losing their homes. These circumstances impacted strongly the residents' perceptions of the living conditions. The demolition of fifteen 16-storey blocks, each containing 132 apartments, was particularly significant. Those blocks were part of the municipal housing company portfolio. This reduced the municipal company's stock and also their resources in terms providing affordable housing for disadvantaged people.

Alongside the demolition work, all the housing companies gradually invested in renovation and renewal activities to keep their dwellings and buildings in a good state of repair and to upgrade the housing environment.

Around the year 2010, the City of Leipzig experienced unexpected and rapid population regrowth caused by economic recovery and development, as well as the city's new appeal among young and creative people. This process was accompanied by an increasing demand for affordable housing. The Leipzig-Grünau LHE gained renewed attention as a residential area, in particular for households with children because of the excellent provision of kindergartens, playgrounds, green areas and affordable rent. A new phenomenon was identified: Former residents who had lived in the estate as children in the early years were returning, because of nearby employment and functioning family supporting networks. But the majority of the remaining residents had

retired in the meantime. They characterized the demographic appearance of the LHE (Kabisch & Grossmann, 2013).

At present (2020), the vacancy rate is between 3 and 7% according to the different companies. Ironically, few new residential buildings have been built at those locations where blocks were demolished 15 years earlier. The estate is well equipped with public transport, a variety of shopping facilities and medical as well social services for different age groups. The green areas within the estate have taken on particular importance. Large parks and meadows with walking and cycling paths enable people to exercise without being disturbed by cars.

5. Methods and data generation of the long-term study

In 1979, a long-term sociological research project was launched to track the residential satisfaction of the Grünau inhabitants. The study focused on the residents and their perceptions of the housing conditions (Kahl, 1989, 1992, 1995, 2003). The key method is repeated questionnaires, supplemented by analyses of planning documents, in-depth interviews with planners and decision-makers, as well as geographic information system (GIS) methods. The tenth survey was carried out in 2015 (Table 1). By using the same core questions in each questionnaire, the comparability of these results over time is guaranteed (Kabisch *et al.*, 2005; Kabisch *et al.*, 2016; Kabisch & Grossmann, 2010; Kahl, 2003). During the first survey in 1979, 350 questionnaires were distributed to selected addresses based on street and block number, not on names. That means that respondents can change over time, because in one block-address diverse households live. The addresses were chosen according to fixed criteria such as the characteristics of the blocks and apartments, location, homeownership and demographics. This core sample was gradually enlarged with additional addresses in accordance with the growth of the estate until 1987. Since 1992, despite a decline in population, the number of surveyed households increased up to nearly 1,000 in 2015. In the completely changed societal context, a variety of housing companies with different rental strategies emerged and consequently raised a multitude of new topics. These topics often related to the small-scale block level and therefore, we adapted the sample size in order to take them into account.

An intensive public information campaign took place in the lead up to each survey. Shortly afterwards, trained interviewers distributed the questionnaires to the residents and collected the completed questionnaires a few days later. This simple but

Table 1. Surveys from 1979 to 2015 in the Leipzig-Grünau LHE.

Period		Inhabitants	Sample size	Response rate %
1	1979	16,000	310	94
2	1981	36,000	578	92
3	1983	60,000	346	92
4	1987	85,000	330	88
5	1992	78,000	415	85
6	1995	74,000	466	82
7	2000	61,000	560	83
8	2004	49,400	672	79
9	2009	45,400	710	80
10	2015	40,000	709	75

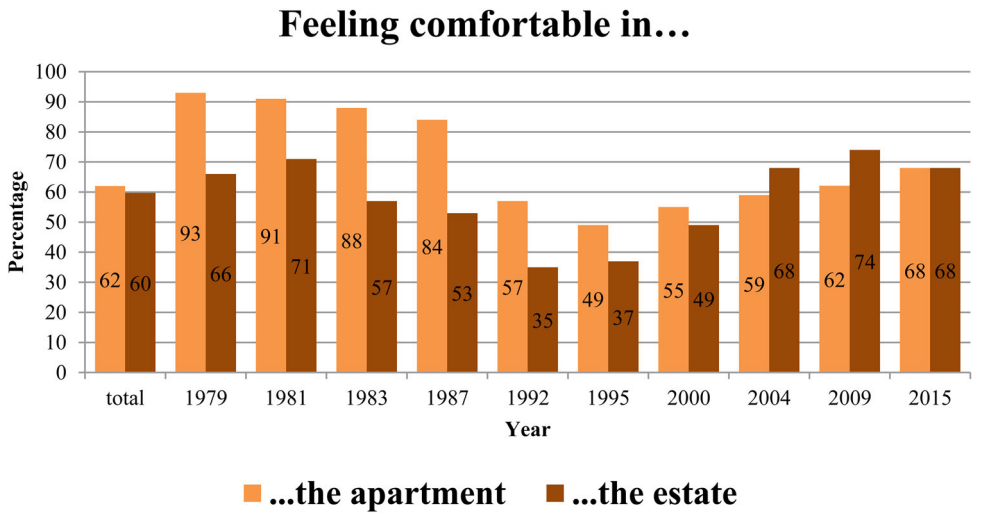

Figure 1. Feeling comfortable in the apartment and in the Leipzig-Grünau LHE 1979–2015 (Kabisch *et al.*, 2016).

effective method guaranteed a very high response rate of at least 75%. All the collected questionnaires were checked for accuracy and completeness. The raw data were transferred to SPSS, a statistical software program, and subsequently evaluated.

In order to measure overall residential satisfaction, the single-item question "Do you feel comfortable in …?" was asked in all the surveys since 1979 (Figure 1). For our analysis, we utilized "feeling comfortable" (FC) as a proxy for "being satisfied". The following two items were used to focus on residential satisfaction at two levels (apartment and estate): "Do you feel comfortable in your apartment?" (FC-apartment) and "Do you feel comfortable in Grünau?" (FC-estate) (Kabisch *et al.*, 2016). The three answer options ("yes", "with reservations", and "no") were dichotomized to yes/no variables, in recognition of the much higher number of "with reservations" responses in comparison to "no" responses to all residential satisfaction items (e.g. in the 2015 survey 68.2% of the participants responded "yes", 31.8% replied "with reservations", and nobody replied "no" to the question "Do you feel comfortable in Grünau?"). Additionally, we asked the respondents to give a brief explanation for their answer (open question). We use this qualitative data as background knowledge for interpretation purposes in section 7.

Using our theoretical concept of residential satisfaction, we selected three different groups of factors (Table S2). The first group includes items related to apartment satisfaction (size, construction quality, residential comfort, apartment layout, and sound insulation), gathered using a 7-point Likert scale from "very unsatisfied" (1) to "very satisfied" (7). The second group considers same scaled items for estate satisfaction (shopping facilities, playgrounds, transport connections, cleanliness, and safety). The third group includes socio-demographic features, such as age groups, gender, educational level, and residential location within the LHE (Eastern Grünau serves as reference).

Although the study started in 1979 (Table 1) with a well-designed questionnaire, it did not include all the indicators which we consider to be important nowadays. Insights gained during the early stage of the survey led to a number of additional

Table 2. Satisfaction with characteristics of the apartment (FC-apartment) and the estate (FC-estate) rated on a scale of 1 to 7, mean values (large values in bold, low values in italic, average values are not accentuated, sample sizes see in *Tables 3 and 4); the socio-demographic characteristics and distribution of the sample within the three parts of the estate are shown in percentages.*

	1987	1992	1995	2004	2009	2015	Total
Satisfaction with characteristics of the apartment							
Size	5.38	5.03	5.16	**6.09**	5.99	5.73	5.65
Construction quality	4.61	*3.27*	*3.40*	5.26	5.13	4.74	4.52
Residential comfort	**6.22**	4.59	4.44	5.41	5.32	5.02	5.15
Apartment layout	5.52	4.48	4.56	5.64	5.58	5.48	5.28
Sound insulation	*3.98*	*2.49*	*2.54*	4.08	4.16	*3.63*	*3.56*
Satisfaction with characteristics of the estate							
Shopping facilities	5.25	4.35	4.74	**6.13**	**6.41**	**6.05**	5.67
Playgrounds	*3.93*	*3.35*	*3.63*	4.80	5.14	4.91	4.47
Transport connections	4.96	5.04	5.35	**6.27**	**6.52**	**6.27**	5.90
Cleanliness	*3.88*	*2.33*	*3.18*	4.69	4.75	4.13	*3.98*
Safety		*2.85*	*2.82*	4.54	4.70	*3.83*	*3.90*
Younger persons	36.3%	19.5%	16.7%	12.1%	13.0%	16.6%	17.1%
Older persons	5.4%	22.9%	32.0%	52.2%	62.8%	64.9%	45.9%
Female gender	61.8%	53.3%	53.6%	55.3%	57.7%	58.6%	56.7%
University degree	21.0%	21.3%	19.2%	20.2%	24.6%	22.5%	21.7%
Eastern Grünau	28.0%	22.9%	30.2%	17.5%	19.6%	17.9%	21.5%
Central Grünau	25.8%	32.8%	39.9%	49.4%	45.8%	50.0%	42.9%
Western Grünau	46.2%	44.9%	30.6%	33.1%	34.6%	32.2%	36.5%

Table 3. ORs for the effects on FC-apartment.

	1987	1992	1995	2004	2009	2015	Total
Satisfaction with characteristics of the apartment							
Size	**1.514****	**1.346****	**1.272***	**1.272***	1.182	0.874	**1.186****
Construction quality	1.115	1.189	0.932	**1.394****	**1.431****	1.194	**1.106***
Residential comfort	**1.499***	**1.387***	**1.480****	1.210	**1.716****	**1.473****	**1.541****
Apartment layout	0.969	1.199	1.134	1.106	1.000	1.072	**1.083***
Sound insulation	1.059	**1.250***	**1.293***	**1.237****	**1.255****	**1.309****	**1.255****
Satisfaction with characteristics of the estate							
Shopping facilities	0.893	0.987	1.091	1.072	0.903	1.137	0.967
Playgrounds	1.000	**1.224***	1.107	0.975	0.928	1.028	1.004
Transport connections	0.947	0.896	0.885	0.847	1.003	0.853	**0.858****
Cleanliness	1.132	**0.716***	0.924	1.087	**1.340****	1.144	1.002
Safety	ND	0.996	**1.261***	1.064	0.910	0.888	ND
Socio-demographic structure and place of residence							
Younger persons	0.652	0.768	1.183	0.797	1.138	0.832	1.057
Older persons	**0.149***	1.195	**2.484***	0.939	1.669	1.156	1.160
Female gender	0.749	1.124	0.788	0.957	1.382	0.773	0.943
University degree	0.674	**0.441***	0.812	0.651	0.808	1.080	**0.774***
Central Grünau	0.535	1.995	0.590	**0.520***	0.992	0.878	**0.643****
Western Grünau	0.905	1.041	**0.249****	0.548	0.937	1.167	**0.677***
N	298	222	260	366	415	396	1957
R^2 (Nagelkerke, 1991)	23.5%	35.1%	34.3%	32.4%	44.5%	31.7%	30.7%

The bold values represent statistical significance: $^{*}p < 0.1$ and $^{**}p < 0.01$; ND-not detectable; all OR are results of multivariate logistic regression.

indicators. The questionnaire quality has thus been improved, but the comparability over the entire study period is restricted, which we can consider as a certain weakness. The survey data that contains the complete range of variables required for our residential satisfaction model is only available for six years (1987, 1992, 1995, 2004, 2009, and 2015) (Tables 2, 3, 4). Thus, we restricted our analysis to these six periods

Table 4. ORs for the effects on FC-estate.

	1987	1992	1995	2004	2009	2015	Total
Satisfaction with characteristics of the apartment							
Size	0.991	**1.268***	1.168	1.080	0.964	**1.224***	**1.112***
Construction quality	0.927	1.017	1.029	1.172	1.146	0.978	1.061
Residential comfort	1.240	**1.418***	**1.678****	0.876	**1.444***	**1.261***	**1.220****
Apartment layout	1.020	0.907	0.970	**1.368***	1.175	0.840	1.030
Sound insulation	**1.213***	**1.232***	1.128	**1.268****	**1.229****	**1.265****	**1.224****
Satisfaction with characteristics of the estate							
Shopping facilities	1.125	0.939	1.215	**1.278***	1.184	1.105	**1.121****
Playgrounds	1.043	**1.248***	1.145	**1.204***	1.017	1.055	**1.086***
Transport connections	**1.156***	1.186	1.008	0.811	1.018	0.886	**1.087***
Cleanliness	**1.334****	0.809	1.222	**1.228***	1.183	**1.292****	**1.299****
Safety	ND	1.129	1.077	**1.481****	**1.247***	**1.174***	ND
Socio-demographic structure and place of residence							
Younger persons	0.788	**0.486***	0.605	1.594	0.804	0.715	0.792
Older persons	1.458	0.743	**3.170****	0.964	**2.182***	1.532	**1.700****
Female gender	0.889	**0.530***	1.027	1.369	1.379	1.271	1.129
University degree	1.030	0.529	0.541	1.651	1.343	1.049	1.006
Central Grünau	**0.503***	2.127	1.084	**0.207****	**0.487***	0.563	**0.700***
Western Grünau	0.644	1.395	**0.460***	**0.146****	0.593	**0.507***	**0.604****
N	299	223	260	369	415	393	1959
R^2 (Nagelkerke, 1991)	20.5%	27.1%	35.3%	42.1%	40.5%	28.2%	35.3%

The bold values represent statistical significance: *$p < 0.1$ and **$p < 0.01$; ND-not detectable; all OR are results of multivariate logistic regression.

and the three groups of factors for which we calculated average values (means) and fractions (in percentages).

Multivariate logistic regressions were applied for the statistical analysis of the associations between the predictor variables and the dichotomous responses FC-apartment and FC-estate. The effects were quantified by odds ratios (OR), their confidence intervals (CI), and significance levels (p-values). An OR expresses the ratio between the frequency of positive and negative responses; it has to be distinguished from the relative rate of satisfaction, i.e. the percentage of positive responses. An OR value equal to 1.0 indicates that the predictor had "no effect" on the outcome. OR values larger than 1.0 indicate a positive association, while OR values smaller than 1.0 indicate a negative association (Grant, 2014). The multivariate approach ensures that all estimated associations are adjusted according to their mutual influences. Due to missing values randomly occurring in the variables included in the analysis, the effective sample sizes (N) decreased.

6. Results

6.1. Residential satisfaction related to the apartment and the estate

The questions "Do you feel comfortable in the apartment/the estate?" were asked in all ten surveys. Putting the data together, a total of 62% of the respondents felt comfortable in their apartment (FC-apartment) and 60% felt comfortable in the estate (FC-estate) (see Figure 1). But between the individual surveys, the values for "feeling comfortable" varied substantially. From 1979–1987, FC-apartment was high (> 83%)

and exceeded the values for FC-estate (53–71%) by one third. In the following three surveys after German reunification (1992, 1995, 2000), both FC-apartment and FC-estate dropped significantly. FC-apartment still exceeded FC-estate, but by much less than before, which indicates that the estate's facilities and configurations still had some lingering shortcomings from the residents' perspective.

Between 2004 and 2015 a change in resident satisfaction levels occurred: FC-estate values exceeded FC-apartment values, and, finally, in 2015 they were equal (68%).

Residents were particularly satisfied with the apartment size, residential comfort, and apartment layout (Table 2; the rating is greater than 5 on a scale of 1–7; for detailed information see Tables S3 and S4). Sound insulation was continuously considered a serious weakness (ratings are much below 5). Transport connections and shopping facilities were ranked high and tended to increase during the entire study period because of ongoing improvements. The same tendency was demonstrated in LHEs in Prague by using retrospective questions (Temelová & Slezáková, 2014). Remarkable progress can also be observed concerning the number and quality of playgrounds, an indicator of a child-friendly environment. In the period between 1987 and 2015 the proportions of younger and older residents changed remarkably. The fraction of older persons ($\geq$ 55 years) vastly increased. The proportion of female respondents and persons with a university degree remained more or less stable.

6.2. Predictors of "feeling comfortable in the apartment" (FC-apartment)

Analyzing the associations between the dependent variable FC-apartment (Figure 1) and residential characteristics, we observed that for the total sample (rightmost column in Table 3, upper section; 95% CIs see in Table S5) satisfaction with size, construction quality, residential comfort, apartment layout, and sound insulation were conducive to FC. These associations were stable over the 28 years considered - all the statistically significant effects are positive. The impact of the apartment size seems to weaken after 2004, but this is not significant. Features of the estate have no clear and consistent effects on FC-apartment. Playgrounds, transport connections, cleanliness, and safety in the surroundings are rarely significantly associated with FC-apartment. FC-apartment was negatively associated with the transport connections (see middle section of Table 3), although this factor was assessed as above average (Table 2). The age groups did not appear to have a significant impact.

Pooling all the data, we realized that residing in Central and Western Grünau had a negative effect (OR $<$ 1.0 in column Total in Table 3) on FC-apartment, compared to the reference area Eastern Grünau. Nearly all factors were mutually correlated (Table S6). Nevertheless, according to an assessment of multi-collinearity (O'Brien, 2007), the variance inflation factors (VIFs) were below the threshold (largest VIF = 2.23), which indicates that the regression results are reliable. The multivariate logistic regressions (sections 6.2 and 6.3) applied to our long-term study explained 24–45% of the outcome, and this level of R^2 indicates reasonable results.

6.3. Predictors of "feeling comfortable in the estate" (FC-estate)

The OR values for the effects on FC-estate suggest positive associations with the characteristics of the apartment as well as the estate (Table 4, upper and middle section; 95% CIs see in Table S7). The apartment's size, residential comfort and sound insulation exert a strong influence on FC-estate over the entire study period (column Total in Table 4). Significantly positive impacts (OR $>$ 1.0) relate to shopping facilities, playgrounds, transport connections as well as to cleanliness and safety. Younger persons ($\leq$ 35 years) expressed a tendency towards dissatisfaction during the entire period of analysis.

The association of age group with feeling comfortable in the estate suggested a tendency: for older persons the significant effects are positive (in 1995 and 2009), while the significant effect of younger persons was negative (in 1992). Note that the negative association of a person's low age with comfort satisfaction is already adjusted for the effects of confounders like shopping facilities, playgrounds, etc., as a consequence of the multivariate logistic regression approach. Throughout the results, we did not notice any significant impact of university degree status (lower section of Table 4).

Similar to FC-apartment, we can confirm that residing in Central or Western Grünau had negative associations with FC-estate (statistically significant in total and in several years). The respective OR $<$ 1.0 (Table 4) indicate that those residents felt less comfortable than residents living in Eastern Grünau (reference area). While researching possible reasons for these differences of residential satisfaction we considered land use and land cover (Kabisch *et al.*, 2018), as well as landscape diversity (Fan & Myint, 2014). We can state that lower building density, substantial infrastructure provisions, the availability of high-quality green spaces (55% green cover compared to 53% in the other two parts, Table S8), and landscape diversity (patch richness density in Eastern Grünau was 12.46 compared to 6.05 and 5.56 in Central and Western Grünau, respectively) are all influencing factors. This might explain the effect of the place of residence.

Furthermore, we found evidence that some factors explain FC-apartment and FC-estate equally over time (permanent significant odds ratios above or below 1.0). Satisfaction with residential comfort, sound insulation and place of residence in the Central and Western Grünau was decisive for FC-apartment (OR significantly different from 1.0, in total, only small differences occurred between the periods; Table 3, marked in bold). The same features plus cleanliness and age were decisive for FC-estate (Table 4, marked in bold).

With respect to the two demographic age groups under consideration we did not find significant differences. We suggest that this was a consequence of combining all cases into only three age groups (younger persons; older persons; persons in the age of 36–54), which resulted in a loss of information. To test specific age effects, we applied a generalized additive model involving the age of each individual by means of a spline function (Figure S9), which indicates a significant linear increase in FC-apartment for residents aged 40 years and older. Obviously, age is a key factor and should be always considered in studies about residential satisfaction. Several studies confirm that being older is associated with higher levels of residential satisfaction

(Campbell *et al.*, 1976; Dekker *et al.*, 2011; Galster, 1987; Gorczyca & Grabiński, 2018; Lu, 1999).

7. Discussion and interpretation

The results indicate that every considered variable had an effect on FC-apartment or FC-estate at least once. High levels of overall residential satisfaction with apartments and estates have also been confirmed for other European LHEs (Herfert *et al.*, 2012; Pereira, 2017). Our long-term data revealed a wave-like pattern of residential satisfaction and provides evidence for its fluid nature (Figure 1). According to our local context knowledge (see section 4) and additional empirical findings based on qualitative data (see section 5), we interpret this pattern as follows: The first residents in the Leipzig-Grünau LHE (surveys 1979 and 1981) were highly satisfied with their apartments and the estate because the LHE housing conditions were an immense improvement compared to their previous experiences. In the second half of the 1980s, economic problems and political pressure resulted in lower-quality housing construction, which might have influenced the evaluation of the apartments erected during that period. In relation to the societal transformation that took place during German reunification in the early 1990s, we saw a distinct decline in "feeling comfortable" in relation to apartments and the estate. In 1992, younger residents had significantly low OR values (0.486; Table 4). These findings might be explained by the socio-economic turbulence caused by the transformation at that time. High unemployment rates fostered outmigration which in turn disrupted social networks.

During the 1990s, the urban administration of the City of Leipzig made major efforts to balance the surplus of apartments through targeted demolition of apartment blocks with a very high level of vacancies. Demolition occurred mainly in Western and Central Grünau. Respondents who were exposed to the demolition of apartment blocks or lived in close proximity might have felt significantly less comfortable in their apartment and in the estate (Tables 3 and 4).

The increasing rates of "feeling comfortable" in the last three surveys might have been a consequence of ongoing maintenance measures and remarkable improvements. Additional descriptions of the advantages and disadvantages by the respondents provide insights that allow this interpretation.

Analyzing the associations between influencing factors and overall satisfaction, we found that satisfaction with intangible aspects of the environment (residential comfort, cleanliness, safety) has a high impact on residential satisfaction. In particular, the residents' perception of residential comfort (nice and helpful amenities at home, e.g. central heating in the 1980s, or age-appropriate equipment) affected both FC-apartment and FC-estate. This is in line with the findings of Pinquart and Burmedi (2003) and Dekker *et al.* (2011), who discovered that pleasantness, perceived aesthetics, and the perceived absence/presence of problems are essential to satisfaction. Additionally, sound insulation (which strongly correlates with construction quality, Table S6) had a major impact on residential satisfaction over the entire timespan of the study. To our knowledge, only a few studies have examined noise as predictor of residential satisfaction and they focus on sources of noise outside the building (e.g. traffic) (Galster &

Hesser, 1981; Parkes *et al.*, 2002). However, it should be emphasized that the building structure of prefabricated panel housing promotes noise dispersion inside the buildings due to thin walls, thin floor coverings, and wastewater shafts and cable ducts that connect the apartments.

Summarizing and critically reflecting, our study demonstrates that the factors we analyzed explained up to 40% of the real variability in residential satisfaction. This explanatory power is higher, or at least similar, compared to previous studies (e.g. 2–29% in Dekker *et al.* (2011) and 29–38% in Cao & Wang (2016)). Nevertheless, we have to consider that our approach was based on an analysis of the dichotomous variable "Do you feel comfortable in …?" This variable might have limited the reliability of our results, because (i) it is used as a proxy for the residential satisfaction under examination, and (ii) we used just one single item for the dependent variable instead of a composed scale. Further, we had to restrict our analysis to six survey waves out of ten due to the availability of data. All six surveys were pooled for the analysis of the total sample containing very few repeated respondents, which may have biased the results obtained for the total sample.

8. Concluding remarks

This paper examines context-related residential satisfaction from a long-term perspective, with a focus on varying spatial, temporal, and socio-demographic influences. The unique long-term study of the Leipzig-Grünau LHE makes it possible to compare and evaluate how characteristics of the residential environment are perceived by the residents over time. Through our statistical analysis, we could show the influence of these subjective measures on overall residential satisfaction. The assessments refer, for instance, to building and dwelling characteristics, infrastructure offers and intangible elements of the residential environment including small scale, spatial differences within the estate.

With regard to the academic discourse, we provide a unique panorama of the development of a specific housing segment over time and enlarge the range of methodological approaches available for measuring residential satisfaction. Our findings indicate that residential satisfaction is impermanent and that characteristics change in importance in time (Q1).

Through our long-term study, we can confirm the following consistent predictors for FC-apartment over time: residential comfort and sound insulation. Remarkably, sound insulation is also a constant predictor for FC-estate, which indicates its exceptional importance. Other predictors vary in their influence on residential satisfaction over time. For instance, apartment size had major influence on FC-apartment from 1987 to 2004. Afterwards this predictor declined. For FC-estate, safety emerged in 2004 and remained important; whereas cleanliness fluctuated over time, changing between significant and not significant effects during the course of the years (Q2). All of these local particularities were influenced over time by political alterations, master plan decisions, and socio-demographic dynamics. Therefore, it is indispensable to embed the findings in the historical context.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributors

Sigrun Kabisch, PhD (sociology) is head of the department of urban and environmental sociology at Helmholtz Centre for Environmental Research. Her research fields encompass urban transformations, resilient cities and social dynamics of large housing estates.

Janine Poessneck, MSc (geography) works at Helmholtz Centre for Environmental Research. She is dealing with social housing analysis in international comparative studies.

Max Soeding, BA (sociology) supported during his stay at Helmholtz Centre for Environmental Research surveys and statistical analysis.

Uwe Schlink, PhD (meteorology) is teaching applied meteorology and statistical data analysis at University of Leipzig. In the Helmholtz Centre for Environmental Research he is working in the research field of urban climate adaptation.

ORCID

Uwe Schlink http://orcid.org/0000-0002-3109-9459

References

Adriaanse, C.C.M. (2007) Measuring residential satisfaction: a residential environmental satisfaction scale (RESS), *Journal of Housing and the Built Environment*, 22, pp. 287–304.

Altrock, U., Kabisch, S. & Grunze, N. (2018) *Großwohnsiedlungen im Haltbarkeitscheck. Differenzierte Perspektiven ostdeutscher Großwohnsiedlungen* (Wiesbaden: VS Verlag für Sozialwissenschaften).

Amerigo, M. & Aragones, J.I. (1997) A theoretical and methodological approach to the study of residential satisfaction, *Journal of Environmental Psychology*, 17, pp. 47–57.

Bernt, M. (2019) The emergence of "Stadtumbau Ost", *Urban Geography*, 40, pp. 174–191.

Bernt, M., Colini, L. & Förste, D. (2017) Privatization, financialization and state restructuring in East Germany: The case of Am Südpark, *International Journal of Urban and Regional Research*, 41, pp. 555–571.

BMBau (1991). Vitalisierung von Großsiedlungen. Forschungsvorhaben des Experimentellen Wohnungs- und Städtebaus. Bonn.

BMI (2019). *Vielfalt im Stadtumbau*. Berlin.

Campbell, A., Converse, P.E. & Rodgers, W.L. (1976) *The quality of American life: Perceptions, Evaluations, and Satisfactions* (New York: Russell Sage Foundation).

Cao, X. & Wang, D.G. (2016) Environmental correlates of residential satisfaction: An exploration of mismatched neighborhood characteristics in the twin cities, *Landscape and Urban Planning*, *150*, pp. 26–35.

City of Leipzig (2007) Development Strategy Grünau 2020. https://notes.leipzig.de/appl/laura/wp4/kais02.nsf/docid/D513EC68DE7FD6A7C1257268003A3C8B/$FILE/IV-ds-2306-anlage-1a.pdf, access: 15 April 2020.

City of Leipzig (2019). *Ortsteilkatalog 2018*. Leipzig.

Dekker, K., de Vos, S., Musterd, S. & van Kempen, R. (2011) Residential satisfaction in housing estates in European cities: A multi-level research approach, *Housing Studies*, *26*, pp. 479–499.

Dekker, K., Hall, S., van Kempen, R. & Tosics, I. (2005) Restructuring large housing estates in Europe: an introduction, in: R. van Kempen, K. Dekker, & I. Tosics (Eds) *Restructuring large housing estates in Europe*, pp. 1–18 (Bristol: Policy Press).

Expert Commission (2000) Wohnungswirtschaftlicher Strukturwandel in den neuen Bundesländern [Changing Structures of the Housing Economy in the new Federal States], in: *Bericht der Kommission i.A. des Bundesministeriums für Verkehr, Bau- und Wohnungswesen (Bauforschung T2949)* (Stuttgart: Fraunhofer IRB Verlag).

Fan, C. & Myint, S. (2014) A comparison of spatial autocorrelation indices and landscape metrics in measuring urban metricsscape fragmentation, *Landscape and Urban Planning*, *121*, pp. 117–128.

Francescato, G., Weidemann, S. & Anderson, J.R. (1989) Evaluating the built environment from the users' point of view: an attitudinal model of residential satisfaction, in: W. F. E. Preiser (Ed) *Building Evaluation*, pp. 181–198 (New York: Plenum Press).

Galster, G. (1987) Identifying the Correlates of Dwelling Satisfaction – an Empirical Critique, *Environment and Behavior*, *19*, pp. 539–568.

Galster, G.C. & Hesser, G.W. (1981) Residential satisfaction: Compositional and contextual correlates, *Environment and Behavior*, *13*, pp. 735–758.

Gorczyca, K. & Grabiński, T. (2018) Ageing in place: residential satisfaction in Polish Housing-Estate Communities, *Ageing and Society*, *38*(12), pp. 2410–2434.

Grant, R.L. (2014) Converting an odds ratio to a range of plausible relative risks for better communication of research findings, *BMJ (Clinical Research ed.)*, *348*, pp. f7450.

Grossmann, K., Kabisch, N. & Kabisch, S. (2017) Understanding the social development of a post-socialist large housing estate: The case of Leipzig-Grünau in Eastern Germany in long-term perspective, *European Urban and Regional Studies*, *24*, pp. 142–161.

Haase, A., Wolff, M. & Rink, D. (2018) From shrinkage to regrowth: The nexus between urban dynamics, land use change, and ecosystem service provision, in: S. Kabisch, F. Koch, E. Gawel. (Eds) *Urban transformations: Sustainable urban development through resource efficiency, quality of life and resilience. Future City*, Vol. 10, pp. 197–220 (Springer International Publishing, Cham).

Herfert, G., Neugebauer, C. & Smigiel, C. (2012) Living in residential satisfaction? Insights from large-scale housing estates in Central and Eastern Europe, *Tijdschrift Voor Economische en Sociale Geografie*, *104*, pp. 57–74. doi: 10.1111/j.1467-9663.2012.00727.x

Kabisch, S., Bernt, M. & Fritzsche, A. (2005) *Grünau 2004. Einwohnerbefragung im Rahmen der Intervallstudie "Wohnen und Leben in Leipzig-Grünau"*, Ergebnisbericht. Leipzig.

Kabisch, S. & Grossmann, K. (2010) *Grünau 2009. Einwohnerbefragung im Rahmen der Intervallstudie "Wohnen und Leben in Leipzig-Grünau"*, Ergebnisbericht. Leipzig.

Kabisch, S. & Grossmann, K. (2013) Challenges for large housing estates in light of population decline and ageing: Results of a long-term survey in East Germany, *Habitat International*, *39*, pp. 232–239.

Kabisch, S. & Rink, D. (2015) Governing shrinkage of large housing estates at the fringe, in: P. Hamel & R. Keil (Eds) *Suburban Governance. A Global View*, pp. 198–215 (Toronto, Buffalo, London: University of Toronto Press).

Kabisch, S., Ueberham, M. & Söding, M. (2016) *Grünau 2015. Ergebnisse der Einwohnerbefragung im Rahmen der Intervallstudie "Wohnen und Leben in Leipzig-Grünau", Ergebnisbericht*. Leipzig.

Kabisch, S., Ueberham, M., Schlink, U., Hertel, D., Mohamdeen, A.M.S., et al. (2018) Local residential quality from an interdisciplinary perspective: combining individual perception and micrometeorological factors, in: S. Kabisch, F. Koch, E. Gawel. (Eds) *Urban transformations: Sustainable urban development through resource efficiency, quality of life and resilience. Future City* Vol. 10, pp. 235–255. (Springer International Publishing, Cham).

Kahl, A. (1989) *Wohnen im Neubaugebiet. Forschungsbericht Grünau 1979-1987*. Leipzig.

Kahl, A. (1992) *Grünau '92. Intervallstudie*. Leipzig.

Kahl, A. (1995) *Soziales Porträt des Neubaugebiets*. Leipzig.

Kahl, A. (2003) *Erlebnis Plattenbau, Eine Langzeitstudie*, (Vol. 84), pp. 212. Opladen.

Kährik, A. & Tammaru, T. (2010) Soviet prefabricated panel housing estates: Areas of continued social mix or decline? The case of Tallinn, *Housing Studies*, *25*, pp. 201–219.
Kohout, M., Tichý, D., Tittl, F., Kubánková, J. & Doležalová, Š. (2016) *Housing estates, What's Next?* Prague: Institute of Building Theory at the Faculty of Architecture, Czech Technical University in Prague.
Kovacs, Z. & Herfert, G. (2012) Development pathways of large housing estates in post-socialist cities: An international comparison, *Housing Studies*, 27, pp. 324–342. Volume
Lu, M. (1999) Determinants of residential satisfaction: Ordered logit vs. regression models, *Growth and Change*, *30*, pp. 264–287.
Lynn, P. (2009) Methods for longitudinal surveys, in: P. Lynn, (Ed) *Methodology of Longitudinal Surveys*, pp. 1–19. (Hoboken (New Jersey): John Wiley & Sons).
Monclus, J. & Medina, C.D. (2016) Modernist housing estates in European Cities of the Western and Eastern Blocs, *Planning Perspectives*, *31*, pp. 533–562.
Musterd, S. & van Kempen, R. (2005) *Large Housing Estates in European Cities: Opinions of residents on recent developments, RESTATE report 4k*. Retrieved from http://restate.geo.uu.nl/results/Opinions.html
Musterd, S. & van Kempen, R. (2007) Trapped or on the Springboard? Housing Careers in Large Housing Estates in European Cities, *Journal of Urban Affairs*, *29*, pp. 311–329.
Nagelkerke, N.J.D. (1991) A note on a general definition of the coefficient of determination, *Biometrika*, *78*, pp. 691–692.
O'Brien, R.M. (2007) A caution regarding rules of thumb for variance inflation factors, *Quality & Quantity*, *41*, pp. 673–690.
Parkes, A., Kearns, A. & Atkinson, R. (2002) What makes people dissatisfied with their neighbourhoods? *Urban Studies*, *39*, pp. 2413–2438.
Pereira, S.M. (2017) Mass housing in Lisbon: sometimes it works, *Journal of Housing and the Built Environment*, *32*, pp. 513–532.
Pinquart, M. & Burmedi, D. (2003) Correlates of residential satisfaction in adulthood and old age: A meta-analysis, in: H.-W. Wahl, R. Scheidt & P. Windley (Eds) *Annual Review of Gerontology and Geriatrics. Aging in Context: Socio-physical Environments*, Vol 23, pp. 195–222 (New York: Springer).
Power, A. (1997) *Estates on the edge*. London: Macmillan.
Rajulton, F. (2001) The Fundamentals of Longitudinal Research: An Overview, *Canadian Studies in Population*, 28, pp. 169–185.
Rowlands, R., Musterd, S. & van Kempen, R. (2009) *Mass Housing in Europe. Muliple Faces of Development, Change and Response*. Houndsmill: Palgrave Macmillan.
Skrivankova, L., Svacha, R., & Lehkozivova, I. (Eds.). (2017) *The Panelaks. Twenty-Five Housing Estates in the Czech Republic*. (Prague: The Museum of Decorative Arts in Prague)
Smrke, U., Blenkus, M. & Socan, G. (2018) Residential satisfaction questionnaires: A systematic review, *Urbani Izziv*, *29*, pp. 67–82.
Speare, A. (1974) Residential satisfaction as an intervening variable in residential mobility, *Demography*, *11*, pp. 173–188.
Szafranska, E. (2018) Large Polish housing estates in transformation. Socio-demographic, spatial and physical Changes – the case of Łódź, in: U. Altrock, S. Kabisch, & N. Grunze (Eds) *Großwohnsiedlungen im Haltbarkeitscheck. Differenzierte Perspektiven ostdeutscher Großwohnsiedlungen*, pp. 297–326 (Wiesbaden: VS Verlag für Sozialwissenschaften).
Temelová, J. & Slezáková, A. (2014) The changing environment and neighbourhood satisfaction in socialist high-rise panel housing estates: the time-comparative perceptions of elderly residents in prague, *Cities*, *37*, pp. 82–91.
Turkington, R., van Kempen, R. & Wassenberg, F. (Eds.). (2004) *High-rise housing in Europe: current trends and future prospects*. (Delft: DUP Science).
Varady, D.P. & Carrozza, M.A. (2000) Toward a better way to measure customer satisfaction levels in public housing: A report from Cincinnati, *Housing Studies*, *15*, pp. 797–825.
Wang, D. & Wang, F. (2016) Contributions of the usage and affective experience of the residential environment to residential satisfaction, *Housing Studies*, *31*, pp. 42–60.

Wassenberg, F. (2018) Beyond an ugly appearance: Understanding the physical design and built environment of large housing estates, in: D. B. Hess, T. Tammaru, & M. van Ham (Eds) *Housing estates in Europe: poverty, ethnic segregation and policy challenges*, pp. 35–56 (Cham: Springer International Publishing).

Wassenberg, F., Turkington, R. & van Kempen, R. (2004) High-rise housing estates in Europe, in: R. Turkington, R. van Kempen, & F. Wassenberg (Eds) High-rise housing in Europe: current trends and future prospects, *pp. 1–14 (Delft: DUP Science)*.

Weidemann, S. & Anderson, J.R. (1985) A conceptual framework for residential satisfaction, in: I. Altman & C. H. Werner (Eds) *Home Environments*, pp. 153–182 (New York: Plenum Press).