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INTRA-REGIONAL MIGRATION IN FORMERLY INDUSTRIALISED REGIONS:

QUALITATIVE MODELLING OF HOUSEHOLD LOCATION DECISIONS AS AN INPUT TO POLICY AND PLAN MAKING IN LEIPZIG/GERMANY AND WIRRAL/LIVERPOOL/UK

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Abstract

The wide spread of old industrial cities in Europe and its particular problems in terms of economic, social and environmental parameters lead to the investigation of intraregional migration in these urban areas. Focused on an efficient land use development a Qualitative Model to the household location decisions builds the centre part of the work. It can deliver inputs to policy and plan making and is a truly new approach to suburbanisation.
The work builds on the assumption that old industrial Western urban regions and those in post-socialist contexts bear substantial similarities which is shown for Leipzig/Germany and Wirral/UK. Along four major research question following aspects have been investigated: (1) the urban/suburban population development in the last 50 years (urban life cycle model), (2) the main reasons for households to move to the urban fringes and (3) the consequences this has caused, (4) the possibilities to act against urban sprawl using the qualitative model that suggests leverage points to the dynamics between households. The dynamic model produces qualitative scenarios about the actors population in dependence of the attractivity of the residential area and the interactions of movers onto the attractivity. With respect to suggestions for policy and plan making aiming at lowering the rates of sprawl the qualitative model suggests that internal dynamics cannot halt urban sprawl in both regions. In Wirral a perpetuating development from low to high demand is projected for the suburban places leaving only a shortening of the high demand phases as intervention possibility. This is to achieve by enabling adequate housing for young couples in the inner urban areas and lower house prices in the suburbs. In Leipzig less sprawl would be achieved if single households are attracted to the fringes. They are changing the attractiveness for other households. As this is not very likely from the present perspective strong planning intervention is needed to change the internal dynamics through external (planning) actions. The model has proven to be useful to support plan making. These efforts are assumed to contribute to a higher awareness of and a joint action against climate change with lower energy consumption and lower land use change in urban regions.

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Glossary

Measures and Units

#	Number
%	Percentage, Percent, per cent
χ^2	Chi-Square
BMI	Body Mass Index
CA	Cellular Automaton
CBD	Central Business District
CCS	Census Coverage Survey
CI	Confidence Interval
CO_2	Carbondioxide
DM	Deutsche Mark
FUR	Functional Urban Region
ha	hectare
hr	hour
km	kilometer
m	meter
min(s)	minute(s)
N	Number, Frequency
NE	No effect
SI	Similarity Index
sqkm	square-kilometer
sqm	square-meter

Institutions, Laws and Programmes

ARL	Akademie für Raumforschung und Landesplanung Hannover Academy for Spatial Research and Planning Hanover
BauGB	Baugesetzbuch, Building Law
BbauG	Bundesbaugesetz, Federal Building Law
BBR	Bundesamt für Bauwesen und Raumordnung
BGB	Bürgerliche Gesetzbuch, civil code
BMW	Bayerische Motoren Werke
BPlan	Bebauungsplan, development plan
BROG	Bundesraumordnungsgesetz, Federal Regional Comprehensive Planning Act
COMECON	Council for Mutual Economic Assistance, see RGW
DEFRA	Department of Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions
DHL	Service provider for express, courier, and logistic services - founders Dalsay, Hillblom, Lynn
DINKS	Double Income No Kids
DIW	Deutsches Institut für Wirtschaftsforschung Berlin, German Institute for Economic Research Berlin
EC	European Commission
ECOTEC	ECOTEC Research and Consulting - international provider for research, cosultancy and management services
EU	European Union
EUROSTAT	European Statistical Office
EXPO	World Exposition
EZ	Enterprise Zone
FNP	Flächennutzungsplan, preparatory land-use plan
GDP	Gross Domestic Product
GDR	German Democratic Republic
GIS	Geographical Information System
GO	Government Office
IfL	Leibniz-Institut für Länderkunde Leipzig
IÖR	Leibniz-Institut für Ökologische Raumentwicklung Dresden, Leibniz Institute of Ecological and Regional Development Dresden
LOTS	Living over the shops (Initiative)
MDC	Merseyside Development Corporation
MORI	Market & Opinion Research International
NL	The Netherlands
ODPM	Office of the Deputy Prime Minister United Kingdom
ONS	Office for National Statistics United Kingdom
PIK	Potsdam Institut für Klimafolgenforschung, Potsdam Institute for Climate Impact Research

PPG	Planning Policy Guidance
QDE	Qualitative Differential Equation
QuAM-Model	Qualitative-Attractivity-Migration-Model
R&D	Research and Development
RDA	Regional Development Agency
RGW	Rat für gegenseitige Wirtschaftshilfe, see COMECON
RQ	Research question
SPSS	Statistical Programme
SPZ	Simplified Planning Zone
TU	Technical University
UDC	Urban Development Corporation
UDP	Unitary Development Plan
UFZ	Umweltforschungszentrum Leipzig-Halle, Centre for environmental research Leipzig-Halle
UK	United Kingdom
UNCED	United Nations Conference on Environment and Development
US	United States
USA	United States of America
WW	World War

Chapter 1

Introduction

1.1 Motivation and aim of research

Change is mostly fascinating, though not always regarded positive.
One can try to explore how everything comes and goes - most people do so and have to in their private life, their personal surroundings.

Cities have always represented the author's immediate surroundings - for 49% (2005) of the world's population the surroundings are urban as well; trend: increasing. By week the number of people living in urban areas rises by more than 1 million (United Nations, Population Division, 2003, 2004[1]). Cities are the built representation of a collectively, socially produced system (Gaebe 2004) – and cities change.

Simultaneously to the global positive trend of urbanisation[2] there are cities which are losing population. Between 1960 and 1990 every sixth city with more than 100000 inhabitants in the world was a shrinking[3] city. Between 1990 and 2000 already every fourth large city was shrinking (Rieniets 2004). But whereas shrinkage was historically connected to wars, dwindling resources, catastrophes or epidemics, urban shrinkage in the twentieth century was entirely different. The loss of population occurred over longer periods of time and took place at a time of peace and affluence and not through external, violent intervention. A sustained shrinkage in modern times began in the cities that had become metropolises in the wake of the industrial revolution.

> Europe, once the starting point of modern urban growth, became the starting point of modern shrinkage as well, which then expanded into a long-term, international pattern of development.
>
> Rieniets (2004, p.21)

[1]Source: Population Devision of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2004 Revision and World Urbanization Prospects: The 2003 Revision, `http://esa.un.org/unpp` 29. November 2005, 6:09:25 AM.

[2]Urbanisation - first, as the development of an increasing number of people living in urban areas (in German Verstädterung) and second, as the extension of urban areas, urban habits and the urban life style (in German Urbanisierung) (Leser 1997; Gaebe 2004).

[3]shrinking - understood as the loss of population

Today, shrinking cities are no longer exceptional occurrences and mostly formerly industrialised cities are affected. Modern population decline is often related to economic decline. Thus, the shrinkage of cities is almost exclusively a problem for industrialised nations (there might be some exceptions with cities that are connected to the exploitation of resources in the developing world). In the formerly industrialised cities, shrinkage started from the centre of the cities and later affected it entirely.

At about the same time as the industrial revolution another trend of urban development occurred in the countries: migration from the inner to the outer city areas or to the immediate surroundings. London was called the "Birthplace of Suburbia" (Fishman 1987), the birthplace of a middle class suburbanisation initiated by a bourgeois elite (in contrast to the suburbanisation only available to the noblemen in the centuries before). Observed first as early as in the late 18^{th} century, a repetition took place in the 20^{th} century. These modern suburbs were the result of formerly unprecedented urban growth. The growth of the urban fringes was associated with excessive growth of the urban core.

This outward migration is accompanied with implications for the functioning of cities and the organisation in space. It is connected, e.g., to an increase in the distance between urban functions, rising total transport energy demand (Helling 2002), air pollution and spatial segregation (Jargowsky 2002; Herfert 2003). As decentralisation advanced in the 20^{th} century, authors spoke of 'urban sprawl' (Siedentop 2005; Harvey and Clark 1965).

The two processes of suburbanisation as a result of urban growth and shrinkage as an unintended consequence of industrial growth, have long been recognised in the Western world. A newer insight is that these two can go together (Gaebe 2004). Suburbanisation is not generally connected to growth (cities in the USA) - and urban growth not generally to the expansion via the suburbs (Asian cities, cities in the socialist countries) (Braudel 1981). The combination of these processes have gained limited attention in urban research, it is a phenomenon only observed since the second half of the last century. Furthermore significant negative consequences have to be expected when both processes occur at the same time. Problems which result from each development might be heavily aggravated, e.g., difficulties with the maintenance of the social and transport infrastructure, the human capital and community expenses - the functioning of cities as a whole as well as for sustainable development.

Against this background it seems significant to investigate recent examples of the combination of urban sprawl and population decline. It needs to be evaluated whether this phase is time-constrained and may be a 'natural' development of cities. The reinforcing problems have to be illuminated and alternative actions for politics and planning to face arising problems need to be developed. Starting from the development sequences of population figures in selected declining regions in Europe possible reasons for migration on a sub-city level will be investigated in these areas. Proceeding with an investigation of likely consequences the analysis will then go on in looking at the profits of an alternative means for politics and planning, a qualitative modelling approach, aiming to influence the urban-suburban population trends in post-industrial regions. Modelling approaches are rarely used in planning today. The author's interest is to contribute to a successful management of urban development, to reduce problems caused by sprawl and population shrinkage and to offer new means for the local and regional planning in facing mentioned developments.

1.2 The difficulties of definition

1.2.1 Forms of intra-regional migration: Suburbanisation and urban sprawl - Similarities and differences

The development that most cities of market-economies face today is a centrifugal process that has many names - most often referred to as suburbanisation or urban sprawl. The name "urban sprawl" as well as "suburbanisation", which is more commonly used in the German context, are figurative terms. They have no sharp boundaries and are used in wide contexts. One can find are a multitude of similar definitions but no clear and uniform concept (Ewing 1997; Galster 2001; Chin 2002; Gillham 2002; Squires 2002; Siedentop 2005). Every study group has to appoint its own definition. It is not the aim of the author to establish a common terminology of sprawl or suburbanisation. Rather the understanding underlying this work, the working definition will be given beneath.

The word suburb means literally 'beyond the city' (Gillham 2002; Siedentop 2005) and thus can refer to any kind of settlement at the urban hinterland or the periphery of an urbanised area. It therefore distinguishes at least between two spatial areas: an outer urban area, the suburb, and an inner urban area. Figure 1.1 pictures the spatial distinctions underlying a division in inner urban and outer urban/suburban spaces. A division according to these two units is very general and many more distinction of urban areas are used commonly, e.g. in the form of additional rings (Claaßen 1996) or sections (Reichart 1999), but also the very braod division into two spatial units finds its application (Gaebe 2004).

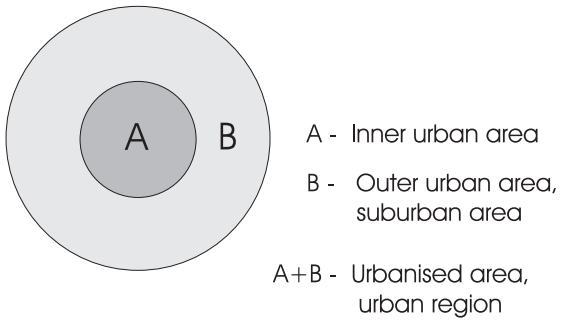


Figure 1.1: Possible structuring of urbanised areas. Source: Author's draft, inspired by Gaebe (2004).

After Gaebe (2004, p.62) such a division is normally not dependent on administrational boundaries between communities but rather relates to a functional connection, such as commuting and shopping trips, between the two spatial parts[4]. He explains further that classifications according to political administrative boundaries are normally insufficient,

[4]Please note that there are substantial differences in the used terminology in the English and German speaking countries which could well lead into confusion. In the German literature the 'Innenstadt' is mainly referred to as the CBD in the English speaking realms, whereas the inner city in the English terminology is the part around the CBD normally characterised as the inner city housing estates. The whole of the city is sometimes called the 'Kernstadt' in German literature, whereas the core city is only the CBD among the English. The division in only two parts as in Figure 1.1 is also a reason (among others) to avoid confusion.

since cities are social and cognitive categories which characterise through institutions, symbols, consciousness and communication. Additionally, there is only a restricted availability of data for aspects that are not connected to administrative units as the division between urban and rural areas is normally undertaken according those. Fishman (1987) explains further, "the suburb, is not necessarily a separate political unit. [...] developers virtually ignored whether an attractive location was within or outside the political jurisdiction of the central city. Even today almost all large cities have suburbs [...] within their borders" (Fishman 1987, p.5f.). Sprawl and/or suburbanisation are therefore not related to administrational areas.

Gaebe (2004, p.63) defines suburbanisation under the perspective of a spatial as well as a structural change of the following kind:

1. Spatially it reveals a shift of population and jobs within an urbanised area from the core city to the hinterland.

2. Structurally, suburbanisation explains the mutually dependent changes of the settlement, business, population and social structure in the core city and the hinterland.

Whereas this is a distinctive definition of suburbanisation it is not as easy to appoint the clear differences between suburbanisation and urban sprawl. The cradle of the term "urban sprawl" is believed to date back to the year 1937 when Earl Draper used the adjective "sprawling" in describing unaesthetic and uneconomic changes in the shape of American settlements (Siedentop 2005). In this early phase a simple conceptual understanding dominated in the US. The sprawl debate was associated with the spatial expansion of physical structures into formerly undeveloped countryside (Gillham 2002; Siedentop 2005). Later, in the 1970s research intensified and brought about the acknowledgement that sprawl is of a more complex nature. E.g. Gillham (2002, p.8) defines for the context in the USA:

> "[..] sprawl (whether characterized as urban or suburban) is a form of urbanization distinguished by leapfrog patterns of development, commercial strips, low-density, separated land uses, automobile-dominance, and a minimum of public open space."
>
> Gillham (2002, p.8)

In the German speaking countries a similar process was circumscribed with the term "Zersiedlung" which arose in the 1960s. It stands for an unsystematic urban development into formerly unbuilt areas. The intensification of related research in the 1990s in central Europe let the term "Zersiedlung" become fully established in German-speaking countries and has since then been closely related to the English term of urban sprawl. Still the lack of a common and clear understanding of sprawl continues – a result of its complex nature (Siedentop 2005).

Complexity is also one criteria in the attempt to distinguish urban sprawl from suburbanisation. Suburbanisation is understood as the more homogenous and uniform extension of settlements over its structural boundaries (Sukora 2003). It is associated with growth in outer urban or adjacent communities around urban settlements and a decline in the inner and core areas of the city by that reducing the density gradient between cities and their suburbs. In contrast, urban sprawl is not any form of suburban growth but a particular

one, as Downs (1999) remarks. Though the particular form finds several interpretations. Siedentop (2005) finds five categories of definitions which all use different criteria:

- density-related gradients (though similar to the definition of suburbanisation),
- spatial concentration indices,
- structural and morphological forms,
- patterns of land use and its societal consequences as well as
- planning-paradigmatic normative parameters.

Here the author disagrees with Siedentop (2005), as most researchers today refer to a mixture of the five categories using several criteria (Ewing 1997; Downs 1999; Galster and Hanson 2000; Galster 2001; Peiser 2001; Chin 2002; Gillham 2002). The diversity in definition is at least one commonality in the sprawl debate.

Furthermore, it is agreed that sprawl occurs on the urban fringe and sprawl has to be distinguished from urban growth (Downs 1999; O'Sullivan 2003; Sukora 2003). As urban areas grow, most growth has to occur at the urbanised edges where space is abundant (Evans 1985; Mills and Hamilton 1989). This affects the costs of the premises in different urban locations conditioned by the expected returns in either. Monetary terms (with businesses) or satisfaction with the living qualities (with residences). A first model of this approach is the land use model of von Thünen (1826). Another example is the so-called 'Alonso' land use model (Alonso 1964).

In order to separate the different aspects of urban development and proceed towards a common systematisation of sprawl, a set of criteria needs to be specified. Galster et al. (2000) developed a methodological approach towards urban sprawl. They argue in line with the aspect of multi-dimensionality and define sprawl as:

> "pattern of land use in an urbanised area that exhibits low levels of some combination of eight distinct dimension: density, continuity, concentration, clustering, centrality, nuclearity, mixed uses, and proximity."
>
> Galster (2001, p.685)

These eight dimensions are observable conditions of urban land use, conceptually distinct from each other. Galster et al. (2000) introduced a method to measure each dimension on a continuum. It represents the first attempt to comprehensively quantify the multi-dimensional process, to proceed in its operationalisation and to compare its extent across urbanised areas. It becomes clear that urban sprawl is a specific form of urban growth.

Given the many issues mentioned it seems difficult to make a clear distinction between urban sprawl and suburbanisation. The definitions differ in the degree of specificity and relate to dissimilar meanings in the international context, for example in the German and the US-American context. In this work the terms urban sprawl and suburbanisation will be used in a similar way and specified further when necessary. For the investigation presented here only the translocation of residential uses from the inner cities to the suburban areas are of particular interest. The investigation will not concentrate on the aspects of commercial

or business relocation to the urban hinterland. For an argumentation without the need of parametrisation the analysis relies on a definition of population changes as described by Gaebe (2004). The working definition is:

> "Population ... suburbanisation is an increase in the share of population ... in the suburban parts of urbanised areas and a decrease in the share of the inner areas under the assumption that this simultaneously changes the settlement, ... the population and the social structure of core city and hinterland."
>
> Gaebe (2004, p.63) - translated by the author

Furthermore argumentations by Gaebe (2004), Gillham (2002) and Fishman (1987) will be taken into account suggesting not to prescribe sprawl and suburbanisation to specific administrative units. A concept based on the functional relations of an inner urban area with its suburban fringes will be used instead, e.g. functional relations via commuting, retail, leisure and/or amusement trips, which are not related to any administrational boundaries. However on the sub-city level statistical units make it easier to compare different urban parts. Data is generally available on the basis of statistical units. The sub-city units, the urban districts are relatively small but are assumed to comply with the functional understanding of spatial organisation when subsumed into groups describing agglomerated, bigger urban areas. The above given definition is therefore useful to the purpose of this analysis. It will be applied to selected urbanised areas characterised by a difference in the share of population in the inner urban and suburban areas over time. On the other hand the author will speak of re-urbanisation if the majority of people (net-migration) is moving back to the inner areas of cities (Gaebe 2004). However, this seems not to be the predominant form of regional migration in Western cities at present.

1.2.2 Formerly industrialised regions: Shrinking cities, shrinking regions

Shrinkage describes a decreasing development, a development with a negative trend. With respect to cities as the built representation of a collectively, socially produced system, shrinkage refers to the decrease of one or more of the components of the system (Forrester 1969; Degele 1995; Wackerbauer 1995). Shrinking can apply to decreasing inhabitants, decreasing jobs, decreasing industrial jobs, etc. Often the decline of one of the parameters will affect others - the system's components are interrelated. In this work, the decrease of population is of central interest implying a particular relation to other components of urban systems, such as (preceding) decline in employment. The focus on population figures is reasoned not only by practical considerations, e.g. a generally widespread data availability and long time series, but also by the fact that a high urban density is one of the most widely used features to characterise urban areas (Leser, Haas et al. 1997). Inferentially from the causes of urban growth the causes of urban decline might be the following:

1. a fall of birth rates under the maintenance level (2.1 children per women) and/or
2. a net outward-migration.

The first issue is, at least within this study, taken as a fact acknowledging the observed relationship between rising affluence of a society and its falling birth rate (Rieniets 2004). The second issue is central to this investigation.

Due to the recent loss of population - without an external intervention, in times of peace and increasing affluence - a completely new discourse about the shrinkage of cities and the decline of regions emerges (Rieniets 2004). One of the main difficulties in definition arises with respect to the historical examples. Shrinkage is related to the scale of time (as growth is). Referring to longer or shorter periods of time, every city might lose population. Such a distinction reduces the clarity of the term used and makes operationalisation difficult. There is no scientifically agreed understanding or (minimum) time period to define urban shrinkage (Oswalt 2005). There are various cities, mostly post-industrial cities in the developed countries, which experienced an urban population decline when the phase of de-industrialisation set in (Oswalt 2004; Rieniets 2004; Oswalt 2005). Often this period lasted for several decades and has not yet been overcome.

Beyond this, shrinkage has to apply to a certain spatial level. Whereas the current decentralisation trend results in general in a loss of population in the inner urban areas and has produced a 'doughnut-shape' of cities in the US-American context this does not relate to the understanding of urban shrinkage as used within this new discourse about shrinking cities (Oswalt 2004; Oswalt 2005). It is instead more focused on the loss of population and economic performance within an entire urban regions. An urban population decline has to be judged against the background of the overall regional development (Alonso 1964; Renkow and Hoover 2000; Burnham, Feinberg et al. 2004; Fishman 2004). And more so the new discourse about urban shrinkage describes especially the loss of urban population within economically fragile regions (Oswalt 2004; Oswalt 2005) which in most cases are old industrial areas. The focus of this work lies therefore on the evaluation of change in population in old industrial regions.

1.3 State of research and new aspects

Planning as the executive body of policies for urban development emerged in the last decade of the 19th and the early years of the 20th century throughout all major industrial countries of Europe. It was an answer to the overwhelmingly urban growth which was closely connected to industrialisation, as already described by Friedrich Engels in 1892 (Ward 2004), and the entailed change of organisation in space (Ward 1994). Planning, urbanisation and industrialisation are interrelated (Fishman 1987; Short 1996). As industrialisation proceeded problems arose as usually found within every system that develops fast and does not adjust (Forrester 1969). The living conditions in the urban areas became unbearable in the late 19th century (with little variations between Western countries). The cities were crowded and lacked adequate sanitary facilities. Against this background, classical urban planning developed to promote a welfare idea of the state. The government as the central entity controls the territory to provide good living standards for the citizens (Oswalt 2005): it is the welfare state envisaged, e.g., by Henry Ford (Ronneberger 2004).

With the world economic crises commencing after the Great Crash in 1929 implying a decrease in economic and industrial production, also the urbanisation trend in the affected

countries slowed down (Munck 2004). The business structures changed, production became more efficient with ongoing technological inventions, improved transport infrastructures enabled companies to relocate to other, more profitable locations (Hoffmann 2004). The need of a close organisation of the functions of general economic interest (Daseinsgrundfunktionen[5]) – dwelling, working, supplies, education, recreation and transport – lost relevance as changed and changing business structures and transport possibilities resulted in the further emancipation from space and time (Müller 2004; Prigge 2004). An increasing share of the population moved to the nicer suburban locations (Fishman 1987) – the traditional city was perceived to be in a crisis (Forrester 1969). This is especially true for the old industrial areas where de-industrialisation hit the communities with especial strength. Normally the economy in these regions was mono-structural and therefore a closure of key businesses especially severe for the regional economy as a whole. Urban population shrinkage in post industrial areas reached its peak in the 1970s and 1980s (Rieniets 2004).

As outlined above, the two processes of sprawl and urban decline can take place synchronous. There was and still is a renewed necessity or urgency to investigate the combined occurrence when the political circumstances in Eastern Europe and Eastern Germany initiated a severe de-industrialisation phase in the 1990s. The breakdown of the so-called socialist regimes[6] and subsequent mistakes during the transformation of the economy and the administrational structures to a market-led economy resulted in various peculiarities. Many authors have written about the political, administrative, economic and social implications (Schmidt 1991; Borst 1996; Dieser 1996; Häussermann 1996; Lenssen 1996; Pfeiffer 2004; Schmidt 2004). A comparison of a capitalist and a (traditional) socialist economy offers the opportunity to compare the influences of a political regime, to compare the causes and consequences of sprawl and decline under different political frameworks. Furthermore, such a comparison offers the possibility to extract information about a stated regularity in urban development, for example as supposed by the life cycle theory of urban areas. With respect to the experience in formerly socialist cities it remains to be questioned whether the urban life cycle model holds for the socialist as for the capitalist cities. Such a general understanding of the urban system and its development is necessary to formulate adequate means of intervention.

Intervention has been the goal of politics and planning ever since its inception at the start of the 20th century in Europe (slightly differing across the states in Europe). Intervention might be especially important in the old industrial areas where the problems associated with urban sprawl are compounded by weak economic performance. Additionally, problems resulting from the strong industrialisation still prevail and might increase the need for but also minimise the possibilities of intervention against sprawl. It is possible that former industrialised cities generate more sprawl than others. It is not as comprehensible that shrinking cities do so as space for changing needs is available in the inner cities.

[5]A term that originates from Sociology and which describes the basic, general activities of people with a spatial relevance. This includes living, working, consuming, education, recreation and travelling/commuting.

[6]It would open up a different discourse to address the aspect of whether the Eastern European countries were actually governed according to socialist ideas. As this is not the focus of this work the author speaks of socialist countries from here on assuming that different opinions about this issue exist.

Common problems of urban sprawl in shrinking, old industrial cities with their older housing stock are: the existing community services, infrastructure supply and maintenance, medical services, educational facilities etc. can no longer be assured as community budgets went down (Renkow and Hoover 2000; Power 2001; Sui 2003; Prigge 2004). Even more severe will be the consequences when sprawl and shrinkage occur in combination as both processes relate to decentralisation. Additionally environmental impacts are possible, e.g. increased land use, sealed areas and land use fragmentation, increased run-off, problems with groundwater discharge, increased air pollution etc. (Richards 1993; Newton 2000; Cieslewicz 2002; Gillham 2002). Furthermore, it was documented that the society increasingly diverges. After the period of aspired equalisation starting in about the 1920s, the traditional planning model went into crises in the 1970s (Oswalt 2005). Since then the state has developed increasingly away from its welfare ideas and the society develops towards a segregated, insular patchwork of social clusters (van der Veer 1994; Ott 2001; Wiest 2001; Herfert 2002; Herfert 2003; Paal 2003; Paal 2004). Whereas there are major and unfavourable impacts to be expected on the community level, the consequences for the individual are (still) mainly positive.

Not at least because of the increased awareness for the environmental consequences but also because of the financial problems of the communities and the duration of the problems in the regions, a need for action has been felt. The interventional policies of the past had little effects (Oswalt 2005). Planning strategies were neither very successful in keeping well-off inhabitants within the cities, nor did they have many instruments to intervene against the changing business structures. Whereas the latter can hardly be influenced by the local, regional or national authorities the former seems astonishing for any authority trying to guide the development from top-down whereas it is less surprising for ethnologists and sociologists.

Planners and politicians have tried to keep people within the cities by various means in the last decades, e.g. extensive re-urbanisation strategies or slum clearance (Couch 1990; Couch 1999; Jeffrey and Pounder 2000; Noon, Smith-Canham et al. 2000; Roberts 2000; Couch 2001) – with little success. Why? One possible reason is that planners and politicians learned to plan like interventionists (Oswalt 2005). A second that, as societies and businesses developed further (from the state of mass production and assembly line work to the era of specialism, and de-hierarchisation), the authority of planning might not have evolved simultaneously. Also, well-off citizens nowadays have more power than in the past. They have a higher financial background, which is still increasing due to rising incomes and increasing social polarisation. Therefore, it might no longer be possible to prescribe a planning goal from 'above'. The citizens have to be incorporated. They are a part of sprawl. The actor's perspectives might not have been sufficiently included.

Against this background the need to investigate new planning tools is motivated, planning tools that can allow for the individuals' desires but do not neglect the general, welfare based framework. One could argue that one has to respect the actor's desires, e.g. to live in nice green, healthy surroundings. This would imply that an understanding of actors in the regional development should be improved. On the other hand, it does not mean that the need for the institution 'planning' would decrease, especially with the observed contraditions between the individuals' desires and the general/common welfare as well as

with the problems of segregation. Segregation is understood as the wish to separate from strangers and the desire to gather with those who are alike. In the view of the author this is a leverage point for the success of planning strategies (Meadows 1999) as residents, among other things, condition the attractivity of a region. However, this does not mean that it is promising to plan for a segregated city. Intermediate solutions need to be found. The approach to this work is grounded in the theory of social system dynamics which allows the presumption that the attractivity of a region is to a large part based on the presence of actors and their interactions. The author suggests a modelling tool as a support for planning authorities that enables the evaluation of the actors' perspectives and preferences as well as population development, and prevailing planning strategies. This is an interdisciplinary approach and has not been commonly used with planning procedures. The application of the model would break new ground and enable the improvement of alternative methods.

1.4 Initial research questions

Against the background discussed so far and especially in old industrial areas where the regions and cities are sparsely populated one might asked: why are people still so attracted to the suburban areas? What does it mean for the city's development with respect to entailing consequences and sustainable city development? And what does it imply to planning, its functioning and its means? The initial research questions organised along 4 themes are the following:

1. **Process oriented**
   What theory helps to explain the occurrence of sprawl in post industrial regions including considerations of the legacies of the different political systems in the case studies?

2. **Causes oriented**
   What are the main causes for sprawl in shrinking, old industrial regions?

3. **Consequences oriented**
   What consequences result from the simultaneous occurrence of sprawl and population decline?

4. **Planning / Governance oriented**
   How can planning contribute to a more sustainable city development in shrinking regions? Can a modelling approach as potential new means to urban planners contribute valuable information to halt sprawling in shrinking contexts?

These 4 themes will guide as a structure throughout the work. The main chapters will be subdivided along the themes.

1.5 Research framework and research focus: Behavioural approach to action space

The approach to answering these questions is based on the assumptions underlying the theory of action space research (Aktionsraumforschung). Within this theory the city is a production of the cumulative actions of individuals, the actors on the micro level. Their individual decisions and actions can explain the urban structures and interdependencies (Gaebe 2004, p.61). Urban structures, the macro level, are analytical constructs dependent on and formed by actions and restrictions. The actions on the micro level are influenced by developments on the macro level and therefore do not occur independently (Gaebe 2004, p.97). However, the approach supposes a strong individual motivation and significant actions. This is relevant in particular to the postulated insufficiency of consideration of the actors' conscious roles in sprawling development. Figure 1.2 shows the assumptions made towards the interdependencies between a macro and a micro level of urban areas.

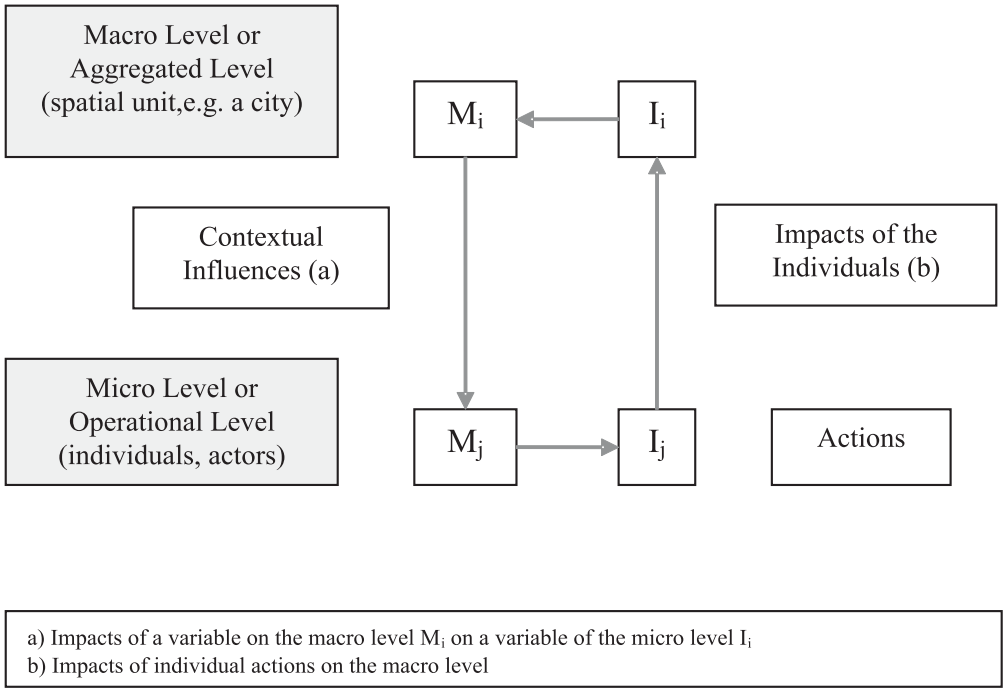


Figure 1.2: Relations between the macro and micro level of cities. Source: Gaebe (2004, p.97), after Friedrichs (1995). Modified and adjusted to the research question.

Within the approach, groups of individuals are of particular importance since an agglomeration of actions will change the structure and therefore the production of the city which then feeds back to the perception of the actors. The approach is based on the claim that the logic of actions should be integral part of action space research (Gaebe 2004, p.19). The work is seen as a contribution to this claim.

Against the background of this theoretical approach, every spatially mobile person has a space of action. Despite the strong increase in spatial interaction, the dwelling and the neighbourhood remain the reference points in life, the reference point of social relations and of the spatial identification. Action spaces are, relevant to the dwelling, limited by the temporal and the spatial range of actions. These actions are defined as the everyday or iterating journeys between the dwelling and the place of work, a friend's house, the shopping centre, etc. (Gaebe 2004).

Such an understanding of cities and their components was influenced by systems dynamics theory. It is the basis of the so called behavioural approach to urban geography (Heineberg 2001; Gaebe 2004). It is a school of geography established in the 1970s which uses the matter of perception and evaluation to explain urban structures and their locations. The interrelations between perception/evaluation and spatially relevant operations of individuals or groups of individuals is the core of that approach. It enables statements about the connection between perception/evaluation and the choice of a location, e.g. a residential location (Heineberg 2001). The concept was further developed by Werlen (1988; 1995; 1997) and Scheiner et al. (1999) to the 'action oriented theoretical approach' (handlungstheoretischer Ansatz). Werlen (1995) conceives action (in contrast to behaviour) as the intentional act of human activity. Although based on intention, an action also incorporates the subjective social, cultural, and physical influence of ones surrounding. Therefore the consequences of an action can be intended or not (Werlen 1995). Scheiner et al. (1999) used this framework and the principle elements of the action space research to create an analytical diagram of operational action (aktionsräumliches Handeln) (Heineberg 2001, p.19) which is shown in Figure 1.3.

Against this background: actors (subjects) are at the centre of any spatially relevant action. The structures of the physical and social surrounding are understood as restrictions (conditions) but also as possibilities and means for action. These two constitute the action space and condition the logic of selection (Scheiner et al. 1999). Other external influences are, e.g. planning policies and land regulations, locational disadvantages, the supply of available dwellings and market conditions. Figure 1.3 shows the assumptions as described. It follows that actors influence the perceived physical and the non-physical surroundings for themselves and for others by their actions. This approach is extremely valuable for the investigation in this work as it contributes to the understanding of the choice of residential locations within an existing housing market (Gaebe 2004, p.97). Effects are to be expected between the perception of an actor and their locational preferences (the internal conditions and internal effects) and the external conditions (such as the supply of dwellings). Relations between the factors are expressed as contextual hypothesis as, e.g. the impacts of dwellings prices on low-income households.

This is one possibility to contextualise and simplify cities as complex systems. Critics of this approach might relate to the simplicity of the theory: it could miss out important influences on the actions of actors. However, this is not necessarily the case, and furthermore all theories generalise from a more complex reality. Further difficulties exist in the operationalisation as the actor's perceptions and subjective locational evaluations are hard to explain, to parametrise and to quantify. This point will be taken up later by considering possibilities to treat these problems. The approach in this work is centred around the behavioural approach to action space - it argues for a behavioural approach to social geography in general and residential migration in partiular.

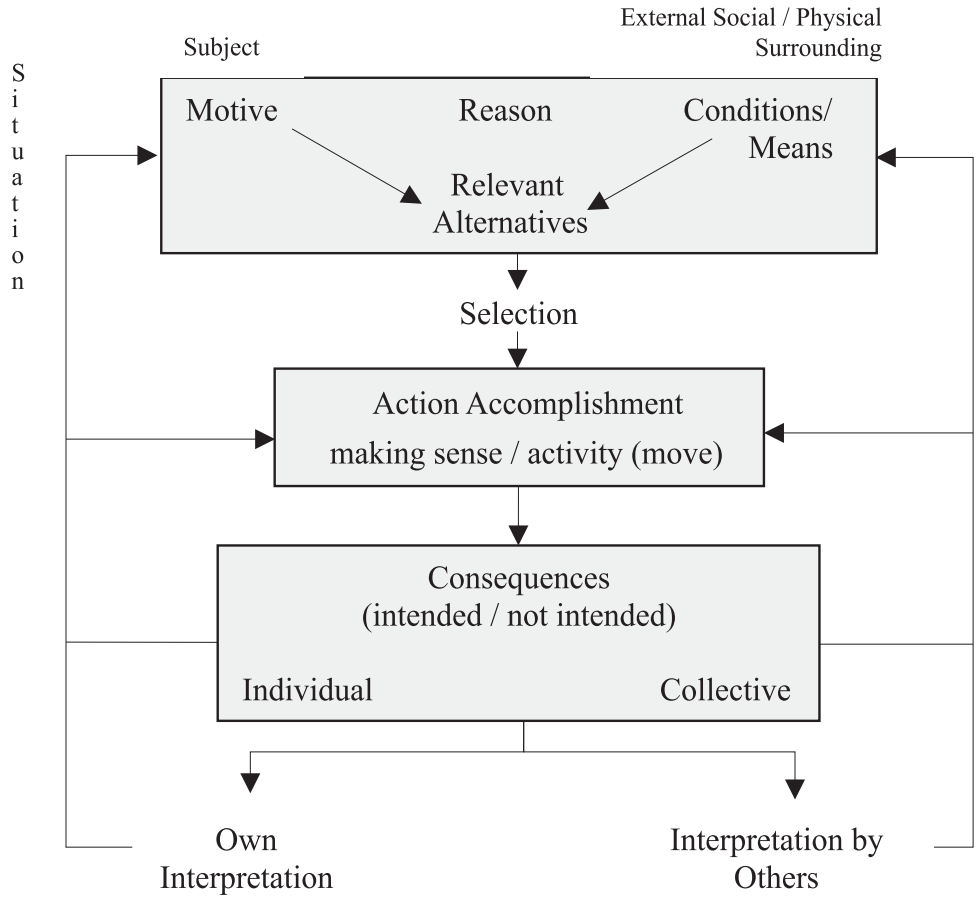


Figure 1.3: The framework of operational action. Source: Scheiner et al. (1999, p.58) - modified.

With respect to the focus of the investigation this means that the sprawl processes in old industrial agglomerations are evaluated as a collectively produced change in the characteristics of urban space where the residents are the most important actors. The author will look at differences in the population figures over time. It will also be investigated the population figures according to the sub-city levels with respect to the inner and outer urban areas. After a theoretical discussion these issues will be analysed in two selected case studies: Leipzig (Germany) and Wirral/Liverpool (United Kingdom (UK)). The case studies have been chosen according to the development of population and employment figures in the recent past. Furthermore both cities are known as formerly industrialised cities with a strong economic performance also in their surrounding regions. Additionally both cities have a different political past which leaves a great opportunity to investigate this political influence. A case study analysis will be undertaken that enables to use the collected information as input to a modelling application. The author proposes a Qualitative Attractivity Migration Model to gain insights into the migration dynamics according to the attractivity evaluation and the interrelations between residential movers. The model is assumed to reveal valuable information about the possibilities of influence of urban sprawl processes and the appropriate points in time.

In the following the specification with respect to the three (geographically) important dimensions of research are given: the matter of reference, the spatial reference and temporal reference (see Figure 1.4).

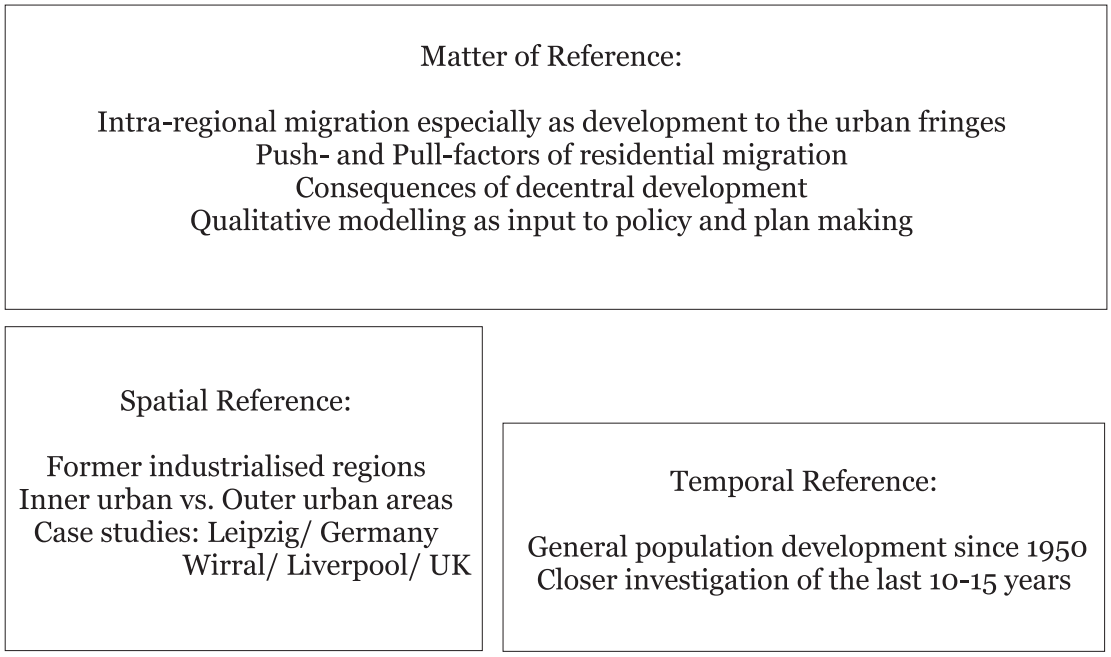


Figure 1.4: The three dimensions of investigation. Source: Author's draft.

The investigation forms around the terms: population decline, intra-regional migration, testing potentially new means of politics and planning, e.g. with qualitative modelling. They represent the matter of reference to the work. Two case study regions have been chosen which are similar in some aspects but different in others. Differences and similarities will be used for the research questions.

1.6 Introduction to the case studies: Leipzig (Germany) and Wirral/Liverpool (UK)[7]

Both case regions are formerly industrialised regions, located in Europe (see Figure 1.5). Both agglomerations have been losing population since about the 1930s (Oswalt (ed.) 2005) and have experienced some kind of urban sprawl. The difference in form, time and extent of urban sprawl is mainly due to the different political frameworks (socialist versus capitalist regime in one temporal part of the investigation), resulting business structures and planning policies. However, substantial similarities have been encountered in the culture, the business organisation and entailing legacies from the industrial past despite the different political background. The reasons for choosing these two case studies will be explained in the chapter on methods further below.

[7]This section is an abbriged version of Reckien et.al. (2006): Introduction to the case studies. To appear in: Urban sprawl in Europe - Planning and Policy. Edited by C.Couch and L.Leontidou. Oxford: Blackwell.

Figure 1.5: Location of the case study areas. Source: Author's draft, SPSS Mapping function, Red: Major roads.

1.6.1 Leipzig

Leipzig is situated in the Free State of Saxony in Germany. It lies at the heart of an old industrialised region with a largely flat topography in the former German Democratic Republic (GDR). In 2005 the city of Leipzig had a population of about half a million people (500352 inhabitants)(Amt für Statistik und Wahlen Leipzig) which is not much less than in 1990, the year of German re-unification. However, this stability in terms of size was only achieved by the incorporation of several former neighbouring municipalities in recent years which almost lead to a doubling of the city's territory (to 29761ha) and likewise caused the population density to fall to 1765 inhabitants per square kilometre (sqkm) in 2003 (from 2888 inhabitants/sqkm in 1996; Statistisches Landesamt Sachsen 2003; Urban Audit 2000). Figure 1.6 shows the regional situation of Leipzig, the former and the current city area. The city area until 1996 forms the inner urban area today, whereas much of the new Leipzig territory can be characterised as suburban.

During the 1990s the city of Leipzig, in absolute numbers, suffered the highest loss of population of all east German municipalities. Within a few years, the number of inhabitants dropped by almost 100000, i.e. about 20%, before the enlargement of the city's territory made up for a good part of this loss (Nuissl and Rink 2005). Approximately half of the population loss of the 1990s was accounted for by population movements to the economically more prosperous western parts of Germany; the other half, however, was an effect of

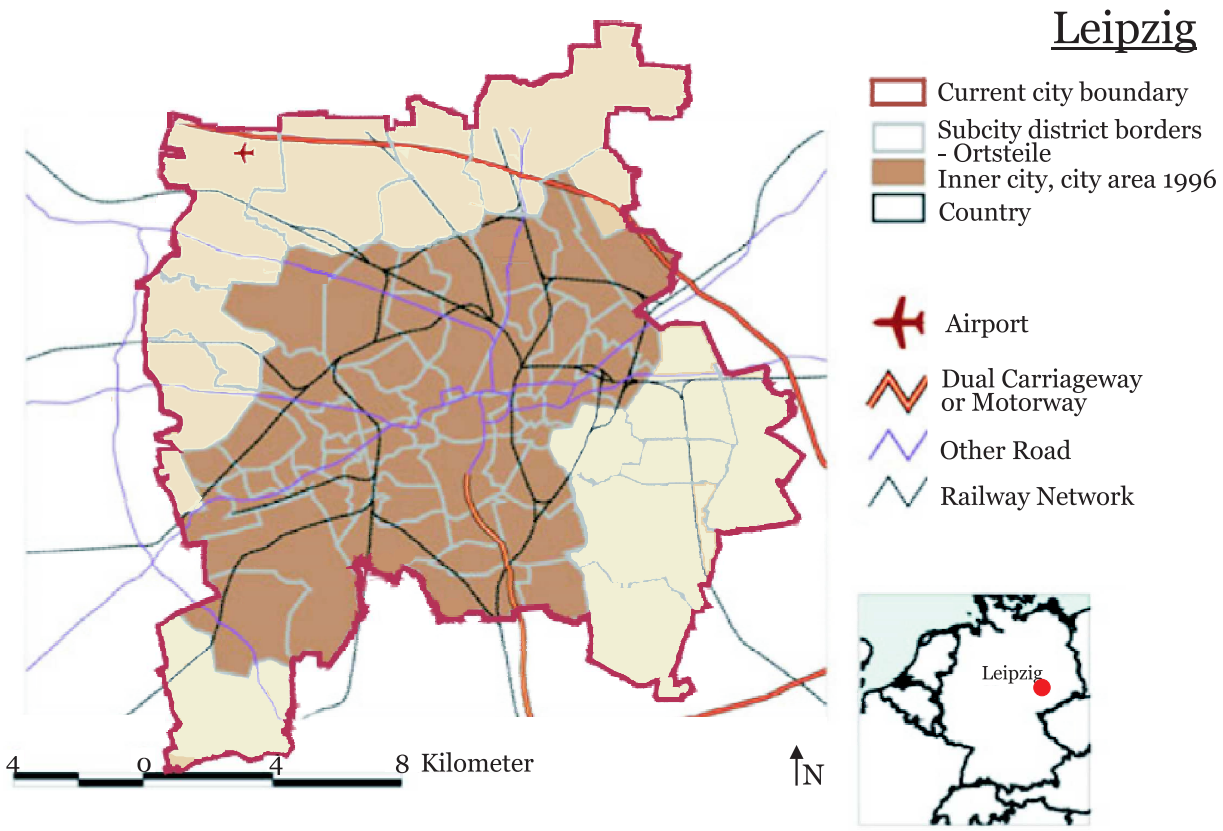


Figure 1.6: Regional situation of Leipzig. Source: Urban Audit 1996, modified.

residential urban sprawl. In addition, a drop in the birth-rate of the population marked a widespread feeling of insecurity in the economic future. Today the city's population is fairly stable. Interestingly, the number of households had dropped to a far lesser extent during the 1990s than the number of inhabitants, because the average household size has decreased significantly.

Regarding its economic, historical development, Leipzig was founded as a place for fairs and trading. It became a largely industrial city not before the late 19th century, with the metal industry being most important at that time. The surrounding region, including its neighbouring city of Halle, underwent heavy industrialisation until the first part of the 20th century which gave the region its distinctive character (Nuissl and Rink 2004; Nuissl, Rink and Steuer 2005). Chemical industry and open-cast mining (power generation) were the most important industrial sectors in those times. The city's industrial economic base persisted after World War II but the environment and landscape around the city deteriorated.

After German unification, and the structural adjustments necessary for free market operations, the economy of the city shifted from being dominated by industry and manufacturing, to being more dependent on services. Between 1989 and 1995, the number of jobs in industry fell by over 70% and services made up to 78 % of the employment as early as in 1996 (Urban Audit 2000). This rapid structural change, which was connected to an

overall de-industrialisation, brought about severe economic problems and high unemployment. The unemployment rate was 8.8% in 1996, but was probably much higher due to the large number of jobs in employment-creating measures, and is today at 13.3% of the economically active population (Stadt Leipzig 2004). Although more than 50000 jobs have been created in banks, insurance companies and private services since 1989, the service sector could not compensate for the heavy job losses so far (Nuissl and Rink 2004; Nuissl, Rink and Steuer 2005). The only positive outcome from de-industrialisation seems to have been the environmental benefits.

Due to a lack of maintenance during GDR-times, Leipzig's building stock was largely in decay until the early 1990s but today the regeneration of the city is clearly visible. Leipzig has also retained its function as a regional financial and educational centre. Transport links within the city and beyond are fairly good. The Leipzig-Halle region has an international airport and the city has a good intra-urban public transport system, which includes trains, buses and trams. The city of Leipzig offers a variety of cultural events and activities, most notably the concert hall (Neues Gewandhaus), the Leipzig Opera House, theatres, variety halls, art galleries and museums, including the Museum of Fine Arts, the municipal Gallery and the Museum of City History. City monuments include the Churches of St Nicolas and St Thomas, the Monument to the Battle of the Nations, the Old and the new Town Halls, the large main railway station and the Russian Memorial Church. The city is also vaunts 'Auerbach's Keller' which is famous for Goethe's cellar scene in 'Faust'.

Regarding the local government and planning structure, the city of Leipzig is divided into 10 municipal boroughs and 63 smaller municipal districts which do not possess any political power (Stadt Leipzig 2004). The council is made up of 71 members, who are elected every five years. The mayor is elected every seven years (Amt für Statistik und Wahlen Leipzig). The city municipality is responsible for development and land use planning. Leipzig is the administrative centre of 'West Ssxony', one out of three administrative regions subdividing the German Bundesland 'Free State of Saxony'. It is on this regional level where regional planning is carried out (Nuissl and Rink 2004).

With respect to the recent history of sprawl in the region, Leipzig is significantly coined by its political history. During the existence of the German Democratic Republic (GDR), Leipzig was almost ignorant of the problem of (post-war) urban sprawl. Since the Berlin Wall came down in 1989 this has changed fundamentally and Leipzig has experienced a period of heavy urban sprawl which was induced by a set of incentives that largely stemmed from the institutional framework. According to the dominant features and dynamics of development this period can be subdivided into four phases. The first phase was mainly characterised by commercial sprawl immediately after the opening of the German-German border. Thousands of investors came, developed land and erected buildings to explore the business possibilities and take advantage of the new market. Then, from about 1992 until 1997 Leipzig experienced a strong process of residential urban sprawl mainly due to the lack of inner city housing in good shape and modern standards. Newly built apartment blocks on the fringes of Leipzig could serve the wishes of many people. After 1997 the trend of moving towards the suburbs started to decline. Inner city refurbishment and the resolution of restitution claims left a mark on the property market and its prices. The city's new retail and leisure facilities made it more competitive against the suburbs. The kind of urban sprawl changed into single family houses as predominant form. Since then

suburbanisation decreased continuously. Many proprties are empty, the prices dropped in the inner city as well as on the fringes (Nuissl and Rink 2002). But the consequences of the development of the former decade remain and the low prices could possibly lead to a new wave of urban sprawl driven by market forces (Nuissl and Rink 2005; Nuissl, Rink and Steuer 2005).

1.6.2 Wirral/Liverpool

Liverpool forms part of the Merseyside County Area, a conurbation made up of five local authorities – the boroughs of Liverpool, Sefton, Knowsley, St. Helens and Wirral – it has about 1.5 million inhabitants. Figure 1.7 shows the Merseyside County area with Liverpool and Wirral. The conurbation is situated in the North West Region of England, an area that borders the Irish Sea at its western parts.

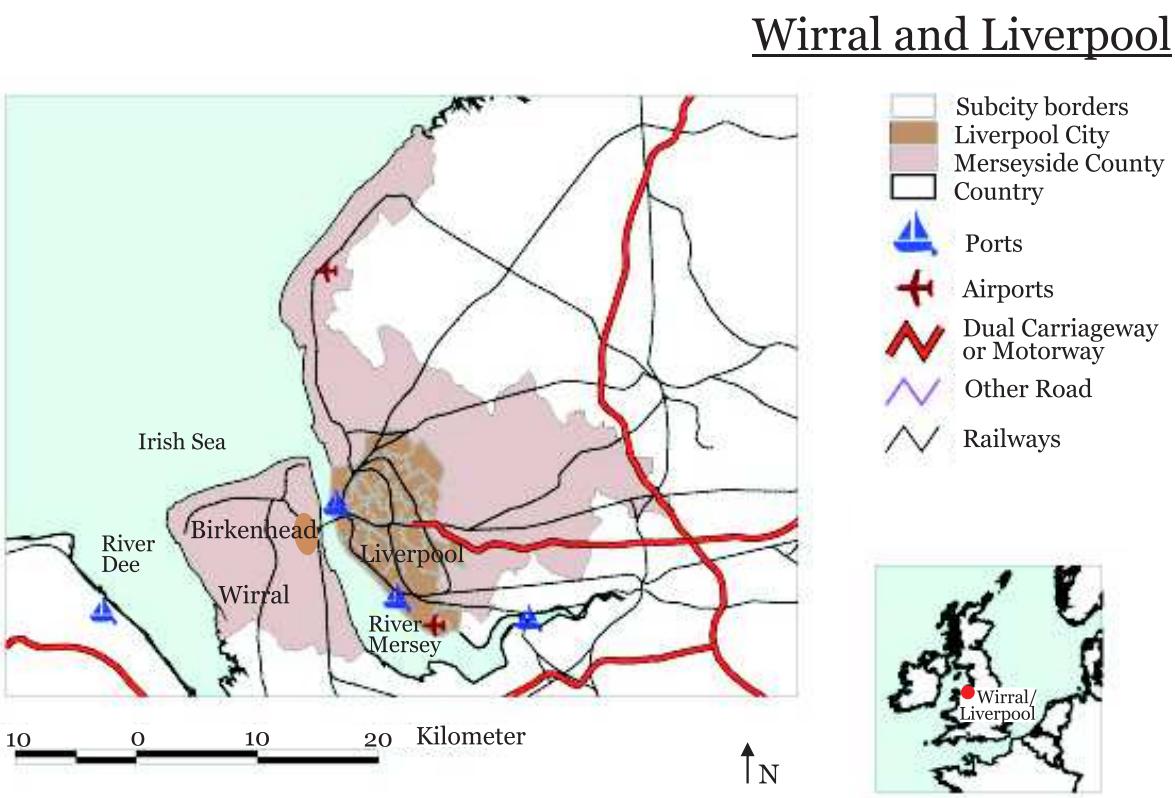


Figure 1.7: Regional situation of Liverpool and Wirral. Source: Urban Audit 1996, modified.

Wirral which is the focus of closer investigation in the case study is a peninsula surrounded on three sides by the River Mersey and the River Dee and Liverpool Bay. It covers a land area of 157sqkm. Wirral has a strong urban character in its eastern parts around Birkenhead at the river Mersey across Liverpool and a suburban, outer-urban part in the west of the district. Overall, the case study area of Wirral had a population of 312293 people in 2001 (census data), and a population density of 1989 inhabitants/sqkm. The population density of the north-eastern part of Wirral is about 3700 persons/sqkm. The

population density in the remaining part of Wirral is about 1500 persons/sqkm (all figures Office for National Statistics UK 2005).

The commercial and civic heart of Wirral is in Birkenhead, which lies directly across the Mersey from Liverpool and to which it is connected by road and railway tunnels. The majority of economic activity is in Birkenhead and along the Mersey shore. Employment has historically been based around the docks and dock-related industries such as ship-building and food processing. Today these traditional industries have declined, giving way to a more diverse and service-orientated economy. There are 27.3% more jobs in the eastern part of Wirral (per head of population) than in outer Wirral, highlighting its continued role as Wirral's economic centre (Couch and Karecha 2003).

In contrast to the historical focus on the ship and harbour industry, the economy in Liverpool is more diverse today. 21.8% of all people aged between 15 and 74 work in manufacturing and construction, 25.9% in wholesale and retail trade, transport, hotels and catering, 23.2% in finance, real estate and public administration, 23.0% in education, health and social work, and about 6.1% in other sectors. Major employers in Liverpool include Littlewoods, Royal Liver Insurance, GPT (payphone systems), and Medeva (pharmaceutical company).

Having suffered heavily due to de-industrialisation and the decline of port activity, the city's economy is beginning to recover. The city centre has been subject to major redevelopment projects that have improved its environment and infrastructure, and the city is increasingly seen as an attractive investment centre. The Merseyside Partnership highlights the recent successes of the city and Merseyside, which includes the creation of more than 3000 new telephone call-centre jobs. The leisure industry is also a sector of growing importance for the city, and investment in new facilities is underway, particularly in hotels. However, despite recent improvements in economic performance, Liverpool remains one of the most deprived cities in the UK. Liverpool has experienced significant unemployment over the last 30 years, with rates consistently higher than the national average. The unemployment rate for Liverpool is given with 6.1% in 2001, and that of Wirral with 3.9%(ONS UK). Merseyside was granted EU Objective 1 priority status in 1993, which was renewed in 1999.

The city has a significant higher education sector. Three universities are located in the city with a total of 42000 students. Liverpool and Merseyside have a rich and varied arts and cultural industry. Liverpool has more museums and art galleries of national status than any other area outside London. The city's mercantile past and recent history are documented in a number of museums and galleries. Several of these are situated in the refurbished warehouses of the Albert Dock, which also houses the Tate Gallery. The Conversation Centre in the city's centre received the European Museum of the Year Award in 1998. Liverpool has also played an important role of the history of contemporary music and was the home of the Merseybeat and the birthplace of the Beatles.

With respect to the local government and planning structure, the district of Wirral is made up of 22 wards. Each ward has 3 councillors making a total of 66 elected representatives (Urban Audit 1996). The District Council is responsible for a wide range of services to the area, including waste collection and disposal, schools and nurseries, libraries, social housing, road maintenance, parks and gardens, and social services. Liverpool City Council has developed a number of successful partnerships to deliver Single Regeneration Budget

projects in the Merseyside area. These include the Speke Garston Partnership, the Dingle Partnership and North Liverpool Partnership. Each of these partnerships include provisions to involve the local community actively in regeneration initiatives (Couch 2003).

Urban sprawl in Wirral is an established and mature phenomenon. Over the last 100 years the settlements of (sprawling) western Wirral have developed, firstly as a result of the railways, and more recently as a result of the growth in car-ownership. The causes of sprawl in Wirral are much the same today as they were in the past. Outer Wirral is perceived as offering 'a better quality of life'. It can also be shown that households are purchasing housing in outer Wirral as an investment. However, in recent years the combination of strong 'greenbelt' policies in outer Wirral with 'urban regeneration' policies in inner Wirral has dramatically reduced the rate of urban sprawl.

Among the negatively seen results of urban sprawl are social segregation, the dispersed polycentric urban form which increases the need for the car, and the loss of rural land. On the other hand urban sprawl in Wirral has provided a good quality of life for those in outer Wirral. Problems of urban deprivation and social exclusion remain in parts of inner Wirral but there is evidence that recent programmes of urban regeneration have had some success (Couch and Karecha 2003).

Chapter 2

Theoretical Discussion

The theoretical discussion will start with a historical reflection on urban settlements and then consider recent urban developments. The literature will be reviewed against the attempts to steer processes such as urban sprawl and population decline, against successes and planning failures – all in the light of policy interventions. It shall be mentioned, that, despite being politics and planning obviously not the same instance, their roles within the processes of sprawl and shrinkage will be explained in a related manner. Politics is understood as the activity of the legislative body, whereas planning that of its executive organ. This is a significant difference but they can be regarded as interconnected since one instance can not work successfully without the other.

2.1 Relevant theories to intra-regional migration

The life cycle theory of cities explains the development of cities from their emergence and the population concentration via suburbanisation, decentralisation and dispersal to a renewed contraction of population, called re-urbanisation. This theory builds on historical monitoring of the situation of Western cities since the industrialisation in the 18^{th} century. Whereas the theory will be explained in more detail below (section 2.1.4), the terminology will already be used to structure the following historical reflections.

2.1.1 Urbanisation: From pre-modern cities to industrial settlements

In historical times the growth of cities was inextricably linked to economic development. There was a symbiotic relation between the two. Economic growth was intimately associated with urban expansion and contraction of the existing cities (Short 1996) and numerous new cities emerged in times of economic revolution (Braudel 1981; Jacobs 1969).

Short (1996) reports about two major economic revolutions relevant to urbanisation until the current date, the agrarian and the industrial revolution.

1. The agrarian revolution of the Neolithic period was induced by the founding of many cities between 5000 and 6000 years ago, the earliest in Mesopotamia. The founding of these cities demanded an agricultural surplus that was made available by the enhanced productivity of irrigated farming and the management of the surplus by a social elite.

2. The second revolution mentioned by Short (1996) is the industrial revolution which started in the 18th century. Britain was the first country to undergo that transformation of economy and society with London, at that time, being the prime city in the world. London was the seat of economic, political and social power. It was the hub of a vast commercial empire and its growth was extraordinary. It is argued that the trading wealth of London fuelled its growth. Almost 11% of the country's population lived in the city in 1750, highlighting the importance of the city in demographical terms (Short 1996). This in turn constituted a huge centre of consumption and resulted in an effective demand for consumer goods. It gave stimulus to a growing agricultural production and an increased agricultural productivity (as shown by Jacobs 1969). It also promoted coal production in the north of the country due to energy requirements. Therefore the technological innovations were stimulated by demand (Braudel 1981), probably not the other way around as one might assume. The concentration of population connected with a huge trading potential stimulated productivity and was the precondition for industrial take-off. The enormous effective demand is seen as the major cause of the industrial revolution (Short 1996; Jacobs 1969).

A reinforcing mechanism then set in: the concentration of production in the new establishing factories in the industrial centres reduced production costs and increased profits while the gathering of workers in itself formed a big consumer pool. For maximum productivity and because of mobility difficulties, the living and working places were located close to each other. The established working class was spatially housed around the factories: this formed the industrial city and accounted for its growth. The expanding industrial sector resulted in the founding of new towns and the growth of existing ones. Urbanisation and industrialisation went hand in hand (Heineberg 2000; Braudel 1981).

Cities arose in locations that were especially suitable for an advanced industrial, the capitalist order throughout the 18th and early 19th century. In Britain, the towns and cities in the Midlands grew where coal production flourished and nearby industries emerged (Heineberg 2000). Friedrich Engels (1973) reported that in those times an aggressive form of capitalism was predominant. The market system generated social inequalities between an upper class and a newly formed working class. The ruling elite stressed a lack of government and of civic obligation. The physical landscape as well as the social environment was transformed. First, the growth of the 18th century city was a source of pride to its citizens. The intimate connection between work and residence explained the universal attraction of the urban cores. Here, the wealthy and the poor were squeezed together and the mixture was accepted without question. In the course of time the consequences of this development appeared (Fishman 1987). Problems of overcrowding, disease and social unrest occurred until the beginning of the 19th century in Britain. In countries where the industrialisation started later, such as Germany (in the middle of the 19th century), also the problems in the cities became apparent some time later (in Germany at the end of the 19th century and the early 20th century). As a result, the reality of the industrial cities belittled the belief in the advantages of the capitalist order and the market economy. However, the experiences of the 19th century cities are of great significance for the ongoing development of the societies. They induced an action, rather a reaction against the hardships of the capitalist city and created the context for governmental intervention and city planning (Hall 1988).

2.1.2 Suburbanisation: From industrial cities to modern agglomerations

The 18th and 19th century capitalism resulted in numerous urban centres with a dense urban population. Not only were there problems resulting from overcrowding but also the wish to change the unbearable circumstances. To the end of the 19th century (with some temporal variations across Europe) the working class started to organise themselves through trade unions and the unemployed went on demonstrations to express their discontent about the housing conditions. These upheavals impacted on the political arena. As a result, authors claim, the growth of the cities initiated a change of the whole western societies (Short 1996; Fishman 1987).

The roots of current urban sprawl[1] are nevertheless to be found elsewhere (Gaebe 2004; Fishman 1987): the first suburbs as we know them today (see footnote) are found in the second half of the 18th century on the outskirts of London. It occurred earlier than the rise of the problems in the first industrial cities, and the industrialisation did not hit London before the middle of the 19th century.

The form of the 20th century suburbanisation and urban sprawl is a successor of the 18th century form of suburbanisation. It did not emerge from a transformation of the outlying districts, usually surrounding towns and villages (which were rather disreputable places) but required a total transformation of urban values. Fishman (1987) claims that the modern suburb was indeed a cultural creation of the 18th century, only supported by the economic structures of that time. Suburbanisation developed parallel to the Industrial Revolution, and is assumed to have started in London, the "birthplace of suburbia" (Fishman 1987, p.18). Only later it spread out to the new industrial cities in the middle of England, where the new concept of urbanity was welcomed.

> "The modern suburb was a direct result" of the pre-industrial trade-induced "urban growth [...] that stemmed from the inability to cope with explosive modern urban expansion. It [...] reflected the unprecedented growth in wealth and size of an upper-middle-class merchant elite. This London bourgeoisie had attained the critical mass in numbers, resources, and confidence to transform the city of their time to suit their values."
>
> Fishman (1987, p.19)

An alteration of values meant the shift away from the traditional principle that home and work form an identity. The pre-modern urban ecology locating the wealthy members of the society living and working close to the centre and the urban poor to the periphery did not allow much expansion over the existing urban boundaries. The peripheral slums were meant to remain as small as possible, both by private landowners as well as by the authorities, which prohibited new building on the outskirts. So, when London grew before the suburban expansion it did so in the existing districts.

[1] A 'sprawl' of cities existed much earlier in the form of week-end houses and mansions for the upper class. However, in this work the current form of sprawl is investigated, when it first became possible also for other social strata to leave the city and secondly, the exploration of a suburban realm includes also permanent living, not only week-end enjoyment.

The pre-modern city did not rely on the basis of single functions, or the idea of single-class districts. The traditional family was more an economic expression than an emotional cohesion where women, children, neighbours etc. helped in the business. But the big city was also a pool for enjoyment. The gardens were public places to be seen and enjoy the London life – different classes all together. The openness and freedom attracted an increasingly wealthy merchant elite but contributed, again, to an urban core that became ever more crowded, dirty, noisy and unhealthy. The wealthy middle class was looking for a change which meant either the rebuilding of the core or a radical decentralisation.

Simultaneously, specific trends in society occurred that helped in choosing the one or other way out of the urban problem.

1. The first but very subliminal trend, Fishman (1987) expresses, is a shift in the relation between the wealthy middle class towards the rest of the city population. The relation of social distance and physical proximity changed mainly due to the different personal habits of the rich and the poor especially visible in personal cleanliness. Whereas in previous centuries the rich needed the presence of the poor to remind them of their privileges, now the rich perceived the physical adjacency as unpleasant. This resulted in the search for single-class neighbourhoods.

2. A second and much stronger trend was the change of attitude towards the family. By the 18th century an intensity in the relations of father, mother, and children arose which was initiated by the decreasing importance of and a rising independence from kin groups. It resulted in the greater opportunities for both men and women to select their partner according to romantic instead of economic attraction. The family then aspired a separation from its environment, a relation on mutual intimacy and child raising.

3. The third trend was the new religious, the Evangelical movement which took hold with especial strength in the middle upper class of London citizens. It emphasised the role of the family with the closed, domesticated family as its typical example. The contradiction between the joyful city and the Evangelical ideal of the family provided an impetus for the separation of the home from the 'immoral' city.

These three trends built the essence of the suburban idea according to Fishman (1987). So, in the second half of the 18th century the London bourgeoisie started to move out of the inner city, it leaped over the circle of poorest neighbourhoods surrounding the town and settled in the picturesque villages in the immediate green vicinity (first via the establishment of weekend houses). Against this background, suburbanisation was the collective creation of the city's bourgeois elite and a gradual adoption of a new way of living by discarding the old preferences for the centre over the periphery, disassociating home and work place, establishing neighbourhoods designated for a single class and a single (domestic) function to form a new kind of landscape that blurred a clear division between city and country.

When London experienced this new way of urban growth the Industrial Revolution had just began in the North of England. London was bypassed by the Industrial Revolution and remained a city of commerce until the mid-19th century. In Manchester, Liverpool and other prospering industrial cities the newly founded experience of suburban living was fondly examined, adopted and even stronger implemented as these cities got similar problems (at

around 1840) that hit London less then hundred years before (after H.J. Dyos in Clapson 2003; Fishman 1987). The extent of suburbanisation in London was fairly small compared to what the industrial cities in the North experienced from then on.

In contrast suburbanisation was not adopted in continental Europe or Latin America at that time (Clapson 2003). For instance, the Parisian middle class remained loyal to and fond of the central city. The substantial growth of Paris was balanced by the opposite development as compared to England: the Parisian industry and industrial workers were shifted to the suburbs whereas the bourgeois elite remained in the urban core. Fishman (1987) assumes this was possible due to the authorities' interventions, as represented e.g. by the comprehensive rebuilding of central Paris by Eugène Haussmann (Albers 2005). It opened the possibility to reshape and restructure the urban core to the changing bourgeois needs. So, continental European and Latin American cities followed first the traditional urban structure, while British and also North American cities decided for the path of middle-class suburbanisation from the late 18th century onwards (Clapson 2003; Jackson 1985). However, the differentiation between continental Europe and Britain became blurred within the next centuries. In the 20th century continental Europe also showed a middle class suburbanisation which is driven by consumer preferences (Ewing 1997; Peiser 2001). With it, sprawl mirrors cultural attitudes. The difference of the 20th century suburbia to its precedents lies in the attempt to make the benefits of this agreeable way of living possible for more than just the wealthy middle class (Fishman 1987). Although sprawl remains a luxury to many people still today (Peiser 2001).

2.1.3 Dis-urbanisation: From modern agglomerations to post industrial cities

The strong cultural impetus in the beginning of suburbanisation was soon joined by an equally strong economic motive. Increased mobility offered an opportunity to convert the land previously far beyond the urban expansion from relatively cheap agricultural land to highly profitable building plots. This possibility provided and acted as a powerful engine to drive suburban expansion forward (Fishman 1987). Other economic motives followed and technological innovations provided the means for a widespread decentralisation in the 20th century (Castells 1999, 2003; Wenban-Smith 2000; Ewing 1997). Especially the achievements in the transport technology were wide ranging: suburban railways, the introduction of trams and street cars (Clapson 2003) and later the invention, innovation and wide introduction of cars (Sukora 2003; Gillham 2002; Kivell 1993; Fielding and Halford 1990; Camagni, Diappi, and Leonardi 1986; Jackson 1985). Table 2.1 shows the rapid development of transport technologies since the 18th century.

The very first result of technological innovations is that products get cheaper due to automatisation or an easing of formerly complicated production (O'Sullivan 2003). Due to mass-production of cars they became increasingly inexpensive during the 1920s, and as wages rose in the post-war economic upswing (prior to the Great Crash in 1929), the prospect of owning a car was given to millions of middle-class people in the United States (Clapson 2003; Fishman 1987; Jackson 1985). In Europe, sprawl was fuelled by the availability of public transport at least until the 1950s, car ownership remained hardly possible to most middle-class people before that date (Chin 2002; Clapson 2003).

Innovation phase and periods	Transportation modes and infrastructure	Comments and effects upon the landscape
18th century	New 'royal' or 'imperial' roads	At the end of the 18th century the travel time from the capital to the border is reduced by half in England and France. The new road network reflects the central or decentralised organisation of the country.
1825 – ca. 1875	Railway network	The railway network spread from Northern England, covered Northwest Europe around 1859 and almost the whole of Europe in 1875. The railways took over the functionality from the waterways.
about 1880	Electric streetcars	1881 in Berlin.
about 1890	Undergound railway, metro	1890 in London (electric, non-electric version was implemented in 1863) 1900 in Paris, 1902 in Berlin.
about 1900	Electric commuter railway	Electric commuter railways were built in and around the major cities of Europe.
1930s	Car	The first controlled access motorways were built in Germany.
1960s onwards	Car	Improvement of existing roads, new roads superimposed the existing network, extension of the motorway network follows international European co-operation. The fragmentation effects by roads increase.
1960s onwards	Sea ports	Increasing sea traffic demands vast areas for storing transit goods and larger harbour infrastructures.
1960s onwards	Air plane	Although most capitals of Europe were connected by airways around 1920 already, an increasing mass transportation with an annual growth rate of approximately 10% occurred between 1970 and 1990.
1980s onwards	High speed train, new railroad networks	First high-speed railway (TGV) operates in France. The new lines are characterised by a strong barrier effect in the landscape.

Table 2.1: Phases of innovation in transportation modes in Europe since the 18th century. Sources: Inspired by Antrop (2004, p.12); Completed after Hall (1993) and Gaebe (2004, p.149).

With the faster transport modes people could settle more dispersed, as the time needed for example for commuting to work remained equal or similar to that needed before the implementation of the new technology: speed increased and enabled a surpassing of bigger distances in the same amount of time (Schafer and Victor 1999; Schafer and Victor 2000). Today sprawl is widely linked to motorisation (Clapson 2003; O'Sullivan 2003; Squires 2002). Nevertheless it represents more an enabling factor allowing access to undeveloped areas than the real cause of urban sprawl (Chin 2002).

Still by the 1920s in the USA and a little later in Europe a change in business structures fostering decentralisation set in. Designated with the term Fordism, a new model of business structure was implemented that engaged the whole society. Fordism characterises a neo-Marxist flow of understanding capitalism. It is connected to the industrial practices of Henry Ford whose organisation of work and capital was typical for the whole period in the early 20^{th} century. It included mass production, an homogenisation of goods and resource driven production that resulted in large buffer stocks. Business structures were organised along assembly line work that assured high productivity and output. Spatially it reflected a homogenisation of intra-regional labour markets and a spatial division of interregional labour. Fordism was also based on a presumed mass consumption with strong emphasis on the family. The uniformity and a productivity-related income should enable that every one can take part in the envisaged economic prosperity and in turn contribute further to economic growth. Based on the Marxist axioms, a social welfare state was believed to facilitate the citizen's life long occupation and a social security system (Schätzl 1998; Leser et al. 1997; Short 1996; Häussermann 1992).

Mass production in western societies did indeed led to an economic upswing and peaked in the so called Golden Twenties. The prosperity spread through the society, and the middle class could fulfil their dreams of a nice, suburban family house. A wave of suburban development in Europe was the result from the 1920s onwards.

Increasingly independent of the urban core, the suburbs lost their traditional meaning from about 1945 onwards (at first in the US) when the suburbanisation of residents was followed by the outward movement of businesses and services. The end of suburbia in its traditional residential sense is followed by the creation of a new kind of decentralised city (Clapson 2003). Since about the 1960s in Europe the economies and businesses increasingly move out of the city centre locations, suburban areas developed increasingly scattered and, in contrast to the more continuous suburban developments in the centuries before, 'leap-frogged' into the countryside: the core of what we today call urban sprawl emerged.

At that time a shift in the production form of most industrialised countries set in, so-called post-Fordism. It is characterised by the invention and implementation of new information technologies, an individualisation of production, a de-hierarchisation, the rise of the service economy and white-collar workers, an increasingly importance of intellectual resources in contrast to material resources and the globalisation of financial markets. It was accompanied by a new emphasis on types of consumers instead of the previous emphasis on social classes, the feminisation of the work force, a decline in the governmental safety systems as well as an increasing privatisation and individualisation of all forms of living. As a general trend the economy underwent a transition away from the primacy of manufacturing to a focus on services (Gaebe 2004; Fothergill and Gudgin 1983). Although the

seeds of service-sector growth and of the new light-industries were already sown between the wars (mainly facilitated electricity and telephone usage), it was in the 1960s that the change took notice in spatial consequences (Clapson 2003).

After the Great Crash of 1929 many of the international markets for industrial commodities collapsed (Hudson 2005). The established trade routes started to change course as industries, capital and labour migrated to other regions. Technological innovations enabled them to became more footlose (Castells 1999, 2003). Additionally, as old industrial regions accumulated significant agglomeration disadvantages since the industrialisation (Gaebe 2004), as e.g. high costs for property and human labour, a lack of available properties for new businesses and decreased accessibility, industries increasingly moved out. The macro-scale structural changes are felt as a de-industrialisation in the European regions that were first industrialised (Prigge 2004). New emerging services located in areas different from those stressed by traditional, industrial economic activity where costs of decontamination and renovation, a lack of space or existing ownership structures might hinder development. This is most visible in the strong north-south divide of the service locations in different countries, as e.g. in Britain and in Germany (Friedrichs 1993; Bade and Kunzmann 1991; Rodwin and Sazanami 1991). In England, much of the growth in new industries occurred extensively in the London metropolitan region and in the south-east.

The changes in the international division of labour also led to a de-industrialisation of Western economical structures by means of a new orientation towards services, liberalisation, and privatisation (Short 1996). Because the Western industrial model was closely linked to the development of cities, a transformation of the industrial mode of production led necessarily to a far reaching crisis for these cities. Industrialisation was connected to urbanisation - de-industrialisation is connected to dis-urbanisation (at least for most urban centres excluding the metropolises, Paal 2005; Munck 2004; Meijer 1993; Camagni, Diappi, and Leonardi 1986).

By the early 1970s in most middle European countries the process of economic decentralisation, and with it dis-urbanisation had fully set in (Clapson 2003). Sprawl became a well-known phenomenon and the location of jobs are discussed as another reason for it. Whereas there is some evidence that people follow jobs (O'Sullivan 2003) the relation seems to have decreased in recent years (Deutsches Institut für Wirtschaftsforschung (DIW) 2001). All these developments mentioned in the last paragraph are connected to post-Fordism and summarised in Table 2.2, which also compares the differences between Fordism and post-Fordism.

As decentralisation and post-Fordism set in, researchers mark the shift from the modern to the post-modern city (Short 1996). Increasing global competition between urban centres and the resulting attempt to differentiate between the cities became more and more evident. Such attempts were felt in a changing urban look, a 'new' enclosure movement, and a 'new' civic culture, as Short (1996) remarks. With respect to urban sprawl especially the new enclosure movement seems of interest. It meant the privatisation of space in all different forms (enclosure of formerly open public land, regulated access to buildings, the invention of gated communities), the increasing wish for security and, post factum, the reinforcement of security aspirations and fear on one another. Short (1996) specifies:

	Fordism approximately 1920s-1970s	**post-Fordism 1970s onwards**
Economic organisation	Monopolisation, Economies of scale, Standardisation of production organisation, Rationalisation, Automatation/mechanisation	Diversification, Economies of scope, De-standardisation, Flexibility, specialization, Flexible automatation/ mechanisation.
Labour Force	De-qualification of the labour force, Unemployment decreased.	Highly qualified and skilled labour force, Unemployment increases, Limited contracts and part time jobs increase, Home working and free-lancing increases.
Income relations Trade Unions	Income inequalities decreased, Power of trade unions increased, The influence resulted in manifold legal and social protection regulations against the monopolistic entrepreneur.	Income inequalities rise, Power of trade unions decrease, Partly because of the rise in services where trade unions are weaker.
Culture & society	Strong collective and co-operational attitudes Uniformisation of the peoples' life styles.	Individualistic attitudes, gain importance, Self-containment and private property gain renaissance.
Role of the state	Extension of the legal social security systems, Interventionist attitude, Responsibility towards society.	Role of state is minimised, Market forces are believed to regulate any development.

Table 2.2: Differences between the production modes of Fordism and post-Fordism.
Source: Author's draft; after Schätzl (1998), Leser (ed.)(1997), Short (1996), Häussermann(1992a).

> "The shared space of the city becomes the segmented segregation of tiny communities fearful of the rest of the city.... Our cities now reflect our sense of fear more than our sense of hope."
>
> Short (1996, p.33)

This reflects why crime is often mentioned as a cause of sprawl too (O'Sullivan 2005; Burnham, Feinberg, and Husted 2004; White 2001).

Underlined by a strong neo-liberal trend that set in during the 1970s, building space and houses, their prices and availability followed market-driven supply and demand patterns. Land is a resource and can be handled purely in economic terms (Alonso 1964; Jacobs 1969; Goodall 1972; Evans 1985; Mills and Hamilton 1989; Chin 2002). The free availability of land is furthermore the very prerequisite for a functioning market (Borst 1996; Fassmann 1991). Land rents arise from the location within an urban system with places closer to the urban core traditionally being more profitable and therefore more expensive. The land rents traditionally decreased in direction to the periphery because the products had to be transported to the market places in the cities. Therefore the profitability of the periphery fell as transport costs had to be added. Such economic reasoning finds its application in the agricultural land use model of von Thünen (Schätzl 1998; Reichart 1999; Leser et al. 1997). Another land use model was developed and applied to urban areas by Alonso (1964). This is related to the costs of the premises in different urban locations conditioned by the expected returns in either monetary terms (with businesses) or satisfaction with the living qualities (with residences). Land users in the urban space are assumed to compete for city centre locations and decide their optimum location within the city. The land users trade-off between rents, which decline with distance from the centre, and transport costs, which rise. The model is based on: a perfect market, a preference amongst land users for a location as near to the city centre as possible, and uniform gradients in declining rents and rising transport costs with distance from the centre. The model is illustrated in Figure 2.1.

Such models of optimum land use and related land rents are important to understand the traditional pattern of land development, but they seem inappropriate for today's land use allocation. Nowadays, decentral locations become more profitable to residents and businesses: the costs of land are lower and the transportion of goods to other locations in a worldwide economy or commuting becomes easier from the less congested peripheral locations (O'Sullivan 2003; Squires 2002). The abundance of transport networks and the spread of modern telecommunication technologies which sometimes remove the need for transportation at all (especially in the case of information exchange) result in the increased profitability of peripheral locations. The attractivity of these places increases for the individuals as well as for businesses. In line with this economic reasoning, demand is driven by preferences towards a suburban attractivity (Miller 2004; Peiser 2001): monetary and non-monetary. Audirac et al.(1990) formulated:

> "The ideal of owning a single family home, the need for an adequate environment for raising a family, a strong desire for privacy, and the appeal of a rural ambience are among the most prominent reasons for choosing suburban and exurban locales."
>
> Audirac et al.(1990, p.473)

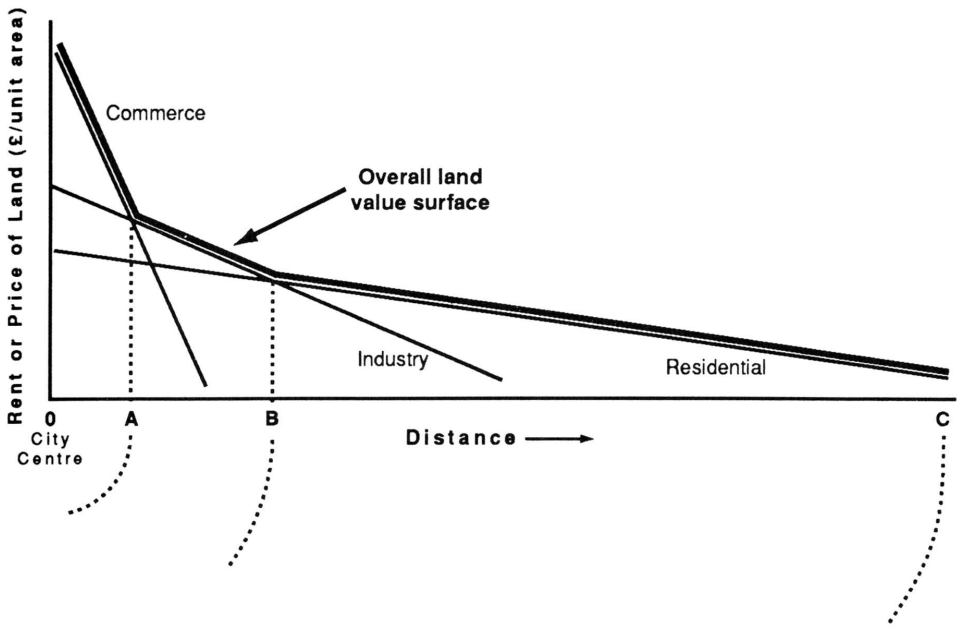


Figure 2.1: Alonso model of the urban land use. Source: Kivell (1993, p.19).

Preferences towards a location are dependent on attractivity evaluations and the prices seem to represent an important criteria for it. When sprawl is the result of a comparison between the characteristics of the inner and outer urban areas (Hassan, Zang, and McDonnell-Baum 1996; White 1981; Todd 1977) it increases when the peripheral locations get cheaper and more profitable. What follows is that especially low prices make sprawl possible. However they are not assumed to be the only reason for it as the individual preferences towards other characteristics of the location also seem to play a role in residential sprawling as they already did in the phase of its 'invention' during the 18th century in London.

Additionally to the social and economic circumstances that influence sprawl development there are policy and planning factors. They shall only be mentioned here in brief as they will be comprehensively considered later. In effect, policy and planning influences have often decreased the costs of sprawl by offering subsidies and allowing externalities. In lowering the price for the individuals compared to the value they receive the attractiveness of the suburbs is 'artificially' increased. Against this background one can understand the high consumer demand for single family low density housing. The consumer demand can be manipulated by public subsidies (Chin 2002). Consumer preferences and technological innovations are a major cause of sprawl and decentralisation but authors assume that they cannot explain the extent of dispersal nor the absence of mixed land uses, nor the loss of valuable natural areas. For that, Ewing (1997) blames the market failures caused by all manner of subsidies (highway, cars), and that public goods such as open space tend to be under-supplied by the private market because of the free-rider problem.

> "the free-rider problem" is "the inability to charge beneficiaries for the value" one "receives."
>
> Peiser (2001, p.277)

This underlines the decisive role of politics and planning in the sprawl process but does not neglect the importance of the individual preferences in the evaluation of suburban attractivities. After these more qualitative reflections, the theory of the life cycle of cities will be subject to the next section. It tries to quantify the described population dynamics.

2.1.4 Life cycle theory of cities: Urbanisation, Sub-urbanisation, Dis-urbanisation, Re-urbanisation

The life cycle theory of cities relies on an assumed connection between the changes in the structure of the urban system and the stage of economic development of a region or city. It suggests a perpetuating urban development. Accordingly, old-industrial areas should pass the stages of growth and decline and grow again. It is hypothesised that each stage is characterised by a certain specific urban development that every city seems to pass through unless the government or other actors continuously try to steer against it (as e.g. in the case of the socialist countries in Eastern Europe throughout the second half of the 20th century, see the explanation of transformation research below). The shift from one urban stage to the next is attributed to the economic development as highlighted by Fourastié. However, in this section the focus is on the spatial implications of the theory in the narrower sense.

In terms of their physical structures cities are a local or regional phenomenon, although their influences are often wider and their non-physical relations are of regional, national or global importance. On the local or regional level, the stages of the model are mirrored as a comparison of the development of the urban core to the fringe. The basic parameter of the model is population. Its changes and relative trends define the urbanisation phases according to the relative population growth and decline of centre and fringe (Antrop 2004). The following stages have been documented throughout the course of the earlier depicted urban development:

1. Urbanisation: the urban cores grow at the expense of the surrounding countryside;

2. Sub-urbanisation: the overall population growth tends to slow down or even to decline in absolute terms, while the population in the ring or in ring municipalities continues to grow - when the ring's growth surpasses the core's the stage of suburbanisation has been reached;

3. Dis-urbanisation: the urban decline in the core exceeds the growth of the suburban ring, so that the total population of the agglomeration declines; the same applies to agglomerations where the core declines faster than the ring.

The theory is based on four stages where the fourth stage is believed to close a circle towards urbanisation and is therefore called:

4. Re-urbanisation: population declines faster in the ring than in the core, or the core grows as the suburban ring declines (Antrop 2004; van den Berg and Klaassen 1986; van den Berg et al. 1982). van den Berg and Klaassen (1982) define re-urbanisation as the result of a sufficiently strong growth causing the entire agglomeration to gain population. Attention shall be drawn to the fact that a faster suburban decline in

comparison to a slower decline in the urban core also means an urbanisation in a strict sense. One has to distinguish between the two kinds of re-urbanisation. The investigation in the case study regions will reveal information about the occurrence of the one or other. Furthermore it is necessary to examine whether re-urbanisation exists, to what extent and under what conditions it might occur.

Figure 2.2 mirrors the phases of the model in the postulated circlular behaviour.

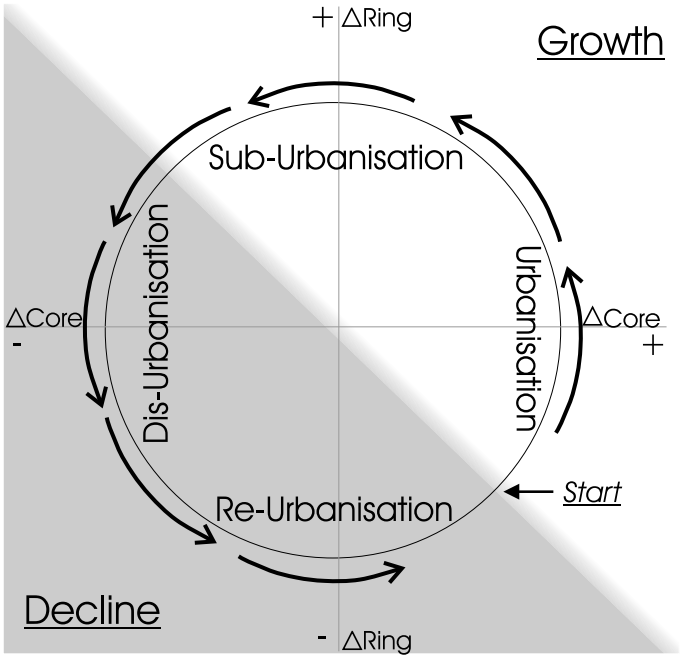


Figure 2.2: The urban life cycle model. Source: Fielding and Halford (1990, p.9) – modified.

Whereas the first three stages have been documented in several western societies throughout the course of the last two or three centuries, the fourth stage characterises uncertainty (van den Berg and Klaassen 1986; van den Berg et al. 1982). Accordingly, two possibilities remain:

1. Progressive dis-urbanisation or
2. Re-urbanisation.

There is some proof of re-urbanisation processes in western cities in recent years (beginning in the 1990s approximately), as e.g. in New York, Manchester, Glasgow, Bilbao (Oswalt 2004). Also, a re-urbanisation trend has been noticed more recently in the case study cities, Leipzig and Wirral/Liverpool (Herfert 2005 - personal communication; Couch 2005 - personal communication; Couch 2003; Herfert 2003; Wiest 2001). Whereas others note that a re-urbanisation as a general trend has not been proven yet in European urban regions (Antrop 2004; Champion 2001). If it occurs, reliable information is lacking as to whether such development is only possible through intensive action on the part of the local or regional authorities, or whether it is a stage that 'naturally' follows from dis-urbanisation (van den Berg et al. 1982). van den Berg and Klaassen (1986) remarked twenty years ago:

> "Natural or market forces, or aggressive public policies ... may spark renewed interest in city life and its economic and cultural potential. With population returning, the agglomeration may experience a revival that starts the development cycle anew."
>
> van den Berg and Klaassen (1986, p.87)

In the 1980s, it was still not clear what conditions – natural, market or policy – may result in a renewed interest in the urban cores. van den Berg and Klaassen (1986) came to a rather pessimistic conclusion with regard to the re-urbanisation possibilities from a comprehensive study of European urban and regional development between the 1950s and 1980s.

They argued on the basis of the following assumptions:

1. Quality of life is an essential determinant of well-being. The attractiveness of a region as residential location depends more and more on qualitative factors, such as housing and environmental amenities.

2. The access to urban facilities and services will continue to determine well-being.

3. The accessibility to work places will be less determining the residential locations.

Following from point 2. they hypothesised that most people willing to leave a dis-urbanising agglomeration will choose another urban area. The new destination is likely to be an agglomeration at an earlier stage of development. Thus, when the place of origin was a dis-urbanising agglomeration migrants will probably relocate in suburbanising or urbanising cities: inter-metropolitan deconcentration sets in. On the other hand, this might reveal that agglomerations with declining populations in both the core and the suburban ring may not expand further into the surroundings. However, under these presumptions dis-urbanising agglomerations will continue to decline in the short- and medium-term. van den Berg et al. (1982) hoped that time would bring more insight into the issue. More than 20 years later, there are some examples of the re-urbanisation of formerly dis-urbanising areas (Oswalt 2004; Ward 2005). Their conclusions did not prove true as a general development.

A higher concentration might be necessary for the renewed prosperity of the region, especially in the low demand old-industrial areas. It might stimulate a new period of urban growth and revitalisation by fostering a network of economic services, mutual exchange between firms, specialisation, high quality jobs as well as the implementation of business strategies for an innovational milieu. According to the New Growth theory by Romer (1986), the spill-over of knowledge results in growth which is enabled especially by concentration (Gaebe 2004).

However, this does not clarify whether re-urbanisation can also take place 'naturally' and in all cities after the dis-urbanisation phase. Even if a re-urbanisation has been documented from some cities in Europe and the US, which speaks in favour for the urban life cycle theory, other investigations doubt the regularity that the model proposes. Antrop (2004) and Cheshire (1995) showed that the theory of the urban life cycle does not apply to all European agglomerations alike. According to a study of 241 functional urban regions (FURs) in Europe there is variability according to the geographical region and time. Northern and Southern European agglomerations pass the stages at different points in time. Figure 2.3 shows the population development for selected Northern and Southern European cities.

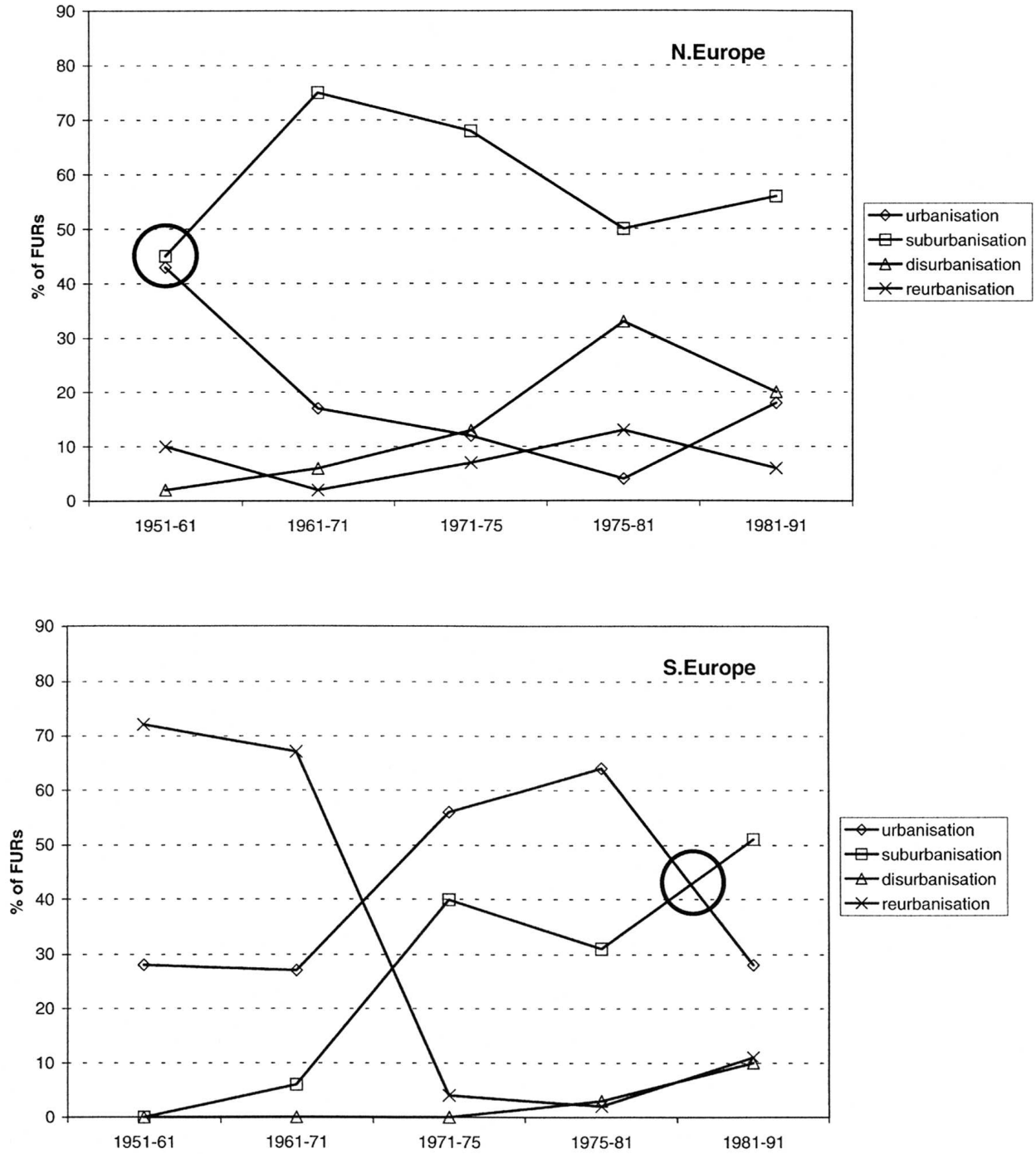


Figure 2.3: The population development of urban core to ring areas in Northern Europe (top) and Southern Europe (bottom) between 1951-1991. Source: Antrop (2004, p.15f.).

According to the population change rate in core and fringe zones the crossover point from the declining urbanisation to the dis-urbanisation phase has been appointed. For Northern Europe, the crossover is situated in the 1950s-1960s (2.3 - upper graph), in Southern Europe between 1975 and 1980 (Figure 2.3 - lower graph). The y-axis of both graphs display the percentage of all 241 FURs investigated that showed the indicated phase. Additionally there is a lack of evidence about the sequences which the model suggests, e.g. in Southern European cities. The lack in validity for the Mediterranean cities is underlined by other sources (Leontidou – personal communication; Antrop 2004; Cheshire 1995).

A re-urbanisation in former industrial regions might also indicate a certain degree of revitalisation or economic growth. This might be difficult to initiate. The transforming economies of Eastern Europe as well as the economies in the former industrial regions of the West reveal a specific weakness that hinders the region from easy structural adjustments: mostly, neither the urban nor the regional administrations have developed any generic schemes or programmes for restructuring the industrial base in a flexible manner. Such a 'planning gap' is often filled by the leverages and strategies proposed by the dominant companies to policy makers. Therefore the inability to adapt to economic changes and the lack of diversification strategies are strong disadvantages that characterise old industrial regions (Hudson 2005; Friedrichs 1993). The influence of the dominant companies in old industrial areas are very intense and restrictive. When, e.g. in Britain, national strategies tried to revive the declining areas with subsidies, the companies reacted by restructuring their economic base, expanding their range of products either by buying new firms or by producing goods and services entirely different from the initial product. This diversification of production leads to the promotion of prospects of survival of the single firm, but does not lead to a diversification of industries in the distressed regions or cities.

The strong power of trade unions further impedes a possible smooth change away from the old, rigid structures. They worked for strongly organised labour movements in many of the old industrial regions. Wages are kept high and the introduction of new technologies which could speed up the rate of work are fought very hard. As an effect the capital flows to cheaper labour regions and cheap-labour countries (Hudson 2005).

If re-urbanisation is connected to an economic revitalisation also locational aspects are worth to be mentioned. Presumably, peripheral locations are worse off (Fielding and Halford 1990; Camagni, Diappi, and Leonardi 1986). Locality in general describes an effect of interaction between external, non-locational features and internal, locally immanent qualities (Cooke 1992). 'Peripheral' stands for a location away from or on the fringe of established trade routes and economic alliances. Observations have shown that especially the peripheral regions of industrialised countries were often affected by economic and population decline, as e.g. the North-West region of England, in which one of the case studies is located. Nevertheless Cheshire et al. (1991) cast some doubts on hasty derivations, as many peripheral regions, e.g. the south-western regions of France and the south-eastern regions of Germany and Ireland, also exhibited some of the most rapid rates of employment growth in the past. They conclude that if a peripheral location contributes to economic decline it does not seem to hinder economic growth. With a changing importance of space and distance in the course of the developing service economies and the spreading of communication technologies the function of locality in a globalised economy remains to be seen.

With these possibly influential aspects in mind, it seems not clear whether the life cycle theory of urban areas applies to the former industrial case studies selected here. A closer look needs to be paid especially onto the circumstances and legacies that a socialist state brings about. The investigation of Leipzig might reveal additional insights into these issues as it has a different political background as the cities quoted above. The urban development was heavily constrained in the GDR whereas it follows a more freely, economic, capitalist order since 1989. A comparison between these periods can give information about the sequence of urban development in dependence from the political influences. The adjusted research question can be formulated as follows:

Did the population development in the case studies follow the sequences of the life cycle theory of urban areas and is a re-urbanisation trend visible in both regions?

Hypothesis:
As a result of the political history of Leipzig, which limited an urban development on the fringes and which also controlled and acted against decentralisation, it is assumed that the city development in Leipzig has not followed the phases of the life cycle model of cities over the past six decades. Re-urbanisation is visible in both regions as a new trend after a period of inner city population decline. However, there are several reasons why this could happen earlier and more easy in Leipzig:

- A political change brings about an abrupt and drastic change on all levels of government, economy and civility. This implies that the existing structures have to be cut off or replaced which might ease a new beginning.
- There was and is an enormous money transfer, especially from the German government but also from other international sources. Investors from the Western part of Germany saw their chance to enter the market (irrespective to whether this was good or bad, or appropriate in the way it was undertaken) entailing a significant money transfer.
- Leipzig is not located peripherally but rather centrally, within Germany but also within Europe after the opening of the European Union to the East.
- Leipzig is located next to a smaller city, Halle. This could offer certain advantages representing an additional pool of population, knowledge, purchasing power etc.

Against this background, there is to expect that Leipzig's revitalisation strategies might have yielded in a re-urbanisation visible in population figures more clearly. A re-urbanisation and revitalisation for Wirral/Liverpool seems more complicated.

2.2 Causes of urban sprawl in former industrialised regions and actors' preferences

A consideration of the spatial changes in urban systems must necessarily take into account the behaviour of the various actors in the process of urban change, and explain how and according to what assumptions that behaviour leads to the spatial changes observed. The aim of such a theory is to derive from a study of the actors' behaviour and from a logical sequence of casual relations, a meaningful explanation of the relevant spatial developments (van den Berg et al. 1982). The theory of "action spaces" (Aktionsräume) can deliver a very helpful framework to understand the behaviour of actors in space as well as its implications. The individual preferences towards the characteristics of residential locations are therefore central, as are the particular circumstances that can enable, restrict or support urban sprawl in former industrial regions. Such issues will be addressed below.

2.2.1 The combination of urban population decline and sprawling

The issues that can lead to and/or enable urban sprawl have intensively discussed. However, for the research focus the combination of sprawl and population decline is of particular interest. For such an evaluation the scale is of highest importance. An inner urban population decline can occur simultaneously to a regional population growth and, on the other hand, urban sprawl can be found in a regional context of population decline (Gaebe 2004; van den Berg and Klaassen 1986). This is already comprehensible from the definition of urban sprawl (and suburbanisation) and can be seen in the assumptions to the life cycle theory. The initial hypothesis however is that these processes are particularly related.

A migration from the inner city areas to the urban fringes is a spatial process: it implies a reduction of residents in the areas of origin and a growth in the area of destination. When people move out, the inner cities lose population. Against this background, sprawl is one possible cause of inner city decline. This is what e.g. Prigge (2004, p.42) sees as the third reason of urban decline next to de-industrialisation and political transformations: the exodus of residents, industry and/or services from the city centres to the peripheries. In turn, it contributes to the inner city problems by aggravating the low demand of inner city locations: the housing stock remains unused and decays, public budgets are stressed and can not contribute to inner city renovation, the least affluent inhabitants remain stuck in the inner cities since they cannot afford to move. This impairs the public budgets even further. In the American context suburbanisation was a considerable reason for population decline in the old industrial cities, mainly because of the wish to socially segregate (Downs 1999; Fishman 2004).

Whereas urban sprawl is responsible for an important part of the low demand in inner city locations today (Mumford and Power 2002) it possibly acts not as a single cause for urban shrinkage, at least not in the European and often also not in the North American context. As Fishman (2004) explains for the United States, the economic downswing in a mono-structural region (e.g. Detroit) initiates suburbanisation. Suburbanisation and/or sprawl then result as a consequence of de-industrialisation too. De-industrialisation appears to be the very important cause of urban shrinkage entailing sprawl thereafter. Urban sprawl can act as a cause of urban population decline and urban decline can also be a cause for urban sprawl. This suggests that sprawl and urban shrinkage can be reinforcing parameters.

Additionally there are some peculiarities to take into account which illuminate the circumstances in old industrial regions. Often, old industrial regions are mono-structurally oriented towards one core industry. Mass unemployment results when this branch declines. The old factories are normally big in terms of the number of jobs they offered. They do not have the possibility to react quickly and adequately, e.g. with a diversification to smaller firms. Often these factories were also nationalised, as e.g. in Britain. So, a first strategy to make these businesses survive was the attempt to privatise. When a privatisation succeeded the new owner answered with additional releases of personnel. This happened to an even larger extent at the turn from the social democratic to the neo-liberal mode of state intervention (Hudson 2005).

Consequently, the economic decline impacted on the social conditions of the cities, but may be they were also evoked by it. Hudson (2005) recalls, that there has been a considerable re-emphasis upon the 'instituted' character of human behaviour in recent years which is of great interest in the connection to this work:

> "Instituted behaviour can be thought of as embracing a wide spectrum from the informality of habits, norms, and routines [...] to the formality of behaviour within the state and its constituent apparatuses and organisation".
>
> Hudson (2005, p.586)

Some of these sometimes unintended habits were felt as a cause for the inflexibility of old industrial regions and can help to reveal the population decline. Following points are mentioned:

- Formerly workers were content and proud of their jobs: they experienced the growth and prosperity of the region (and nation) to which they contributed. With the breakdown of the major industries, the pride can result in a mental stubborness towards change, as Hudson (2005) calls it.

- The educational level of the population is very specifically oriented towards the one practised job or craft. Retraining might therefore be burdensome, time consuming, unsuccessful or even not welcomed.

- The traditional economic branches were strongly gender divided. With the collapse of the manufacturing, male employment opportunities broke down while female jobs increased, mostly in the emerging service sector. Therefore especially the men became long time unemployed and had to cope with a changed role as domestic workers. This resulted in psychological entanglements and apathy that often left the women being both single wage earner and main unwaged domestic worker.

- Because the activity spaces of the population was traditionally very small (firms, factories and living places were organised close together) there is a marked reluctance to commute. Even modest distances to work are often regarded as unreasonable. With a limited number of jobs in the region, people would often need to commute over long distances (Hudson 2005).

These last points are of particular interest in terms of regional migration. Following from this, one might conclude that sprawling in former industrialised regions might be less common. The strong connectivity of the population to their city and an inertia in change might also contribute to a loyalty towards the place. However with regard to the last point, it would be important to clarify what 'modest' commuting distances means.

Furthermore, old industrial cities are often undersupplied with natural and green spaces, the environment is sometimes polluted, parks are often missing, the built environment is dense and often lacks renovation or revitalisation: the housing stock is old, facilities poor, dwellings small and dark. In the earlier sections, it was found that the residents' preferences are one of the most important reason for sprawl. The preference towards a suburban location is the hypothetical choice in comparison to other locations. Therefore preferences reflect the consideration and appreciation of urban versus suburban attractivities. Sprawl can result from high suburban attraction and from strong antipathy towards the cities. O'Sullivan (2003) has found that, next to the other reasons of sprawl, central city problems are a strong imperative for suburban migration. In this case, especially in old industrial cities, suburban locations become relatively more attractive than the inner city locations. Taken together, the combination of serious inner city problems, and the very strong connection of the people to the location seems to be a breeding ground for sprawling, in particular in the old industrial regions.

Also Power (2001) calls the inner city characteristics the main reason for people to move to the suburban areas and the periphery. The buildings and public spaces have been allowed to decay, the streets are insufficiently peopled but over-used by cars and this in turn lets people feel uneasy. Fear prevails and crime becomes the greatest worry of the population. Poorer, run-down neighbourhoods have a higher reputation for crime and disorder than more affluent ones. Figure 2.4 shows that there are higher levels of anxiety about crime in inner cities and in areas of physical decay and disorder in particular.

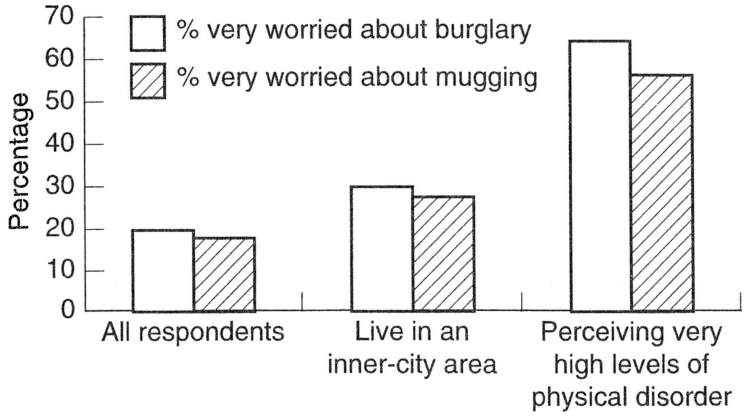


Figure 2.4: Worry about crime linked to locations and physical conditions.
Source: Power (2001, p.733).

With former industrial inner cities having probably more old, unrenovated buildings than non-industrial cities, this could be a reason for a substantial out-migration from old industrial cities' inner areas.

On the other hand, a necessary prerequisite for sprawl was a sufficient financial background. The limited resources of the population, e.g., with unemployment in the family, might be an obstacle and hinder a widespread outflow of the inner cities. In contrast the property and housing prices are often relatively low as compared to, e.g., the national average since the demand for property is lower as well (Mumford and Power 2002). Taking this into account the rate of sprawl might not be hindered that much by financial restrictions. This unresolved issue will be further considered in the case study analysis while the specific preferences to residential locations are the focus of evaluation hereafter.

2.2.2 Actors residential preferences and the importance of these for sprawl

The focus of investigation is positioned against the behavioural approach of action space. It presupposes constraints and influences to an actor's behaviour on a macro and micro level. On the macro level, a further division allows the consideration of influences that impact either on the demand or the supply of dwellings. These can be summarised as follows in Table 2.3.

Influence on supply	**Influence on demand**
Housing and dwelling stock (changes through construction, renovation, demolition etc.)	Requirements (population development)
Housing policy and city planing (amount of social housing, incentives, subsidies, building restrictions etc.)	Housing and dwelling supply
National and local regulation schemes (conservation, preservation of historical sites, rent policy, tax policy a.o.)	Population structure, social structure (demographic, ethnic and socio-economic specifics)
Demand for dwellings	Housing policy, town planning (housing constructions, infrastructure etc.)

Table 2.3: Influences on the supply and demand of dwellings on the macro level.
Source: After Gaebe (2004, p.105f.) - modified.

With respect to the micro level, the individuals as actors are the most important entities conditioning urban sprawl. Their locational preferences and locational choices are setting the parameters of residential sprawl. Several reasons seem comprehensible for a change of residential location. The most prominent named are: a change in household size and a change in incomes (Gaebe 2004; Chin 2002). Gaebe (2004, p.142ff.) describes prominent reasons for a general intra-urban migration according to a division in directions: (1) leaving the inner city, (2) choosing the urban fringes, (3) moving to the inner cities.

Add 1. Reasons for leaving the inner cities:
Amongst the most significant reasons to move out of the core cities are the lack of availability of desired houses with garden, especially for families with children, and owner occupation.

A move to the fringes cannot necessarily be explained as an urban flight. People in the inner city blame most prominently distress of industry, retail, and traffic, but also the lack of green and open spaces. On the other hand, the high dwelling prices in the inner cities often work as push factors to leave the city. The trend towards a higher share of older people and also the increasing singularisation of the society can cause a shortage of dwellings in inner urban areas (Gaebe 2004). The last point is however, not as relevant for the low-demand and declining regions.

Add 2. Reasons for choosing the urban fringes:
De-industrialisation has led to an increasing number of jobs located in the urban fringes and periphery. They attract residents who want to be close to their place of work. But, the general trend points towards a decreasing importance of employment location for the attractivity of a residential area, as other investigations show (Kloas and Kuhfeld 2003; DIW 2001; Renkow and Hoover 2000; van den Berg and Klaassen 1986). Additionally, most new development happens on the fringes which can also be an incentive for some people. The wish to live close to people of similar age, education and income, of similar occupation and life style (social and economic segregation) is another, very likely factor.

Add 3. Reasons for moving to the inner cities:
Current trends of a higher share of women working, the increasing number of single person households, the trend towards fewer children, make suburban locations relatively less attractive. Especially the young, childless and affluent part of the population appreciate inner city living, the cultural infrastructure and the urban living qualities. But also older people seek the vicinity to the centres supposing quiet urban amenities and green spaces are supplied in the surrounding (Gaebe 2004). Importantly, the reasons for out-migration (from a living location) have to be distinguished from the reasons for in-migration (to a certain neighbourhood). Table 2.4 summarises possible reasons for a change of dwelling according to this division.

Of central importance to this work, as it will be taken up by the modelling later on, are the reasons to choose the new dwelling displayed in the right hand column of Table 2.4. They are constrained by personal preferences, resources and other restrictions.

Whereas Gaebe (2004) puts emphasis on household size and income, there is also support for the importance of age (Knoll et al. 2002). The parameter 'change in the household size' in Table 2.4 infers a change of dwelling according to the advancement in the life cycle of the population (Lichtenberger 1998). The life cycle model assumes a relation between the demand of dwellings (in the form of size, standard and property form) and the age of the head of household as well as the number of children. It implies that with the latter increasing, the household will successively move to the fringe areas of a city and back. Table 2.5 mirrors the different places of living in dependence of the 8 hypothesised stages in the life cycle model of residents. To evaluate this model of migration several assumptions need to be taken into account. It was developed from the migration pattern of an 'average citizen' of the United States who moves eight times. Therefore, it assumes a great willingness to move, it presupposes that the single family house is the optimum place of living for a family and implies the financial resources to follow this pattern (Lichtenberger 1998).

Possible reasons for out-migration from the current home	**Possible reasons for in-migration in the next home**
Loss of dwelling	Residential preferences: Size and standard of the dwelling Location (accessibility with different means of transportation, job location) Social environment (family, friends, neighbours) Neighbourhood and physical environment (facilities, culture, quietness)
Lack of dwelling standards (size, price)	
Lack in the quality of the neighbourhood (location, crime, environmental conditions)	
Change in the job location (more jobs in the the peripheries)/ place of education	
Finishing a job/ education/ retirement	
Decrease in mobility	Resources: Financial resources (income and price of the dwelling, respectively) Cultural capital (education, life style)
Social advancement/ promotion (job, income)	
Change in household size (number of people in the family)	Restrictions for action: Level of information to the housing supply Housing supply, infrastructure
Distance to family and friends	
A new dwelling place	
Economic, ethnic and social changes in the neighbourhood by in- or out-migration	Barriers for in-migration (access to places, discrimination, violence)

Table 2.4: Possible reasons for moving. Source: Author's draft, after Gaebe (2004, p.127f., p.142f.).

Life cycle concept	**Places of living**
1. Young single person in employment	Cheap apartment in the inner cities of town
2. (Married) couple	Bigger apartment in the inner city
3. Family with small children	Suburb, small single family house
4. Family with younger teenagers	Suburb, bigger single family house
5. Family with older teenagers	Move to another suburb according to the career of the family father
6. Children moving out of the parents household	Small single family house or return to the inner cities
7. Parents retire	Return to an apartment in the inner cities
8. Single household of widow/widower	Small apartment in the inner city or home for the aged

Table 2.5: Stages in the life cycle and possible residential location. Source: Lichtenberger (1998, p.144) - Modified.

Against this background, one has to be careful to apply this model to other cities, as e.g. the transforming countries in Eastern Europe. It is believed that low prices to housing will remarkably change the migration pattern of the people in those countries (Lichtenberger 1998). Gaebe (2004) notes that there is a lack in empirical evidence if this model is applied as a single cause for the migration of families to the urban fringes. Other parameters have to be taken into account. Additionally the life cycle model does not apply to the migration patterns of gentrifiers, DINKS[2], one person households and single parent families. For the traditional family however, there exists a substantial power of explanation.

Additionally, it is not clear whether the assumptions would hold true in the post-socialist context. The work will regard this by describing residential preferences in the socialist and post-socialist realm. During the socialist period the preference towards the inner cities prevailed (Häussermann 1996), as e.g. Schulz (1995) could show for Berlin. The standard of apartments as well as the quality of the neighbourhood, such as the amount of green space etc., were of minor importance. The number of bedrooms was the most important criteria for judging a dwelling.

After the political change, the demand for spacious flats soon fell as a result of increasing rents. Counting even more for the new apartment, rising prices were also the reason that the premises of the old building stock became interesting again, especially to students and young people. However, next to the price argument, also the quality of the neighbourhood rose in importance to the attractivity of a residential place (Harth and Herleyn 1996) but also the poor conditions of inner city housing (Schulz 1995). The lack of maintenance of most houses during GDR times mainly due to small governmental budgets led to the expressed wish of many people to move into apartments of higher standard. See Table 2.6 for a comparison of the housing situation in the eastern and western part of Berlin as an example.

	East Berlin 31.12.1989	**West Berlin** 25.05.1987
Property form (in %)		
Private	23.6	54.3
Co-operative	16.8	31.2
Governmental	59.4	6.5
Others	0.2	8.0
Accommodation		
Flats/1000 inhabitants	493	514
sqm/inhabitant	30.4	37.4
sqm/apartment	61.3	69.5
with bath or shower (in %)	88.8	92.0
Rent price/sqm	Mark 0.85-1.25	DM 6.93

Table 2.6: Housing stock in East Berlin and West Berlin before the political change. Source: Schulz (1995, p.203).

[2]Double Income No Kids

The wish for new housing with higher standards resulted in the hasty erection of multi-family houses on the urban fringes, as e.g. in Leipzig (Nuissl and Rink 2005). Space was abundant and the mostly west-German investors saw the market potential. The more affluent inner city inhabitants moved to the urban fringes, most already in the early years after re-unification (Lichtenberger 1995a). Less affluent citizens had to remain in the old inner city stock or the high rise buildings. Nevertheless, especially the financial resources restrained an out-migration of people into single family houses on the urban fringe, at least in the early years of the transformation (Lichtenberger 1995a).

According to the focus of the investigation, the preferred characteristics of suburban locations in former industrialised regions are of particular interest. The reasons for sprawl were outlined in earlier sections and preferences towards residential characteristics in this. What remains to the case study analysis is the question whether the issues named hold true for the population in dwindling regions and particularly also in post-socialist realms. Following research questions are formulated:

What are the main reasons for people in old industrial regions to move to the urban fringes? What is more important in the decision to move:

- the characteristics of the inner cities with their mostly negative evaluation as strong push factors, or
- the characteristics of the outer urban areas, mostly positively evaluated as stronger pull factors?

Hypothesis:
If the latter is less important than the former, this will indicate that the inner city problems/ the urban environments in former industrial cities are more important in the evaluation of residential attractivity of sites than the pull factors of the surrounding. Against the comparison of other investigations a stronger weight of push factors than pull factors is expected. This in turn would suggest that former industrialised cities might generate more sprawl than non-industrial cities.

2.3 Consequences of population decline and sprawling

In earlier sections the causes of urban sprawl have been explained. It has been found that urban sprawl and decline can respond to each other: decline can cause sprawl and sprawling can cause decline. In a very unfortunate situation both processes act in a negative way resulting in a sink spiral reinforcing each other. In such a sink spiral the causes are likewise the consequences of the development. Therefore a lot of the explanations concerning the causes of urban sprawl will also apply to the consequences. Already mentioned consequences of sprawl and decline will be mentioned concisely, issues which have not been received adequate attention before will be elaborated below.

2.3.1 Social consequences

2.3.1.1 Segregation and social retreat

Segregation means the spatial separation of social groups according to various parameters. The aspiration to do so was mentioned as a possible cause of urban sprawling in earlier sections. The term segregation was coined by the so-called Chicago School of Sociology[3]. In the meaning of social segregation it describes the degree of disproportionate distribution of population groups or social strata in different spatial parts of a city. Segregation is more pronounced the higher the social distance between the groups. Most evidently and most intensively investigated was social segregation along with ethnic minorities in the USA (ethnic and racial segregation). It is hypothesised that an early residential segregation during the phase of industrialisation leads to increased ethnic segregation (Heineberg 2001). However it is not as prominent in the European contexts (Meen and Meen 2003). In Britain, social segregation and social exclusion (as the most severe form of segregation) is more pronounced in the industrial cities of the north than in the cities of the south. However, it is important to notice that social exclusion does not only result from economic decline but can also result from economic growth if a certain share of the population can not participate in the rising prosperity (Roberts 2000).

Gaebe (1991, in Heineberg 2001) distinguishes between different kinds of segregation. Demographic segregation and social-economic segregation are the most prominent forms in European cities and can be assigned to the social consequences of urban sprawl. Small numbers of social housing within the cities as well as a high rate of privatisation in the housing sectors are made responsible for an increased degree in social-economic segregation (Heineberg 2001; Harth and Herleyn 1996; Lichtenberger 1995a; 1995b). But also a

[3]The Chicago School of Sociology created three models or theoretical approaches about the structure of urban areas and their development. These three classical models constitute what are termed the theories of Social Ecology today. The Chicago School of Social Ecology represents a very early attempt to describe the regularities of an interdependent relationship between the social and the economic parameters of a city. The approach was developed in the beginning of the 20^{th} century but mainly after the First World War. Important contributors were R.E. Park, E.W. Burgess and R.D. Mc Kenzie. The three urban development models of Social Ecology (the ring model of urban development after E.W. Burgess, the sector model of urban development after H. Hoyt and the multiple core model of urban development after D. Harris and E.L. Ullman) shall not be employed as hypothesis to my studies since their models apply to the macro-level of spatial reference , after E. Lichtenberger the level of the whole agglomeration. My studies apply to the meso-level and look to the relationships between different parts or districts of the cities. The term segregation was coined from the school of Social Ecology (Gaebe 2004).

demographic shrinking, as found in the cities in Eastern Europe after the transformation from the socialist to the capitalist systems, and a falling demand in the inner city housing stock result in social segregation (Herfert 2003). The very rapid dynamics in the moving behaviour during the political transformation led to an acceleration of social segregation. The numerous movements of families to the suburban regions during the 1990s contributed to a very low share of households with children in the inner city, as e.g. in Eastern Germany (Herfert 2003).

When people move for the reason of an aspired segregation one might think that sprawl leads to fewer social contacts of the suburbanites in their neighbourhood. It was also argued that the middle-class suburbanites develop much more short-term local friendships than, e.g., the inner city working class which is more dependent on the proliferation of kinship ties. Affluent suburbanites it was argued have the resources to and do retain more long-term relationships to peers across greater spatial distances (Power 2001).

Sprawl less often creates newly built settlements but adds to existing ones. It develops in the smaller settlements and communities surrounding bigger cities. Consequently, the suburban settlements have a mixture of old and new residents who often differ in terms of education, income, life styles and preferences with respect to the area's development (Sukora 2003). Another consequence is the social retreat of the old residents and aggression against the newcomers. Social retreat has not only been reported from the autochthonous population, but also from the inner city residents. With the ongoing trend of tertiarisation, manufacturing continues to decline. The industrial workforce can only adjust slowly. The skills of the people does not match the requirements of new jobs without further education which often is difficult to pursue. New jobs are often settling in other regions or outer suburban areas, following the trend of decentralisation and driving dispersal. For many people commuting is unwanted and burdensome (as mentioned earlier). As a result, people give up the quest for work altogether. They drop out of the labour force and are not in the statistics as unemployed (Power 2001). A phenomenon which seems to be pronounced in old industrial areas.

2.3.1.2 Traffic

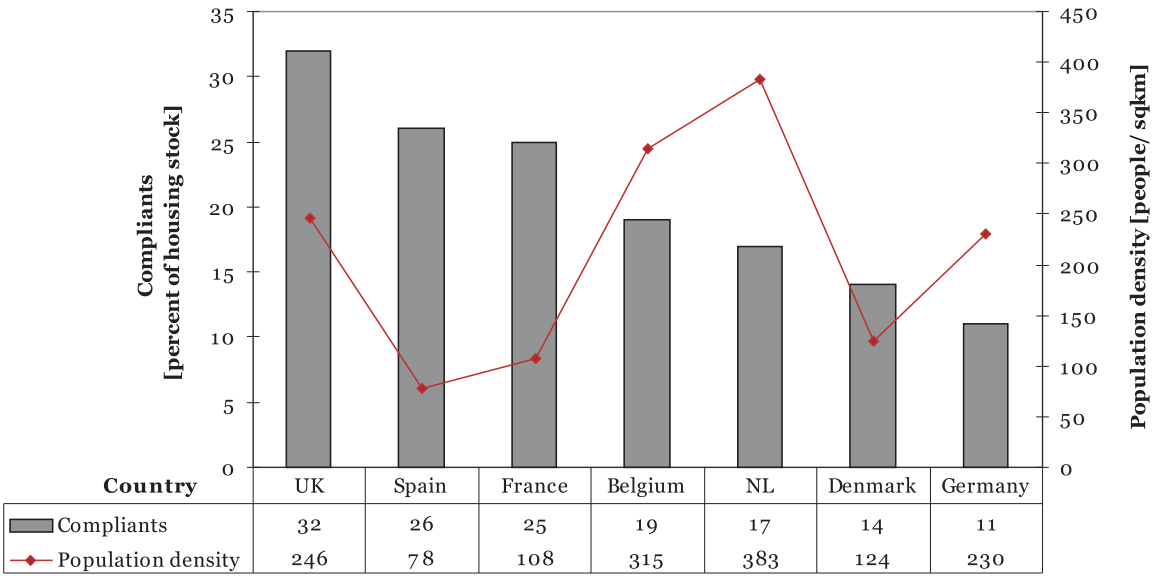
The more people disperse the greater is the flow of traffic through and around the cities. Urban sprawl has been associated with traffic congestion, noise and air pollution and increasing danger on and adjacent to the roads (Power 2001) as the use of cars becomes essential for the people in suburban areas. The development towards a constant use of the car brings those adults possessing a car more freedom, more choices, more comfort and convenience but it discriminates against people without one, e.g. the elderly and children. They are especially affected since the public transport, if it exists, gets increasingly inefficient. Providers cut services and routes or have to increase prices.

Next to these more obvious consequences a higher car use can also imply health problems due to the minimisation of physical activity (Jackson and Kochtitzky, nY; Sui 2003). Sui (2003) reports from an investigation in the 50 largest US-American cities using the length of commuting as a parameter. Sprawl shows a connection to obesity and heart disease[4].

[4]According to the body-mass-index (BMI) Houston 'won' in 2002 and 2001, followed by Chicago, Detroit, Philadelphia, Dallas. The heaviest German city is Rostock, Leipzig ranks 17th (Renz and Krause 2005; dpa 2005).

2.3.1.3 Crime

A decrease in physical activity is associated to the modern life styles but it can also be an expression of the fear about safety (Jackson and Kochtitzky, nY). Car use decreases the physical activity and it minimises the social contacts. This, in turn, makes the urban neighbourhoods so thinly populated and streets so under-used that abuse and crime could occur unwatched (Power 2001). Crime is related to social control (Schelling 1971; Gladwell 2002). Along this line of argument the cities of lower demand and vacancy, such as former industrial cities would feature a higher rate of crime incidences and vandalism. Power (2001) finds different levels of vandalism for different European countries. She concludes that cities built at higher densities suffer less social breakdown than those built at lower densities as, e.g., Great Britain. The higher densities result in stronger street presence and might lower levels of vandalism (Power 2001). Figure 2.5 portrays the complaints about vandalism in selected European countries and underlines that Britain ranks first among the selected.



Country	UK	Spain	France	Belgium	NL	Denmark	Germany
Compliants	32	26	25	19	17	14	11
Population density	246	78	108	315	383	124	230

Figure 2.5: Compliants about vandalism to houses and gardens in 1991 [percentage of housing stock]. Source: Author's draft. Data: Power (2001, p.736), Fischer Weltallmanach 2003, data for population density relate to the year 2000.

From 32% of all dwellings there must have been a compliant to the police. Or reversely, as each compliant relates to one dwelling this affects 32% of the housing stock. The number of compliants does not relate to urban densities as one can see. An increased crime activity and vandalism bring additional economic consequences for the individual as well as for the community.

2.3.2 Economic effects

Sprawl is often blamed for the disproportionate distribution of costs and benefits between the inner and the suburban areas. This is most visible in the differences of community budgets which are differently stressed according to the residents. Sprawl brings problems to the communities and the society, e.g. when the socially lower classes concentrate in the inner urban areas (Herfert 2003; Downs 1999). People who move take their social and financial capital with them. This is why owner-occupation is considered a way to increase the social capital of the community. Owner-occupiers have a greater commitment to the neighbourhood, move less often and might therefore contribute to a stabilisation of the area (Meen and Meen 2003). This is an impact on the community level. However, differences also result for the individuals themselves.

2.3.2.1 Costs for the individual

For the individual the move from the inner city areas to outlying regions has to be positive, summing up all the changes. Otherwise, one could hypothesise, the residents would not do so (providing a perfect market). Nevertheless there might be some aspects which have either not been foreseen by the individual or which are labelled negative but outweighed by other more positive outcomes (Downs 1999).

When the individuals decided to move they have incorporated prices for dwellings, building plots and/or the construction of the building itself. However, sprawl has been made responsible for a rise in house prices as the demand increases (Peiser 2001).

Another outcome affecting suburbanites is the widely agreed rise in traffic volumes and passenger-miles travelled (Gillham 2002; Peiser 2001; Power 2001). It is often connected to (increasing) traffic congestion in the urban but also suburban locations. Traffic congestion is also due to the economies of businesses, which want most people to work during the same hours so they can interact efficiently. That means they have to travel to and from work at about the same time each day (Downs 1999). Traffic congestion and the increase in passenger-miles travelled are linked to air pollution and energy consumption. The use of petrol escalates. While new vehicle technology may eventually reduce petrol demand per car and unit of distance travelled, an overall decrease in petrol consumption is not likely before energy prices increase substantially, which is (against an environmental sound reasoning) difficult because of the fear of serious economic outcomes (Gillham 2002; Downs 1999).

Traffic also brings about noise pollution, a prominent reason why people move to the suburban locations. A move can, in this respect, be rather disappointing for the migrants as noise pollution increases there too, especially with more people wanting to live more quietly the sources for noise pollution increase. However, the point sources and the extent of noise pollution in the inner cities might still be substantially different from those in suburban realms.

Another consequence brought about to the individual is a kind of 'trapping' in the neighbourhood. Purchasing property brings about a stronger affection to the home and a greater commitment to the neighbourhood. Both might decrease a wish for further moving (Meen and Meen 2003). A financial trapping on the other hand occurs when people have a mortgage which has to be paid off or when property prices drop substantially after the

acquisition (Herfert 2003). Moving does not always bring full satisfaction to the residents, although a split between the satisfaction with the home and the satisfaction with the neighbourhood has to be made. Herfert (2003) showed for the East German suburban context, that the satisfaction with the neighbourhood is sometimes very low. The wished-for green surroundings had to often to be shared with too many neighbours near by, he concludes.

2.3.2.2 Costs for the community

The community budgets in European countries are mainly covered by two kind of taxes: first, the income tax on the resident population and second, the business tax (Mäding 1998; Downs 1999).

Add 1. In Europe income tax is paid at the place of residence, not at the place of work. For the community the total payment is of highest interest. The amount of migration only delivers a limited explanation (Mäding 2001). An imbalance of community budgets therefore mainly results from the out-migration of a wealthy middle class, not from out-migration per se.

Add 2. The business tax is paid to the community in which the firm is located – the relocation of firms and businesses out of the administrative areas is therefore the main reason for a change of community income from the business tax. The trend towards economic dispersal leads to the imbalance of community incomes between urban and their neighbouring communities.

Urban sprawl is also made responsible for additional infrastructure costs as plots have to be developed and prepared before construction, roads built and the infrastructure to be maintained. Downs (1999) reports from studies undertaken in the US: the growth of cities via sprawl was estimated to cost about 20% more for roads and land (leaving other costs aside) as compared to the growth via more compact forms of development. Additional costs are mainly brought about by the construction of roads, schools, sewerage and water systems as well as other public facilities which are substantially higher with sprawl.

In contrast, the infrastructure of the inner cities deteriorates and is under-used as it was built for a larger number of people. Falling demand in inner cities means falling maintenance inputs, faster deterioration and a shortened life time of the infrastructure (Mumford and Power 2002; Peiser 2001; van den Berg and Klaassen 1986). Falling demand also means a decrease in property prices, which aggravates the economic basis of the individuals, the community and other entities possessing property as their values fall.

The oversupply of infrastructure according to the decreasing demand applies not only to the local traffic infrastructure but also to social facilities, e.g. schools, libraries, health care centres etc. It is different with social facilities that are oriented towards a regional catchment area, e.g. hospitals, cinemas, theatres and so forth. The city normally provides an adequate performance, but this becomes difficult as the tax base falls with the relocation of households to outlying communities. The core areas are left with a disproportionate burden of providing costly services for a regional population but from fewer and less wealthy residents. This creates a vicious downward fiscal spiral that weakens the ability of core-area governments to provide quality public services and results in unequal urban environments (Downs 1999).

However in a comparison of community budgets, it seems inappropriate to speak of symmetrical losses in the core areas and gains of the communities on the fringes. At least with respect to Germany the financial compensation between the Länder results in asymmetries (Mäding 2001). The losses of the urban cores are higher than the gains of the hinterlands, as Mäding (2001) summarises. The same relation holds true for the differences of the business tax between communities in Germany – the core areas are mostly affected more severely.

2.3.3 Environmental impacts

The 'anti-sprawl debate' as often referred to started from environmental concerns. Among the classical arguments against urban sprawl are the land use change, an increase in land fragmentation and a decrease of valuable natural area, damage to the water systems, air, ground and water pollution (Squires 2002).

2.3.3.1 Consequences for land consumption and fragmentation

In a hundred years, the density of the population in Britain has fallen from around 1000 people/hectare (ha) to just over 50 (Downs 1999). Today there are one-tenth of the homes/ha than were built a hundred years ago when the population was half the size and each home had twice the number of occupants. Against this background, the difficulties of providing public transport, local shops, banks or schools with current densities become comprehensible (Power 2001). Table 2.7 gives an interesting overview of the estimated urban densities at different times. Britain serves as an example for a general development in Europe.

Date	**Number of dwellings/ha**	**Number of people/ha**
1900: bye-law housing	250	1000
1950: new towns	35	120
1970: inner city estate	100	330
1990: inner city renovated streets e.g. Islington, part of London	70-100	185-250
1999: national average planning requirement for new housing	25	53
Ratio of dwellings: 1900-1999	10:1	
Ratio of people: 1900-1999	20:1	

Table 2.7: Estimated urban densities at different times. Source: Power (2001, p.736).

The term 'despoiling the landscape' has been frequently used (Peiser 2001) to describe trends such as land consumption and land fragmentation. Some of the developments in the former rural settings, as e.g. new business parks, have been called ugly and wasteful (Power 2001). They have shown little spatial rationality, are cheap and spacious. Sprawl has been made responsible for the diminishing beauty, drama of the landscape (Power 2001), scenic

resources and regional open space. It closes up formerly natural spaces that were potentially available to recreation and leisure activities.

Especially at risk to the conversion from natural to urban uses is the agricultural land adjoining urbanising areas. They are easily made accessible and do not require much pre-work, e.g. in comparison to forest areas. As land conversion increases there is also an increase in the loss of habitat for species. Biological communities that need spacious untouched and open areas might decline as the landscape becomes more fragmented - edge habitats increase. The highly specialised species might suffer most, as those in wetland habitats have shown (Gillham 2002).

2.3.3.2 Consequences for open waters and groundwater

The loss of open green spaces affects both the surface and groundwaters, its resources and quality.

Add 1. Surface waters: Under natural conditions, the rainfall is either intercepted by vegetation or percolates slowly through the ground. In urbanised environments where a higher proportion of the area is sealed, rainfall becomes surface runoff. During its flow across the impervious surfaces it takes up pollutants, such as oil, and is then either channelled into storm drains or runs directly into the water streams. This marks a disruption of the natural cycle, causes higher runoff and a faster speed than the rivers and streams might be able to handle (Jackson and Kochtitzky, nY). This can result in high water levels, flooding and/or faster stream flows (negative to certain species, causing additional impacts to the river beds). Furthermore pollutants can be filtered out less, water bodies get more polluted.

Add 2. Ground waters: A greater runoff reflects on the groundwater bodies as well. Aquifers are increasingly bypassed from rainwater as most rainfall directly reaches the open water bodies through the drainage system. Communities report difficulties with natural aquifers and the water provision, although these shortages are often overcome by an exchange with neighbouring communities (Reckien -the author- 2001).

2.3.4 Attribution problems

The social, economic and environmental consequences that are often mentioned with regard to urban sprawl have been highlighted in the former sections. One can see, the impacts are felt on the two areas: the inner cities and the suburban areas as sprawl describes a spatial process between the two. As a kind of intermediate summary the consequences of sprawl on the urban hinterlands as well as its possibly amplifying effects on the inner cities will be mirrored in Table 2.8. The interactions of the social, economic and environmental pressures that result from urban sprawl make a more sustainable approach to cities and land use inevitable. Against this background it seems imperative that the costs to cities and to the society as a whole are recognised. Additionally, nearly all major problems related to urban growth are regional, not local, in nature. This is most obvious with problems such as air pollution or traffic congestion and important to notice when it comes to the role of politics and planning in influencing the urban sprawl processes.

Impact on urban hinterlands	Impacts	Impact on the towns
Disturbance of social networks and local communities	**On individuals**	Population loss
Difficulties in surpassing space for the personally immobile, e.g. children and elderly without cars		High costs and poor quality of services
Increased air pollution, road traffic and accidents		Polarised, fragmented neighbourhoods – depleted elderly care/ disorder
Increase in noise pollution		
Tendency to an over-supply of land due to speculative development	**On the community**	More traffic inflow – commuting – congestion
Increased road traffic, weak public transport in dispersed settlements		Vacant buildings and land, falling demand – over supply problems
Increased demand for some services, e.g. health		Loss of shops and amenities
A relative increase in tax base		Decline in property values, Public infrastructure becomes less viable
Impact on waters – pollution and amount of run-off	**On the Environment**	Vacant and derelict land and buildings
Increased land consumption, deterioration of the countryside – aesthetical aspects		
Loss of countryside, damage to wildlife		
High social costs		
High economic costs		
High environmental costs		

Table 2.8: Environmental, social and economic impacts of residential sprawl and inner city decline. Sources: Author's draft; after Rogers and Power (2000), Power (2001).

For a comprehensive reflection of the sprawl process and its side-effects, one has to structure the discussion further. Sprawl has often been made responsible for "all the evils of modern urban life" (Chin 2002, p.11). There is a hot debate about urban sprawl, which sometimes lacks a constructive or rational argumentation. This might be due to the fact that there are considerable difficulties in making the link between sprawl and certain consequences, e.g. that there is an absence of reliable empirical evidence to underline the arguments made either for or against sprawl (Chin 2002). Few empirical studies have been undertaken and many of them are case studies which are difficult to generalise from. A possible reason comes also from unclear definitions of sprawl (as elaborated upon in the introduction to this work). What remains is a blurred picture of the link between sprawl and its ascribed impacts. In fact, it is very difficult to provide the proof for an attribution, e.g. of rising energy consumption to sprawl, when the rising energy consumption results to a substantial part from higher living spaces that need to be heated. It is hard to tell whether the actor using more energy in the suburb would not have done so in the inner city also, if she/he would have found a totally comparable place to live. Another example: 'Sprawl results in rising housing costs' is also difficult to prove as long as the numerous subsidies promote sprawl (Peiser 2001). Even more: retail development on large plots has often been associated with urban sprawl - in fact, sprawl does not create large-scale retail centres, the economies of retail distribution and often the consumer preferences do (Peiser 2001). The legitimate criticism of large-scale retail development is not that it is a consequence of sprawl, but that it consumes enormous amounts of land and that it can threaten city centre vitality.

Chin (2002) gives a comprehensive overview of the debate of urban sprawl and summarises the attributed features and outcomes that are agreed upon within the research community. It turns out that there is very little agreement about what effects should be attributed to sprawl. Many of the outcomes of sprawl are in fact the costs of modern urban living, regardless of urban form (Chin 2002). Discussions about the attribution of sprawl refer to the need of a 'prototype' of inner city living or inner city housing in contrast to outer urban living. It strongly depends on what can be regarded as typically urban and what can be regarded as typically non-urban, sub-urban, ex-urban. One needs a paradigm to compare any consequences of sprawl to something else. Without such a possibility one can only speak of a compilation of case studies without a derivation to more general processes. However, this might be a difficulty scientific research is facing in general.

Furthermore, urban sprawl is accompanied by a number of processes, of which some seem to be part of sprawl itself (in Heineberg 2001). Difficulties have been encountered in the separation of developments that belong to the process and in those reflecting a consequence of sprawl (Peiser 2001). Gaebe (in Heineberg 2001, p.54) names the following processes that accompany urban sprawl:

1. A re-organisation of the population and of land use within the agglomeration. He distinguishes

    - A demographic segregation which is characterised by an increase in the proportion of middle-aged people, by children, teenagers and multi-person-households in the surroundings of the cities whereas the core cities are featuring higher proportions of the elderly, of foreign persons, one-person-households and ethnic minorities.

- A social-economic segregation which can be felt as a rise of middle-income households in the surrounding areas of towns and a rise of lower-income households in the inner cities.
- A functional segregation. This is the new allocation of industry, area- and transportation-extensive functions in the urban periphery, as e.g. wholesale or dispatch businesses. A concentration of high and highest level functions is emerging in the inner cities with, for example, financing, management, trade, consulting, communications and information services in the core areas.
- A change of land use in the suburban areas. It concerns an increasing use of space for single functions, the formation of residence parks with owner-occupied single-family houses, new industry, trade or service clusters in the periphery. The core areas of cities on the other hand become socially diverse and a place of increasing conflicts. The deterioration of inner cities, building boom and gentrification appear on a spatially small scale (Lambert and Boddy 2002).

2. An increase in the urbanised area with the simultaneous divergence of the traditionally spatial-functional unity of living, working, supplying and production.

3. A decrease in the population density of the core and inner city areas.

4. A relative gain of economic power of the surrounding communities of the cities while simultaneously the core cities lose economic power, tax income and purchasing power. Also increasing social welfare benefits and the proportionately higher use of infrastructure (by citizens of the whole agglomeration) increasingly burden the community budgets (Gaebe (1991) in Heineberg 2001).

Peiser (2001) summarised the different outcomes often connected to sprawl by dividing them into process elements, negative end results, both bad and not-bad end results and further complex results. He assigns the issues named under process elements being the sprawl process itself. It has to be distinguished from the negative and not as negative end results, but sometimes does not receive this recognition in the literature. There are also complex results - the role of these issues in the sprawl process seem not to be fully understood yet. Peiser (2001) also adds his thoughts to the causes of the named outcomes and distinguishes between market failures, regulatory failures and the development (process) of urban areas in general. Table 2.9 shows his considerations. It is an attempt to structure the sprawl debate and shows the need to further investigate the different contributions of each of the issues named as only then a target-oriented action, e.g. by planning bodies, can be implemented. With respect to the focus on former industrial cities, the outcomes of sprawl subsumed under 'complex results' are of special interest. Both a decay of inner city areas as well as a concentration of the poor have been revealed as characteristics especially of old industrial regions, mainly because the economic decline left the population with scarce financial resources and the early industrialisation left its footprints on the housing and building structure. If both processes are, in a complex way, involved in the urban sprawl developments one can expect that they occur in old industrial regions in an amplified manner.

Outcomes of sprawl	**End result caused by**		
	Market failure	Regulatory failure	Development process
Process elements			
Low-density development			X
Discontinuous (leapfrog) development			X
Scattered development			X
Land speculation			X
Decentralisation of employment			X
Retail suburbanisation			X
Decentralisation of leisure facilities			X
Negative end results			
Increasing use of land	X	X	
Monotonous development	X	X	
Environmental degradation	X	X	
Inefficient development:			
poor accessibility and infrastructure	X	X	
Loss of open space	X	X	
Increase in car use	X	X	
End results both bad and not-bad			
Strip development	X	X	X
Large retail development	X	X	X
Complex results			
Decaying inner city	X	X	X
Concentration of the poor	X	X	X

Table 2.9: Outcomes of sprawl divided by process elements and end results. Source: Peiser (2001, p.284) - modified.

Impeding a structural discussion of sprawl comes about by a normative affection to the process connected to either 'good or bad' (Peiser 2001). Sprawl has positive and negative sides (Downs 1999), there are cost and benefits (Chin 2002) which apply to different actors, different levels of time and space.

Additionally, there might be aspects of sprawl that are neutral at a low level of aggregation (a few people moving to the fringes as an example) but which are severely negative on an aggregated level (when a sufficient number of people contribute): sprawl is not 'as bad' when 10 people move as when 1000 people move. Good or bad can be an issue of thresholds.

Another issue should be remembered. Sprawl describes a spatial relocation of population and businesses, which implies that there is a place of origin and a place of destination. Sprawl and its sub-processes mean different things to different people and different places, consequently there are mainly two sets of problems.

1. First, there are impacts on the regions of origin – the cities: Here, the people have to cope with outcomes that remain from actions of other entities. Additionally, the impacts on inner cities are mainly accounted negative.

2. A second set of consequences applies to the areas of destination - the growing sub-urban locations: Here problems arise for the individuals that moved and for the autochthonous population[5]. Whereas some of the results on these groups will be seen negative too, many outcomes are judged positive (Downs 1999).

It appears that the consequences of sprawl are often investigated by looking at the impacts on different people in different areas. This seems to be a major drawback as seen by the author. In order to achieve a clearer understanding of the sprawl-related effects one should first look at the changes for one same entity, e.g. a household moving from the inner to the outer urban areas. A comparison between the situation or conditions of living in the inner versus the outer city within one same household is assumed to contribute to a clarification of the consequences of sprawl. It is a first step as to the attribution difficulties in the sprawl debate. It is assumed to deliver valuable information to the effects of some aspects related to sprawl but cannot provide further clarification in the problems of definition in terms of process elements versus end results. The analysis in this work will focus on both an assessment of sprawl-related consequences to different people living in different places, inner urban versus outer urban areas, at the same time and an assessment of sprawl-related consequences to the same people living in these locations at different times. Adjusted research question:

Can an increase in living space, the number of cars and the commuting distance be clearly attributed to the migration from an inner to an outer city location when both different households are compared at the same time (inner versus outer urban residents) and the same households are evaluated at different times (moving households from the inner to the outer urban areas)?

Hypothesis:
Against the background of the current literature it is assumed that the households which are living in outer urban areas have a higher amount of living space, number of cars and commuting distance in average. If one compares the situation in the same households before and after a move from the inner urban parts to the fringes, it is assumed that this will lead to an increase in living space and the amount of cars per household. However, taking into consideration that the financial resources of residents in former industrial areas are small, a concentration of employment as a legacy from the GDR period remains, and the people especially in old industrial areas by cause of a constituted behaviour do not like to commute it is not assumed that the commuting distance changes much.

[5]This separation of consequences distinguishes only between the impacts for humans at different locations. There are however, consequences of sprawl on other living as well as non-living entities, see further up.

2.4 Possibilities to influence urban sprawl processes

In this section an overview of the roots of European planning shall be given. It will be explained how the institutions developed and what kind of planning mentality prevails today, especially with the focus on Germany and Great Britain. Commonly used planning strategies against sprawl will be given and new means elaborated to make a reduction of the negative outcomes of sprawl possible.

Shortly the relation of planning and politics shall be pointed out again. These are understood as two sides of a coin. The one gives the legal framework, formulating laws and binding regulations whereas the other side is responsible for the implementation, the kind of means, the amount of efforts. However, both act in direction of the same goal and are dependent on each other to reach it. The focus in this work lies at the investigation of the planning system however this does not mean that the political connection can be left aside.

2.4.1 Planning systems in Europe

Planning receives power through its embodiment in the legislation and regulation which form part of the legal apparatus of a country. The nature and style of this legal apparatus can vary between countries and explains the different approaches to planning. On the other side, the implementation of planning occurs through the administrative system which again varies across the countries. Newman and Thornley (1996) relate to different 'legal families' of planning in Europe (see also Langhagen-Rohrbach 2005). They summarise the variations in planning systems and identify its factors of influence on urban systems as drawn from the differing legal and administrative structures. They distinguish 5 'legal and administrative families' in Europe: the British, the Germanic, the Napoleonic, the Scandinavian and the East European family. The British and the Germanic family will be explained in detail, since they embrace the legal frameworks for the two case studies.

The Germanic family: The Germanic legal family is based on the approach of codification[6]. Historically, in Germany there was no central power to impose a unified legal system. This lack of central power also meant a lack of authority to rationalise and anew the system, laws became more and more obsolete. Responding to this deficiency, the ancient Roman law was applied in a more comprehensive way during the 15^{th} and 16^{th} century. It provided a suitable overall framework to the prevailing situation. Later the approach to codification was adopted in the Age of Enlightenment during the 17^{th} and 18^{th} century. The realisation of its merits led in the German case to the implementation with especial rigour and without the ideology of change. The German approach was abstract and intellectual.

In contrast to the English (unwritten) constitution, there is strong emphasis on the (written) constitution in the German planning family. It arranges very clearly the powers of the different levels of government and requires a constitutional amendment to alter the balance of responsibilities. The Constitution relies on a federal approach: the central government shares much of the power with the states (Länder), which are the next lower level of government. The states have their own specifications to deal with the district authorities

[6]Codification means the collecting and restating of law for a certain jurisdiction and a certain area of living. It is usually done by subject, as e.g. the civil code (Bürgerliches Gesetzbuch - BGB).

(Kreise) and the local authorities (Kommunen, Gemeinden), the two levels beneath. To work efficiently in such a case of multiple responsibilities strong interlinkages between the government levels are needed and essential – a governmental network develops.

The commune is the basic building block of local administration. The 'doctrine of competence' found here is based on the assumption that local authorities have a general power over the affairs of the community (Planungshoheit der Kommunen). The principle of subsidiarity is applied and circumscribes that higher levels of government only become involved when the lower levels fail to meet the demands. Systems that place importance on the local commune are likely to have numerous and small authorities at the lowest level. This fragmentation of independent communes makes it particularly difficult to implement strategic policies (Newman and Thornley 1996).

The British family: The British family of legal and administrative organisation is highly distinctive from the other forms in Europe. It is the only family relying on a system of case law that has gradually built up decision by decision. Evolved from the tradition of English Common Law (Gewohnheitsrecht) there is a highly empirical note to this approach and an emphasis on past experience and precedent cases.

There is an 'unwritten constitution' (Basic Law - Grundgesetz)(Newman and Thornley 1996, p. 30) in Britain. This means that, with particular reference to the local authorities, no special protection is available to them. On the other hand as no binding documents exist, greater flexibility follows. Traditionally, the local authorities in England have been regarded as deliverers of services. As a result the units of government are fairly large – an efficient delivery of services is easier with bigger spatial units. The operating range of local governments is defined by and their action supervised from the central government. Local authorities are perceived as agents carrying out central government's policies, so the national government's regulation, laws and controls are formulated to allow the enforcement of their own competence. This is in contrast to the other families in Europe which apply the 'doctrine of general competence' (Newman and Thornley 1996, p.30)(see above).

The traditionally strong dual system of administrative government in Britain -comprising the national and local level- implies that the central government is responsible for the local governments' legal and financial constraints. Local authorities have little need for local taxation. Their finances are mainly obtained from national grants. The two levels of government are very distinct and operate in two different spheres, e.g. the movement of politicians from one level of government to the other is seldom in Britain in contrast to other countries of Europe where politicians work their way up through more than one level of government (Newman and Thornley 1996).

The legal and administrative families that built around the German and the British case study feature important differences. However, apart from the historical development of the legal and administrative frameworks and their distinctive impacts, there are also present trends and remarkable similarities in the planning systems in the European countries. The trend towards a globalisation of both the economy and the personal interactions between people has strong effects on European cities. It reflects the opening up of international markets, most notably since the process of economic integration in Europe (Schätzl 1994, 2000). Technological innovations might have encouraged this by enabling communication

and physical interaction over greater distances more easily (Hall 1993; Castells 2003). As a response to the changing international challenges, the European Commission (EC) tries to consolidate its role in urban and regional policy.

In contrast, Newman and Thornley (1996) argue that the international policy in Europe has developed to respond to the global economic change and its economic and social consequences. The competition between cities has increased both for command and control functions as well as for other economic development. This, so it was argued, will bring few benefits to peripheral regions but will rather increase competition between already dynamic areas, in particular the metropolitan centres (Paal 2005; Newman and Thornley 1996).

Despite the trend towards high level integration, such as the formation of the European Union, there is a counter-trend towards the increasing importance of sub-national governments, regional associations etc. (Schätzl 2000). The Agenda 21 programme that arose out of the 1992 United Nations Conference on Environment and Development (UNCED) has encouraged the strengthening of regional and local governments, mainly because it is assumed to ease an implementation of environmental policies (Newman and Thornley 1996). Additionally, the European policies increasingly focus the regional level most visible with the implementation of the Structural Funds and the Committee of the Regions.

The changing international and global trends call for an adaptation to new roles. Cities have become dependent on the successful adaptation to the global economic trends (Paal 2005; Sassen 1999, 1994, 1991; Meijer 1993) and on their attractiveness to a global economy. They are no passive spaces in which national or international capital and functions locate but have themselves become important actors in enabling opportunities for economic development through marketing strategies, the creation of new, positive and dynamic images as well as through the preparation of spaces for economic development (Newman and Thornley 1996). Competing on international markets is one of the new roles of local (and regional) communities, their governments and planning institutions. However competition brings about winners as well as losers. The less dynamic cities and regions, so it is argued, remain reliant on the international aid and on governmental support (Newman and Thornley 1996).

2.4.2 Planning in the case studies: Germany

2.4.2.1 The planning system in the Federal Republic of Germany

Since 3 October 1990 Germany is again a unified state. The planning system of the former West Germany has been applied with small modifications to the East German Länder (Schätzl 2000; Lichtenberger 1998). The key features of the German approach of governing is the strong legal framework and a decentralised decision-making structure. The division of power between the levels of government is set out in the constitutional law of 1949. It specifies that the Länder produce their own planning laws and the federal government sets out a framework of regulations only. Whereas the planning legislation is an obligation of the Länder the full responsibility in the implementation of the development and landuse control refers to the local level (kommunale Planungshoheit), referring to and derived from the established self-government of communities (kommunale Selbstverwaltung). There is a considerable variance of planning practise across the different federal states.

Following from that, historically there are three levels of administration and correspondingly also three levels on which spatial planning is carried out, though with different services, responsibilities and obligation.

1. The federal state:
   Planning matters on the federal level are housed in the Ministry 'Bundesministerium für Raumordnung, Bauwesen, und Städtebau' (BMBau) since 1973 and specified in the Federal Regional Comprehensive Planning Act (Bundesraumordnungsgesetz – BROG). The task of the planning institutions on the federal level is the coordination of planning ressorts and a co-operation in the coordination of the state-wide planning matters. Furthermore to the coordination, a very important task refers to the competence in the Building Law (Bauplanungsrecht) which e.g. regulates the local planning practise (Bauleitplanung). The passing of the law regulating the building control (Bundesbaugesetz, novelliert als Baugesetzbuch (BauGB) in 1987) sets out uniform building standards throughout the country (Vogt 1999). The BMBau does not have any competence of implementation in planning but more a legislative task. To enable a better communication, coordinated planning and appraisal of the work an additional body was established on the federal and the state level (Länder): the Ministerkonferenz für Raumordnung (MKRO). The MKRO has an advising task but can also formulate resolutions. The achievements of its work are e.g. a common terminology and basic concepts of planning across the country. It has also contributed to the federal programs 'Raumordnungspolitischer Orientierungsrahmen' (1992) and 'Raumordnungspolitischer Handlungsrahmen' (1995), the latest and important framework-setting documents regarding national planning strategies (Vogt 1999).

   Plans and programs can be regarded as one instrument of planning which exists on all different levels. The first program on the federal level was the 'Bundesraumordnungsprogramm' (BROP), which was released in 1975. This first program was a comprehensive evaluation of the spatial development in all German regions including the monitoring, a prognosis and evaluation of deficits. Later, the federal programs applied to areas of interest or concern and therefore to specific ressorts only. Another instrument represents the accounting of the government to the parliament via federal planning reports (Bundesraumordnungsberichte). With the re-unification the extent of differences between the German Länder, especially in terms of economic development rose sharply. Therefore in 1991, a new concept was released referring to the situation in the eastern states (called 'Raumordnerisches Konzept für den Aufbau in den neuen Ländern'). Similar to the concepts in Western Germany, the development of urban centres shall be fostered. Accordingly 12 urban regions in eastern Germany were declared development zones – Leipzig/Halle is one. Development axes and a strong network between them shall enable and support activities across the urban centres.

2. Planning on the state level (level of the 'Länder' - Landesplanung):
   The Länder have autonomy in relation to the details of planning policy. They have a more executive function as compared to the federal institutions and are the central level of planning in Germany (Vogt 1999). However, these laws ('Raumordnungsgesetze' - ROG) have to comply with the federal framework-setting laws. The Länder are obliged to set up state-wide comprehensive plans which contain broad statements of the development intentions and refer to issues such as population projections, settlement hierarchies and priority areas (Heineberg 2001; Langhagen-Rohrbach 2005, Vogt 1999). Therefore the Landesplanung is especially dedicated to the local communities (and to the different ressorts of planning) and works also with plans and programs as their main instruments[7]. These plans are called 'Landesentwickungspläne' or 'Landesentwicklungsprogramme' (state-wide development plans or programs). They have to be sufficiently detailed to serve as basis for the next layer of planning administration.

   In the bigger Länder (in terms of spatial area) the implementation of the planning laws is strengthened by an additional layer: the 'Regierungsbezirke' (regions), in the smaller Länder these are missing. The case study region is situated in Sachsen, where an intermediate level of Regierungsbezirke exists. On these level regional planning is set out and the regional plans are developed (Vogt 1999). These regional plans have to conform to the guidelines of the Federal Regional Comprehensive Planning Act (BROG) as well (Leser et al. 1997). The planning policy on the regional level is only in the development stage in Germany - only a few regional planning bodies exist, which were established since the 1960s, most oftenly by reason of a need for coordination in bigger agglomerations. Also here the specific plans and programs are the most important instruments (Regionalpläne, regionale Raumordnungspläne, Gebietsentwicklungspläne)(Vogt 1999). These plans are developed under the participation of the communities but are not obligatory and therefore not yet common in the German planning practise. There exists a legal body for regional planning concerns in the wider Leipzig region (Regionaler Planungsverband Westsachsen) and regional plans have also been developed (Regionalplan Westsachsen 1995, Planungsatlas Region Westsachsen 2001). However their power of influence is small.

   There are several means for the achievement of the aims specified in plans and programs. Generally one can distinguish between direct means, e.g. prohibitions, orders, land use dedication, and indirect means, e.g. infrastructure investments, general budgets (Allgemeinzuweisung), specific budgets (Zweckzuweisung), regional economic development programs, etc. They have different power of influence, an increasing one in the order mentioned. A common problem of the means to achieve planning goals on the state level is the easy infringement in local planning matters (Vogt 1999). However, a retreat from it e.g. by its most powerful means, the budget reduction, could be compared with an abandonment of influence in planning matters of the Länder, which is not a wanted outcome according to German legislation.

[7] Other instruments on the state level are e.g. the reports of the Länder governments to the parliament, land registries, planning trials, planning prohibitions.

3. The local level:
   The communities have full responsibility in the implementation of the development and landuse control. This regulation is specified in the Building Code (Baugesetzbuch 1987 - BauGB) which incorporates the Federal Building Law (Bundesbaugesetz 1960 - BbauG) (Heineberg 2001; Leser et al. 1997). The central instrument on the local level is the 'Bauleitplanung'. It specifies the use of two types of plans: the preparatory land use plan (Flächennutzungsplan - FNP) and the development plan (Bebauungsplan - BPlan) (Langhagen-Rohrbach 2005, Vogt 1999). The preparatory land use plan is set up for the whole of the community and mirrors the envisaged development. The second plan, the development plan, is legally binding and has to conform to the preparatory land use plan (Leser et al. 1997) - it determines the accepted land use of plots and contains an environmental assessment. Public participation is envisaged in the final stage of the preparation of the development plan and objections can be raised during the time of public inspection of the draft plan. There is also the possibility to set up local development plans which have to be understood as a coordinating program between the different ressorts of planning. This became necessary in bigger cities with a multitude of tasks and rising interacting responsibilites (e.g. concerning environmental and social matters)(Vogt 1999).

   With the challenge of new tasks to urban planners and politicians also new instruments had to be and have been developed. The most relevant with respect to the study presented here will be described in more detail: regional land use plan ('Regionaler Flächennutzungsplan'), planning proposal or intention plan ('Vorhaben- und Erschliessungsplan'), urban re-development (Stadtumbau), town planning projects.

   A new instrument on the border between local and regional planning is the so called regional land use plan ('Regionaler Flächennutzungsplan' - RFP (ARL 2000) or RegFNP (Langhagen-Rohrbach 2005)). It was implemented not before the year 2000 (ARL 2000) and tries to meet the challenges of a corporate planning in city regions. The general idea is to merge two planning levels via the production of one plan that enables the degree of detailedness like a FNP for a certain fragment of the regional plan only. The legal basis form the ROG of a specific state and the BauGB. A precondition to it is the simultaneous development of the regional and the land use plan, to be approved jointly (ARL 2000). This entails a substantial effort of coordination between the communities and the Länder government. Furthermore, problems can result from the 'new' distinction between areas lying inside the FNP and those outside, which might bring new problems or shift old ones onto a different scale (Langhagen-Rohrbach 2005). Critics also refer to the scale of the plan, which was set to 1:50000 - this is considered too small to sufficiently take up the tasks of a FNP and to serve as a good basis for the local development plan (BPlan). However, it is the first plan in Germany which includes a strategic environmental assessment (Langhagen-Rohrbach 2005). It has solved cross-border problems between communities which were so far only met by comprehensive incorporations. With the compliance to the planning concept of 'development axes'[8] which are represented by major transport routes between communities such a plan could become necessary in the future. The construction of

[8]other concepts are e.g. the central-place-concept, the concept of development zones and its proceedings to the development axis/development network etc. (see e.g. Vogt 1999)

an excellent transport infrastructure has become a high objective and enables further out-migration. The planning authority of the region Frankfurt/Rhein-Main was the first institution that developed such a plan. The response of other regions is mainly positive, so that e.g. the Ruhr-region and the wider region around Berlin consider the development as well. The city of Leipzig does (up to the current date and as far as it is known) not consider the preparation of a RFP yet.

A new instrument which was originally implemented for the use in the new Länder (but since 1993 available throughout the whole of Germany) is the plan about intention and opening up of a certain area (Vorhaben- und Erschliessungsplan). It includes a special kind of development plan (Langhagen-Rohrbach 2005) and enables the planning permission in areas where a local plan is missing and a developer guarantees the preparation of a local plan as well as the financing and the service implementation of the development (Newman and Thornley 1996).

In urban areas of special interest or with particular needs, as e.g. in the declining regions of eastern Germany, there is the possibility to set up a development concept that incorporates an urban re-development ('Stadtumbau'). They refer to guidelines such as the 'perforated city' ('perforierte Stadt', Lütke-Daldrup in Langhagen-Rohrbach 2005) and allow a planned demolition of building structure. For example it regulates the distribution of costs for such an urban retreat.

As another new instrument there is a growing interest in the power of the large-scale town planning projects. It was first implemented in the old Länder but rapidly adopted in the new Länder also. In contrast to the introduced concepts, plans and strategies above, this is regarded as a soft planning instrument. Langhagen-Rohrbach (2005) distinguishes between soft and hard instruments and classifies the former as new instruments that seem to become increasingly popular in recent times. This is especially interesting with respect to the potential in former industrial areas which are normally characterised by large un-used plots (Heineberg 2001). This goes hand in hand with the so-called 'festivalisation of town planning' and development policies after Häussermann and Siebel (1993). Prominent examples in the German context are the Bundesgartenschau and the Landesgartenschau, but also international festivals gain much attention, as e.g. EXPO or the European festival of cultures (Heineberg 2001). Heineberg (2001, p.240) describes the evolution and incorporation of such events into the city planning activities as a new local, urban or regional instrument ('Stadtmarketing', 'Citymarketing' or 'Regionalmarketing'). Its greatest capability is seen in the establishment of a corporate city identity embracing a corporate design, corporate communication and corporate culture (Ward 2005).

Whether these instruments can be successfully applied in the case study region is also dependent on another issues such as: the political transformation. The re-unification put new challenges on the agenda of planning authorities especially in the eastern regions where the new legal and administrative framework had to be set up. The transformations of the post-socialist countries brought about certain peculiarities as legacies from the old systems remained but new structures had to be established 'on top'. Relevant issues to the planning system in the GDR, its legacies, the transformation of the economic system to the market oriented approach of the West shall be described in detail hereafter.

2.4.2.2 Planning system in the GDR, transformation and legacies

The transformation from a socialist to a capitalist regime brings about structural, legal and fiscal specifics which can result in a multitude of economic and social problems. Whereas the problems are often manifold the concentration in this section will be put as much as possible on the implications for the spatial organisation of cities. Another focus is laid on the East German circumstances as one of the case studies is located in the former German Democratic Republic (GDR) though the transformation of other socialist regimes in Eastern Europe might have substantial similarities (Lichtenberger 1998).

As one of the most remarkable consequences, the transformations in the Eastern European countries brought about a strong de-industrialisation and connected structural problems. The old and manufacturing based economies of Eastern Europe that formerly acted on a regional basis with only trade links to a selected number of countries had to cope with a global, highly competitive, service based economy and global market after the transformations. Changes further occur in the fields of decision making and the distribution of information and resources. For example, it is agreed that the German re-unification took place under political premises whereas the economic consequences were regarded as being of only secondary importance (Schmidt 2004). According to Faßmann (1995a) and others (Schätzl 2000), the political change from a socialist to a capitalist polity involves a structural re-organisation on mainly three levels:

1. the level of the state,
2. of the enterprises and
3. the population.

Add 1. The organisation of the state:
The real estate market in socialist countries was not liberated. All property, economic entities and means of production were state owned (Häussermann 1996). Table 2.10 gives an overview of the development of the property relations for accommodation in the GDR.

	Share of accommodation per property form (in %)		
Year	state owned	co-operative	private and others
1971	28.0	9.8	62.2
1981	37.3	14.9	47.8
1991	41.3	17.6	41.1

Table 2.10: Property relations of accomodation in the GDR over time. Source: Schulz (1995, p.198).

The prices for accommodation, but also for other convenience goods and services were low and fixed. E.g., rents amounted to only about 3% of the net income (Schulz 1995). One result of the low price policy was a considerable demand for living space and a supply shortage. Another consequence was the advancing decay of the building stock (Seger 1991).

Flats as well as jobs were allocated by the central authorities according to different criteria such as family status and political loyalty (Schulz 1995). This enabled a minimal level of segregation and a full employment (less than 3% unemployment rate; Fassmann 1991). The regulative mode of the state provided a comprehensive social security system (Schulz 1995) in which the firms became the central place of public assistance. Social services were provided by and social interaction took place within the firms (Häussermann 1996). This is very similar to the social organisations in Western, formerly industrialised areas, e.g. such as the UK (Hudson 2005).

Further parallels are to be found in the organisation of cities. Short (1996) calls the socialist urban areas 'cities of primitive accumulation'. The whole city was oriented towards the creation and maintenance of profit: centres of money making with poor living qualities for the majority of the people. He compares the cities of the centrally planned economies with the cities in the early phase of the industrial revolution. Both underwent rapid urbanisation and industrialisation. Even in the 1970s and 1980s many socialist industrial cities were characterised by poor living conditions for the workers under environmental and deteriorating housing conditions. A form of privately induced suburbanisation as found in western societies was missing. City extension took place in the form of the numerous pre-fabricated slab buildings on the urban fringes (Häussermann 1996).

The institution planning was formally centralised and concentrated on the big industrial cities where the model of communist living and housing was aimed to be realised. In the GDR the role of the local authorities in strategic planning was negligible (Häussermann 1996), planning districts on the intermediate level absent and a planning for rural areas non-existent (Lichtenberger 1995c, 1995b). Because of the 'principle of reserves' that was applied in the socialist cities, there was an indirect loss of urban area during the transformation. The principle of reserves meant a generous allocation of space to and often around the firms and the city in general. These abundant spaces are now brownfield sites similar to those in old-industrial cities of western societies (Lichtenberger 1998, 1995c). It might contribute to a negative, deteriorating picture of the urban environment and could fuel urban sprawl development.

The political change meant a change of the institutional framework. The state has to lay the ground for a market economy. The heart of a capitalist order is the liberalisation of goods, services and properties in order to enable business on a liberal and almost perfect market. Prices for all goods have to be negotiated. Therefore the state has to retreat from the economic scene. After Faßmann (1995a), typical steps towards a market economy include:

a) The privatisation of land[9], of real estate and properties as well as of the enterprises and means of production: A privatisation of land is one of the most important prerequisites for the formation of a market economy (Lichtenberger 1998; Borst 1996; Fassmann 1991). The Eastern European countries decided for the 'principle of restitution' of land to the pre-1945 owners (see further down).

b) The liberalisation of the land market and a new organisation of the housing market.

[9]In 1990 land prices in eastern Germany had to be invented with the West German circumstances as a guideline. But "imagination was plentiful"... (Häussermann 1996).

c) The institutional reforms concerning the organisation of banking and the stock market.

d) The new orientation of the money policy.

e) The re-organisation of the fiscal policy with the implementation of a sales and income tax.

The privatisation processes, especially the selling of firms, developed slowly and further decreased in speed after the most profitable firms were sold in the early 1990s. Then the chances for a fast establishment of a new economy decreased. The principle of restitution produced an additional legislative insecurity and delayed the privatisation and investment possibilities enormously. Most cases involved a lengthly process of owner clarification (Häussermann 1996; Schmidt 1995). An additional obstacle lies in the law of inheritance of the former GDR, as, in a strict sense, real estate could not be inherited. Therefore the inheritors were often a community of heirs. Competing interests made the treatment of claims even more difficult. Taken together, the legal obstacles caused a lack of available premises mostly in the inner cities. It drove prices upwards and city development to the urban fringes.

Add 2. The organisation of enterprises:
The enterprises as the second level of re-organisation need to gain independence from the state and its centralistic distribution mechanisms. It is an important undertaking within the transformation process. The socialist polities of central Eastern Europe were characterised by a controlled economy with economic entities that were few in numbers but enormous in the amount of jobs they offered. They accumulated as many workers as possible firstly for economic reasons (economies of scale) but also for the reason of political and social power: a small number of economic entities is easier to direct from the central government. On the other hand, a few, large economic entities make a region highly dependent on these. A strongly separated labour market and a high degree of inflexibility result (Fassmann 1991).

With respect to economic sectors, agriculture and industry represented the basis of the economy, they offered the majority of jobs. Although a general sectoral change (after Fourastié) and related de-industrialisation trend must have been recognised, it was tried to freeze or to decelerate (Faßmann 1995b). In contrast, the service sector remained relatively small. Overall, the economic structure of the socialist countries were highly comparable to the industrial areas in western societies.

The productivity of an enterprise was not a criteria of success for the businesses. But productivity is the criteria for success in a market economy and enterprises have to assert itself on the international markets. Due to the output of -under market conditions- hardly competitive products the political transformations in central Eastern Europe brought about a fall in the agrarian and in the industrial production. Specific to the fast change and in line with the observed sectoral development, the decline in agriculture and industry occurred simultaneously. Furthermore the formerly established market among the socialist countries (COMECON[10] states) broke down and resulted in a decrease of trade, sales and output (Faßmann 1995a; 1995b; Fassmann 1991). The unemployment rose accordingly

[10]COMECON – 'Council for Mutual Economic Assistance' ('Rat für gegenseitige Wirtschaftshilfe' - RGW), from 1949 to 1991 the economic community of the socialist states.

and people did not easily switch to other jobs. Whole labour markets were closed and the new demanded qualifications considerably differed from the old ones (Faßmann 1995c). The small service sector could not compensate for the releases from industries. Massive unemployment resulted. As a necessary consequence these economic trends brought about the decrease in real incomes. The purchasing power within the countries dropped and sales decreased further. It is either in the rural areas, in the old industrial and mining regions as well as in the especially mono-structurally oriented areas where the economic implications of the transformation were especially severe (Faßmann 1995c).

The only remedy against a further decline in jobs seems the attraction of new jobs in services. However, this is also problematic. The qualification of the labour force often mismatches the demand. The better educated population, the young and ambitious 'deserted' the regions (Dieser 1996). Furthermore, the lack of a capitalist oriented social strata of entrepreneurs will impede a smooth and easy transformation to a functioning capitalist market (Fassmann 1991). The social heritage of 'life as an industrial worker' produces a type of employee who is hardly proactive, who is relying on institutions to ameliorate the living conditions and whose self-help feelings are low (Olk and Rentzsch 1996). First the population has to learn and to adapt to the changing qualifications. Also here there exist considerable similarities to the old industrial regions of western countries (Fassmann 1991). Against this background there is hardly to expect a fast catching-up of the post-socialist countries to western regions. Extended stagnation seems more likely (Bulwien and Schmidt 1995).

One aspect of the East German situation distinguishes it from the other examples of transformation. The economic process of catching-up to the economic performance of western European countries and especially to the economic performance of western Germany is and was accompanied by enormous financial transfers from the German state (Schätzl 2000). It amounted to DM 150 to 200 billion per annum in the early 1990s. However, the demand for investment was still estimated to be DM 3 trillion DM per annum (Bulwien and Schmidt 1995). One reason is that the GDR had been used as a model for real socialism[11] (Lichtenberger (ed.)1991) in which the repercussions of the socialist idea might last with especial strength.

Add 3. Changes for the population:
De-industrialisation and unemployment came suddenly. The older people and later the younger ones were most affected. The increase in unemployment and the hardship of getting a new job split the society. Income disparities rose. A decrease of the social middle-class was soon recognised. A 'post-socialist underclass' emerged and homelessness increased (Olk and Rentzsch 1996; Faßmann and Lichtenberger 1995). A new 'proletarisation' was possible but only to the most clever and prosperous. The society spoke of the winners and the losers of the transformation (Frick and Lahmann 1996; Lichtenberger 1995a; Faßmann 1995). Formerly socially highly coherent communities now developed further apart: privatisation drives segregation, social retreat and rising disparities (Harth and Herleyn 1996; Lichtenberger 1995a, 1995c). Furthermore, the restitution of premises to the old owners resulted in a disturbance of the locally grown communities (Faßmann 1995).

[11] Hungary in contrast developed an intermediate form of planned and market economy since the 1960s; for a comparison of country specifics see Fassmann (ed., 1995).

On the other hand due to a new freedom of migration, the number of moves increased considerably after the political change. In combination with the de-industrialisation trend, the high unemployment figures and the new spatial possibilities of migration a dramatic loss in urban population was observed after 1990, as Ott (2001) reports for eastern Germany. People moved to other cities and regions with better employment chances, as e.g. to western Germany. But also within cities there were recognised high fluctuations (Ott 2001).

In contrast to the first suburban developments of western cities throughout the 1970s which was single family residential, in Eastern Germany urban sprawl started with large scale projects first by the establishment of big shopping centres and retail parks (Schmidt 1995), little later as multi-family housing blocks. Mostly foreign investors or West German entrepreneurs (Borst 1996) entered the scene and wanted to gain maximum profit from the new emerging market. New tax regulations acted as enormous incentive (Frick and Lahmann 1996). These big shopping centres and housing developments were often constructed on greenfield sites where land was abundant, cheap and easy to reach, and the property rights clear (Häussermann 1996). Lacking in speed was often the provision of transport connections or the integration to the urban centres (Bulwien and Schmidt 1995).

In the beginning city planning did not have the means or the power to regulate the urban development. The administrative reforms in the transformation phase took time to implement. Qualified personnel were lacking and local politicians often expressed a preference towards fast growth. This meant mostly uncoordinated, suburban development as space was missing in inner cities. The new multitude of actors in the cities (property owners, investors and developers, free instances of welfare maintenance, the charges, building societies, organisations and citizen's groups, parties etc.) results in a completely different scene on which the power of city development is negotiated today (Häussermann 1996).

With regard to urban sprawl legacies of the socialist period are here especially visible with respect to the planning institutions. In the early years of the transformation, the planning and implementation of land use and development had to take place in a contextual uncertainty. This meant:

- Either, the political elite, planners and other experts have to be replaced by new 'staff' who knows the structures to be established. Therefore experts were 'imported' from the West. However they were often unfamiliar with the local situations in the new Länder and as a result their methods and measures were inappropriate. The import of experts led to a discomfort with the local people.

- Or, the politicians and planners that were already in place remained in their position and tried to adapt to the new situation. This was not easy either, since the expertise was lacking and the people were not experienced.

- The uncertainty with the new situation resulted in many rash approaches and often incorporated elements from before the change in 1989. These provisions have often proved inappropriate (Newman and Thornley 1996).

- People in the socialist countries were members of a social group, members of the society more than single citizens. Social involvement was organised through the place of work and the professional organisations. The firms provided social services such as kindergartens, cultural programmes, holidays, sport facilities, health care or housing.

After the change the responsibility for social services went to the local authorities. The reform of local authorities and the respective new responsibilities of communes was therefore greater than might have been expected.

- As many enterprises went bankrupt, went down for other reasons or were privatised, the social budgets were cut first. Additionally in a climate of cost consciousness there is the danger that small and/or financially weak local authorities will not be able to pick up this welfare function adequately.

- Furthermore,as after the political change the word 'planning' was difficult to use because of its connotation to the centralised approach to economy - other phrases had to be used, as Newman and Thornley (1996) point out. It led to the implementation of terms such as 'strategic or urban management' (Newman and Thornley 1996). It is possible that the rephrasing/renaming leads to a faster and more easy accustoming of new roles of planning as e.g. in old industrial regions. The general situation of change and the relative frustration with the past might have flown into a positive attitude towards change. Difficulties arise however in coping with the popular expectations that the market will solve all problems. In reality it will create new ones as inequalities and unemployment rise, and many subsidies, for example in the form of low housing rents, have diminished (Newman and Thornley 1996).

- The principle of uniformity of state authority during the socialist period did not support local policies. The socialist party controlled the state and its elected councillors had to implement the party's national programme. After 1989, so it was argued, there was a tendency to resist highly centralised structures, in return very decentralised structures were adopted. The present federal government strives to increase public participation in local decisions, including the planning procedures. However, there is cynicism towards any participation in government action resulting from involvement in the past (Newman and Thornley 1996). Such attitudes are hard to overcome and do not match with the participatory idea of a federal government.

With a new legal and political system, city building and CBD (Central Business District) formation almost starts anew (Lichtenberger 1998). Similarities to the beginning of city formation, e.g. according to the life cycle theory of cities are possible. The post-socialist cities might start city re-building with a centralisation process, similar to the urbanisation phase. Underlining the importance of research question 1, it is interesting to see whether the proposed stages of a city's life cycle will be followed, beginning with urbanisation to suburbanisation, dis-urbanisation and re-urbanisation, or whether the western stage of dis-urbanisation will be adopted immediately (Seger 1991).

With rent prices becoming a more important determinant of living space and the comeback of market-oriented land rents according to locational qualities, inner city locations and luxury renovations in the central cities could generate a gentrification[12] process (Harth and

[12]Gentrification is a process of social revalorisation of the inner city, especially central residential areas due to the in-migration of a socially upper and upper-middle class. Gentrification is mostly the result of re-urbanisation strategies that after intensive renovation measures force out the lower income population due to the higher property prices (after Leser et al. 1997; see also O'Sullivan 2005).

Herleyn 1996). When the personal situations and especially the incomes become more stable, the more affluent can and might aspire to a privately owned house. In most post-socialist countries the building of privately owned houses is subsidised by national programmes, and thus achievable to a greater number of people. The amount of owner-occupied housing is assumed to increase and to approximate Western figures, most conceivable as sprawl in the urban surroundings (Ott 2001).

Although the different political backgrounds in Leipzig and Wirral/Liverpool might cause the impression of very different structures several aspects have been revealed in the last section showing that remarkable similarities between post-socialist and formerly industrialised western cities exist. This is noticable especially under the consideration of the remarks about the constituted behaviour made in section 2.2.1. It is assumed that the post-socialist feature of Leipzig brings about a higher comparability to the case studies. It highlights the former industrial character of both case study regions. After these considerations to the specifics of the German planning system the focus is now on the British planning practise.

2.4.3 Planning in the case studies: United Kingdom

2.4.3.1 The planning system in England

The first comprehensive planning legislation which dates back to the year 1947[13] determines the basic principle of planning in England (Roberts 2000). It characterises the division of planning into three broad functions: development control, development plans, and central government supervision (Newman and Thornley 1996).

1. Development control
   The development control involves the local authority as the executive organ receiving applications and taking the decision to grant or refuse application. The decision is made by local politicians based upon advice from local planners taking into account the political framework and the local situation. An important feature of the British legislation is that applicants can appeal against a local development control decision and the appeal is decided by the central government. This is especially important when the central and the local government have different views on planning. It might also influence the decision of the local planners towards an application (Newman and Thornley 1996).

2. Development plan
   The local authority is also responsible for the preparation of a development plan to sketch the land use policies for its areas. The plan is important to consider and decide on applications but it is not legally binding.

   Development plans exist on two levels: there are first, the structure plans which are prepared by the counties (in the case study: the authorities of the County of Merseyside) and second, the local plans which are set up by the district authorities (in the case study: the authority of the District of Wirral). In metropolitan areas

[13] 1947 Town and Country Planning Act

these two tiers are combined into a Unitary Development Plan (UDP). Formerly with less power the plans' influence increased after 1991 as compared to the decades before: the adoption of a plan does not need the approval of the central government any more, although the government has the right to step in if it wishes. A public enquiry is held before the approval of the plan (Newman and Thornley 1996).

The practice of development control puts a stronger emphasis on the negotiations of planning permission in recent years. It is called planning gain or planning obligation and concerns a secret discussion with the developer about the financial responsibilities, the provision of infrastructure or community-oriented uses.

3. Central government supervision
   The central government takes care of the legislation and the issuing of policy guidelines. The central government has a strong impact via the instrument called Planning Policy Guidance (PPG) Notes. There are two kinds, one topic-based and one area-based. Topic-based Planning Guidance Notes concern, e.g. Green Belts and Housing. It has often a big impact on the local policy by e.g. regulating whether to allow out-of-town shopping centres. The second kind, the area-based Guidance Notes, concern the Regional and Strategic Guidance for specific areas. These are plans to which the lower tier plans have to conform.

The particular circumstances described here apply to the English planning system. Other parts of the United Kingdom, such as Scotland or Northern Ireland, have different legal and administrative arrangements. However, the distinctive feature of the British planning system is its centralised nature. There is scope for flexibility for the local authorities only by balancing the factors in which the development plan is not binding, e.g. local issues such as access, traffic generation, effect on neighbours etc. The central government has the ability to influence the local policy through its Planning Policy Guidance, and its role in deciding appeals. The Planning Policy Guidance approach further allows the central government to change the planning policies quickly (Newman and Thornley 1996). The latter has been proven easily in the time of the Thatcher government which is regarded being worth to look at in more depth.

2.4.3.2 Planning and Urban Regeneration during the Thatcher era

Urban regeneration is an expression for the outcome as well as the opportunities and challenges of the interplay between the many sources of influence cities may encounter. It is described as ...

> ... the "comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental conditions of an area that has been subject to change."
>
> Roberts (2000, p.17)

Urban regeneration developed during the 1950s in Great Britain (Roberts 2000). Especially with the focus on declining regions, which underwent drastic changes throughout the last

century, urban regeneration represents one effort to meet resulting urban problems. It implies the application of long-term, strategic approaches and therefore moves beyond the aims and aspirations of urban renewal.

> Urban renewal is "a process of essentially physical change."
>
> Couch (1990, p.2)

Urban renewal has a less well-defined purpose, it fails to specify a precise method or approach in urban revitalisation and only formulates the need for action (Roberts 2000).

With the commencement of the Thatcher government in 1979 there was a radical ideological turn in public policy and urban regeneration. Since 1947 urban planning in England was connected to the ideas of the post-war Welfare State which then were completely denied (Lichtenberger 1998). The aim of the Thatcher government was the adoption of a market-oriented approach to policy (Newman and Thornley 1996; Schätzl 1994). The flexibility in the British planning system and the power of central government allowed a major change. However, Britain was only realising a liberal development felt throughout Europe, though it was implemented with stronger force than seen on the continent. The establishment of the European Community and of its single market can be seen as an expression for the economic liberalism in European policy (Newman and Thornley 1996). Liberalism dominated the political discourse in many countries throughout the 1980s - political parties of the right were not only successful in Britain. One reason for this political shift is seen in the long-term de-industrialisation in the cities (Newman and Thornley 1996). Other authors have a different view.

For example Munck (2004) has almost an opposite interpretation and remarks that there is a significant political aspect to the de-industrialisation of old industrial regions in Britain. The politico-economic renewal in the 1980s (e.g. represented by the so-called Thatcher-effect and the economic policies of monetarism) were the advance guard of neoliberalism with its maxims of liberalisation and privatisation (Hudson 2005). By the mid-1970s the Keynesian model[14] of state intervention in economic affairs had become exhausted. The state activism to restore full employment could no longer be assured. The new Thatcher policy rejected state spending or invention. The old industries were left to neo-liberal market conditions and often closed down due to lacking profitability. It was expected that industry would become leaner and fitter. As Munck (2004, p.52) remarks, "it certainly became leaner but not at all fitter in terms of productivity or competition".

Political structures comprehensivly condition migration, the housing and property market as well as business structures, all aspects which might influence the urban/suburban popoulation dynamics. This is not only visible in the comparison of a capitalist and socialist state but also within the same kind of state regulation when political leadership changes.

[14]Economic theory after J.M. Keynes, that ascribes a key role of regulation and intervention to the state policy. Through the enforcement of full employment a sufficient income level for all citizens was envisaged that in turn drives consumer demand, consumption and production. A multiplier effect sets in. The state should enable full employment and accumulate reserve funds to balance in case of economic depressions. In such a case the state should invest more than it gets (Schätzl 1998).

Much of the Thatcher reforms concerned local government. In general, it was aspired to reduce the power of the local authorities, most notably through financial policies. The change of local government boundaries, their structures and organisation followed from a comprehensive review of local government in 1991. It was implemented to reform the community charge. Furthermore, metropolitan authorities and regional planning responsibilities (e.g. in Scotland) were removed when their functions could rather be fulfilled by private entities. It would allow governments to operate on a smaller budget and free resources to concentrate on core activities. A variety of agencies were working alongside the local authority, the latter only regulating standards and monitoring the process. A local authority should run like a private company and was viewed as one of the many agents within the urban realm only.

In practise this meant: a shift away from the local authorities housing to owner occupiers (e.g. with the 'right to buy' policy for council houses), the rejection of social objectives of the planning system and the dawn of a multitude of agencies accomplishing planning matters. To support or establish the economic viability in an area different initiatives were implemented that completely by-passed the normal planning system. Especially the Urban Development Corporations (UDCs), the idea of Enterprise Zones (EZ) and Simplified Planning Zones (SPZ) achieved wide acceptance.

EZs and SPZs are characterised by a special treatment of investors with respect to the easement of planning and tax regulations to stimulate development and encourage investments. Although successful in the early years the overall success was limited as the investments mostly ceased when the status was taken away from these areas.

The UDCs should boost confidence and help stimulate private sector investment mainly through flagship projects. The first two UDCs were established in 1981 of which one was in the Merseyside region (Roberts 2000). The rebuilding of the Albert Dock in Liverpool by the Merseyside Development Corporation is an example of its achievements. The designation of an UDC resulted in the removal of responsibility for the regeneration away from local authorities, which had no means of influencing the Corporation's decisions. The idea was to open up areas for development without the influence of local residents or their local political representatives – to shift the control over planning in these areas to the central government. The corporations received money from the government, could buy land cheaply from local governments and had often planning control powers. The participatory rights of communities and individuals in the planning process were removed. These initiatives further created competition among the cities (Newman and Thornley 1996).

Conflicts of the strategy followed from the differing economic and environmental objectives of planning. The central government responded with a new implemented possibility in which certain areas, such as National Parks, Conservation Areas, Areas of Outstanding Beauty, Green Belts etc. can be excluded from the planning measures. Other implications that a strongly economic and liberal emphasis brings about were rather disregarded, as e.g. for the social situation of the society, the trade unions and community groups and health issues. It was assumed that e.g. social benefits would result from a 'trickle-down' effect in which the economic prosperity of a region will filter down and improve the life of all inhabitants (at the end of the Thatcherite government it was revealed that this effect did not take place)(Musson and Tickell 2005; Newman and Thornley 1996).

As another result of the Thatcherite approach there emerged new forms of partnership between the local and regional as well as between the public and private interests (Roberts 2000). As cities have been constrained by central government's financial controls they needed to look for other sources of funding which was in consultation with the political idea. This resulted in a 'city boosterism'. Its objectives were image creation and the attraction of inward investment. Especially in areas of economic decline such a strategy was connected to high aspirations. Cities wanted to make most of their unique local assets, emphasise their local industries, the role of sports or those of higher education (universities etc.) and, very importantly, promote urban tourism. Such strategies had proven successful in some cases, e.g. Glasgow, and other other European examples, Bilbao and Barcelona (Gaebe 2004). Flagship projects, a comprehensive marketing strategy and the application to host international festivals are all features of such an idea.

At the end of Mrs Thatcher's time in office the problems, especially the pressure between the advocates of the market-led approach and the environmentalists, became stronger. Newman and Thornley (1996) make two trends responsible for that. First, there is the general increase of attention towards environmental matters, e.g. in the EU. Britain could not suspend itself from this trend when it was interested in European funding. The second source of pressure resulted from the construction companies who tried to get greater access to areas of environmental restriction, e.g. in the fast developing areas around London and the south of England. This circumstance did not affect Liverpool in particular but changed the attitude of planning for the whole of Britain. People living close to protected areas heavily fought against the acceptance of the claims of the house building companies. These grass-root reactions and the demands from the EU forced the central government to respond to the opposition of the house building companies by presenting a 'greener face'. Additionally, the conflicts between the house building companies and the residents of certain shires (among other reasons) lead the central government shifting such difficulties to the local level. Following from that the Planning and Compensation Act of 1991 gave renewed importance to the development plans, local authorities received a higher importance in order to balance different interest groups. However, the possibilities for the central government to intervene into the planning procedures remain valid.

2.4.3.3 Planning and Urban Regeneration after Thatcher

During the Thatcher era, urban policy followed a fairly consistent pattern: the central government announced an initiative which it controlled through financial and regulatory powers. In 1990, at the end of the Thatcher government[15] audits of the urban initiatives were carried out. They came to the conclusion that, amongst others, the programmes implemented during the Thatcher era only served as a patchwork of ideas, a coherent approach was missing, furthermore the problems of social disadvantage were ignored. The envisaged trickle-down-effect of economic prosperity onto poorer neighbourhoods did not take place. Furthermore there was a lack of integration between the local voluntary sector and the local government (Musson and Tickell 2005). The economic performance was strongly imbalanced with investments and employment favouring the south and south-east

[15]The Conservative Party formed the government for the upcoming years. Only in 1997, the government changed and the Labour Party took power.

regions of England (Schätzl 1994). If uneven economic development was to be tackled a transformation of governance would be necessary (Musson and Tickell 2005).

In the 1990s, new government initiatives for the urban areas were launched.

In 1991, the City Challenge approach was set in place which introduced the competitive bidding approach in which local authorities try to win awards. This document initiated an important shift in the responsibility of the local authorities although the approach in general received much criticism. It consumed time, money and effort and was therefore regarded unproductive. However, the document further opened the way to a greater coordination between departments which should be intensified throughout the 1990s. Simultaneously to the redirection of responsibility to the local level there arose the call for stronger public participation. The term 'community' expanded widely within the context of urban planning, nationally in Britain as well as internationally, e.g. within other parts of the EU.

Other initiatives followed and in 1994 additional attempts were made to better coordinate different programmes: the Single Regeneration Budget and the regional government offices (GOs) were introduced. The GOs were created to coordinate the regional spending of the departments of the environment, employment, trade and industry (only three of ten government departments were structured along the GOs in the beginning) - they are not a regionally elected authority (Musson and Tickell 2005). In general the centrality of the British government remained but it was rather restructured to show some form of regional tier as this was needed to do business with the EU and to receive regional funds (Musson and Tickell 2005; Webb and Collis 2000; Newman and Thornley 1996). Also, the strong hold onto the belief in the efficacy of the market remained whereas a greater emphasis was put onto considerations about the environment: an evaluation to the environmental sustainability was then needed prior to development. It constrained transport and out-of-town developments (Newman and Thornley 1996).

Although the GOs performed an important role towards a transition in planning paradigms, it was not before 1997 (the year of the election of the Labour government), that regional governance became a serious issue. In 1999, the government announced that each region had to have two new institutions: a Regional Development Agency (RDA) and a Regional Assembly.

- The RDA has the aim of promoting sustainable economic development and regeneration, overall business competitiveness, and labour market development.

- The Regional Assembly is a body of regional voluntary representatives from the local government, the business community, the voluntary sector, and other social and economic partners. It is responsible for regional planning activities, such as a regional waste strategy, and the production of regional transport and sustainable development strategies. In the Assemblies, the sub-regional tensions are played out. It has form of democratic accountability and fosters the creation of a regional civic culture. Their effectiveness depends on the ability of their chairperson, who has to be a local government representative, and of their chief executives. They have to balance the competing interests of the members.

- The GOs together with the two formerly described organisations form a 'triad' of regional governance in England (Musson and Tickell 2005). The formal work of the

GOs is programme administration and policy communication - they represent the interest of the central government as a link between the centre and the regions. The range and number of programmes that are administered by the GOs in the regions as well as the represented departments is steadily increasing, which is an indication for the rising sense of regionalism in England. However, the GOs remain the most powerful and influential as compared to the other institutions of the triad. They coordinate and monitor the programmes of the RDAs and the Regional Assemblies and are the most financially significant institutions of the triad (Musson and Tickell 2005) which mirrors the state of the central government in the regional structures.

Against this background regional governance has expanded markedly during the past decade. Furthermore, there is more devolution of responsibility and greater freedom to local authorities today. Musson and Tickell (2005) conclude, however, that the national state retains a high level of power and control in relation to the other levels of government. After these more general reflections to the planning systems the focus is put back onto the sprawl developments in urban regions.

2.4.4 The role of politics and planning in influencing urban sprawl development

Peiser (2001) among others (Galster 2001; Downs 1998) blames sprawling development on especially weak, poor or even non-existing planning practise, especially for monotonous communities built from developers with high profit. On the other hand he also recalls that planners are often forced to act according to zoning regulations that are out of date. Economy and society have rapidly developed during the course of the 19th century as shown above. International commerce and intercontinental production raised competition which is also felt on the sub-continental and sub-regional level. Today the competition between municipalities is of greatest importance. Communities long for commercial, industrial and population growth to enable and to attract public-facility, new residents and firms. Income and business taxes fill the communities' budgets (O'Sullivan 2003; Squires 2002; Mäding 2001; Peiser 2001). If local communities are very small, people can easily move from one to another but still be in sufficient commuting distance to work and services. This problem is aggravated when the taxes between local communities vary highly. A more fragmented system of local governments is therefore deteriorating the competitive situation and increases sprawling (Squires 2002; Downs 1998).

Critics of sprawl also blame the national policies that encourage single-family homes and the construction of highways towards more scattered and less dense, car-dependent developments (Peiser 2001; O'Sullivan 2003; Jackson 1985; Gillham 2002). National governments are often responsible for the motorway systems (e.g. in Britain, Germany and the USA). Furthermore they sometimes provide mortgages for the houses (e.g. in the USA since 1932/1933) (Chin 2002; Jackson 1985; Gillham 2002) and allow the deduction of interest paid on home loans, which is an implicit subsidy for home ownership (e.g. in Germany). Such strategies were implemented as an attempt to activate the building economy in former decades but have later been considered planning failures with regard to urban sprawl (Clapson 2003). Subsidies are believed to substantially affect the consumer demand, strengthening the decentralisation trend (Chin 2002).

Another important issue with regard to sustainable development and already mentioned shortly before concerns the regulation of externalities. For example, commuting generates congestion and pollution externalities - the marginal private cost of commuting are lower than the marginal social cost produced (O'Sullivan 2003). If authorities are unable to charge the full price of sprawl, additional financial incentives are set in place.

The discussion about the effects of urban sprawl and necessary actions against it developed, broadly, along two streams of argument: the one that supports urban sprawl and the other that advocates compact development - centralists versus decentralists (Lichtenberger 1998; Breheny 1996). Usually those from the planning family support compact development. They advocate greater regulation and planning to solve the negative outcomes of sprawl. Their main argument is that people do not act for the general welfare of the community but only for themselves, which can lead to an unwanted outcome and problems for the rest of the population. Planning should take care of such insufficiencies and act in the general welfare it was argued (Chin 2002). On the other hand, the main sprawl supporters are those who take an economic perspective – although also some supporters of compact development exist that argue with an economic reasoning. Among both the belief predominates that the economic market will ensure efficient development (Chin 2002). These two contradicting views reflect the historical evolution of the sprawl debate. Breheny (1996) adds another group of people contributing to the debate today: the compromisers.

Historically, planning has seen its main goal in lessening the problems that people encountered in the 19th century cities. As a common motive there was the desire of healthy and efficient surroundings, away from disease and congestion. The first comprehensive approach to an amelioration of urban living and to lessening environmental inner city problems represents the Garden City by Ebenezer Howard (Lichtenberger 1998). In fact, they represent the first suburban communities built coherently. The idea of garden cities developed in England, but it did not spread widely and it was hardly applied in eastern and central Europe (Lichtenberger (ed.) 1991). Mini-models exist in Prague and Dresden.

Le Corbusier with his Ville Radieuse, as strong promoter of the centralist view, and Frank Lloyd Wright with his Broadacre City, as decentralist, responded to the work of Ebenezer Howard with these two total extremes. They both felt the need to propose a counterweight to Howard's work, which retrospectively constitutes more the middle way of the three mentioned concepts (Breheny 1996).

To advocate centralism or decentralism one needs to take into account whether the ascribed advantages of centralism and disadvantages of decentralism hold true (see Thomas and Cousins 1996; Knight 1996; Troy 1996; Barrett 1996; Farthing, Winter, and Coombes 1996). Whereas decentralisation has been dammed for a multitude of negative problems in our cities throughout the last century, the experience of recent decades shows that this might no longer be pervasive. In some bigger cities of Europe re-urbanisation is claimed to occur at present (Oswalt 2005). However, Breheny (1996) notes that this does not count for Britain. Especially the old industrial cities are losing population to the suburban neighbourhoods and to smaller villages in their surroundings.

A strong debate about urban compaction and centralism versus decentralism arose in the late 1980s when it became clear that this discussion is evidently connected to sustainable development. The most frequently mentioned benefits of a compact urban structure are seen in a lower demand for transportation, and therefore lower transport emissions as CO_2 and others. More compact urban structures enable the efficient provision of a public urban transport network (Apel 1998). Another string of argument concerns the environmental benefits, such as a reduction in the loss of open space and valuable land (Power 2001; Breheny 1997, 1996). Again another kind of argument in favour of a compact city refers to the improved quality of urban living. Urban compaction is normally advocated by planners and politicians. However a major concern relates to the question of evidence (see section to the attribution problems, chapter 2.3.4).

Newman and Kenworthy (1989) ignited the debate on whether more compact cities clearly result in lower energy demands and CO_2 emissions for transportation. In their international study comparing a number of cities all over the globe, they came to the conclusion that density corresponds to less travel by car and therefore reduces the amount of fuel used by the inhabitants. Another study for the UK government, the ECOTEC study (1993) came to the same conclusion. Newman and Kenworthy's study was widely discussed. Major critique concerns the singularity of the parameter (density) taken into account (Wegener 1998). Later it was suggested that the price level and the income ratio also have a significant stake in the consumption of transport energy (Schafer 1998; Schafer and Victor 1999). Additionally, the location of jobs seems highly important (Breheny 2004). As jobs move increasingly to the urban peripheries or the rural hinterlands as reported from Germany (BBR 2000) and also from the UK (ODPM 2000; Kupiszewski and Rees 1999; Power 2001) this can change the travel patterns, the travel distances and the energy consumption for transport considerably. Concerning a comprehensive evaluation of the most important influencing factors of urban CO_2 emissions from transport see also Reckien et al. (2007).

There will be some merits in either extreme position. Nevertheless, Breheny (1996) points out that in a realistic judgement advantages and disadvantages exist on both sides. This is why he claims to support the compromisers view and adds four reasons why the centralist view might not be realistic:

1. There is a likelihood that centralism does not bring the environmental benefits it claims.

2. Urban decentralisation might probably not be halted anyway.

3. Some greenfield development is needed even if urban compaction is favoured, because at some point there will be no more brownfield sites that can be redeveloped at acceptable costs.

4. Higher urban densities are not likely to provide the high quality of urban life that centralists believe.

Breheny (1997) notes that a strategy favouring the compact city development might meet the environmental objectives of reducing emissions and protecting the open countryside, but that there are economic, technical, and political constraints. Against the background of population decline a discussion of the four arguments seems appropriate:

Add 1. The environmental situation in industrialised regions is normally relatively strained. Therefore it seems difficult to say whether a decentralisation in industrialised regions will worse the environmental conditions.

Add 2. The inability to halt decentralisation sounds reasonable if one follows the urban trend in western cities throughout the last century. On the other hand there are contributory political and planning influences as was discussed above. With that in mind, it seems at least possible to lessen the decentralisation trend.

Add 3. The exhaustion of brownfields seems not to be a comprehensible argument for the declining regions where economic development and population are decreasing.

Add 4. The point about urban living quality is not easy to prove and may not be influenced by population increase or fall but be more a life style type of argument. An indicator for the quality of living could be the satisfaction of people in and with the neighbourhood, but also the contacts people sustain to other people in their surroundings. Urban areas can be sparsely populated in old industrial regions, so a compaction seems possible and could ameliorate the urban quality of living. Outlined above, people feel uneasy in sparsely populated neighbourhoods as investigations have shown (Power 2001). But this requires more than just re-urbanisation and compaction, it is also a question of physical improvement.

Taken these remarks together, it appears plausible that urban compaction is possible in old industrial regions and that it will bring advantages to the region. It remains a question of research how to achieve an urban compaction or a re-urbanisation, e.g. by an influence of which parameters or under what conditions. The planning institutions have an extremely important role in it, especially against the background of the general decentralisation development in Europe and other issues as mentioned under point 1-4. Especially in the light of a sustainable city development, an envisaged reduction in energy consumption, greenhouse gas emissions and land consumption but also with the recent trend of smaller households, more single households and more childless households (Bundesministerium für Bauwesen und Raumordnung 2005; Roberts 2000) it seems to be the only strategy to secure pleasant conditions of living for a large share of the population and for other generations (Hillman 1996; Green 1996).

2.4.5 Planning alternatives to decline and sprawling: suggested action

2.4.5.1 The call for sustainable city development

Sustainable city development and also the concept of more compact inner cities are guiding principles in urban development. Both developed and became part of the urban planning practise during the 1990s (Heineberg 2001). Sustainable city development is to be understood as an answer to the global environmental problems and refers to the international call to favour a sustainable development in general. The term sustainable was introduced in 1987 by 'The World Commission on Environment and Development'.

> Their report, more referred to as the Brundtland report, specifies:
> "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" as being sustainable.
>
> World Commission on Environment and Development: Our common future - Brundtland Report (1987, p.46)

Sustainable development questions the (historical) paradigm that only urban growth is associated to urban success (Petschel-Held, Lüdeke, and Reckien 2005; Richter 2004; Meadows 1999). Sustainable development proposes a balance between the environmental, economic and social aspects of a development over time. The use of resources by one generation should not reduce the potential of these resources for succeeding generations. Meanwhile the principle has been extended and also applies to the current generations: unsustainable actions, e.g. in the industrial countries not only effect these countries but are 'exported' in terms of unfair shares of global resources, and growing inequity between rich and poor nations, regions, cities (Williams, Burton, and Jenks 2000).

Starting from the sustainable development discourse in the 1980s and 1990s, follow-up conferences specified the concept further. These included the United Nations Conference for Environment and Development in Rio de Janeiro (1992) and the United Nations Conference on Human Settlements in Istanbul (1996). The international efforts also stimulated national actions and debates at lower levels, as the Agenda 21 and the following Local Agenda 21 document. On the basis of these ideas spatial principles for a sustainable urban development (räumliche Ordnungsprinzipien) within different countries have been formulated. Heineberg (2001, p.129) names the following three guidelines which are specific to the German interpretation:

1. Density to urban development
   This concerns a compact but high quality development structure which shall be able to halt the sprawling of urban areas. It is understood as a focus on infill development and on the extended usage of free potentials. It does not refer to high-rise building and slab housing. Keywords are renovation, modernisation, re-dedication, brownfield development.

2. Mixture of land uses
   This concerns a mixture of functions, of social classes according to income groups, households types and life style clusters. The mixture of land uses is more than others connected to the patronage of compact structures and the 'city of short distances'. The latter is seen as especially important in order to reduce the need for mobility.

3. Polycentric city structures/ decentral concentration
   This principle goes back to the idea of the Garden City of Ebenezer Howard. It aims to reduce the need for new development on greenfield sites and more so to enable a sufficient use of public transport (Heineberg 2001).

In the British context, the following principles have played a major role: Until about 1970 the major task of town planning in England was to enable the people to move out of the towns, which at that time were regarded as unhealthy and unfriendly places to live, especially in the old industrial parts of the country (Power 2001). As an answer, after World War II (WW II) an emphasis was put on slum clearance (demolishing of whole neighbourhoods) but also to the building of New towns and new estates within existing ones (Heineberg 2001). Big inner city council housing developed. This idea has been abandoned since and quite a few of the older council housing prospects are being demolished. Liverpool underwent a reconstruction phase twice in two generations, mostly to the cost of widespread demolition (Power 2001). The most severe problems of the slum clearance strategy evolved from the translocation of the residents. Social confusion, an alienation of the residents in the new neighbourhoods and additional social problems appeared in many of the affected cities in Britain. In contrast, city centre recovery (urban renewal), inner city renovation and the protection of traditional communities (urban conservation) are the principles of town planning today (Heineberg 2001). It focuses on the compaction of urban areas which typically comprises "urban regeneration, the revitalisation of town centres, restraint on development in rural areas, higher densities, mixed-use development, promotion of public transport, and the concentration of urban development at public transport nodes" (Breheny 1997, p.209; see also Couch and Dennemann 2000). This closely matches the ideas about sustainable city development in Germany. The suggested actions to meet current urban problems are similar in both case study countries.

Sustainable city development is often looked at from the perspective of economic versus environmental feasibility but also social issues need to be incorporated for sustainable city development. Burton (2000) has investigated urban compaction in relation to ten claimed effects of it with respect to social equity in medium-sized cities (80000-220000 inhabitants) in Britain. Table 2.11 portrays the claims that are typically connected to urban compaction in relation to social equity. As a parameter for social equity Burton (2000) investigates the impacts on low-income groups. The table gives also an overview of the strength of the assumed impact.

Compact city claim	**Evidence**
Better access to facilities	Weak but supporting claim
Poorer access to green space	Weak but supporting claim
Better accessibility to jobs for low-income groups	Ambiguous
Better public transport/use by low-income groups	Supporting claim
Greater opportunities for walking and cycling	Contradicts claim
Reduced domestic living space	Supporting in some respects/ not in others
Poorer health	Supporting in some respects/ not in others
Reduced crime	Contradicts claim
Reduced social segregation	Supporting claim
Lack of affordable housing	Supporting claim

Table 2.11: Evidence for compact city claims related to social equity. Source: Burton (2000, p.1981).

The results show that urban compaction in most of the cases does relate to the chosen effects, though with different intensities. Burton (2000) concludes that, looked at in its entirety, in a combination of all indicators, social equity has a limited relationship to compactness. Meaningful relations can only be derived when the relation is separated in its parts. The most important predictor for social equity is the proportion of local authority tenants: the higher the share of council housing, the better the social equity (Burton 2000).

These goals for a sustainable and successful urban development need to be specified with respect to the locational characteristics. Following peculiarities seem to arise with respect to urban sprawl development in the case studies.

Sprawl and sustainable development in transforming contexts: A major lesson of post-socialist transformation in central and eastern Europe has been that the quick exchange of formal institutions did not bring about the intended results immediately. Rather the implementation of new laws was obstructed by both the inexperience of the authorities and the perennial influence of informal institutions (of 'semi-legal' activities) that had been shaped in former decades. In terms of spatial planning this resulted in a kind of planning vacuum in the first half of the 1990s. It was aggravated by the fact that urban planning has been neglected in the 1990s because of the priorities of macro-economic reforms and the connotation of such planning with the former socialist regime (Fassmann 1995a). In this situation it was often easy to get building permits that did not comply to the development plans and to sustainable development. Often market forces, not planning prevailed or the balance between social, economic and environmental needs.

This problem was further aggravated by the unresolved situation of land and building tenure (e.g. in Leipzig the restitution of property to the owners before the formation of the GDR). This lack of planning and regulation results in an outward movement to the outlying communities. Additional difficulties or delays in the implementation of a functioning planning system which promoted sustainable development follows from the enforcement of the privatisation of the building stock. Inner city areas are highly fragmented and difficult to control.

The backlogs of the institutional transformation have to be overcome as soon as possible. City partnerships or learning from best practise are a few suggestions promising success. New planning institutions need to be devised and time should be taken for careful design of these institutions, they also often need time to become effective.

Problems of sustainable city development in declining cities: In declining regions the economic performance and social peculiarities seem to be responsible for or at least connected to the sprawl developments and its distinctive problems. In situations of urban decline it generally becomes easier for the planning system to control residential sprawl because of a low demand for housing. On the other hand, it tends to be more difficult to restrict peripheral employment growth because the political pressure to grant economic investors their requirements is particularly strong when economic growth is lacking. In a situation of decline, economic development aims mostly take precedence over the aims of sustainable development and the planning system is obliged to stimulate employment growth, as found in the Merseyside region (Couch and Dennemann 2000). Even more so, if an urban region suffers from severe structural problems it is very unlikely that much effort

will be placed onto the containment of urban sprawl. A public budget which is extremely stressed hampers costly measures to restrict sprawl as the clearance of contaminated land or the preparation of derelict buildings for further development.

One promising alternative to urban sprawl in declining regions seems the initiation of a re-urbanisation, involving inner city regeneration and site clearing. More concretely the following strategies seem promising:

- Anchoring the goal of economic use of land (i.e. brownfield re-development) in national policy so that regional land use planning can effectively obstruct greenfield developments; in connection with this – establishing an effective monitoring system is needed which gives an account of how much development is taking place on brownfield/ greenfield sites is needed;
- Development agencies on the regional and local level which effectively promote and organise brownfield redevelopment;
- Steering investment programs towards inner city brownfields by making the re-use of previously developed land a prerequisite for subsidies.

Very importantly, it has been found that a well implemented and functioning planning system has some power to work against urban sprawl developments to support re-urbanisation and sustainable development (Couch et al. 2005). A closer look will be paid at which measures seem workable for re-urbanisation in formerly industrialised regions.

2.4.5.2 Re-urbanisation – Urban re-generation - Urban revitalisation

A precedent of the Brundtland-Report can be seen in the report of Dennis and Donella Meadows "The limits of growth" (1968) to the Club of Rome. This book questioned the belief that success is always connected to growth. Meadows (1999) referred to their first postulates of curbing growth by suggesting and discussing ten anchor points of influence. These points of greatest effect of influence by a minimum of power of influence are called 'Leverage points' (Meadows 1999). Meadows explains as follows:

> "Leverage points [...] are places within a complex system ([...], a city, [...]) where a small shift in one thing can produce big changes in everything."
>
> Meadows (1999, p.1)

One key aim of this study is to find the leverage points for the reduction of sprawl in old industrial regions.

Often it is argued that it is difficult to practically implement means for re-urbanisation that do not conform to the market, because residents prefer to live in decentralised structures (Breheny 1997). There are two aspects to this argument: first, there are the developers or the house building companies and, second, there are the residents.

Add 1. The above mentioned view is not supported by empirical studies of Fulford (1996) who undertook interviews with house builders and developers in Britain. He concludes "Indeed, far from rejecting the compact city as an unattainable planning blueprint, some of the interviewees suggested that the policy framework should be tightened further still" (Fulford 1996, p.132). It has been found that the house building companies are fully aware of the implications their work is bringing to sustainability and that they are willing to commit to a responsible attitude in the process of urban containment and re-urbanisation. Recognition of this would make a big difference to planning and policy in this area.

Add 2. On the other hand Breheny (1997) has found that most people still aspire to the very opposite of the compact city and have romantic, positive ideas about a place of living in a quiet, non-urban surrounding. This view might be influenced by poor urban living conditions, especially in the old industrial regions. Therefore, it is probable that, even after an urban revitalisation, some of the proponents of decentralised locations will label them high value. Nevertheless, there are others who claim that residents' preferences have been disturbed by the inefficient market and subsidies (Chin 2002), as mentioned before. Breheny quotes evidence to show that actually the local authorities resist promoting higher urban densities in order to preserve the well-established residential preferences of low density, suburban housing (in Roberts 2000).

There is certainly a big step to make in public education, as e.g. in the case about the effects of sprawl and greenfield development (Meadows 1999; Peiser 2001). Information is a high leverage point (Meadows 1999). Still, the question remains whether this will achieve the re-urbanisation trend. Roberts (2000, p.150) summarises the following suggestions as important to an urban revitalisation strategy:

- The provision of further and higher education, and associated with it a strong local service of technology transfer to companies through technology and science parks.
- The supply of a comprehensive health care system and culture, entertainment and sports facilities, most effectively at the urban transport hubs.
- Heritage and theme retailing as well as tourism that builds on local specifics.
- The 24-hour city with the provision of goods and services around the clock might also have further potential.
- Building on local strength in sectoral terms to attract new companies with multiplier effects.
- The promotion of local goods and local services to the local residents.

There are also other measures promoting re-urbaNisation, some are directly related to the planning practise. In Britain the expertise with urban sprawl is longer than in the East-German context. Britain has answered to the decentralisation trend after the WWII with a number of measures. The following two have proved especially successful:

- The Greenbelt policy (PPG2): The function is to restrict the growth of urban areas and safeguard the countryside from encroachment. Within the Green Belt there is a

presumption against development except for certain specified exceptions in line with Government Guidance. However the Greenbelts have to be included into the UDP and approved by the local governments before they are in force. Councils also have to assign a separate policy that specifies how the council will react to proposals for development within the Green Belt. This should be based on the Government advice on Green Belt Policy (PPG2)[16].

- Sequential test: British Government's Planning Policy Guidance Note 6 (PPG6: Town Centres) requires that before planning permission can be granted for a large retail or leisure development on an out-of-centre site, an assessment must be carried out of the suitability of other sites, the preference being for those in or immediately adjacent to town centres. The requirement may now be applied to other types of development[17] since it has proven to be a successful principle that seeks to identify, allocate or develop certain types or locations of land before others e.g. brownfield housing sites before greenfield sites, or town centre retail sites before out-of-centre sites[18].

These are two direct examples from the British planning practise. There has often been a focus on infrastructure investments as an attractor to potential investors for inner city locations. But authors note the risk of providing excessive infrastructure, in particular in declining regions (van den Berg and Klaassen 1986). The functional lifetime of (at least part of) the urban infrastructure is shortened but costly, resulting in the additional risk of over-expanding the infrastructure relative to its shortened social life (van den Berg and Klaassen 1986). This goes hand in hand with the investments in seminal commercial sectors. For example, in Germany and many other west-European countries numerous high-tech parks were established in the belief that investors will come. However, the high-tech sector is in itself highly heterogeneous. It involves the development of products and processes together with organisational, market and social innovations. The investment in high-tech parks is therefore highly controversial, as Häussermann (1992) argues.

Amongst others, a very prominent re-vitalisation strategy is also the creation of new cultural symbols and the attraction of new 'cultural capital', e.g. an opera house or similar large-scale project. The competition for international events such as the Olympic Games and/or cultural festivals are believed to deliver similar results. Therefore, the cultural industries have become an important part of regeneration strategies as the example of Glasgow in 1990 highlights. Since then the European City of Cultures annual arts festival designation has been used by many to a city-wide economic strategy and marketing drive (Newman and Thornley 1996). The idea was gaining momentum in the 1990s and is one facet of the city boostering described above. The belief in these more-than-regional events remains in current planning. Liverpool is putting faith in an economic and social momentum from being the host of the European Capital of Cultures in 2008. Connected with a comprehensive city marketing it is expected to have multiplier effects, bring 'external' prestige and 'internal' confidence (see Figure 2.6).

[16] `http://www.odpm.gov.uk/index.asp?id=1143928`
[17] `www.eastherts.gov.uk/pp/PlanningDictionary.htm`
[18] `www.planningportal.gov.uk/england/government/en/1115310689529.html`

Figure 2.6: Inner city image of Liverpool. Source: Author, September 2005.

Urban revitalisation or re-urbanisation does not only refer to the establishment of new centres/structures/events but also relates to the improvement of existing ones, much in line with an argumentation that people should not only be attracted to the inner cities but also hold there. Against this background the perception of crime being higher in inner cities is certainly one of the major threats to an envisaged re-urbanisation. It generates anxiety across all social strata. It is especially severe in urban neighbourhoods with high levels of social housing "where the ... disaffected come together. Noise, harassment, vandalism, theft and drugs are often cited as disincentives to urban living, although the relatively affluent and more rural areas are not immune" (Roberts 2000, p.159). On the other hand, Robert (2000) also mentions that crime has much in common with feeling unsafe. Here it becomes clear that urban crime has a lot to do with the disorder in the neighbourhood. One strategy to combat crime is through social and educational programmes. Others relate to neighbourhood watch schemes, community safety strategies and improved surveillance. Again others apply to the improvement of the physical security such as 'Secured by Design' measures (e.g. parking close to the house etc.) and improved housing management. Additionally, a meaningful community involvement is believed to lessen the fear of crime (Roberts 2000). The inner cities not only lose population but also custom in the shopping centres. In the UK, where the problems with crime are perceived to be worse than in Germany (Taylor and Jamieson 1998; Kupiszewski and Rees 1999), cities try various measures. The investment in security, but also cleaning and car parking staff, funded by a partnership between the city council and the main retailers has shown big effects, e.g. as documented from Coventry (Power 2001).

Inner city areas have to be significantly improved to hold people within the urban centres. It is believed that if this is not pursued any attraction of new jobs could immediately lead the residents to move out. "Liverpool has found that increasing job opportunities and wealth in the city simply led to more people leaving it. The overall surplus, and consequently low house prices which make it easier to move into owner occupation outside the cities, fuel this pattern" (Mumford and Power 2002, p.13).

This again shows that inner city (economic) revitalisation might not be the full answer to the problem. The pressures of sprawl and decentralisation places new demands on planners especially in formerly industrial areas. No successful means has been developed to be able to influence sprawl, e.g. in the formerly industrialised areas. Planning needs to be able to adjust to alterations. Self-organisation is the strongest form of system resilience. Any system which can not adjust and self-evolve is dammed to collapse (Meadows 1999; Arnstberg and Bergström 2003; Power 2001). With urban areas being subject to sometimes fast developments, with projected changes in the European household structures a modelling approach might be an appropriate means. It can incorporate future projections and therefore prepares for future changes. It gives planning a longer time to react to possible urban developments.

In this work a new means as support to urban planning decisions is proposed: a qualitative attractivity migration model. Whereas for more than forty years efforts to bring together policy design and modelling practise have had a limited success only (Couclelis 2005), there have been made important steps forward in modelling design to adequately combine the two (Meen and Meen 2003). New methods are now available that promise to deliver the information helpful to the planning process (Meen and Meen 2003). The adjusted research question:

What benefits can a modelling approach bring to the urban planning decisions with respect to the halt of urban sprawl in formerly industrialised regions, e.g. with reference to land use consumption?

Hypothesis
It has been shown that the preferences for urban living might be blurred by subsidies and other planning decisions but also that urban sprawl is a social process and that the proponents of suburban living might be influenced by the behaviour of other people in the society or the neighbourhood. People who look for suburban living often do so for the reason of segregation, environmental qualities, and living space. Against this background a migration model that takes into account the preferences of the movers and the qualitative attractivity of the suburban areas in dependence of the presence of other movers should be able to supply important insights into the dynamics of residential migration. It is assumed that such a model can offer benefits for planning practise.

Before going on in describing the different methods that are used to gain answers to the research questions they are listed contiguously below.

2.5 Final research questions and hypothesis

On the basis of the theoretical discussion, chapter 2, here the main findings are compiled by putting together the adjusted research questions and hypothesis as mirrored in former sections.

Research Question 1: Process oriented
Did the population development in the case studies follow the sequences of the life cycle theory of urban areas and is a re-urbanisation trend visible in both regions?

Hypothesis:
As a result of the political history of Leipzig, which limited an urban development on the fringes and which also controlled and acted against decentralisation, it is assumed that the city development in Leipzig has not followed the phases of the life cycle model of cities over the past six decades. Re-urbanisation is visible in both regions as a new trend after a period of inner city population decline. However, there are reasons why this could happen earlier and easier in Leipzig.
The hypothesis will be tested by comparing the population figures between an inner and an outer urban area, defined further down (chapter 3.2.3 and chapter 3.2.5). The decennial trends will be evaluated in both case studies since the year 1950/1951.

Research Question 2: Causes oriented
What are the main reasons for people in old industrial regions to move to the urban fringes? What is more important in the decision to move:

- the characteristics of the inner cities with their mostly negative evaluation as strong push factors, or
- the characteristics of the outer urban areas, mostly positively evaluated as stronger pull factors?

Hypothesis:
If the latter is less important than the former, this will indicate that the inner city problems/ the urban environments in former industrial cities are more important in the evaluation of residential attractivity of sites than the pull factors of the surrounding. Against the comparison of other investigations a stronger weight of push factors than pull factors is expected. This in turn would suggest that formerly industrialised cities might generate more sprawl than non-industrial cities.
The hypothesis can be tested by comparing the reasons for leaving the last dwelling and those of choosing the current place of living. Answers to questionnaires of recently been moving households in the two case study regions will deliver the statistical material.

Research Question 3: Consequences oriented
Can an increase in living space, the number of cars and the commuting distance be clearly attributed to the migration from an inner to an outer city location when both different households are compared at the same time (inner versus outer urban residents) and the same households are evaluated at different times (moving households from the inner to the outer urban areas)?

Hypothesis:
Against the background of the current literature it is assumed that the households which are living in outer urban areas have a higher amount of living space, number of cars and commuting distance in average. Also the preference to use the car is assumed to be larger. If one compares the situation in the same households before and after a move from the inner urban parts to the fringes, it is assumed that this will lead to an increase in living space, the preference to use tha car and the amount of cars per household. However, taking into consideration that the financial resources of residents in former industrial areas are small, a concentration of employment as a legacy from the GDR period remains, and the people especially in old industrial areas by cause of a constituted behaviour do not like to commute it is not assumed that the commuting distance and changes much.
The hypothesis will be tested using statistical data with respect to the case study of Wirral. This is assumed to follow the traditional method of comparing inner and outer urban neighbourhoods at the same time. Additionally, the answers of the questionnaire survey in Leipzig will be used which enable a comparison of the size of living space, the number of cars and commuting distance of one same household before and after the move from the inner to the outer urban areas.

Research Question 4: Planning / Governance oriented
What benefits can a modelling approach bring to the urban planning decisions with respect to the halt of urban sprawl in formerly industrialised regions, e.g. with reference to land use consumption?

Hypothesis:
It has been shown that the preferences for urban living might be blurred by subsidies and other planning decisions but also that urban sprawl is a social process and that the proponents of suburban living might be influenced by the behaviour of other people in the society or the neighbourhood. People who look for suburban living often do so for the reason of segregation, environmental qualities, and living space. Against this background a migration model that takes into account the preferences of the movers and the qualitative attractivity of the suburban areas in dependence of the presence of other movers should be able to supply important insights into the dynamics of residential migration. It is assumed that such a model can offer benefits for planning practise.
The application of the qualitative model onto the case study regions and the evaluation of the model results is regarded as a test of the hypothesis.

Chapter 3

Methods

In the literature, urban development is increasingly discussed from a systems analytical point of view that comprises the actions of different actors in space (Oswalt 2005; Borries and Prigge 2005; Kuhnert and Ngo 2005). Actors are increasingly considered as active, problem conscious and problem sensitive social subjects who are able to influence societal processes. Since about the 1970s, the government is less frequently seen as responsible for the overall welfare of its citizens. This responsibility was, amongst others, met by politics and planning before that time. As the neo-liberal focus set in, the belief in planning able to steer or balance spatial development decreased (Oswalt 2005). In turn, the role of many different actors in space grew. Also urban sprawl and the re-organisation of urban spaces are increasingly discussed under an actor's approach.

Moves are motivated by the encountered dis-amenities of the current home (Spain 1988) and the preferences for a 'hypothetical', not experienced living place somewhere else (Fuguitt and Brown 1990; Spain 1988; White 1981). Against this background, urban sprawl is the result of a comparison of attractivities in the light of the actors' preferences. Urban sprawl mirrors the performance of actors in the urban region according to the differences in attractivity between the sub-regions. Actors are all those involved in the migration process: individuals, economic entities, political bodies, planning institutions, developers etc. The latter influence the space of action for the movement of residents, and therefore have to be included as process elements (macro variables that influence the action space on the micro level - see Figure 1.2 in the introduction). So, one can distinguish between moving and non-moving actors involved in the urban sprawl process. This is comprehensible in the light of the research focus as macro-variables, such as subsidies, infrastructure provision, building codes and building restrictions etc., apply to a particular area. These macro variables are fixed for a certain amount of time and set the scene in which the actors behave/react/move according to their individual micro variables. However, both kinds of variable influence the attractivity of a residential area.

White (1981), using a quality-of-life-index from Todd in 1977, states that an area is attractive when it features parameters with high values listed in a personal quality-of-life-index. The provision of specific attributes (or characteristics of a certain living area e.g. 'living close to nature') is thought to bring people nearer to their desired goals, to the so-called life values.

> "By life values are meant goals or desirable end-states, like for instance freedom, togetherness, and comfort, which individuals strive to attain in their lives"
>
> Garvill et al. (1992, p.41)

According to Garvill et al. (1992), these life values can be reached at four different attribute levels: intrinsic attributes of the dwelling, locational, neighbourhood and cost attributes. Cost attributes have been found to be important for both the preferences towards a living place as well as for the actual choice to live there, two aspects which have to be distinguished. A certain relation between preferences and consequential choices regarding locations of living is now widely accepted but the significance was a major discussion point throughout the 1970s and 1980s. Researchers noted a discrepancy in people's stated preferences towards a residential area when asked before an envisaged move and their actual choice some time later: according to investigations in the US, more people named a preference for rural living than actually lived there, when the new residential location was documented one year later (Garvill et al. 1992; Fuguitt and Brown 1990; Lindberg, Gärling, and Montgomery 1989; Weichart 1983; White 1981; Fredrickson et al. 1980; de Jong 1977; Fuguitt and Zuiches 1975). The discrepancy encountered between preferences and choices was lessened by the introduction of costs into the evaluations of residential areas. Nevertheless it remained to a lesser extent. The authors conclude that migration seems to be a complex behavioural process, more driven by internal constraints (White 1981; Fuguitt and Brown 1990).

In line with Garvill et al. (1992) in this work attractivity is viewed as based on the four attribute levels. It assumes a strong interdependence between the subjects living in a certain region. By that it accounts for some internal constraints that were missing in other studies (White 1981). This element can be understood as an index of the wish for segregation documented with urban sprawl processes since the 18^{th} century. However as an answer to the difficulty between preferences and choices another aspect will be added to the analysis. Here, information about the attractivity of a location will be used that was elicited after a move to the new place of residence. By that, the discrepancies found between preferences and choices of a living location when people were asked hypothetically or before an envisaged move will be counteracted. This is considered to get more realistic results to the locational preferences of actors, although the valildity cannot be proven within the framework of this analysis.

According to the methodology, urban sprawl is discussed as an actor-based process that is initiated by the comparison of locational attractivities between residential areas. As noted above, the analysis is backed up on three assumptions:

1. Attractivity is viewed as a sum of certain attributes – here called dimensions of attractivity. These dimensions are characteristics of the living areas close to the subjects preferences (similar to Garvill et al. 1992). It is further assumed that the dimensions of attractivity differ between certain kinds of actors. To elicit and account for the probable diversity in actors' preferences a questionnaire survey was conducted in the selected suburban regions of two case studies.

2. It is further assumed that there exists a number of residents who have similar dimensions of attractivity and similar attributes. As people seem to behave in groups more than they do as individuals (Epstein 1999) these residents are subsumed into actor classes. A cluster analysis was applied to the empirical data of the questionnaire survey. It represents an appropriate method to form clusters according to both similar locational preferences and socio-economic attributes of the respondents. The latter is reasoned by a potential influence of the life cycle of residents, the lifestyle, the family status and household type as shown in the theoretical discussion. However, it was also found that the relevance of the life cycle theory of residents might underestimate trends such as the increase of one-person-households and single parents. The chosen cluster algorithm will be sufficient to check the relative importance of locational preferences versus socio-economic attributes of the residents.

3. In the light of a behavioural approach to action space (Scheiner, Illig, and Lichtenberg 1999; Werlen 1995, 1997) it is assumed that the intended migration of the actors is restricted by several objective or subjective conditions. For the evaluation of spatial attractivities in particular it is important to take subjective, internal constraints within and between the actors into account (White 1981). The existence of actors residing in the region of preference can reflect such an internal constraint (Wolpert 1965; Werlen 1997; Scheiner, Illig, and Lichtenberg 1999). Results from Herfert (2003) and Wiest (2001) support this assumption by summarising that the social circumstances in the neighbourhood are a strong motive for people to consider moving to a different place, as found e.g. in Leipzig. In line with these findings other studies reveal that social circumstances in the neighbourhood are the most important assessment criteria for people considering a new place to live (Couch et al. 2003a). Issues of segregation are an apparent picture of current spatial structures and societal behaviour (Herfert 2003; Wiest 2001). Subsequently, an assessment of interdependencies between the actors (and actor classes) is of outstanding importance. Therefore, a modelling approach is proposed that can account for the peculiarities mentioned: a Qualitative-Attractivity-Migration-Model will be applied.

Each assumption is treated with another method and elucidated in detail. They are applied to the two case study regions: Leipzig and Wirral/Liverpool. Before going on by describing the used methods in detail it will be explained why these two agglomerations have been selected as case studies.

3.1 Case study selection: Leipzig/Germany and Wirral/Liverpool/UK

As outlined in the introduction to this work a need has been noticed to further investigate the possible answers to the problems encountered in old industrial regions. Many post-industrial cities and regions exist in Europe and there is evidence that they might increase in number as the transformation of the Eastern European countries and the shift to the service economies proceed. Former industrial cities are often characterised by population loss and planners and politicians have tried to revive them for many decades (Couch 2001,

2003; La régéneration urbaine dans l'Europe du Nord-Ouest: Histoire d'un groupe de travail entre six villes 2002; Roberts 2000; Noon, Smith-Canham, and Eagland 2000). Against this background one might justify a further need for action.

It seemed particularly interesting to check whether old industrial regions with a similar historical and economic development might go through similar problems, and whether the historical peculiarities have led to a similar building structure, city appearance, to similar approaches in response to the problems. To see whether possible peculiarities are not dependent on a cultural attitude a cross-national comparison was decided for. To still be able to reveal informations about the role of different political backgrounds, it was decided to select two cities, one with a post-socialist and another one with a capitalist history. The influence of the capitalist versus the socialist order and its legacies onto the city development can therefore be evaluated. Furthermore it was found that old industrial and post-socialist cities and its inhabitants have remarkable similarities. This ensures still a high degree of comparability. Both are formerly industrialised cities in which the legacies of the past sustain with especial strength.

Within Germany, there are many other examples which could offer some of the prerequisites mentioned, for example also the Ruhr area. However, there is a very important peculiarity which might hamper an intra-regional and strongly urban-suburban analysis in the Rhur area: the whole region features multiple centres. It might have been hard, even impossible, to clearly distinguish urban from suburban areas. Therefore, more or less solitary cities or urban areas with a clearly suburban surrounding offer considerable advantages in the light of the research question. The inclusion of an English city was intended from the beginning of the investigation as it is the country where industrialisation started. The selection of a city in the North of England was found especially appropriate as cities there experienced a very strong industrialisation.

Liverpool and Leipzig are both known for their industrial past. Both cities where known to have suffered from the reduction in manufacturing jobs in particular as both regions were reliant on a few business sectors only. Additionally, time series of population figures were investigated before the case study selection which revealed that the cities had experienced a significant population decline since about the 1930s. It was also found that both cities have had a significant amount of migration within the agglomeration, most notably as sprawl to the suburban neighbourhoods. It was another important criteria for the selection. Under these assumptions and some prior knowledge, such as the personal history in the GDR and former working experience[1], the decision was taken in favour of the agglomerations Leipzig/Germany and Wirral/Liverpool/UK.

As a second step the suburban case study region was to be selected. In Leipzig this is the eastern part of the city which since the year 2000 has belonged administratively to the city itself (see Figure 1.6 in the introduction). It was a political decision to include the suburban areas of Leipzig and regain the population into the municipal statistics, so that additional funds are allocated by the federal government. Incorporations are often due to financial considerations. The reasoning to decide for the eastern parts of Leipzig is explained later

[1]Both case studies were part of the European research project URBS PANDENS (Urban Sprawl: European Pattern, Environmental Degradation and Sustainable Development - Contract No. EVK-CT-2001-0052) to which the author contributed from mid-2002 to early-2005.

in this section (see subsection 3.3.1) when the method and specifics of the social survey are introduced. In the case of Wirral/Liverpool the closer investigation is based in Wirral, the neighbouring community of Liverpool. It is one of five metropolitan boroughs that comprise the conurbation of Merseyside (please see Figure 1.7 in the introduction). Liverpool (and Merseyside) will serve as a reference and comparison of the results. The social survey is based in Wirral for a number of reasons:

- Wirral has the second highest population density of all five parts in Merseyside (Liverpool 3947 people/sqkm, Wirral 1989 people/sqkm)(ONS UK). It is therefore the most urban structured borough after Liverpool. It is situated on the other side of the river Mersey facing Liverpool. Together they represent one urban agglomeration.

- Wirral is large enough to contain all types of land use and urbanisation from an urban core with central business district, through an inner core suffering the effects of urban restructuring, to a relatively stable suburban belt and a rural part.

- In contrast to Liverpool it is much closer in size to Leipzig. Wirral has a population of 313800 residents according to the mid-2003 estimation (ONS UK). Leipzig had a population of 500352 inhabitants in the end of 2005 (Amt für Statistik und Wahlen, Leipzig). It is therefore much more comparable to Leipzig than, for example, Merseyside, which has a population of about 1.5 million people.

- Liverpool in contrast to Wirral has no real suburban ring around the city and within its own administrative boundaries. The administrative area covers the urban part of the city with no surroundings which could be classified as suburban. To adopt the same approach as in Leipzig, the suburban and the urban part investigated should be located within one administrative district. It assures that the statistical data (this applies to both case study regions) is computed on the same basis and in a comparable way. While this is not such a strong reason in England where the censuses are guided and the statistics administered by a national authority (the Office for National Statistics UK), it is very much a reason for concern in the German case. Here, statistics on the municipality level can be counted and computed differently. It depends on the procedure in the respective community, e.g. as found in the case of Leipzig and its surrounding communities for the population estimates (according to Mrs. Gelfert; Amt für Statistik und Wahlen, Leipzig - personal communication, 20.04.2005).

Against this background the distict of Wirral in the Liverpool conurbation will serve as the focus of the investigation. Nonetheless, data for Liverpool will be included in cases where it can deliver valuable information to the regional situation.

3.2 Statistical analysis of secondary data

3.2.1 Approach to answering research question 1

Research question 1 and the formulated hypothesis is given again beneath:

Research Question 1: Process oriented
Did the population development in the case studies follow the sequences of the life cycle theory of urban areas and is a re-urbanisation trend visible in both regions?

Hypothesis:
As a result of the political history of Leipzig, which limited an urban development on the fringes and which also controlled and acted against decentralisation, it is assumed that the city development in Leipzig has not followed the phases of the life cycle model of cities over the past six decades. Re-urbanisation is visible in both regions as a new trend after a period of inner city population decline. However, there are reasons why this could happen earlier and easier in Leipzig.

For an answer to research question 1, a statistical analysis was performed with secondary data to the population figures. The data was retrieved from the Boards of Statistics in both case studies. The heart of the investigation to this question forms population data on a sub-city level. Therefore the entire urban areas looked at will be subdivided into an inner urban part and a outer urban part. For each case study agglomeration, the reasoning and definition of the judgement 'inner urban' versus 'outer urban' wil be given in the two following sections 3.2.3 and 3.2.5. The calculated population changes in these two sub-regions will then be compared as shown in Table 3.1.

Development phase	**Features of population change**			
	Inner urban	**Outer urban**	**Agglomeration**	**Overall development**
I - Urbanisation	++	–	+	Net population growth of the entire agglomeration
	++	+	+++	
II - Sub-urbanisation	+	++	+++	
	–	++	+	
III - Dis-urbanisation	– –	+	–	Net population decline of the entire agglomeration
	– –	–	– – –	
IV - Re-urbanisation	–	– –	– – –	
	+	– –	–	

Table 3.1: The phases of urban development according to the urban life cycle model. Note: +,++,+++ represents population growth from slow (+) to fast (+++); –,– –,– – – represents population decline from slow (–) to fast (– – –). Source: van den Berg and Klaassen (1986, p.88).

According to whether change is higher in the inner or the outer urban area, it is possible to draw conclusions with respect to the sequence of the stages of the urban life cycle model. The analysis drew on data from the censuses as far back in time as 1950/1951 until today. This represents a unique compilation. However some drawbacks arise from certain peculiarities of the data. These are described in detail beneath.

3.2.2 Population statistics for Leipzig

In the case of Leipzig, mainly the specific peculiar historical development is reflected in the data, especially in its availability and comparability. The socialist government was not interested in making much of the statistics public, although many aspects of life have been documented. No data is available on the sub-regional or sub-city level in Leipzig during the time period of the socialist government. Data is available for the years 1950-1989 only for the whole of the city of Leipzig. Table 3.2 mirrors the availability of data for Leipzig since 1950.

Time period	Data source	Spatial resolution and comments
1950, 1960	Statistical Year Book, Statistisches Landesamt Sachsen	Population data available on the level of the local municipality only, referring to the entire city to then current boundaries
1971	Census 1971, Staatsarchiv Leipzig	Population data available on the level of the local municipality only, referring to the entire city to then current boundaries
1981	Census 1981, Statistisches Landesamt Sachsen	Population data available on the level of the local municipality only, referring to the entire city to then current boundaries
1989	Statistical Year Book, Statistisches Landesamt Sachsen	Population data available on the level of the local municipality only, referring to the entire city to then current boundaries
1992-2005	Statistical Yearbooks, Publications of the Amt für Statistik und Wahlen, Leipzig	Population data available on the level of city districts (Ortsteile) However, since 1998 the population data is given as a summary of resident population and secondary residences only which hinders the direct comparison with former time series

Table 3.2: Population data for Leipzig since 1950. Source: Author's draft.

The data was provided by the Board of Statistics and Elections in Leipzig (Amt für Statistik und Wahlen Leipzig) and the Boards of Statistics for the Bundesland Sachsen (Statistisches Landesamt Sachsen). Additionally, as not all population data from the socialist period is already published, the figures for the year 1971 had to be retrieved from the State Archive in Leipzig (Staatsarchiv Leipzig). All figures are listed in Annex 8.

As the table shows, the years before German unification and the time series after it are not fully comparable. From 1998 onwards the authority of Leipzig (Maria Gelfert, Auskunftsdienst - personal communication, Amt für Statistik und Wahlen, Leipzig) decided

no longer to publish solely the resident population, but included the secondary residences, which from then on cannot be separated in the figures. In the years before 1999, back until 1950, population data was gathered on basis of the resident population only. This fact decreases the comparison between data of before and after unification.

Problems also arise when city and district boundaries change. This probably affects most administrations over time and calls for particular attention. Since 1950, in Leipzig adjacent municipalities were incorporated in 1979 and 1984 and in almost every year throughout the 1990s. In 1979, Leipzig grew from 14305 ha to 14380 ha - an increase of 175 ha or by 1.2%. In the year 1984, the city area increased by an additional 261 ha to 14641 ha or by 1.8% (Stadt Leipzig 2004). These incorporations concern minor land parcels, not incorporations of whole villages or towns. No population changes are accompanied to the boundary shifts. This allows a full comparison of the population data between 1950 and 1989.

After unification, incorporations took place in 1993, 1994, 1995, 1996, 1998, 1999, and 2000. Major incorporations were in the last two years. Throughout the whole of the 1990s, the city grew from 14641 ha to 29754 ha, an increase of 49.2% (Stadt Leipzig 2004), please see Figure 3.1. As a consequence of this, the population data between 1992 (there is a gap in data between 1989 and 1991 for the population figures on city district level) and 2005 are not totally comparable, at least not over the whole of this periods. As an additional reason, one has to mention the change in population data publishing that occurred in 1999 (mentioned above). Before that date, only the resident population was counted whereas afterwards the population data for the city districts of Leipzig has been available as amalgamated first and secondary residences only. Here, the city of Leipzig differs from the calculation methods common in the neighbouring communities and Saxony as a whole. The population figures for communities that were incorporated throughout the 1990s can only be retrieved on the basis of first residences (until their incorporation). As a consequences, it is only in 2000, when the major incorporations were finished that the population data on sub-city level in Leipzig is comparable again as from then on it refers to a similar basis of calculation. But still, they are not comparable to the pre-1989 figures as the city boundaries changed. This problem is met by the delineation of an inner versus an outer urban area.

3.2.3 Definition of an inner and an outer urban part of Leipzig

A separation between an inner urban and an outer urban part of Leipzig becomes necessary if one wants to trace the intra-urban migration flows according to the method underlying the life cycle theory of urban areas.

According to Artmann (2000), in 1990 there were still small settlements of about 500 inhabitants in the immediate surrounding of Leipzig which almost seemed to have missed 200 years of urban development. The whole of the suburban development in the 1990s concentrated on these areas, which then at the end of the decade resulted in the enormous incorporations of the Leipzig hinterland (see also the Results chapter) (Artmann 2000). Additionally, Nuissl and Rink (2005, p.128) divide the city area of Leipzig into two parts: Inner Leipzig and Leipzig's new fringe, the former comprises Leipzig in its 1990 boundaries and the latter is the area of municipalities that have been incorporated since. On basis of these remarks, it was decided to split the administrative area of Leipzig into an inner urban part, which forms the administrative area as found until 1990, and an outer urban part which

comprises the districts incorporated afterwards. Figure 3.1 documents the major stages of incorporation throughout the 1990s. Since 1989 the city area of Leipzig approximately doubled (Stadt Leipzig 2004).

Figure 3.1: City area of Leipzig in 1990, in 1998, in 2000, and in 2005. Source: Author's draft. Data: Amt für Statistik und Wahlen Leipzig.

Yet, in a few cases, the incorporation did not affect whole settlements but only parts of them. The new boundary is displaced and cuts through former communities. In such a case the new district was sorted towards the category 'inner urban area', although they include some acres of the formerly surrounding of Leipzig. Another strategy would have been to split the spatial areas in cases where necessary. However, it was decided against such an approach as the data is not available for a lower statistical level than city districts (Ortsteile). One example where this applies is the new district Plaußig-Portitz. It is on

the eastern edge of the city, where residential development was begun already during GDR times. To keep in line with the reasoning above, this should therefore be classified as an 'inner urban area'. The second example for a cut through former communities is Lausen-Grünau, in the western part of the city. For the sake of consistency in the argumentation Lausen-Grünau is attributed 'inner urban' as well.

Accordingly, the 63 districts of Leipzig are split into the two categories 'inner urban area' and 'outer urban area'. Both are comparable in size: the inner urban part is 15650 ha large and the outer urban area extends over 14160 ha. For a visualisation see Figure 3.2. The names of the districts belonging to each category as well as the areas are listed in a table in Annex 7. The classified areas are hereafter called Inner Leipzig and Outer Leipzig.

Figure 3.2: Definition of Inner Leipzig and Outer Leipzig. Source: Author's draft.

3.2.4 Population statistics for Wirral

In the British case study, the availability of data concerning population figures for the sub-city level is better than in the German case study to the extent that no political transformation occurred during the relevant time period.

Time period	Data source	Spatial resolution and comments
1951, 1961, 1971	Census data, Office for National Statistics UK	Population data available on ward level as separated before the governmental reorganisation in 1974
1981, 1991, 2001	Census data, Office for National Statistics UK	Population data available on ward level according to the new partition valid after 1974

Table 3.3: Population data and availability in Wirral since 1951. Source: Author's draft.

Data was retrieved from the Office for National Statistics (ONS) in Britain and is listed in Annex 10. Additionally to the change in ward boundaries and county affiliation which are noted in Table 3.3 there are small changes in the method of census taken over the years. The ONS gives following information: The 1981 population base excludes households wholly absent on Census night. The 1991 Census refers to the resident population: the number of people resident in Merseyside on Census night (that is, excluding visitors but including residents who were recorded as absent on Census night). The observed decrease in resident population since 1981 results principally from a net loss due to migration, despite there being more births than deaths in the county. The 2001 "Census results are the first to represent the entire population, not merely those enumerated as in past Censuses. This was achieved through a new strategy known as the 'One Number Census'. A key elements was an independent follow-up survey - the Census Coverage Survey (CCS) which involved face to face interviews with 320000 sample households spread across every local authority in the UK. By combining the results of the Census and the CCS, it was possible to estimate the total resident population in 2001 - the 'one number' - to a high level of precision"[2].

Despite these small changes, the census results between 1951 and 2001 are assumed to be fully comparable as appropriate adjustments in the calculations were made.

Furthermore as noted in Table 3.3, drawbacks result from the change of ward boundaries over the years. A major governmental reorganisation took place in 1974 (Alistair Sumptner, Wirral Borough Council, Forward Planning - personal communication; ONS UK). For the case study area, this meant a shift in assignment from the County of Cheshire to the County of Merseyside, associated with major changes in the partition of the area as noticeable in the ward boundaries and their sizes. To enable a comparison of intra-regional population dynamics the former ward classification has to be related to the later one. This translates into certain particularities in the definition of an inner and an outer urban part of Wirral.

[2] http://www.statistics.gov.uk/census2001/stat_methods_qual.asp

3.2.5 Definition of an inner and an outer urban part of Wirral

The district of Wirral comprises of 22 wards. The main town is Birkenhead and there are many smaller surrounding settlements. The urban heart builds around Birkenhead and additionally comprises some of the surrounding districts of it. The outer urban zone is classified as the remaining areas in the west and the south of the district. Researchers in the area split the district into an inner and an outer urban part (Couch and Karecha 2003) according to the classification as seen in the table in Annex 10. Figure 3.3 portrays the division in space. The 'inner urban part' and the 'outer urban part' are referred to here as Inner Wirral and Outer Wirral.

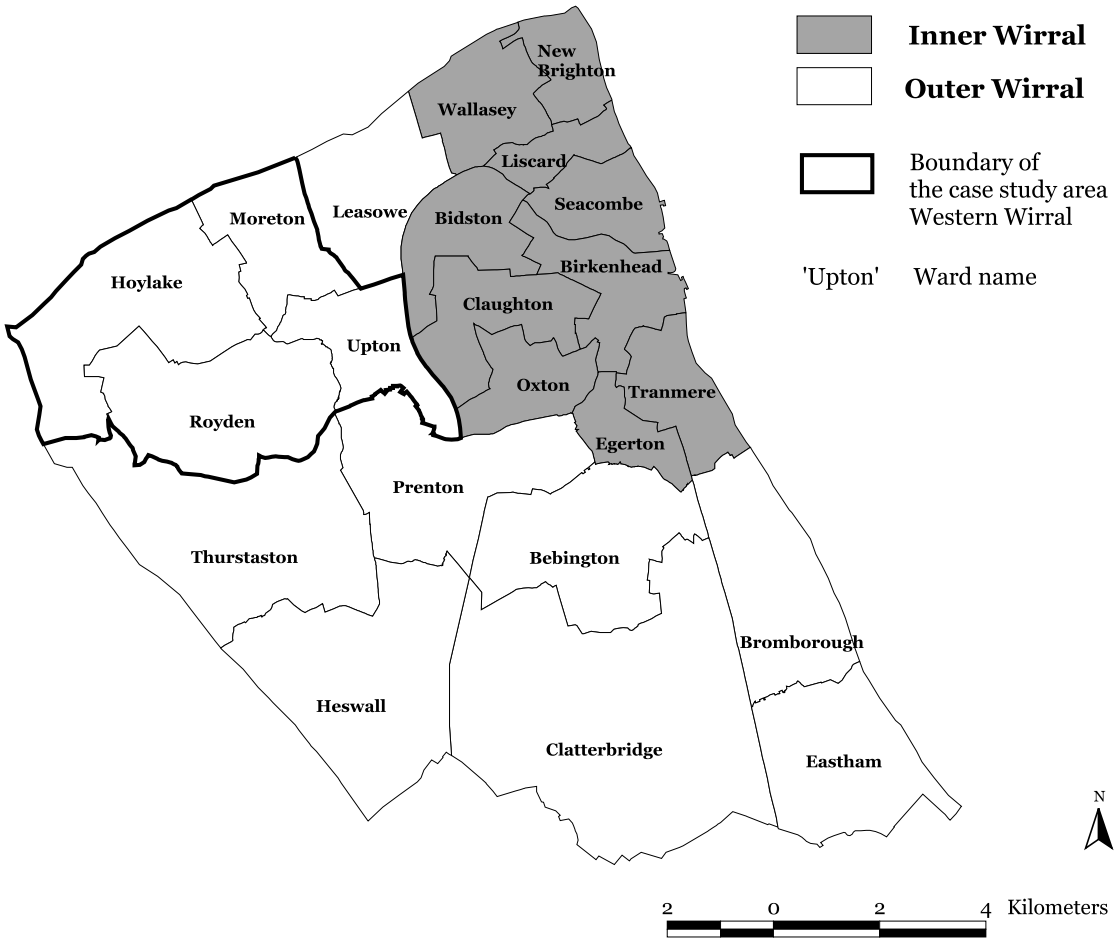


Figure 3.3: Definition of Inner Wirral and Outer Wirral. Source: Author's draft.

However, due to the administrative reform in 1974 small adjustments are necessary to allow a full comparison of the data before and after this date. For the time series analysis (research question 1) the former definition of an inner and an outer urban area of Wirral can not serve as a basis for comparison. For research question 1 the definition of the inner urban area of Wirral additionally includes the wards of Upton, Moreton and Leasowe. The spatial difference is very small. This peculiarity does not reflect on the quality of the scientific result. The classification on ward level before 1974, after this date and the corresponding areas are shown in Annex 10.

3.3 Statistical analysis of primary data: questionnaire survey

In both case studies a postal questionnaire survey provided the basis of the analysis to reveal information to answer research questions 2, 3, and 4. A questionnaire was the most appropriate means to gather information about residential location preferences and the attributes of households. It is a direct approach to the people who move house. Households are considered the most important entities when investigating residential migration, because decisions are taken at that level. To grant anonymity, the questionnaire was posted which offers substantial advantages. It is assumed to provide the least influenced or biased responses of residents, which might have occurred if an interviewer were present. A postal questionnaire also involves fewer interviewers (human resources) than, e.g., oral interviews, and additionally allows the independent organisation of the respondents. The heads of household can decide freely about when they want to answer the questionnaire with no need to be available when the interviewer rings at the door.

Both questionnaires substantially relied on closed questions which means that people could choose from a selection of offered locational and social attributes. There was additionally the opportunity to answer three open questions for the Wirral residents and one additional open question in the Leipzig case. A closed questionnaire seems most suitable to provide a significant level of comparison between the two studies. It is not assumed to have restricted the quality of the information because there was also the possibility to give additional comments. This was hardly used by the respondents. However, it cannot be ruled out that a completely open questionnaire would have revealed different results. Nonetheless, for the focus of this study a closed questionnaire is regarded the most appropriate way of investigation to achieve a high comparison between the single questionnaires as well as between the two case studies.

In both case studies the questionnaire was similar, but not identical. This has two reasons. First, the later survey could profit from the earlier in that it was improved to meet weaknesses of the former. Second, it appeared necessary to cover some additional aspects with the latter survey which were not included in the earlier one. This applies to national, regional and local peculiarities. The survey in Leipzig was undertaken after the survey in Wirral. Next to the improvements of insufficiencies the post-socialist context should be reflected in some aspects. Therefore slight modifications of the questionnaire became necessary. However the broad outline is the same in both and organised along three themes:

1. Locational preferences of the current home - the pull factors of the current residential area,

2. Misgivings with the former place of residence or the former dwelling - the push factors of the previous neighbourhood or residence,

3. Socio-economic aspects.

As noted above, drawbacks arise from the difficulty of simultaneously investigating preferences and choices. This problem contributes to the difficult predictability of choices from preferences noted in the 1970s. People change their judgement of living location and their attributes, their preferences towards a living area and the choices made depending on the

point in time when they have been asked (Evans 1988; Burton et al. 1990). To overcome these shortages the questionnaires were posted to people who had recently moved. Shortcomings from false memory or hypothetical moving are therefore kept minimal.

3.3.1 Postal questionnaire Leipzig

The questionnaire survey for the German case study Leipzig focused on newly registered inhabitants of the eastern suburban area of Leipzig in the years 2000-2004. The questionnaire which was sent to the selected districts in Leipzig is portrayed in Annex 1.

Ten urban districts (Ortsteile) were selected. These are: Seehausen, Plaußig-Portitz, Thekla, Heiterblick, Engelsdorf, Mölkau, Baalsdorf, Althen-Kleinpösna, Holzhausen, Liebertwolkwitz. These districts comprise most of the eastern part of the city which was already traditionally and still is a prominent region for residential development (Artmann 2000). In particular after 1990, the residential migration concentrated on the now eastern regions of Leipzig (formerly outside the city border) as it is the most attractive in terms of natural surrounding. Especially for the well-off population strata the eastern part of Leipzig offers an attractivity for both the construction of multi-family apartment houses and single family houses since the political change (Artmann 2000, Henning Nuissl - personal communication, 19.05.2005). The case study area is hereafter called Eastern Leipzig.

The addresses of the newly registered residents were retrieved from the registration office of the City of Leipzig. This is possible for scientific purposes only, and a fee has to be paid to the city authority of Leipzig. The draw is based on a stratified sample allowing for all age groups in a representative share. The sample is drawn randomly and corresponds to the population proportion of one district in comparison to entire Leipzig. The questionnaires were addressed to the resident newly registered, not necessarily to the head of household. This is a small difference to the Wirral study but unavoidable at this stage. It is possible that in a few cases two or more people of the same household were approached, as both were newly registered in the respective time period. In these cases, the statement of slightly different locational preferences was the criteria to retain both questionnaires in the sample. It is not regarded as a drawback to the study as both perspectives might have resulted in the decision to move which was the truly important information to gain.

The survey was carried out in the second half of September 2005. In total, 1423 addresses were selected and equivalent questionnaires sent. 194 completed questionnaires were returned – a response rate of 13.6%. This is much less than in the Wirral case and might be due to several reasons:

- The survey was undertaken in the second half of September. A small number of the addressees might have been on holiday. However, due to the long time needed to retrieve the addresses from the Leipzig authority (the personnel was very busy during the summer to prepare for the national election on the 18 September 2005) it was not possible to organise the study earlier. Due to time constraints within the study and the aim to proceed adequately it was decided not to postpone the survey further. But September is not the vacation season in Germany. Therefore families are not accidentally excluded, only a minor percentage of households without schoolchildren could have been on holidays.

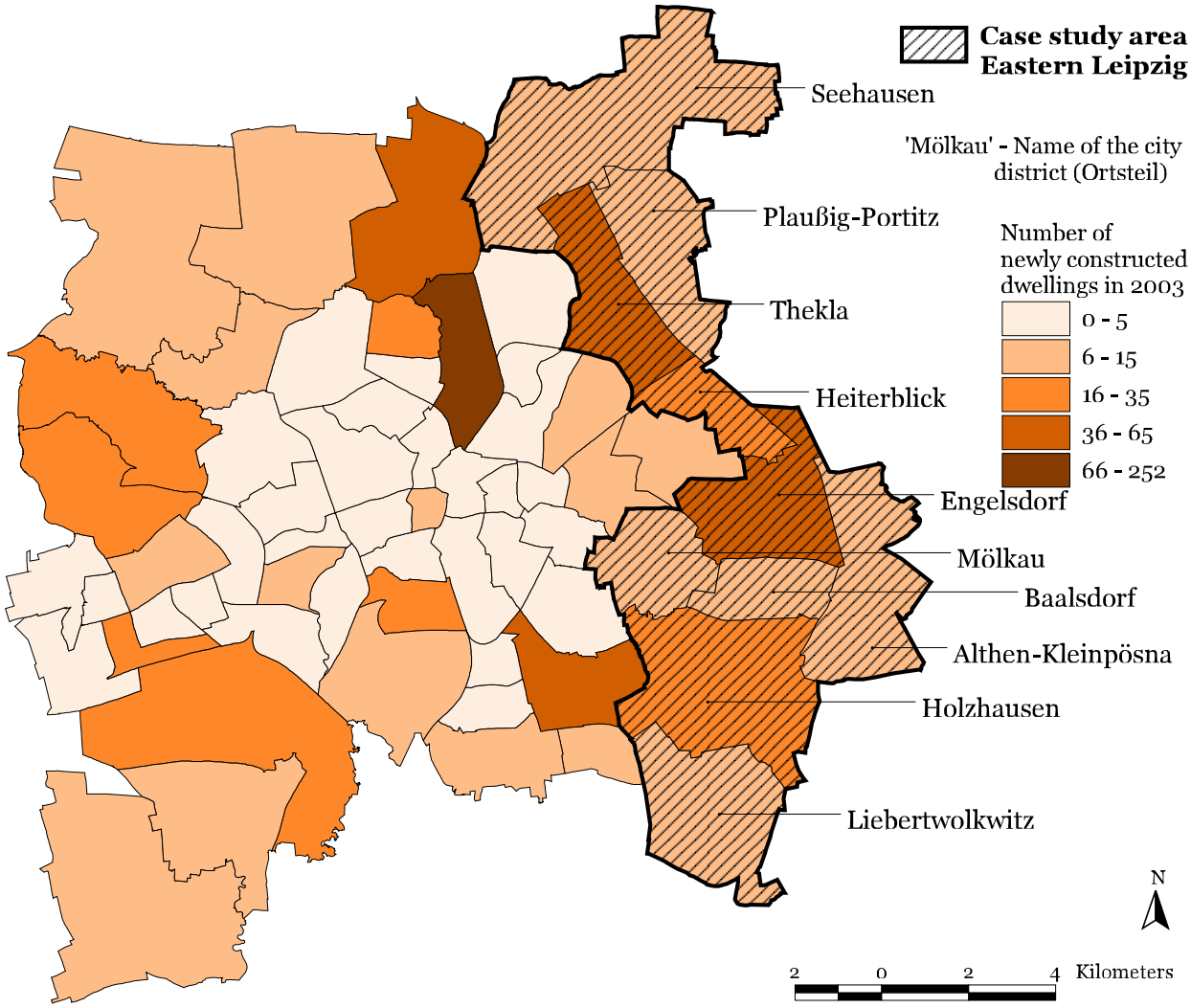


Figure 3.4: Case study area Eastern Leipzig. Source: Author's draft. Data: Amt für Statistik und Wahlen Leipzig.

- The relatively short time period given to respond to the questionnaire: about 7-14 days dependent on the time taken to deliver the letter. The 'Deutsche Post' does not make precise statements about the duration to deliver them as daily post is given priority.

- The fact that the author and the institute under which umbrella the study was conducted are not local representative. This might have led to the consideration that the study is of lower importance or even to a reduced trust in the application of the survey's result as a benefit to the region.

- The decision against sending a reminder which is regarded very important in postal questionnaire surveys. Some authors conclude that it is even more important than the introductory letter (Dr. Thorsten Grothmann, PIK - personal communication, 25.07.2005). However, sending a reminder did not seem possible due to financial constraints.

- A general reticence against divulging information. This might be explained by the residual mistrust from the GDR experience.

- The fact that the questionnaire was sent to the individual's home addresses might have been regarded as suspicious, despite the assurance of anonymity. Some respondents expressed their discontent that it was possible in general to retrieve personal addresses for scientific purposes. Beforehand sending out the questionnaire it was elaborated what approach might lead to the least uneasiness with the residents. The personal form of address is believed to increase the motivation to respond by using the residents full name. A general form of address (such as 'Dear madam, dear sir', 'Dear resident of >>street, number<< - 'Sehr geehrte Damen und Herren', 'Sehr geehrte Bewohner der >>Strasse, Hausnummer<<) is very informal but would also decrease the appearance of importance to the survey. The questionnaires were therefore formally and directly addressed to the residents, naming first and surname in the address as well as headline in the introduction letter.

Taking into account these circumstances the response rate of 13.6% is considered a reasonable result.

There are two further peculiarities to this questionnaire. First, as mentioned earlier, it is aimed to account for the post-socialist political framework of Leipzig with some particular questions. This is most visible in Question 1, where people could indicate the preference for either affordable rents or affordable land prices. By distinguishing between dwelling and land prices in Leipzig it was hoped to obtain additional information about the wish to build new private, single family houses which was not easily possible in the GDR. While renting is major characteristic of the German housing market and in particular of the East German housing market, an assumed trend towards a higher share of owner occupation driven by consumer preferences could be tested.

A second peculiarity of the Leipzig questionnaire lies in additional queries to some of the features concerning the previous dwelling and its location. The time of commuting, the number of cars, the preferred mode of transport and the amount of living space can be judged in terms of before and after the move. This provides information about the potential consequences of urban sprawl on car use, mobility and living space.

A preliminary fault analysis can be obtained on basis of the size of the sample selected for the analysis, the overall number of newly registered people in the case study area and those newly registered in the whole of Leipzig. Table 3.4 summarises the descriptive statistics regarding the representativeness of the sample. As shown in Table 3.4, the sample of 194 people represents a share of 13.6% of the statistical population, i.e. the pool of people approached with the questionnaire. This represents 0.77% of all people that newly registered in the case study area Eastern Leipzig 2000-2004 and 0.04% of all newly registered people in Leipzig in this period. These are small numbers, therefore the results must be treated with some caution. However, keeping in mind that the case study sample was taken randomly and according to the respective age and population distribution in the areas, it is assumed that the drawn sample is representative. The statistical population shows a percentage of 5.63% of the possible sample, those people that newly registered in the case study over the respective years. This is 0.33% of all new Leipzig citizens.

Frequency	N	Percent		
		of statistical population	of possible sample	of total population
Case study sample = Respondents	194	13.6	0.77	0.04
Possible respondents = Statistical population	1423	100	5.63	0.33
All newly registered people in the study area over the period 2000-2004 = Possible sample	25281	-	100	5.81
All people newly registered in Leipzig over the period 2000-2004 = Total new population	434900	-	-	100

Table 3.4: Selected sample of residents and comparison to the overall development in the case study and in the whole of Leipzig. Source: Author's draft.
Note: 'Total new population' does not mean that the residents have lived outside of Leipzig before. Newly registered people include those moving house within the current boundaries of Leipzig.

If one assumes that the sample of household addresses is representative it does not necessarily mean that the responses are representative. It is possible that a special group of people with similar characteristics answer very frequently whereas other social groups might not. In section 4.2 the social characteristic of the respondents will be analysed, and also the answers of the heads of household of the case study samples will be compared with regional or national figures. This gives a further insight into the possibility of generalisation from the results although an unexpected result must not in all circumstances be interpreted as an irregularity or unrepresentativeness of the data. In general, elderly people might be expected to respond more often for the reason of time availability. Furthermore one could expect that the better educated answer more frequently, because they might be more confident in their ability to interpret a questionnaire correctly, and might feel that they have the right to be heard (Anke Fischer, International ALTER-Net Summerschool, 04.09.2006).

From the sample households currently living in the case study area of Eastern Leipzig 13.2% of the respondents moved from Inner Leipzig to the suburban areas, 10.6% moved to their current home from a place belonging to the classification Outer Leipzig and 76.2% came from elsewhere. The latter category comprises not only, the vicinity of Leipzig but also places in other parts of Germany as well as outside of it. It is not possible from the questionnaire to make a precise statement as to the location of the former place of residence if it concerns a place outside Leipzig. One has to assume that the high figures concerning the category 'outside of the current city boundary of Leipzig' witness a significant flow of households moving from the surroundings of Leipzig into the city (Table 3.5, Figure 3.5).

Among the households already living in Leipzig, a higher fraction formerly resided in the inner parts. The smallest proportion of migrants comes from the area classified as Outer Leipzig. Overall it would seem that there are more new residents from outside of Leipzig than movers within the city boundaries.

		N	Percent	Valid Percent
Valid	Inner Leipzig	25	12.9	13.2
	Outer Leipzig	20	10.3	10.6
	Elsewhere	144	74.2	76.2
	Total	189	97.4	100.0
Missing	999	5	2.6	
Total		194	100.0	

Table 3.5: Place of origin of the sample households in Eastern Leipzig. Source: Author's draft.

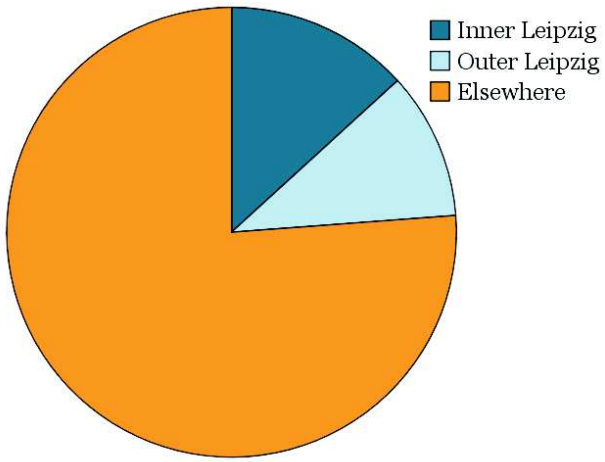


Figure 3.5: Former place of residence of the sample households in Eastern Leipzig. Source: Author's draft.

However, this distribution might be questioned if one looks at the migration figures from the Board of Statistics in Leipzig, Amt für Statistik und Wahlen Leipzig. Astonishingly, according to their data the total migration to Leipzig in the years covered by the study comprises of a majority of people formerly residing in Leipzig and a minority of residents from elsewhere. In the questionnaire 23.8% of the responding households moved to the suburban areas from Inner Leipzig and 76.2% came from elsewhere whereas the data from the boards of statistics in Leipzig points to a distribution of 70.57% from inside and 29.43% from outside of Leipzig as an average over the years in question.

Table 3.6 displays the statistical data for migration numbers in Leipzig in the sample districts. Against these figures the sample households of the questionnaire study seem not to account for a representative share of the households in those districts of Leipzig. One has to expect that significantly more people who are new residents in Leipzig responded to the questionnaire as compared to those who have already lived within city boundaries before moving.

	2000		2001		2002		2003		2004	
	From outside	From Leipzig	From outside	From Leipzig	From outside	From Leipzig	From outside	From Leipzig	From outside	From Leipzig
Thekla	201	835	316	484	330	436	288	367	261	414
Plaußig-Portitz	52	158	51	140	36	171	51	149	48	100
Heiterblick	473	466	255	397	358	380	154	357	86	345
Mölkau	350	697	177	385	151	367	79	386	104	433
Engelsdorf	419	1051	223	836	253	662	219	760	220	683
Baalsdorf	64	125	29	116	33	85	18	67	30	113
Althen-Kleinpösna	198	239	83	211	79	173	85	166	91	158
Liebertwolkwitz	175	374	140	377	117	350	133	315	111	400
Holzhausen	138	477	123	408	112	435	16	375	131	366
Seehausen	79	224	69	206	66	211	106	197	124	149
	2149	**4646**	**1466**	**3560**	**1535**	**3270**	**1149**	**3139**	**1206**	**3161**
Percentage distribution in each year	**31.63**	**68.37**	**29.17**	**70.83**	**31.95**	**68.05**	**26.80**	**73.20**	**27.62**	**72.38**

Table 3.6: Migration into the case study districts in Eastern Leipzig according to the former place of residence with respect to in/outside of Leipzig. Source: Amt für Statistik und Wahlen Leipzig.

It is concluded from this that especially and may be only the 'new Leipziger' are open to answer questionnaires and that only those households might be interested in a sustainable city development, which was the main motivational issue in the introductory letter (see Annex 2). Additional reasons for this distribution seem the following:

- In the year 2000, the beginning of the period covered with the questionnaire survey in Leipzig, the new districts of Leipzig formerly surrounding the city had just been incorporated. Big areas of the current administrational area was assigned to Leipzig in 1999 and 2000. People might have been sparsely informed about the incorporations, so that a substantial share of the population in communities surrounding Leipzig might not have been aware of the reform.

- Closely connected to this interpretation, it is also possible that the respondents who moved within the currently assigned part Outer Leipzig indicated 'out of Leipzig' as former place of residence becuase the major incorporations were quite recent (from days to less than one year). This would mean that the corresponding question in the questionnaire was misunderstood. These households already resided within the administrational area of Leipzig. Consistency within the spatial area covered by the survey was the main reason to decide for the time frame of newly registered people of between 2000-2004. The last incorporations came into force 01 January 2000.

If these mentioned aspects apply, fewer people would have indicated moving within the outer urban areas of Leipzig as actually moved within the suburban area. Correspondingly, the share of people indicating that they have moved from outside the city into the city area of Leipzig would decrease. This means, an underestimation of movers within the suburban areas and an overestimation of people that moved in from outside. It is however not assumed not to impact on the quality of the results to, e.g. the locational preferences of actors but reduces only the sample that can be used as representable share of suburban-suburban migrants.

3.3.2 Postal questionnaire Wirral[3]

In the British case study, the postal questionnaire survey was undertaken with households that moved to newly constructed dwellings in a few wards in the metropolitan district of Wirral. The questionnaire is supplied as Annex 2.

The selected wards comprise: Upton, Moreton, Hoylake and Roydon. These wards belong to 'Outer Wirral' as a representation for the suburban neighbourhoods (Couch and Karecha 2003b). Two of these wards (Moreton, Hoylake) were characterised by some of the highest percentage change in dwellings between 1991 and 2001[4]. This was the main criterion for selection. Both the additional wards have been included to form a continuous section from the inner to the outer areas of Wirral. Figure 3.6 displays the case study region.

The survey covered a stratified sample of the households in Wirral. It comprised all households that moved into newly constructed dwellings over the period of 1997 to 2002

[3]The questionnaire survey was undertaken by colleagues from the Liverpool John Moores University: Prof. Chris Couch and Jay Karecha. The Author is grateful for the provision to use the data.

[4]Office for National Statistics UK

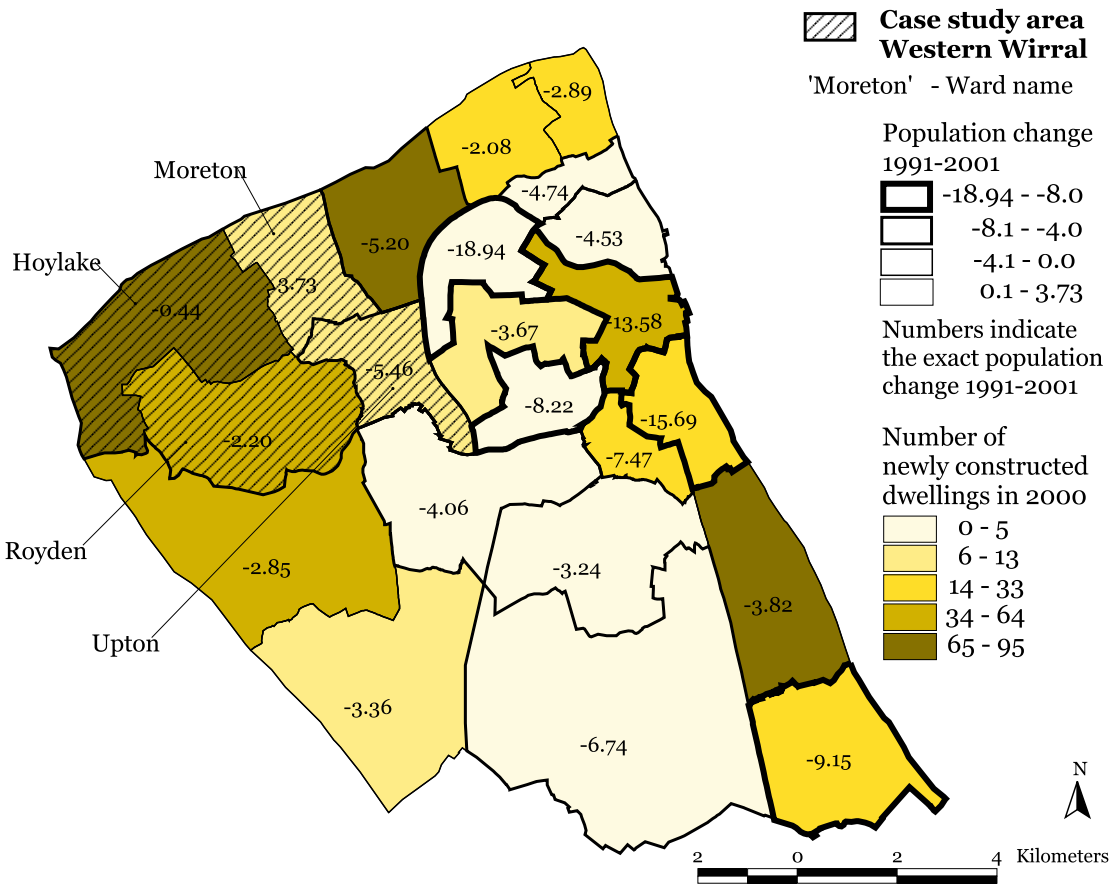


Figure 3.6: Case study area Western Wirral. Source: Author's draft. Data: Wirral Borough Council, ONS UK.

in the respective wards. Therefore the sample comprises 100% of all households that are of interest to this study (see Table 3.7). This is a remarkable feature. The addresses were retrieved from the Planning Department of the Wirral Metropolitan Borough Council.

The questionnaires were sent to the heads of households. In all, 598 new dwellings were approached in the selected wards and questionnaires posted. A total of 203 completed questionnaires were returned from Outer Wirral. This is a total response rate of 34.0% which is reasonable considering the means of investigation. A response rate of 20-30% is normal in questionnaire surveys depending on the research outline (Dr. Thorsten Grothmann, PIK - personal communication, 25.07.2005). The form of address in the Wirral survey was to the head of the household as the researchers knew only about the construction of the house and the address. Therefore the name of the recipient could not be used. Against this background a response rate of 34.0% from the outer urban areas of Wirral is a remarkable result. The social survey was undertaken in spring 2003.

3.3.3 Comparison of questionnaires

The differences and peculiarities of the two questionnaires shall be elaborated here in a concise manner although some aspects have already been named. It is not assumed that the differences between the questionnaires will substantially influence the comparability of the results received as they are only small. However, they shall be mentioned.

	N	Percent	
		of statistical population	of possible sample
Case study sample = Respondents	203	33.95	33.95
Possible respondents = Statistical population	598	100	100
All newly registered people in the study area over the period of 1997-2002 = Possible sample	598	-	100
All people newly registered in Leipzig over the period of 2000-2004 = Total new population	n.a.	-	-

Table 3.7: Selected sample of residents and comparison to the overall development in the case study and in the whole of Wirral. Source: Author's draft.

- First, the questionnaires in Wirral were sent to the heads of household, with only one questionnaire for one household. In Leipzig the questionnaires were sent to individuals instead. However the questionnaire was designed to speak for the whole household and sometimes even formulated to refer to the head of the household, such as with socio-economic aspects like 'the profession of the highest wage-earner'.

- Referring to the same issue, sometimes in Leipzig (though very rarely) two people belonging to the same household both received a questionnaire. This was only recognised after two questionnaires were returned in the same envelope. In most of these cases only one questionnaire was returned, speaking for the household's overall perspective. However, in other cases the two questionnaires came back and revealed different locational preferences but the same socio-economic aspects of the household. This is assumed to meet the requirements as given by the research question. A household's move might have been decided by weighing up different locational preferences of the members of the household. It is a demonstration that residential places are heterogeneous, with many qualities to different people and that the household's moving decision was taken by consensus. In such a case, both questionnaires are included in the sample. In other cases again, the questionnaires were answered identically. This speaks for the similarity of residential preferences between the members of the household and is therefore an underpinning that actor classes exist. All correctly returned questionnaires have been included in the analysis.

- The form of address is also significant. In the case of Wirral, the households were approached indirectly without displaying a name. In the case of Leipzig the respondents were approached directly with full name, street and postcode. When people realise that their addresses are not protected and can be accessed for scientific purposes, this could either lead to resentment towards the investigation or it could result in a higher motivation to take part in the investigation. The latter is assumed to establish a

more personal level between the respondents and the researchers. People might feel especially important in contributing to the improvement of their neighbourhood and the city they live in, to a decrease in urban problems, or as a contributor to scientific research in general. The increase in personal involvement and motivation was assumed to be stronger than the possible resentment.

- Additionally there appeared difficulties to directly transfer the British questionnaire into the German context. Firstly, one question had to be modified to account for the different clusters of professions in Germany. This was necessary due to the different social backgrounds and classifications used. A further difficulty with the English questionnaire appeared during data interpretation. It was not possible to clearly distinguish retirement as one form of occupation in the English questionnaire. Also, the household type had a distinction between 'elderly living alone' and 'single adult living alone' but no for the 'adult couples'. These drawbacks could be eliminated in the German questionnaire with a slight modification. However, these differences are presumed to be of minor importance in the comparison between the case studies and insignificantly influential to the results as they can be leveled out by another question in the questionnaire (e.g. in the case of occupation the elderly were extracted by seperating the 'unemployed' and the 'over 60 years of age').
  Secondly, there was an artefact taken from the English rankings (the preferences to a new place and the push factors of the old one had to be ranked in numbers from 1-low to 5-high according to English school grades (see the questionnaires in the Annex 1 and 2). This ranking is also used in the German version. Later it became apparent that this could have caused some confusion with the German respondents, as the school grades in Germany are from 1-good to 5-bad, i.e. in the opposite direction. However, the ranking is stated very clearly and included beneath every question. It is assumed not to have altered the quality of the information gained.

Under consideration of all points mentioned, both questionnaires are still assumed to provide a good level for comparison between the case studies and a valuable means for the research questions 2 and 3.

3.3.4 Approach to answering research question 2

Research question 2 is repeated again beneath:

Research Question 2: Causes oriented
What are the main reasons for people in old industrial regions to move to the urban fringes? What is more important in the decision to move:

- the characteristics of the inner cities with their mostly negative evaluation as strong push factors, or
- the characteristics of the outer urban areas, mostly positively evaluated as stronger pull factors?

Hypothesis:
If the latter is less important than the former, this will indicate that the inner city problems/ the urban environments in former industrial cities are more important in the evaluation of residential attractivity of sites than the pull factors of the surrounding. Against the comparison of other investigations a stronger weight of push factors than pull factors is expected. This in turn would suggest that formerly industrialised cities might generate more sprawl than non-industrial cities.

Descriptive statistics, most notably the frequency distribution, will be used to interpret the results of the questionnaires towards an answer of research question 2.

To answer it satisfactorily one needs to distinguish between

1. Why people move and
2. If they move, why they move to the urban fringe.

These issues are closely related to the question of push and pull factors as it can be assumed that (1) relates to a dissatisfaction with the current home and dwelling and (2) refers to an attraction to a location somewhere else. All aspects can be retrieved from the questionnaire, which includes a question about the reasons for leaving a (the former) place and a question about the choice of (the present) location. With the aid of frequency distributions information to both aspect (1) and (2) shall be gained which implies an answer to the first part of research question 2.

A comparison of the extent of strong positive answers to the push and pull factors will reveal whether the push or pull factors are more important in the decision to move to the suburbs (in the Leipzig questionnaire: question 1 and 3, in the Wirral questionnaire: question 1 and 2; see Annex 1 and 2). If there are stronger answers for the push factors than for the pull factors one can expect that the quality of the inner cities in former industrial urban areas contribute significantly to an out-migration of the residents.

3.3.5 Approach to answering research question 3

Both the use of statistical data and the results of the Leipzig questionnaire prove useful to gain answers to research question 3.

Research Question 3: Consequences oriented
Can an increase in living space, the number of cars and the commuting distance be clearly attributed to the migration from an inner to an outer city location when both different households are compared at the same time (inner versus outer urban residents) and the same households are evaluated at different times (moving households from the inner to the outer urban areas)?

Hypothesis:
Against the background of the current literature it is assumed that the households which are living in outer urban areas have a higher amount of living space, number of cars and commuting distance in average. Also the preference to use the car is assumed to be larger. If one compares the situation in the same households before and after a move from the inner urban parts to the fringes, it is assumed that this will lead to an increase in living space, the preference to use tha car and the amount of cars per household. However, taking into consideration that the financial resources of residents in former industrial areas are small, a concentration of employment as a legacy from the GDR period remains, and the people especially in old industrial areas by cause of a constituted behaviour do not like to commute it is not assumed that the commuting distance changes much.

The hypothesis of research question 3 will be tested using primary and secondary data. With respect to Wirral, data will be analysed that is assumed to comply with the traditional method of neighbourhood comparison evaluating inner and outer urban areas at the same time. Along the division of Inner versus Outer Wirral the general difference in car ownership, size of living space and commuting distance can be analysed. Such an evaluation takes into account all the wards in Wirral, not only those in which the questionnaire survey was undertaken. It results therefore in a statement of the consequences of urban sprawl as often conducted in other studies and referred to in the literature. It allows a test of whether the claims of higher levels of car ownership, size of living space, and commuting distance for suburban households hold true for Wirral as an old industrial area. Here a comparison will be made of different households from Inner and Outer Wirral at the same point in time.

Additionally, the answers of the questionnaire survey in Leipzig will be used for a comparison of the size of living space, the number of cars and commuting distance of the same household before and after the move from the inner to the outer urban area. The questionnaire for Eastern Leipzig was designed to allow for a before/after comparison with respect to some characteristics of the households. It was provided with additional queries referring to the previous home and neighbourhood. Depending on the former residential location, e.g. inner city or other suburban neighbourhood, it is also possible to estimate whether a likely increase in the variables mentioned is due to the move from the inner city to the suburban area or is caused by other factors such as socio-economic status, income, life style etc.

Mobility and commuting pattern as well as the size of living space are influenced by many aspects, not only the place of residence. They are conditioned, e.g., by the building structure, transport infrastructure, building regulation and other aspects. To fully account for the contribution of sprawl towards the increase in car use and the increase in living space all other possible influencing variables would need to be equal (in a perfect comparison). As this is hardly possible one needs to rely on an environment which is assumed to be as close as possible to a static state. The reliance on the same entities of investigation (households) at different points in time is assumed to provide a more valuable assessment of consequences of urban sprawl than the involvement of different actors at the same time. There is more than one reason for this. First, in the literature there has not been a focus on such studies so far. Therefore, no clear understanding exists about what changes result if households move to the fringes from the inner city locations. This is when most changes to the households should become visible. Secondly, such an approach tries to distinguish between the move from a higher density location (as one characteristic among many of inner city locations) to a lower density location, such as suburban areas normally are, and the staying in suburban areas. If one understands sprawl as moving to more sparcely populated areas (as one characteristic among many), this would mean that the consequences should be visible when households move from a more to a less densely populated area.

If it holds true that urban sprawl leads to an increase in living space, the number of cars per household, and the commuting distance, a migration between suburban neighbourhoods should have no significant effect on these aspects. Or vice versa, only the households that moved from the inner to the outer urban locations should be characterised by an increase in car ownership, size of dwelling and distance to work. In contrast to the division of Inner Leipzig versus Outer Leipzig, which was explained earlier, the change of car ownership, distance to work and size of dwelling will be evaluated with respect to the former place of living.

3.3.6 Statistical tests

Beside the peculiarities of the data mentioned in the comparison of the questionnaires above, additional statistical analysis is necessary to test that the results are representative.

This includes firstly that all results to the frequency distribution for research questions 2 and 3 will be displayed with the statistical confidence interval (CI). The household sample in both case studies represent a categorial (nominal) sample in which a certain percentage of the whole population belongs to a certain category (e.g. the percentage of the population that say yes or no to a particular issue). According to the frequency distribution one gets percentages for the one or other category which cannot promise that the same distribution of percentages will appear if one draws a second sample out of the statistical population. Therefore standard errors should be provided along with the parameter estimates. An informative way to do so is the use of confidence intervals. Confidence intervals allow one to be more specific about plausible values of the parameter of interest than just reporting a single value (Mason, Gunst, and Hess 1989). They are intervals formed around the parameter estimate. It is described as

> "A 100(1-α)% confidence interval for a parameter θ consists of limits $L(\hat{\theta})$ and $U(\hat{\theta})$ that will bound the parameter with probability 1-α."
>
> Mason, Gunst and Hess (1989, p.246)

The statistical analysis in this work relies on a 95% confidence interval, which is commonly used in economic and social sciences (Bamberg and Baur 1996, p.161; Sachs 1992, p.179). A higher confidence, e.g. 99%, is more often used in surveys where the error probability α needs to be extremely low, such as in medical studies (Sachs 1992, p.179). The length of the interval provides a direct measure of the precision of the estimator. However, there is a contradiction between the precision of a statistical statement and the confidence: in cases where the precision is high the confidence interval is correspondingly wider.

Confidence intervals can be provided for different statistical distributions that are assumed to underly the statistical sample. The normal probability distribution is well-known and often used however it is not the most precise. Especially when the statistical sample is small the normal distribution might not be a good representation. The number of cases necessary to justify the reliance on a hypothesised normal probability distribution can be computed. According to equation 3.1 a normal distribution for the parameter n can be hypothesised for cases in which:

$$N\ p_\theta\ (1 - p_\theta) \geqslant 9 \tag{3.1}$$

after Sachs (1992, p.270)

N – statistical population,
p_θ – percentage distribution of the parameter investigated.

This holds valid in cases where confidence intervals are computed for the entire statistical populations used in this work, the number of returned questionnaires (N=194 in Leipzig, N=203 in Wirral) as well as some subgroups. It is not valid in the cases where conclusions are drawn from the sample of people who moved from the inner to the outer urban areas (N=25 in Leipzig, N=31 in Wirral). In those cases the confidence intervals need to be provided on the basis of a hypothesised binomial probability distribution, which has its peak not in the very middle of the sample if one plots it. The binomial distribution is assumed to be more precise than a normal probability distribution. The latter is an approximation of the binomial probability distribution and allows a simplification of many statistical problems (Sachs 1992). However, as it was not possible to justify the use of a normal probability distribution in all cases the binomial probability distribution has been used even in those where the size of the sample would have been sufficient. .

A binomial probability distribution does not assume an even spread of the data but has a higher gradient before and a lower gradient after its peak. The confidence intervals for a percentage distribution of a population parameter p_θ needs to be a range of a lower $L(\hat{\theta})$ and an upper $U(\hat{\theta})$ confidence limit which is assumed to embrace all figures of further samples θ_{+1} drawn.

$$\mathrm{CI}:\ \mathrm{L}\left(\hat{\theta}\right)\ \leqslant\ \theta\ \leqslant \mathrm{U}\left(\hat{\theta}\right) \tag{3.2}$$

after Sachs (1992, p.433)

The confidence intervals are displayed as follows:

$$\mathrm{CI}: \left[\mathrm{L}\left(\hat{\theta}\right) - \mathrm{U}\left(\hat{\theta}\right)\right] \tag{3.3}$$

The lower and upper boundaries of the confidence intervals for a binomial probability distribution are:

$$\mathrm{U}\left(\hat{\theta}\right) = \frac{(x+1)F}{N-x+(x+1)F} \text{ with } F_{[df_1=2(x+1),df_2=2(N-x)]} \tag{3.4}$$

$$\mathrm{L}\left(\hat{\theta}\right) = \frac{x}{x+(N-x+1)F} \text{ with } F_{[df_1=2(N-x+1),df_2=2x]} \tag{3.5}$$

after Sachs (1992, p.433)

with
N – statistical population,
x – number of occurrences of the parameter investigated,
F – F-value,
df – degrees of freedom.

Statistical programs compute the lower and upper limits of the confidence interval if the percentage distribution of the investigated parameter is given. This was done under the support of the statistical program R and the function binom.exact() in the package epitools in this work. The algorithm was developed by Clopper and Pearson (1934).

Because confidence intervals provide bounds on a population parameter, it is also the bounds that are random, not the parameter value. "The advantage of confidence intervals lies in the quantification of its imprecision" (Sachs 1992, p.180). Accordingly one can assume that if a large number of samples could be taken, 95% of them would be within the one interval one has computed. Confidence intervals can be interpreted in three ways:

- With 100(1-α)% confidence, the confidence interval includes the parameter.
- The procedures used (including the sampling technique) provide bounds that include the parameter with probability 1-α.
- In repeated sampling, the confidence limits will include the parameter 100(1-α)% of the time (Mason, Gunst, and Hess 1989, p.246).

The above described procedure only provides confidence intervals for a binomial data set, e.g. yes and no. In cases of a multinominal data distribution with more than two categories, the data set has to be converted into a binominal one. This is possible by using one parameter of interest and combining all other categories to a second category (as to be seen in DeGroot 1989, p.297). This depends on the structure of the questions in the questionnaire.

Shortcomings of confidence intervals are given especially with respect to the results which can lead to a false interpretation. First, the larger the confidence level, the higher the intervals. In turn, the lower the confidence the shorter the interval. The shorter intervals are more precise but they are also more uncertain. The next sample drawn would, with a higher probability, be outside the given interval. Second, confidence intervals do not reveal any information about the validity of the parameter. The parameter gained is not tested in terms of right or wrong. And thirdly, confidence intervals are therefore only one method or one approach to retrieve an interval estimation (Bamberg and Baur 1996, p.161; Sachs 1992, p.179). They do not reduce the need for additional statistical tests.

3.3.6.1 χ^2-test for independence in cross tables

In cases where cross-tabulation is used (crosstables show the relation between two variables in rows and columns grouped by a number of categories of each variable in the column and row) a χ^2-test can give a more precise indication of whether the variables in rows and columns are interrelated. This test applies either to a 2×2 matrix or to multiple matrices, as e.g. R×C matrices (see Table 3.8).

1. variable → **↓2. variable**	**Grouping category 1**	**Grouping category 2**	**-j-**	**-C-**	**Row sum**
1					
2					
-*i*-					
-*R*-					
Column sum					*N*

Table 3.8: Example for an R×C matrix. Source: Author's draft, after Sachs (1992, p.593).

The null hypothesis represents the statement that there is no relation between the variables in rows and columns. For tables with any number of rows and columns, a χ^2-test should be selected to calculate the Pearson χ^2 and the likelihood-ratio χ^2. It is based on the following approach:

$$\hat{x}^2 \;=\; N \left[\sum_{i=1}^{r} \sum_{j=1}^{c} \frac{N_{ij}^2}{N_i N_j} \;-\; 1 \right] \tag{3.6}$$

after Sachs (1992, p.593)

with:
N − statistical population
r − number of rows (all i)
c − number of columns (all j)
N_{ij} − parameter in the i^{th}-row and the j^{th}-column
N_i − sum of row i
N_j − sum of column j.

The χ^2-test on independence gives the output of an asymptotic significance. If the significance is low, normally lower than 0.05, it cannot be discounted that there might be some relationship between the two variables. Whereas the χ^2-test for independence can be used to a single data set with different categories in the statistical population there is also the possibility to test samples from two alternative populations. The null hypothesis of independence between the variables can be rejected if:

$$\hat{x}^2 \; > \; \hat{x}^2_{(df,0.05)} \tag{3.7}$$

after Sachs (1991, p.581)

with:
df – degrees of freedom.

It means that the computed $\hat{x}^2$ is compared to the $\hat{x}^2_{(df,0.05)}$, a figure which is provided in statistical books. *Df* stands for the degrees freedom and represents the number of columns minus one $(N-x-1)$ multiplied by the number of rows minus one $(k-1)$ in the k×2 table. This means if $\hat{x}^2$ is larger than $\hat{x}^2_{(df,0.05)}$ the variables tested are significantly related.

3.3.6.2 Analysis of two-way tables of the type k×2-type - contingency tables

The peculiarity of this test is that it can be applied to tables displaying two independent samples or variables but not the grouping variables of one parameter in the rows or columns. Therefore it is perfectly applicable to the frequencies of two independent case studies and their comparison. The row-sums and the column-sums do not need to be equal in both samples. This is important to test the data for research question 2. A k×2 matrix is shown in Table 3.9.

Variable → ↓ **Category**	**1**	**2**	**Row sum**
1			
2			
-*j*-	x_j	$N_j \; - \; x_j$	N_j
-*k*-			
Column sum	x	$N-x$	N

Table 3.9: Example for a k×2 matrix. Source: Author's draft, after Sachs (1992, p.593).

Pearson-χ^2-test on homogeneity can be used. To follow this approach the equation of Brandt and Snedecor is a valuable test for homogeneity between the two independent samples. It shows whether two samples of alternative data can be regarded as belonging to the same statistical which is provided in statistical books. *Df* stands for the degrees freedom and represents the number of columns minus one $(n-x-1)$ multiplied by the number of rows minus one $(k-1)$ in the k×2 table. population. The null hypothesis of homogeneity is that both samples are similar, because they are drawn from the same distribution. It states that all distributions from which the different samples are drawn are actually alike, homogenous.

This means that the share of parameter 1 is assumed to be equal in the population of k. In the sample of k this can be tested by x/n. If the null hypothesis cannot be rejected the matrix in Table 3.9 will show an approximately proportional distribution towards the row and column sums. This translates into the test whether the relative distribution of frequencies of j is similar to the frequency over all j classes. For a decision to reject or adopt the null hypothesis, the following approach is used:

$$\hat{x}^2 \;=\; \frac{N^2}{x(N-x)} \left[\sum_{j=1}^{k} \frac{x_j^2}{N_j} \;-\; \frac{x^2}{N} \right] \tag{3.8}$$

after Sachs (1991, p.581)

with:
N – statistical population,
x – total numbers of categories
N_j – sum of the frequency of the category j in column 1 (see Table 3.9).

The null hypothesis can be rejected if the

$$\hat{x}^2 \;>\; \hat{x}^2_{(df,0.05)} \tag{3.9}$$

after Sachs (1991, p.581)

with:
df – degrees of freedom.

Formula 3.9 can be used in confronting the computed $\hat{x}^2$ with a comparative figure of $\hat{x}^2_{(df,0.05)}$, a number provided in statistical books. If the computed $\hat{x}^2$ is larger than the given $\hat{x}^2_{(df,0.05)}$ the two statistical samples do not belong to the same statistical population.

3.4 Qualitative Attractivity Migration Model

3.4.1 Contextualisation of the QuAM-Model - Approach to answering research question 4

The qualitative model represents an important part of the investigation discussed in this work. The development of the model and the application of the modelling approach onto urban dynamics can be understood as one of the main efforts of the work and the analysis. It is the centre piece to deliver answers to research question 4:

Research Question 4: Planning / Governance oriented
What benefits can a modelling approach bring to the urban planning decisions with respect to the halt of urban sprawl in formerly industrialised regions, e.g. with reference to land use consumption?

Hypothesis:
It has been shown that the preferences for urban living might be blurred by subsidies and other planning decisions but also that urban sprawl is a social process and that the proponents of suburban living might be influenced by the behaviour of other people in the society or the neighbourhood. People who look for suburban living often do so for the reason of segregation, environmental qualities, and living space. Against this background a migration model that takes into account the preferences of the movers and the qualitative attractivity of the suburban areas in dependence of the presence of other movers should be able to supply important insights into the dynamics of residential migration. It is assumed that such a model can offer benefits for planning practise.

As noted above, a meeting of the two fields of planning and modelling is an attempt that goes back for more than 40 years (Couclelis 2005). During that time most emphasis was put on the integration of land use models into the planning practice. While it is assumed that during the early years, the modelling tools could not appropriately answer the questions planners really face, with the increasing sophistication of models and the application on other research issues than only land use it is worth considering a potential contribution of modelling to planning (Couclelis 2005). The improvement of tools, techniques and approaches are assumed to considerably ameliorate the application of modelling approaches in planning issues. To justify such a statement one would need to assess how models improved and what they can offer for planning today.

The tension between modelling and planning has many roots, e.g. the conflict between science (the model world) and policy (connected to planning). Planning has to integrate a lot of disciplines with problems often arising from issues in the purview of social sciences - but modelling often concentrates on single disciplines. Planning is about interpretation and values - models about information and facts. Problems especially stem from the need to consider an uncertain future - on the other hand, this point in particular represents a field where modelling could aid to planning matters with the consideration of the past

as a preparation for the future. It has been noted that nowadays planning has often lost sight of the future (Couclelis 2005) and some of its function as strategic, forward acting entity. One reason for it was described by the increasing trend of bottom-up, decentralised activities within the field of planning. Blame was also put on the quantitative methods that often dominate in modelling (Couclelis 2005). There are now new methods available which work on the basis of qualitative assessments instead of quantitative measures. They work in favour of social sciences and social based research approaches and allow for particular local circumstances that bottom-up approaches have to consider: one of these qualitative modelling approaches will be presented here.

Another main problem, and a reason for the continuing tension is the uncertainty connected to an evaluation of future developments. Generally, there is uncertainty in any decision one takes, as every effort (hence also planning effort) launches a unique, nonrepeatable experiment in place, time, and context, so that in general it is not possible to tell whether things would have been different, better or worse without it (Walker et al. 2003; van der Sluijs et al. 2005). It should not be forgotten that planning and modelling face the same uncertainties. However, of particular concern is the apparently paradoxical fact that models which are most often developed to make forecasts about (possible) future states of a system rely on historical data, processes and trends.

Nonetheless, it is a likely possibility that the future will be a prolongation of the past - in this case modelling could contribute significantly to planning decisions as it is able to draw future prospects from the present and historical situations. Modelling cannot hide from uncertainty but can narrow it down. As future always relies on the past (as it comes out of it) many elements of future urban systems can be assumed to be predetermined. It is not assumed that urban systems are chaotic. Couclelis (2005) sees scenario-writing as an important contribution by modelling to planning, certainly an aspect concerned about the future. By displaying a variety of options and their outcomes, modelling can contribute and improve uncertain future-oriented planning decisions.

To consider a fruitful co-operation of planning and modelling, one has to know the demands and possibilities of both. For planning that acts on a local to regional level certain peculiarities need to be considered. Meen and Meen (2003) name:

1. The interactions between agents on the local markets, which can be extremely strong.
2. Behaviour may be highly non-linear, e.g. with strong differences in house prices across a few streets.
3. Social segregation and social exclusion are the central theme (Meen and Meen 2003).

These are the minimum demands that models should be able to cope with if they are to be useful for planning design. Additionally they should be able to integrate policy issues, as the authors conclude (Meen and Meen 2003). Briefly, it will be refered to some of the historical developments in modelling. Points 1. to 3. will be addressed. This is important for a conceptualisation of the suggested qualitative modelling approach which will be described in detail later.

In order to account for the social interactions (see point 1.) in a neighbourhood social interaction models were developed which drew on complex biological systems (Rubner 1995;

Pahl-Wostl 1995; Wackerbauer 1995). This was reasoned by the observation that groups of people do not behave as single actors would do (collective versus individual behaviour; Rubner 1995), a fact proven in biological and social systems alike (Epstein 1999; Rubner 1995). However, social and economic systems have been found to be less comparable to biological dynamics in another respect. People include more psychological aspects into their interactions to other people and they can learn from past experience (Rubner 1995). A further and very important difference relates to the self-organisation of complex (biological) systems. Meen and Meen (2003) specify:

> "Complex systems are those with a very large number of interacting parts where the interactions are non-linear and the behaviour of the system as a whole cannot be understood simply from a consideration of the constituent element"
>
> Meen and Meen (2003, p.924)

It implies non-predictability and uncontrollability which is not necessarily the case in social and economic systems (Meen and Meen 2003). QuAM takes up this point in supposing specific interactions between the actors in a residential area, which respects a certain degree of predictability and relates to point 1. and 3.

Furthermore, as migration describes a dynamic process, the model should be able to reproduce these dynamics. The work on the representation of dynamics and the spatial distribution of actors in the urban space goes back to the 'checkerboard model of segregation' by Schelling (1971), which is a slim form of a cellular automaton (CA)[5]. The basic idea is that depending on the (e.g., racial) composition of an actor's neighbourhood they make the decision to stay or to move to another neighbourhood with a more appropriate composition (see 3.). In case of moving the composition of both the old and the new neighbourhood is changed, thereby directly influencing the appropriateness for other actors and generating possible new moves. Characteristic to this approach is the emphasis on the immediate feedback of locational decisions of moving actors on the decisions of others which generates an endogenous spatial dynamic (i.e. only controlled by the explicitly formulated decision rules)(see 3.). Because the model includes the functional relationships between actors in space, the spatial areas investigated with the model can be very small. This allows to respect point 2.

Another branch of modelling uses conceptual dynamic models which also follow the feedback paradigm and include non-economic relations between actors by quantifying these with plausible, albeit not further justified mathematical functions (Forrester 1969; Allen 1997). These conceptual models were the first that made it possible to investigate mathematically the influence of complex and differentiated relations between actors and places on the qualitative spatial dynamics of an urban region (concentration, homogenisation, differentiation etc.). But the non-economical relations have to be expressed by explicit quantitative formulations (mathematical functions), for example, social relations which are not actually known in quantitative terms.

[5]A kind of modelling where a number of actors or land use types are combined through complex rules of interaction aiming to produce e.g. the most appropriate neighbourhood structure for an actor, (Lüdeke and Reckien 2006)

But migration is possibly not only caused by considerations regarding the social composition of the neighbourhood. Economically oriented approaches to spatial dynamics close the feedback loop between the motivation to move and the influence of movements on the properties of locations via market mechanisms. The spatial dimension is introduced into the originally "space-less" economy via transport costs (Alonso 1964; von Thünen 1826). In these early theories the spatial concentration of economic activities due to increasing returns was postulated but not mathematically explained.

That is one of the main aspects where the qualitative attractivity models attempt to go one step further. On the one hand, it seems important to consider the results and include the gains of studies dealing with preferences and mechanisms of locational choice but, on the other hand, one needs to include feedbacks between actors as realised in cellular automata, spatially explicit economic models and conceptual models. They give important insights in the mechanisms generating urban dynamics. The important new mathematical concept of qualitative differential equations (QDEs) was first introduced by Kuipers (1994). Their main characteristic is the possibility to represent qualitative relations directly, i.e. without choosing one quantitative function arbitrarily. An interesting consequence is that the resulting dynamics differ from usual outcomes of quantitative dynamic models: they include different possible developments and are described rather in terms of trends and trend changes than in terms of explicit numbers. This is of particular interest when using urban models to predict possible future developments. Here the scenario-like outputs of QDEs seem much more appropriate than the exact and unique quantitative outcomes which have been identified as a significant drawback of traditional modelling (Couclelis 2005).

3.4.2 Basic structure and development of a QuAM-Model

The Qualitative Attractivity Migration Model (QuAM) introduced here is an appropriate tool as it can meet for the requirements stated above. Qualitative modelling seems an appropriate method to derive information about a possible future development when data is lacking. It is especially appropriate where the value of a certain variable is difficult to express in quantitative terms, e.g. 'proximity to natural landscape' or 'the aesthetic value of the landscape'. These aspects are relatively vague and their evaluation and parametrisation very difficult. Qualitative modelling is useful in aspects and processes commonly ascribed to social sciences where data might be insufficient, a clear definition of parameters and their quantification difficult. It is appropriate for a comparison of case studies on a more general level. In line with the argumentation of a behavioural approach to migration decisions the central entities of the model are actor classes, their locational preferences, and the impacts of their behaviour on the region and the people (see point 3. in the previous section, also see Figure 1.3 in the introduction; Wolpert 1965; Werlen 1988, 1995, 1997).

The approach mainly starts from the reason of migration as the basis of consideration, the attractivity of an area but proceeds in suggesting that migration implies a feedback onto the properties of a location. Attractivity of an urban region will be used here in an extended sense, closer to the migration decision: it comprises the usual locational properties as well as the affordability to move for the considered actor class. In this notation a region which does not offer affordable housing, for example, is not attractive for an actor class that has this preference independent of other advantages. An example for feedbacks is

given by the work of Weichhart (1983) who could show that the natural environment of a location is an important determinant of residential preferences - a spatial property which is certainly strongly influenced by in-migration. Issues of social or socio-economic segregation (point 3.) are also implemented via the feedback of migration onto the characteristics of the residential location. For example, if one assumes that the middle income households are highly interested in affordable housing it is hypothesised that an increase in well-off residents would decrease the attractivity of the location to them. This is an example of socio-economic segregation. Other interdependencies can be formulated with respect to household type, age structures etc. As all interaction in the QuAM-Model are translated into an attraction or rejection among actor classes the issues of segregation are a centrepiece of the approach. The reliance on actors and actor classes additionally enables the modelling of highly close, specific and spatially restricted neighbourhoods, as it was asked before (point 2. in the previous section).

The term 'actor' is used similar to the term 'agent' deriving from the multi-agent-systems-approaches (cf. Hare and Deadman 2004) referring to their heritage from agent-based simulation. Here actors are moving and non-moving entities in space. Moving actors contribute to sprawl by causing land consumption and land use change. In the case of residential actors the households are considered as single actors. This is the smallest unit in which decisions are taken to move home. Non-moving actors are physical features of the area, land use planning schemes, the political framework and other external influences impacting on the residents' decisions. They are included as indirect parameters of the locational attractivity translated as a direct feedback via an increase or decrease of the attractivity dimensions for an actor class, e.g. an extension of subsidies is felt as an increase in the financial attractivity if this issue is of concern for the actor class in question.

A model which describes the dynamics of intra-urban and in-migration of aggregated classes of actors seems to be appropriate to understand an important part of urban dynamics, as it was noted that people are assumed to behave in groups more than they do as individuals (Epstein 1999). Classes of actors (different kinds of residents in this case) are characterised by homogeneous ways of assessing the attractivity of different urban regions with respect to a decision to move there. In the model, the attractivity assessment of an actor class depends on three aspects:

a) the fixed characteristics of the respective region (orography, ...),

b) the presence of other actor classes (competition, synergies, homogeneity, etc.), and

c) policy influences (incentives, taxes, ...).

Actor classes migrate along attractivity gradients (from a region of lower to a region of higher attractivity). They reduce their population in the region they leave and increase it in the region they move. This migration may change the attractivities of both regions for all actor classes with respect to mechanism (b) and causes potentially further changes in migration fluxes. This means that the mechanisms cited in (b) will be endogenised into the formal model while (a) and (c) will be considered as exogenous. The proposed model deals with net migration of actor classes, i.e. some actors of the class may move in the other direction, the model describes the net fluxes under mean preference assumptions.

So far the main ideas of the proposed model are similar to established attractivity models in urban dynamics (e.g. Allen 1997) but it differs by applying a qualitative method of dynamic modelling. The main characteristics of formal qualitative modelling is that only the direction of the interactions between the actor classes (A influences B) and their nature (A dampens or reinforces B) are used as inputs for the calculations. The effect of a changing number of the population of actor class i in region j (P_{ij}) for the attractivity for actor k in the same region j (A_{kj}) will be characterised only by the direction of change (e.g.: 'the attractivity of an urban region for the elderly decreases with an increasing number of teenagers'). This makes it possible to consider interactions although they are not quantifiable. As a consequence of these qualitative statements, the resulting dynamics will not be characterised by quantitative rates of change (e.g. '500 families with children will move to suburbia during the next year') but by trend combinations and their changes (e.g. 'while the population of retired residents will continuously increase, the number of families with children will first increase and then decrease'), and by the succession of the changes and possible persistent development states from which no further changes are to be expected (provided that the stated interdependencies and external mechanisms do not change). Qualitative modelling produces possible and conceivable scenarios for the regions dependent on the actor class interdependencies.

A main limitation of the model is the magnitude of trends and the time scale of trend changes which are not possible or, at best, in a very restricted way. The model tells us what will happen, but not when.

Setting different interactions of actors (e.g. caused by external variables such as politics and planning that change the interactions of the actor classes) the externally changing political and planning framework can be evaluated. By judging the scenario results of the model e.g. in the light of sustainable development, policy and planning recommendations can be derived. In general there are two different ways to use the suggested model for policy advice:

1. Starting with general targets for urban development a model based analysis can result in the identification of specific mechanisms which have to be influenced. This is most comprehensible if the impact of a specific actor class is negatively dominating the attractivity of the area. The policy advice could then be formulated as a suggestion to either reduce the strong impact of the actor class, or the overall attractivity of the region to the actor class (therefore reducing and maybe reversing its population trend). Both possibilities can gain from information of the model.

2. The strategies proposed by planners, politicians, and urban experts to make urban development more sustainable can be evaluated on the basis of the model results. This is most effective if the suggested dynamics and their spatial implications in terms of actor class population trends can be judged against development goals.

The mathematical basis of the qualitative modelling approach is provided by "Qualitative Differential Equations (QDEs)". They were introduced by B. Kuipers (1994). The algorithm was developed at PIK. For the model structure see also Lüdeke, Reckien, and Petschel-Held 2004, or Lüdeke and Reckien 2006, and the explicit mathematical description in Annex 3. Two steps are necessary to define a Qualitative Attractivity Migration-Model:

1. An identification of relevant actor classes and their specific preferences in locational characteristics and

2. The feedbacks of the changing actor class populations onto the properties and the attractivity of the location, e.g. by a change of the social composition or a change in the locational properties.

The questionnaire survey can be used to gain information to the first point. The second has to be defined according to other investigations and secondary expert knowledge. It has to be understood as hypotheses. Both steps will be explained in more detail.

3.4.2.1 Clustering of actor classes

The forming of classes of actors is in two ways important to the study:

1. Any change in the urban system and the urban physical, structural dimension is produced by the collective behaviour of actors on the micro level. The city represents the aggregated action of its residents and any change is in turn feeding back on those. This implies that a change in city parameters only becomes visible from the combined actions of its people (see introduction, Figure 1.3).

2. It has been stated that people behave in groups more than they do as individuals (Epstein 1999).

Therefore a cluster algorithm was applied to the questionnaire results. The clusters should form along the equal statements to the preferences towards a location's characteristics as well as along the socio-economic features of the residents. By that clusters with shared preferences and attributes have been extracted (preference- and attribute-homogeneous). It backs up the assumption that people in those clusters are looking for similar residential locations and have a similar impact on the attributes of the location, by e.g. land use.

It was decided to take a cluster algorithm for binary datasets to express most clearly the preference towards or against an attractivity dimension. As the characteristics of a residential location, the attractivity dimensions, had to be ranked by the respondents from 1 to 5 (see Annex 1 and 2), the responses of the questionnaires were re-coded. The original rankings and the new codes are given in Table 3.10:

Coding in the Questionnaires	**Meaning**	**New Coding**	**Meaning**
1	Irrelevant to the choice of location	0	Not important to the choice of location
2	Of slight importance		
3	Fairly important		
4	Very important	1	Important to the choice of location
5	Crucial to the choice of location		

Table 3.10: Re-coding of the relevance of attractivity dimensions. Source: Author's draft.

For the binary code the former rankings 1, 2, and 3 are transformed to '0 - unimportant to the choice of location' and the formerly used rankings 4 and 5 are taken to express '1 - important to the choice of location'. This translates into a binary data set in which the number of people that rated a dimension highly important were most relevant.

The socio-economic information is already available as binary code. However for practical reasons, some adjustments were made. In the case of Leipzig, some of the socio-economic categories were subsumed into one group. This concerns those summarised in Table 3.11:

Category	Former code	Former label	New code	New label
Occupation	7	Person in military service	7	Trainee/student
	8	Trainee/student		
Household type	3	Family household with with one child	3	Family household with with child/children
	4	Family household with two or more children		

Table 3.11: Re-coding of the socio-economic information in the Leipzig questionnaire. Source: Author's draft.

The first merger is justified by the fact that nobody in military service responded. The second merge has to be understood against the background of the British questionnaire where only family households were extracted independent from the number of children. For the sake of comparison the codes 3 and 4 in the category 'household type' have been subsumed into one, so that also in the case of Leipzig a category 'family households with child/children' appear. In the end, there were 39 variables for the clustering of the sample of the Eastern Leipzig respondents: 15 attractivity dimensions and 24 socio-economic attributes. For Western Wirral 38 parameters were used: 14 attractivity dimensions and 24 socio-economic attributes. Table 3.12 lists the included parameters.

In Eastern Leipzig and Western Wirral all returned questionnaires that were completed correctly have been implemented. This results in a number of N=194 responses in Leipzig and a total of N=203 samples for the clustering of Wirral respondents. The actor classes of residents were formed independently in each of the case studies. They did not need to be the same size in Wirral/Liverpool and Leipzig. This ensures that the investigation stays as close as possible to the local particuliarities and the actual regional processes. Additional settings to the cluster algorithm include:

- The dataset in this analysis consists of binary variables. Therefore a cluster algorithm for binary datasets has to be applied. The choice of clustering method will determine the way in which the proximity (or similarity) between two clusters is measured. It is therefore the central parameter for a cluster method. Similarity and dissimilarity coefficients are common [6] [7]. Here, a similarity index p is applied. The so-called simple

[6] `http://www.clustan.com/proximity_analysis.html`, 02.05.2006
[7] `http://www.resample.com/xlminer/help/HClst/HClst_intro.htm`, 02.05.2006

	Parameters for Eastern Leipzig	Parameters for Western Wirral
Attractivity dimensions	Proximity to work	Being near to your place of work
	Proximity to shopping	Being near to food shopping places
	Proximity to leisure facilities	Being near to other shopping places
	Proximity to nature and landscape	Being near to leisure places
	Little environmental pollution	Being near to areas of countryside or the coast
	Good road network	Having good road connections
	Good public transport	Being near to a railway station
	Family friendly neighbourhood	Being in an area with good bus links
	Good schools/child-care facilities	Being in a low-crime neighbourhood
	Proximity to friends and family	Being in an area with good schools
	Quiet neighbourhood	Being near to friends or family
	Safe, low-crime neighbourhood	Being in a quiet neighbourhood
	Affordable building land	Being in an area of affordable housing
	Affordable rents	Being near to a park
	Appropriate offer and supply	
Attributes	One person household	Single adult living alone
	Two person household, no children	Elderly person living alone
	Family household with child/children	Adult couple
	Single parent with children	Adult couple with child/children
	Community household	Single adult with child/children
	Worker	Two or more adults sharing (with no children)
	Skilled worker	Other
	Junior employee	Professional or managerial position
	Senior employee	Administrative or clerical work
	Executive employee/manager	Skilled non-manual work
	Self-employed/freelancer	Skilled manual work
	Trainee/student	Semi-skilled work
	Pensioner	Unskilled work
	Job-seeking/not in employment	Not in employment
	Up to 34 years old	Up to 34
	35-59 years old	35-59
	Older than 60 years	60(+)
	Less than 20 minutes	Less than 20mins
	Between 21 and 40 minutes	21-40mins
	Between 41 and 60 minutes	41-60mins
	Above one hour	1hr+
	No car	No cars
	One car	1 car
	Two and more cars	2 or more cars

Table 3.12: Parameters for the cluster analysis. Source: Author's draft.

proximity measure counts the differences between two data points in a case (0-0=0;1-1=0; 0-1=-1; 1-0=1). From this, the absolute values are summed up across all the data points. The distance between two clusters is defined as the average of distances between all pairs of objects, where each pair is made up of one object from each other. This is called the average linkage clustering. In the average linkage method, the distance $D(r, s)$ is computed as

$$D(r, s) = T_{rs}/(N_r \cdot N_s) \tag{3.10}$$

with:
T_{rs} – the sum of all pairwise distances between cluster r and cluster s,
N_r, N_s – the sizes of the clusters,
r, s – the clusters, respectively.

At each stage of the clustering, the clusters $r$and s, for which $D(r, s)$ is the minimum, are merged. With this method, groups once formed are represented by their mean values for each variable, that is, their mean vector. The inter-group distance is now defined in terms of distance between two such mean vectors. Those two clusters are merged such that the newly formed cluster, on average, will have minimum pairwise distances between the points in it.

- The similarity index p was set to 0.87 in Western Wirral and 0.8 in Eastern Leipzig (p ranges from '0'=no matching to '1'=totally alike). It was the highest possible value that still formed sound actor classes and is different in dependence on the regional situation. This means that the clusters formed for Western Wirral are more consistent then those for Eastern Leipzig. In the context of the results there will be more explained about the significance of the values of p.

- The cluster algorithm is based on a hierarchical technique of clustering for binary data codes. Additionally a Monte-Carlo Method and an Exchange Method were tested to check the consistency of the results. In hierarchical clustering the data is not partitioned into particular clusters in a single step. Instead, a series of partitions take place, which may run from a single cluster containing all objects to n clusters each containing a single object. Small differences have been revealed between the methods, though the overall characteristic of the results (number of clusters, distribution of attributes and preferences among actor classes) are very similar. In the end, the algorithm based on a hierarchical method was chosen because it gave the most consistent results.

- The amount of clusters was decided for 5. Several test runs with a number of 3, 4, 5 and 6 actor classes preceded this decision. The increase of cluster numbers up to 5 improved the results remarkably. However, a further increase to 6 clusters could only yield a small quality gain in both case studies.

- The cluster seed was selected randomly. This is to allow for an adequate mixing of actors and different results of test runs in order to find the most appropriate cluster compositions.

- Furthermore a weighting between attractivity dimensions and the attributes of the respondents is possible with the algorithm. This is represented by the variable α which is set to alpha=20 in both case studies. Alpha=0 stand for a perfect consideration of the attractivity dimension whereas alpha>0 includes the attributes of the respondents into the formation of the clusters. Alpha can reach up to 100.

The cluster algorithm is attached in the Annexes 4 – 5. Since both the attractivity dimensions and the attributes of the movers are included in the clustering, it is possible to form attribute and impact consistent clusters. This is necessary for the assumptions of interdependencies between actors and the impacts on attractivities. The clusters are used in two ways:

- First, the actor classes are formed and

- Second, also the locational preferences of each class can be elicited.

For more clearly visible results the stated importance of the locational preferences was divided by a grouping of 0-30-60-100%: this stands for a respective percentage of actors who named a respective attractivity dimension important in the decision to move. The frequency of respondance will later be visualised with colours: dark grey stands for a clear importance named by 60% or more of the sample in each actor class, light grey marks a less clear result in which 30-59% of the respondents in the respective actor class named the parameter important and white cells indicate that this attractivity dimension or attribute was named by less than 30% of the respondents in the respective actor class. This three-tailored division is assumed to represent an appropriate overview of the issues that are very important, still important and not very important. A 0-30-60-100 division is often used in quantitative research where thresholds have to be set on a scale of 1 or any order of magnitude (e.g. see Massey and Denton 1988; Cutler, Glaeser, and Vigdor 1999, to investigations about the extent of segregation using 0-30-60-100-tailored indices of dissimilarity as a potential measure of segregation; and Meen and Meen 2003 as an overview). Such a division brings additional the advantage that it yields information about the consistency of the preference structure of each of the actor classes. The actor classes with a lot of preferences indicated by a frequency between 30-59% of respondents have to be assumed least consistent while those actor classes with a preference structure of many dark grey and many white cells are very consistent.

Following as a next step, the mutual influences between the actor classes have to be formulated but only for the dimensions of significant importance.

3.4.2.2 Feedbacks of the actor class populations on the attractivity - Influences between actor classes

In a next step the interactions between the actor classes will be extracted. They are of great importance to the chosen methodology. Each of the dimensions of attractivity named by an interviewee has to be assessed regarding its vulnerability to change dependent on the change of the actor class populations: how do the dimensions of attractivity change in qualitative terms when the populations of actor classes change?

The interdependencies of actor class populations, the actor classes, their attractivity dimension and the influence of the attractivity by the actor populations, can best be mirrored in a matrix structure. The attractivity matrices mirror the different actor classes P_i in columns and their respective preferences in attractivity dimensions A_i in rows (Table 3.13). The influences are represented by '+' = positive/mutually reinforcing, '-' = negative/conversely reinforcing and '0' = no influence. This means that, e.g. in the case of the displayed '-' in Table 3.13, an increase in the population figures of P_1 (column) will decrease the attractivity A_1 (row) for the same actor class.

	P_I	P_{II}	P_{III}	P_{IV}	P_V
A_1	-	0	+		
A_2					
A_3					
A_4					
A_5					

Table 3.13: Example for the display of interdependencies of actors = Attractivity matrix. Source: Author's draft.

In both case studies the questionnaire was not able to reveal such information about interdependencies. It had to be derived from expert knowledge and secondary data. Despite these difficulties, a reflection on the interactions between actor classes seems very important to get a closer insight into the residential dynamics of the region. The interactions have much to do with the actual situation in the case studies. Therefore the assumptions that underlie a reasoning of the mutual influences will be explained in the next section while presenting the results. It is regarded as an outcome of the analysis.

Such a matrix structure is sufficient for the input to the qualitative model. The output is given as qualitative scenarios picturing trends, trend changes and their succession.

3.4.3 Qualitative Scenarios

The graphical output of the modelling result can look as shown in Figure 3.7.

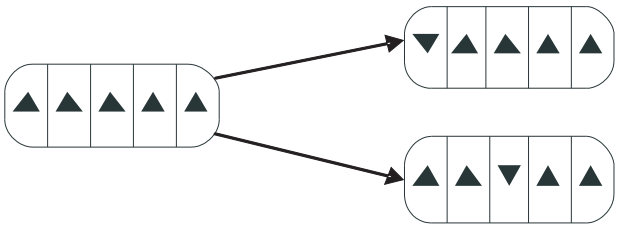


Figure 3.7: Example for the graphical representation of the model result. Source: Author's draft.

The ellipses represent qualitative states. The arrows in between two ellipses indicate that the development can proceed along this line from the one to the next state. A development

between ellipses which are not connected through an arrow cannot occur according to the formulated dynamics of the attractivity matrix. A pictured change-over from one state to the next is always accompanied by a trend change of exactly one actor class. The columns in the ellipses are reserved for the five actor classes as formulated in 3.13, from the left-P_I to the right-P_V. The icons in the columns show the respective trend, e.g.

▼ - decreasing population,
▲ - increasing population,
⧫ - unclear trend, increasing or decreasing population.

With the aid of the pictograms an evaluation of the succession of the actor class populations, their trends and trend changes can lead to an assessment of desirable urban developments and the possibilities to steer these. Comprehensive model outputs reveal the relevant stages in the systems' development from which a desired development state or a desired stable state can no longer be attained. These decisive development stages act as leverage points for the urban system. An analysis of these can reveal information for planning support.

Chapter 4

Results

4.1 Past and recent intra-regional population development in the case study regions

Before presenting the results in detail, an overview will be given to the general population and economic trends in the case study cities, both historically and in recent times. This is intended to provide a better foundation for the comparison of case studies later. It will enable a consideration of the developments in the case regions within the wider regional or national context. A closer look is taken at the intra-regional migration in the two case studies, e.g. the process of suburbanisation. Additionally the first results of the questionnaire survey are presented giving the socio-economic attributes and living conditions of the respondents.

4.1.1 Leipzig

Leipzig developed as a market town, a place for fairs and exhibitions.

Founded in medieval times at the crossing of important trade routes, it was given trade-fair privilege in 1497 (Oswalt 2005, p. 628). With an extension of the privilege to a wider area in 1507, Leipzig was given the title for market fairs in a radius of 112 km (Berger 2005). It is a proof of Leipzig's advantageous location in Europe and Germany at that time. A good location for trading in historical times does not need to account for an advantageous location in present times, as has been witnessed during GDR times. However, the re-unification of Germany and the European Union's opening to the East increased the locational advantages of Leipzig - very much in contrast to that one of Wirral/Liverpool.

Industrialisation started in Leipzig around 1840 with light industry and mechanical engineering. The construction of the new railway system across wide areas of Europe in the 19th century improved Leipzig's spatial impact and boosted the industrialisation that had just begun. Numerous unions and other political organisations for workers were established until the end of the 19th century (Oswalt 2005, p.628). Leipzig's appearance is marked by industrialisation: the fair developed from a market place for goods to a trade fair and spread over a bigger area in the city, the urban population increased rapidly from 1870 onwards and new workers' tennement housing (gründerzeitliche Blockrandbebauung) was erected in inner city quarters.

In about 1933 Leipzig reached its historical peak in population of 713470 people (official figure by the Stadt Leipzig 2004). As a result of the world economic crises following the Great Crash in 1929 the trade fair lost a third of its exhibitors and visitors. A decrease in industrial production follows, unemployment rose to about 40% in the following years (Oswalt 2005) and Leipzig decreased in population from that point on (despite several extensions of the city area until the current date)(Stadt Leipzig 2004a; Oswalt 2005, p.628-629).

In the early years of the GDR the industrial basis of Leipzig was fortified with allocations of plants from the coal, energy and chemical industries. Due to the importance of lignite in the south of Leipzig mining and refinement industries were especially prominent (Artmann 2000). 1.6 sqkm of the present city area was allocated to open cast mining. Population resettlement became necessary and affected communities, e.g. Hartmannsdorf in the south-west of Leipzig (Haase and Magnucki 2005). In the 1970s additional branches were allocated to the region, such as the metal industry, engineering and the car industry as well as electronics. In the 1980s more than half of the population was employed in industry and manufacturing. Leipzig was the only big city in the GDR that lost population since about 1930 (see also Nuissl and Rink 2005) although the GDR government invested substantially in the industrial and economic performance of Leipzig, controlled the population distribution and regulated the migration flows with the aim to plan for a prosperous industrial city.

A suburbanisation in the form of an individual's decision to move to the suburban fringe as found in many western cities after the WW II did not exist during socialist times in Leipzig. However, although the political system in the GDR controlled the free movement of people there was a tendency towards more single and double family houses on the urban fringe of Leipzig after 1945. According to calculations by Lüdeke, Rommeney and Boschütz (unpublished material) on the basis of data from Haase[1] (UFZ Leipzig/Halle) (Haase and Magnucki 2005) the land area dedicated to single/double family houses amounted to about 2.6% in 1940 and 7.1% in 1985. The area for this land use type increased by 4.5%, therefore more than doubled from 1940 to 1985 (cf. Figures 4.1 and 4.2)[2].

In the maps, the category displaying the detached and semi-detached family houses is represented by the very orange colour. One can see that the area for this kind of housing increased very much between 1940 and 1985 which seems incomprehensible at first sight as one would expect no change or a decrease against the background of a very restricted and controlled housing market. Such a development is especially interesting against the light of the life cycle theory of urban areas, which was not found realistic in Southern European cities. With this in mind it is most interesting to look at the population re-distribution within Leipzig during GDR times.

Leipzig was planned for a prospering industrial city during GDR times - it could not maintain this status after the political change. In 1989, the economy in the eastern part of Germany collapsed and mass unemployment was the result. Little has been invested in the modernisations of industrial plants during the GDR times, and adjustments to the changing economic demands were not pursued. Consequently, the plants were even less competitive

[1] In gratitude for the use of the data: Dr. Dagmar Hasse, UFZ Leipzig/Halle, email: dagmar.haase@ufz.de, Matthias Lüdeke, PIK, email: luedeke@pik-potsdam.de

[2] See the full set of land use maps developed by Haase and Magnucki covering 1870 - 2003 in Annex 6.

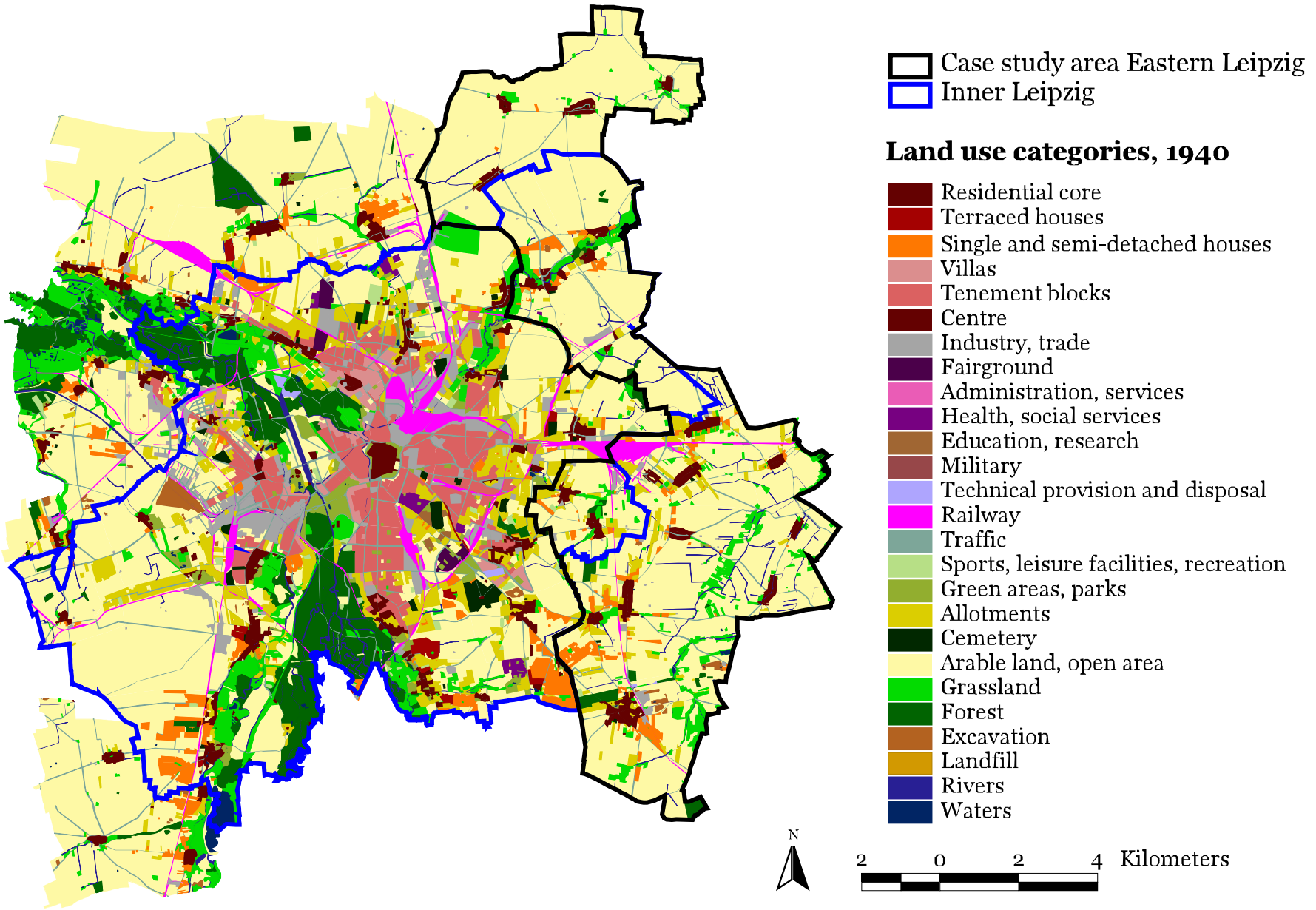


Figure 4.1: Land use of Leipzig in 1940. Source: Magnucki and Haase (2005, p.12-14).

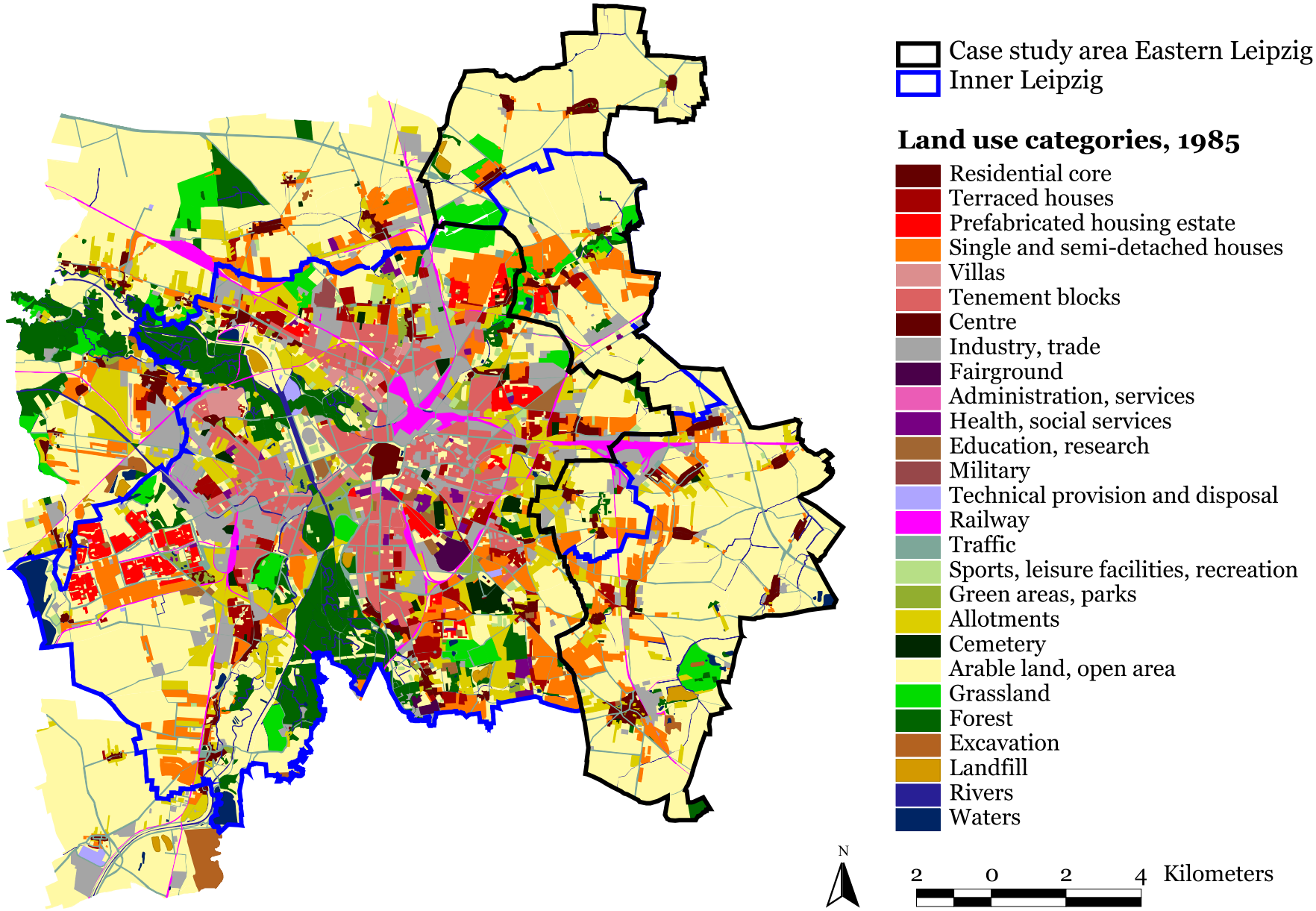


Figure 4.2: Land use of Leipzig in 1985. Source: Magnucki and Haase (2005, p.12-14).

on the open international markets that Leipzig had to face since 1989. Leipzig's economic performance almost vanished within a period of a few years. Between 1989 and 2003 a decrease in industrial jobs by more than 90% (1989: 101000 to less than 10000 in 2005) are documented (Nuissl and Rink 2005); as an illustration see Figure 4.3.

Figure 4.3: Abandoned industrial plant near Leipzig - Malzfabrik Schkeuditz; Source: Author, May 2005.

A strong decrease in employment reported as a consequence of the de-industrialisation after the political change is visible in the map in Annex 30 for the whole of Eastern Germany. Leipzig lost between 0 to 7.5% of employment in the city between 1997 and 2003, the surrounding region up to 15.0%. The unemployment rate is especially high in eastern Germany as compared to the national average. Leipzig and the surrounding region show an unemployment rate of 20% and more - not a singularity in eastern Germany but a percentage which is not reached in any west-German region (BBR 2005, p.154).

In an ensemble of two trends a "dispensing with industrialisation"[3] (Rink 2004, p.634) resulted in an extreme decline of population: first, the drop in the birth rate and second, the migration, either to western Germany, where jobs were available, or to the urban surroundings. In a more recent comparison of the German communities Leipzig does not stand as a solitaire and performs as seen in Figure 4.4. Many communities in Eastern Germany are characterised by a population loss.

In terms of migration, half of the population loss can be accounted for by the migration to the West, whereas the other half is attributed to suburbanisation (Nuissl and Rink 2005). Figure 4.5 mirrors the population development of Leipzig during the 1990s.

[3]The term was suggested as a contrast to de-industrialisation which relates to a structural change away from manufacturing to the service economy. This is not necessarily the case in the post-socialist countries, and Rink (2004) proposes to speak of a "dispensing with industrialisation".

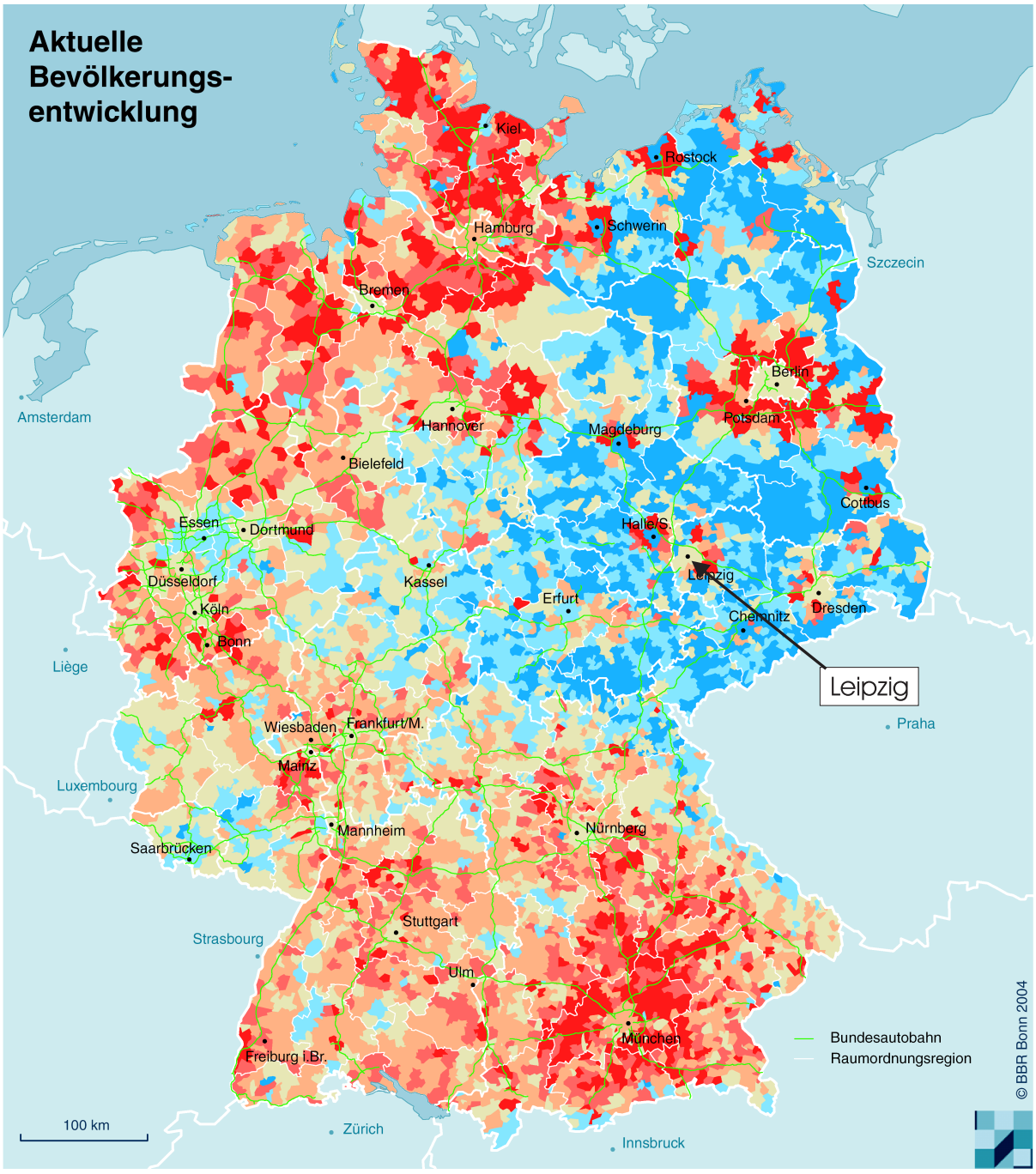


Figure 4.4: Population development in Germany between 1997-2003. Source: BBR (2005, p.31.).

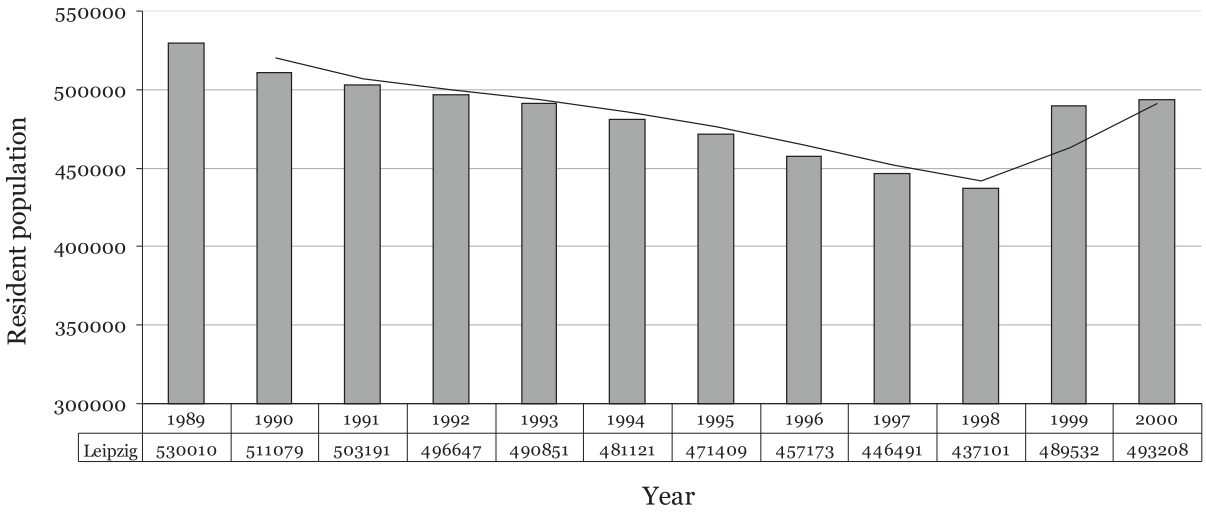


Figure 4.5: Population development in Leipzig since 1989. Source: Author's draft. Data: Amt für Statistik und Wahlen Leipzig. Note: The line indicates the trend (average of two periods).

There was a drop in the population from 1989 until 1998. To the beginning of 1999 one can see the effect brought about by incorporations.

As another consequence of the political change, the legal framework for city planning changed completely. A restructuring of authorities and other institutions is time intensive so that in the early years of the transformation an effective planning body was missing. To attract investments from western Germany or other parts of Europe large infrastructure projects were started immediately after the change, mostly with the aid of transfers from western Germany. Leipzig, with its history as a crossing at trade routes concentrated on the amelioration of the transport infrastructure, e.g. the construction of motorways (another route is currently planned to the south of Leipzig) and the improvement of the airport and the huge cargo transport centre in the north of the city (Artmann 2000). The legal peculiarities in combination with an interest for development led to three phases of suburbanisation throughout the 1990s (Nuissl and Rink 2005, 2004; Artmann 2000):

1. The first phase, 1990 to 1992, is characterised by a predominant commercial development of industry and businesses on greenfield sites. Mainly investors from western Germany attempted to establish a foothold in the promising, under-developed market, and established shopping malls and business centres on the urban fringes. New developments took place on the outskirts whereas the inner city felt further into decay.

2. The extensive construction of housing estates represents a second phase. It started in 1992 and went on until the end of the decade. Again, mainly west-German investors wanted to take part in the lucrative development as the population was eager for higher standard flats. Almost 80% of dwellings in Leipzig were evaluated in need of urgent refurbishment in the end of 1989 (Nuissl and Rink 2005). In this period mainly two to

Figure 4.6: Suburban apartment blocks, city district: Leipzig-Heiterblick (left). Suburban apartment blocks, city district: Leipzig-Baalsdorf (right). Source: Author, May 2005.

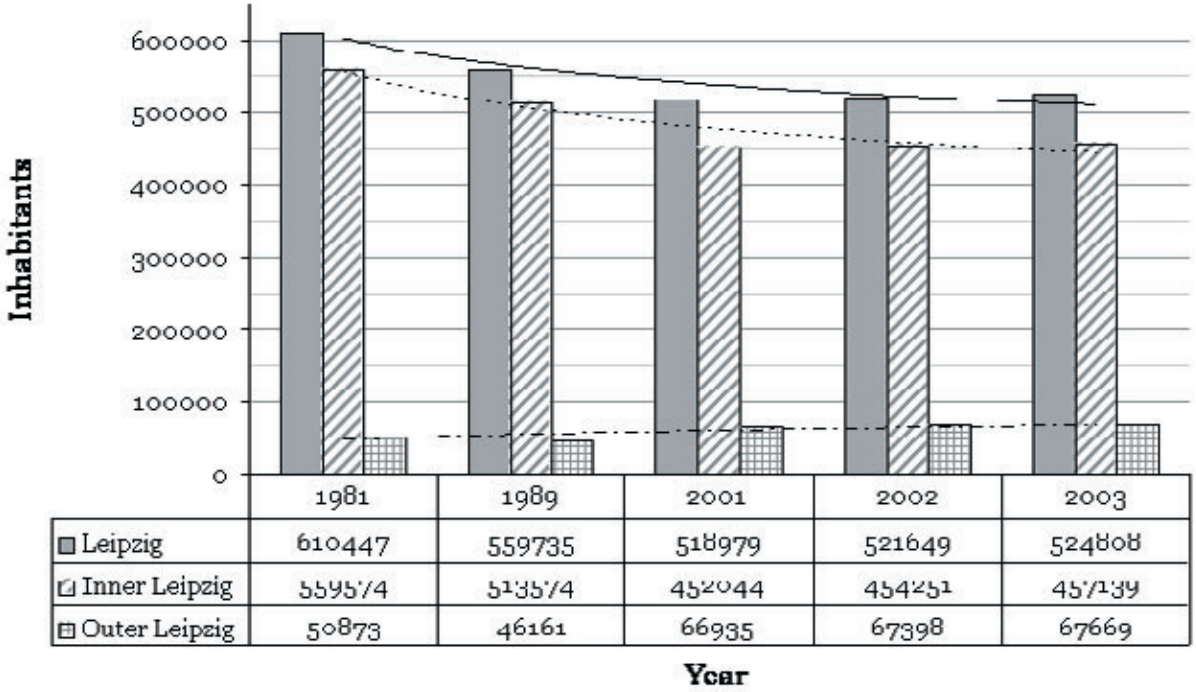
four storey apartment blocks were built in the suburban zone of Leipzig. The pictures show two examples (Figure 4.6). During both phases there was a lack of investment space in the inner city and respective high prices for the available ones. Restitution claims, bad shape of inner city flats and high renovation costs, but especially the tax incentives (depreciation possibilities) for new buildings shifted the development to the fringes. This increased the division between the more prosperous suburbs and the decaying inner city in terms of both, the building stock and the resident population (Doehler and Rink 1996).

3. After 1996, when the suburbanisation in multi-storey apartment blocks peaked (Herfert and Röhl 2001) the face of suburban migration changed. The construction of apartment blocks decreased substantially in the following years and then the construction of single or double family houses became predominant. A strong effect emanates from the abolishment of incentives for the construction of new dwellings in comparison to the refurbishment of the old housing stock. Related is the increasing regeneration of the inner city of Leipzig and the connected modernisation of the inner city housing stock (Nuissl and Rink 2005). Another contribution is seen in the kind of developments at the urban fringes of Leipzig which are rather densely built as an answer to the widespread desire for better standards. Aspiration of a green surrounding were either low in the beginning or too late paid attention to. Figure 4.7 documents these issues. As a consequence, suburbanites are increasingly discontent with their surrounding. This results in some parts of suburbia losing population and others gaining (Herfert 2002; Nuissl and Rink 2005). Leipzig is very fragmented in terms of population dynamics (Herfert 2002, 2003; Herfert and Röhl 2001; Nuissl and Rink 2005).

At the beginning of the new millennium, the migration between the inner and the outer urban areas had roughly levelled out (Nuissl and Rink 2005; Herfert 2005 - personal communication). This was mainly caused by the incorporations of neighbouring communes into the administrational area of Leipzig - the population increase in Figure 4.5 corresponds to the incorporations over these years. In 1999, Leipzig's population increased remarkably and since then has maintained a slightly positive trend.

Figure 4.7: Suburban single family houses, city district: Leipzig-Engelsdorf (left). Suburban semi-detached houses, district: Leipzig-Heiterblick (right). Source: Author, May 2005.

Within the last 25 years, the population of the Inner and Outer Leipzig parts show a trend as visible in Figure 4.8: during the course of the last 3 censuses the population of Leipzig declined until 2001 but it increased in the suburban parts since 1989.



	1981	1989	2001	2002	2003
Leipzig	610447	559735	518979	521649	524808
Inner Leipzig	559574	513574	452044	454251	457139
Outer Leipzig	50873	46161	66935	67398	67669

Figure 4.8: Population development in Leipzig since 1981. Source: Author's Draft; Data: Statistisches Landesamt, Amt für Statistik und Wahlen Leipzig. Note: All categories displayed refer to the same spatial area with basis in 2001 but belonged to different communities over the time investigated, e.g. Leipzig refers to the city area plus surrounding communities before 2001 and since then to the entire city area as incorporations increased it. The (dashed) lines indicate the trend (average of two periods).

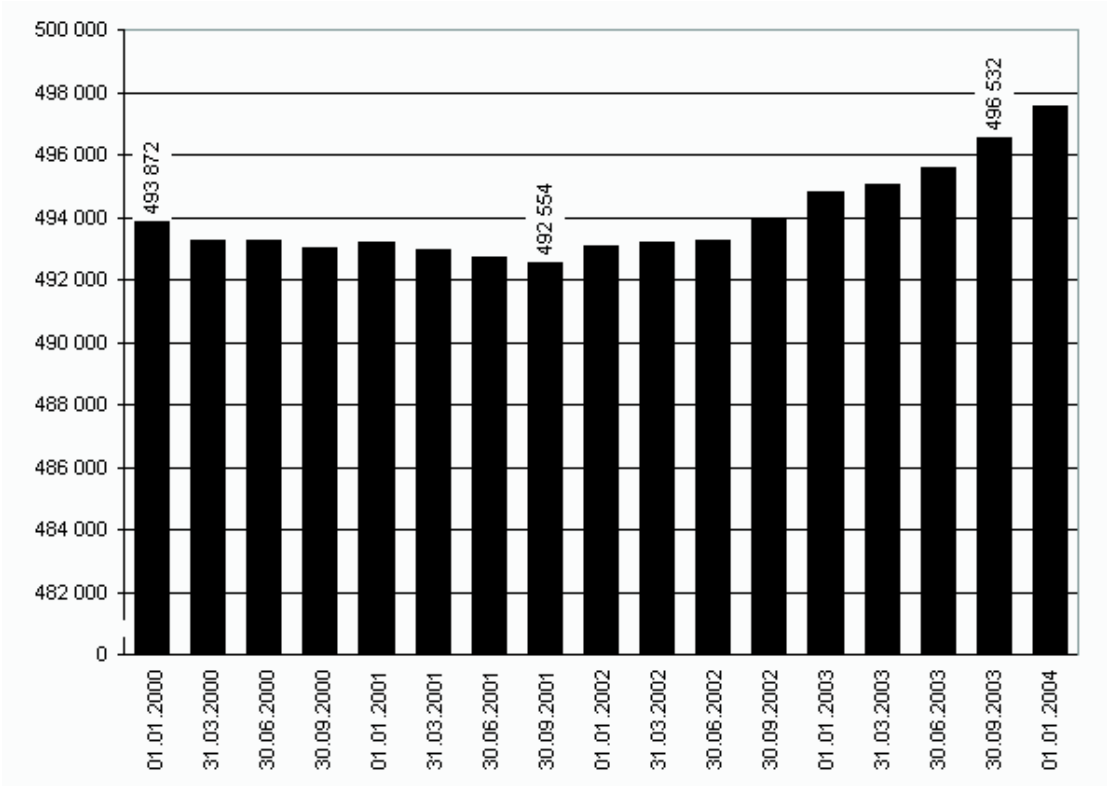


Figure 4.9: Population development in Leipzig since 2000. Source: Amt für Statistik und Wahlen Leipzig, Data: Statistisches Landesamt Sachsen.

The period of closer investigation by the questionnaire survey refers to the beginning of 2000 to the end of 2004. The population development for the respective years shown as the quarterly trend series is given in Figure 4.9.

During this period no incorporations took place. Therefore the data is perfectly comparable with regard to the area covered in those years. If one looks at re-urbanisation versus suburbanisation trends however, one has to allow for the intra-regional distribution of residents in Leipzig. According to other authors (Nuissl and Rink 2005; Herfert - personal communication, 27.05.2005) sprawl and suburbanisation has almost ceased in recent years. This will be tested later in this chapter.

4.1.2 Wirral/Liverpool

Liverpool and the neighbouring district of Wirral also developed as a region for trade. The two regions build the adjacent metropolitan districts at both sides of the river Mersey at the Irish sea (cf. Figure 4.10). Because of that in Liverpool and Wirral the harbour industry was predominant (see Figure 4.11).

Figure 4.10: "Sealine" of Liverpool (left) and Birkenhead (right). Source: Author, August 2005.

The first goods to be shipped were cotton, sugar, slaves and paper (Grant 2004). But trade and industry began to flourish when the first steamship line from Liverpool to New York started in 1848 (Oswalt 2005, p.405). From this harbour Irish and East-European Jewish migrants were carried - in all about 9 million by 1930 and most of them to the United States of America. But also cotton fabrics which were produced in Lancashire (north and north-west of Liverpool) made up to a substantial part of the shipping load. By the middle of the 19th century, 45% of the British trade revenues and over 80% of all cotton imports were handled in Liverpool (Oswalt 2005). The large shipping centre had a strong lobby of traders for imperialistic politics, but also trade unions developed to powerful organisations for the workers.

However, as early as a few years after the First World War (WWI) the export volume in the harbour decreased. One of its most important trade destination, India, decided on a boycott of British goods as a means of passive resistance to the colonial rule. The trade routes were interrupted through the WWI and never again reached pre-war levels. The world economic depression accelerated the decline of the cotton industry in the region of Lancashire and with it Liverpool's importance as a trading city (Parkinson 1992). As a result already in 1929 nearly 44% of the Liverpool residents live on or under the poverty level (Oswalt 2005).

To broaden the economic basis, the government tried to establish new industries in the area in the 1940s, such as airplane and engine factories (Parkinson 1992). The effect was minimal, especially with relation to the long-term development and an envisaged economic revitalisation. Further redundancies were brought to the ports after the WWII when 'the container revolution' brought higher efficiency. In the 1960s, the government tried to attract business to the region by subsidy programmes and succeeded with the automobile industry

Figure 4.11: Harbour view through Water Street in Liverpool (left), Harbour view from the Liverpool Cathedral over the Mersey into the Wirral (right). Source: Author, August 2005.

(Parkinson 1992). However, the first success faded when those firms soon located in cheap labour countries (Oswalt 2004) which became possible by the increase of internationalisation of the economy. According to a general classification of all districts in England by the ONS the region of wider Liverpool is still classified as a 'Mining and Industrial Area' (Rees, Durham, and Kupiszewski 1996). It is based on the 1991 census and compares to 5 other categories which are described as 'Urban Areas', 'Rural Areas', 'Maturer Areas', 'Prospering Areas' and 'Inner London' (see Annex 15). Despite the classification as industrial and mining region, the de-industrialisation continues. Liverpool has lost over 50% of its manufacturing employment since the 1960s (Couch 2003). As a result of the strong de-industrialisation and the little success to attract new businesses the unemployment rate is still comparably high in the region. The figure in Annex 19 shows that this is however comparable to the situation in other industrial and mining regions in England and Wales.

The 2001 census reveals an unemployment rate of 4.3% of all economically active people[4] in Wirral. This compares with an unemployment rate of 6.0% of all economically active people in Liverpool. In contrast, the employment figures show that, of the people in Wirral who were of working age[5] the employment rate was 76% during June-August 2004 (ONS

[4]Specified as people aged 16-74.

[5]This refers to people aged between 16 to 64 for men or 16 to 59 for women.

2005[6]), compared to 59% in Liverpool and 75% for Great Britain. Over the same three months in 1999, the number of people in employment as a proportion of those of working age was 65% in Wirral, compared with 64% for Liverpool and 75% for Great Britain. This development indicates that recently the availability of jobs in Wirral is rising whereas it is still decreasing in Liverpool. This could mean that employment in general is decentralising on the intra-regional level. Furthermore and according to the 2001 Census, of the people in Wirral who were unemployed, 21% were aged 50 and over, 10% had never worked and 36% were long-term unemployed. This compares with Liverpool, where 15% were aged 50 and over, 17% had never worked and 40% were long-term unemployed and with England and Wales as a whole, where 19% of unemployed people were aged 50 or over, 9% had never worked and 30% were long-term unemployed.

Liverpool's 'problem' was the strong dependence on the port. Outside the port industry hardly any qualified jobs were available. Low-qualified, unskilled jobs and low-paid work attracted workers from the outlying areas, but Liverpool lacked sufficient human resources in the form of skilled and qualified workers and employee's jobs (Parkinson 1992) (cf. Figure 4.12 as impression).

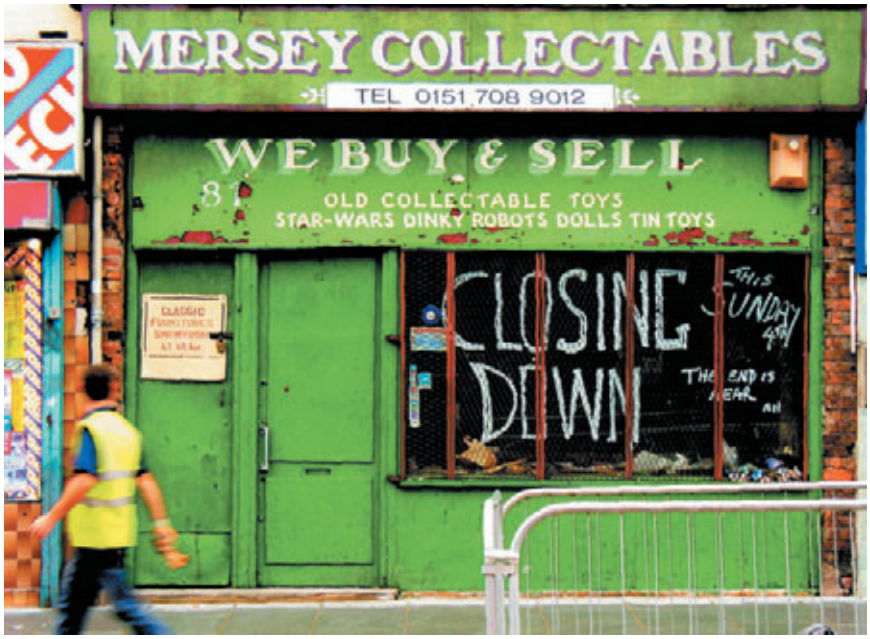


Figure 4.12: Inner city appearance in Liverpool - Renshaw street. Source: Author, August 2005.

Another reason given for the decline of its economic performance is the location: Liverpool found itself on the 'wrong' side of the continent after World War II. England joined the European Union in 1973, trade affairs were strengthened with the Continent and overseas connections decreased. Additionally, the port had highest influence from multinational, big firms and not locally bound employers. They rationalise easily without taking into consideration the local social consequences (Parkinson 1992). Since the 1950s, the Merseyside region has had the highest unemployment figures of all English agglomerations (Parkinson

[6] `http://neighbourhood.statistics.gov.uk/dissemination/AreaProfile2.do?tab=5`, 21.04.2006

1992). However, their workers were proud of what has been achieved in the past: the wealth of the country, industrialisation, unions (Grant 2004). This character resulted in an attitude of resistance and sometimes opposition[7]. This is a similarity to Leipzig, where the same attitude is reported from authors in the region (Herson 2001; Heinker 2004).

As a result of the economic crises, the population of Liverpool has decreased since 1931 (Oswalt 2005, p.404f.). With it the decrease in population started at about the same time as in Leipzig which might be an indication that the depression following the Great Crash is responsible for the economic and population development in both cities since that time. Liverpool reached a population peak of 857247 inhabitants in 1931 (Oswalt 2005, p.406).

After WWII, the economies of most of the countries in Europe experienced a boom, so also in Britain and Liverpool (Couch 2003). This (short-lived) boom not only brought possibilities of decentralisation for the economy but also for the population. As a result from income advances, the residents moved to the urban periphery and urban sprawl increasingly spread over the region. From the end of the 1950s, through the 1960s to the early 1970s suburbanisation was most intense (Richard Lewis, Wirral Borough Council/Forward Planning Manager - personal communication, 2nd September 2005; Couch 2003). The private sector was allowed to built large amounts of new owner occupied housing on greenfield sites at increasing distances from the urban centres (Couch 1990). A remarkable difference to the situation in post-socialist Leipzig is the pace of change. In Liverpool and Wirral suburbanisation developed more slowly in combination with the general decentralisation trend after the Second World War.

Social tensions, such as the problems between immigrant and indigenous populations, crime and unemployment further exacerbated sprawl and encouraged people who could afford it to leave to the suburbs. Suburbanisation in those days was fuelled by the speculative private housing development and reached as far as Formby in the north, St. Helens to the east and across the Mersey into the Wirral and to the south of Liverpool (Couch 2003).

However, suburbanisation was not only caused by the migration of private households but appeared in the framework of the social housing policy as well. The elderly and the low-income groups were left behind in the inner cities where problems grew worse. In the 1960s and mainly until the mid-1970s the government pursued a slum clearance programme aimed at demolition of the entire building structure in the most deprived neighbourhoods. The residents were relocated in new towns, overspill council estates and expanded towns. 'Expanded town' agreements existed for Ellesmere Port, a new town that has been created at Warrington, and new council estates in Speke (Grant 2004; Couch 2003). Against

[7]During the 1980s the Labour party governed City Council of Liverpool became in conflict to the neoliberal policy pursued by Margaret Thatcher. First, Liverpool's economic situation worsened throughout the 1970s - the government initiatives did not tackle the underlying problems. Secondly, also the strategies implemented by the Thatcher government did not succeed in ameliorating the problematic situation of the city (Couch 2003). The Militant Trotzkist group in the Labour Party took office in the City Council between the years 1983-1987. Although they increased the rate of social housing, social facilities and pursued a slum revitalisation they did little to support the economic base of the city (Parkinson 1992), and as budget allocations from the central government were cut they brought the city household close to bankruptcy (Grant 2004; Oswalt 2004). The conflict did long-term damage to the economy of the city. The council's ability to provide adequate local services decreased and attempts to attract inward investments diminished (Couch 2003; Parkinson 1992). Liverpool was increasingly lacking the image as a place with a business friendly environment.

this background the decentralisation of population during the post-War period was mainly brought about as a result of the housing policy in the 1960s and 1970s. Figure 4.13 portrays the population development in Liverpool as part of the population in the whole conurbation as an indicator for the decentralisation in the region. As can be seen the decentralisation trend in Merseyside has not turned. Some development still exists in peripheral locations, although this occurs at a much slower rate than in the 1970s, for example.

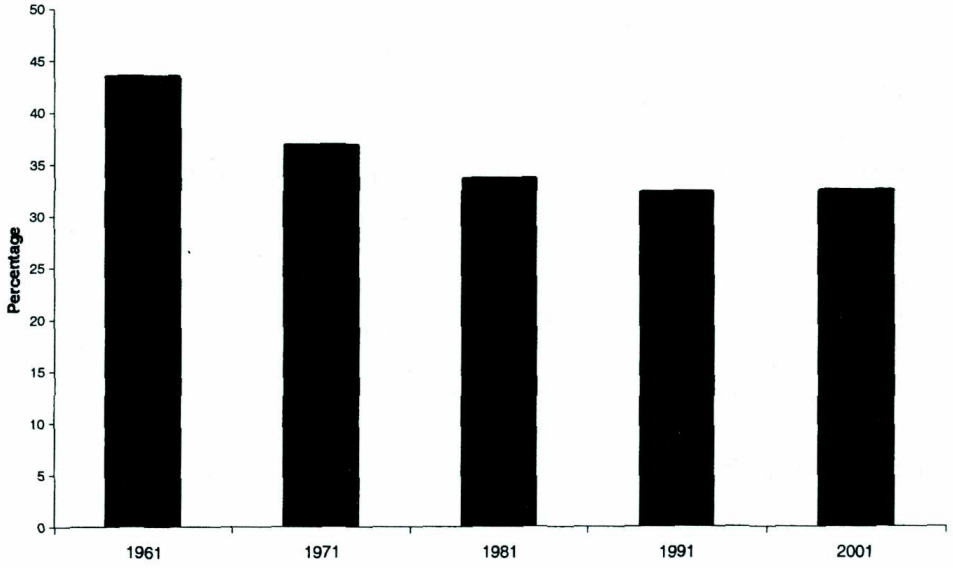


Figure 4.13: The proportion of Merseyside population living in Liverpool. Source: Couch (2003, p.192).

The high rate in suburbanisation was also due to the abandonment of the regionally responsible layer of planning matters in 1974: the City Council ceased to exist as a county borough. Responsibilities for urban planning and regeneration were split between the new Merseyside Country Council[8] and the metropolitan districts of Liverpool and Wirral. The opportunity for corporate planning was eroded (Couch 2001). Figure 4.14 gives and impression about the suburban living in Wirral. A recent development on a peripheral site is also shown.

Later in the 1970s, it was recognised that the slum clearance policy and the entailing relocation of households did not solve the inner city problems. Additionally, new problems appeared in the destination neighbourhoods of the relocated. Social conflicts between the autochthon population and the newcomers were not rare (Oswalt 2005). Slum clearance slowed down in the 1970s and came to a halt by the 1980s, only very few projects were

[8]Later in 1986 the Merseyside County Council was also abolished and its power divided between the metropolitan boroughs, such as Liverpool and Wirral (Couch 2001). Each borough had to provide its own plans: the Unitary Development Plans replaced the Structure Plans. There was no comprehensive strategy for the region, the Merseyside Strategic Guidance which was in force from 1988 onwards is only an advisory document. In 1996 the First Regional Planning Guidance for the North West (followed by a second one in 2003) acted as a strategic document though without binding power. In 2004 there was again a change in the planning system: Local Development Frameworks provide the basis of local planning and the Regional Planning Guidance now receives statutory force as Regional Spatial Strategy (Richard Lewis, Wirral Borough Council/ Planning Forward Manager - personal communication, 2nd Sep. 2005).

Figure 4.14: Suburban living in Bromborough, Allport road (upper panel), new suburban private housing in Wirral: Eastham - near Eastham Ferry (lower panel). Source: Author, September 2005.

undertaken after this date (Couch 2003, 1990). For the next 20 years an alternative housing policy was pursued: housing renovation and urban regeneration (1979 - Merseyside Structure Plan). The classic approach to urban regeneration from the end of the 1970s was the restriction of peripheral growth and the simultaneous encouragement of investment within the inner urban areas. It is still the advocated approach in the new millennium (as the Urban White paper reveals) (ODPM 2000).

One instrument of this policy relates to the establishment of Greenbelts (cf. Figure 4.15 for an impression). It was applied in Merseyside by the approval of the Merseyside Green Belt Local Plan in 1983[9]. Since that time the Greenbelt around Liverpool, mostly lying in the neighbouring districts such as Wirral, has been held up relatively well with only few incursions of development into formerly non-urban areas. This is partly explained by the low demand on new sites in the region compared to the booming region of the south-east of England. Between 1985 and 1997 over 75% of all development in Merseyside was on existing urban land (Couch 2003).

Secondly, a use of vacant or derelict land within the urban boundaries was to be fostered e.g. by the attraction of developers to the older built up areas (ODPM 2000; Couch 2001).

[9]The idea of Greenbelts goes back to the inter-war period when e.g. Liverpool's built up area doubled within 20 years (Couch 2003).

Figure 4.15: The Greenbelt at Fender Farm/Leasowe/Wirral. Source: Author, September 2005.

Another facet of this new approach was the formation of Development Corporations, e.g. the Merseyside Development Corporation (MDC). Founded by the Thatcher government in 1981[10] it was aimed to accelerate the regeneration of the Liverpool and Birkenhead docklands. The MDC was not an authority under the umbrella of the City Council but a separate unit, supplied with considerable financial resources[11] and planning power from the central government. It was given a part of the harbour, space that belonged to three different districts in the Merseyside county but which was subject to their influence only. Their main tasks were: an allocation of premises to an effective use, the promotion of existing businesses and the attraction of new ones, the regeneration of the area to supply an agreeable surrounding and the development of housing and social infrastructure. In retrospect, the supply of infrastructure did not automatically result in an economic or industrial revitalisation of the area. The achievements lagged behind in terms of economic aspirations but succeeded better with respect to the stimulation of demand for the tourist economy. The restoration of the Albert Dock was the project that kick-started the renovation of the city centre. Many more projects followed. Both the Green Belt policy and the Urban Regeneration strategy should impact on the sprawl development in the region which was substantially brought under control (Richard Lewis, Wirral Metropolitan Borough, Forward Planning - personal communication, 2nd September 2005; Couch 2003). The pictures in Figure 4.16 show inner city development in Liverpool.

The strong restrictions on building on formerly non-urban sites might encourage the constructing of multi-apartment buildings - a new trend in both the inner and outer urban areas (see Figure 4.17). Another recent trend, not visible before 1995 and about two decades after its first pronunciation, inner city revitalisation is observed in Liverpool and Birkenhead: the city centre of Liverpool and the inner areas of Wirral, e.g. in Birkenhead, Claughton or Tranmere, (re-)emerge as a popular housing location, especially amongst younger households (Couch and Karecha 2003; Couch 2003, 1999) (cf. Figure 4.17).

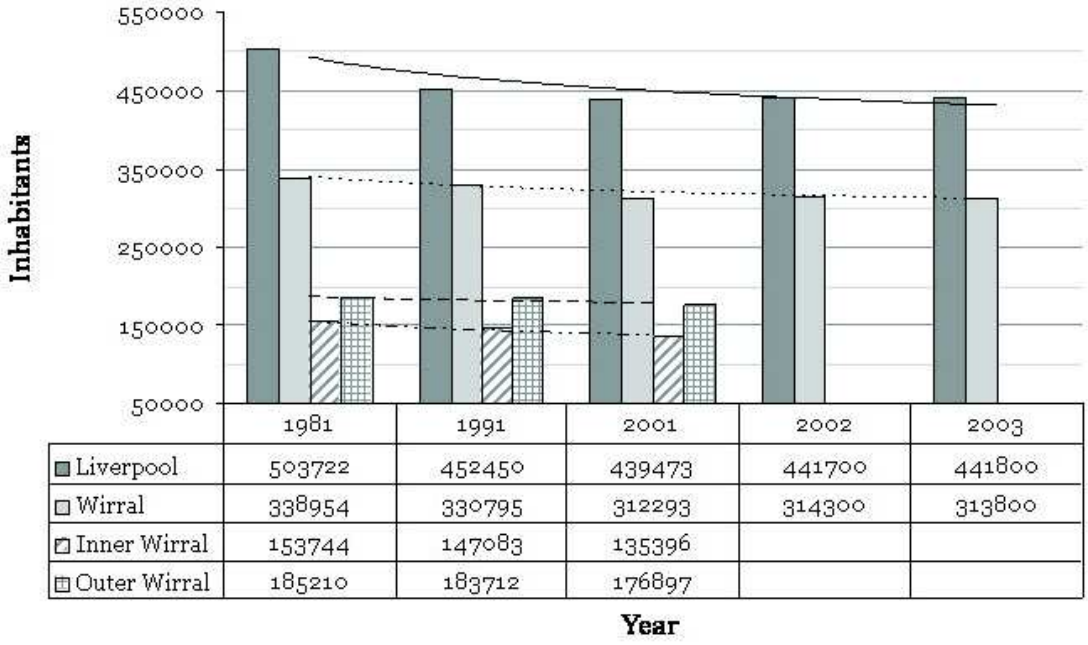
[10] In 1988 the area under influence of the MDC was substantially expanded on both sides of the river.
[11] It was supplied with a budget of Ł 25 to 30 million per year (Parkinson 1992).

Figure 4.16: Liverpool: The Albert Dock (upper row), inner city refurbishment: Renshaw Street (lower left), inner city atmosphere: Williamson Square (lower right). Source: Author, Aug.2005.

This new trend was first stimulated by the 'Living Over the Shops' (LOTS) initiative of the government during the early 1990 (although the achievements of the programme have been quantitatively modest), as Couch (1999) explains.

Figure 4.17: New housing development in Inner Wirral: Tranmere - Old Chester Road (left). Housing development in Liverpool: Pine Mews (right). Source: Author, September 2005.

Housing investments in the urban centres, as e.g. in Liverpool, have grown remarkably since 1995 (Couch 2003). Re-urbanisation is a recent phenomenon in Liverpool and the inner urban parts of Wirral (Couch and Karecha 2003). On the other hand, the growth in inner urban investments and the increasing interest in the city centres might not be a proof of attractiveness over the whole agglomeration. 'Islands' of socio-economic upgrading in 'seas' of socio-economic downgrading" have been noted (Tang and Batey 1996, p.926; cited in Couch 1999). This is similar to the situation as reported from Leipzig (Herfert 2002). The population statistics 1981-2003 in Liverpool and Wirral are shown in Figure 4.18.



	1981	1991	2001	2002	2003
Liverpool	503722	452450	439473	441700	441800
Wirral	338954	330795	312293	314300	313800
Inner Wirral	153744	147083	135396		
Outer Wirral	185210	183712	176897		

Figure 4.18: Population development in Liverpool and Wirral since 1981. Source: Author's Draft. Data: Office for National Statistics UK. Note: The line and dashed lines indicate the trend according to the average of two periods.

Both Liverpool and Wirral experienced a decline in population in the periods 1981 to 1991 and 1991 to 2001. From 2001 onwards both districts have gained population. In mid-2003 Wirral had an estimated 313800 residents. This compares with the 2001 Census figure of 312293 residents. Liverpool had an estimated population of 441800 residents in the mid of 2003 and 439473 residents at the 2001 Census. From 2001 onwards, Liverpool gains population but the rate of change is slowing. On the other hand in Wirral, there was first an increase in the rate between 2001 and 2002 but later a dip in the population development again. The increase in population since 2001 has been very modest in both districts and shows that the recent positive trends are rather weak. However, re-urbanisation is taking place in the Liverpool agglomeration if one looks at the mid-2002 and mid-2003 estimations. Please note that there are no population estimations available on ward level for the years between the censuses.

For a comparison with other districts in England and Wales see the latest population dynamics between 1991 and 2001 in Figure 4.19: In the twenty years between 1981 and

2001 the population of Wirral declined by -7.8%, compared with a decrease in Liverpool of 12.8% and of 2% for the North West region as a whole. Overall, the population of England has grown by about 5% in these 20 years but there have been big variations in the English regions with the North East and North West regions experiencing a decline in population while the South West, East and South East have seen population growth of 10% or more (all figures ONS UK). One can also see that until 2001 Liverpool did not distinguish from Wirral.

However, to be able to compare the urban - suburban dynamics a closer look will be paid onto the development at the sub-district level later in this chapter. For that the district of Wirral has been chosen which comprises both an urban and a suburban part as an example for the agglomeration. It is assumed to provide information about whether old industrial regions follow the urban life cycle model of agglomerations.

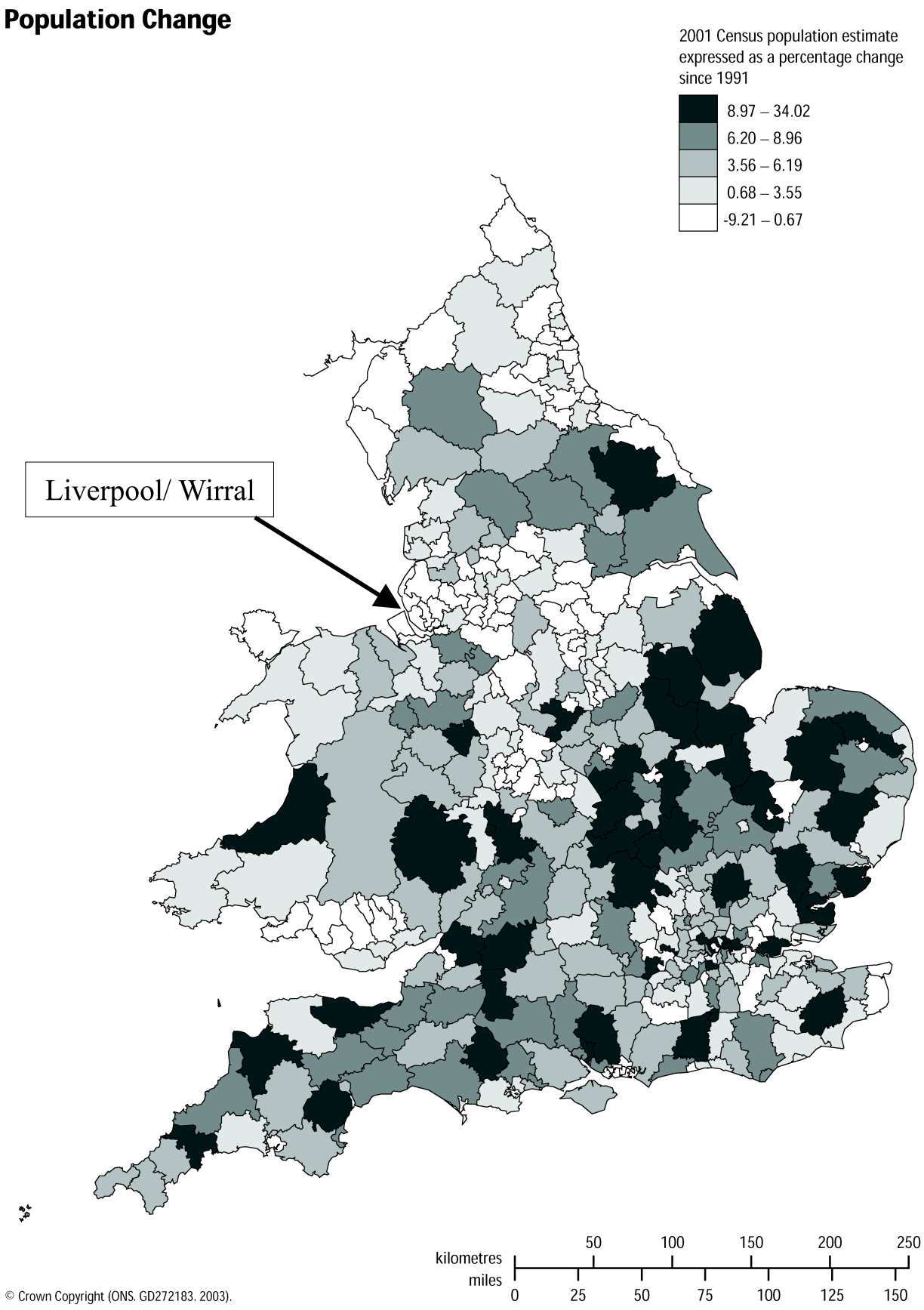


Figure 4.19: Population change in Britain 1991-2001. Source: ONS UK.

4.2 Socio-economic aspects and living conditions in the case study regions

The case studies offer a sample of the resident population in households. The socio-economic characteristics of the respondents of the questionnaire surveys shall be reflected before looking deeper into their migration behaviour in following sections. Where possible the data from the questionnaires is compared with that from the wider region or with national averages. Results for Eastern Leipzig are displayed in the left hand column - results for Wirral are shown in the right hand column. Furthermore tables of frequencies and pie charts are used to present comparable results. Similar classes are colour-codes in both case studies. Both the household structure and issues of mobility will be explained.

4.2.1 Household structure

Particular issues of the household structure comprise the household type, tenure, the age structure of the heads of household and the occupation of the highest wage earner. The latter is understood as an indicator of the household income.

4.2.1.1 Household types

Both questionnaires reveal information about the household types of the survey samples. Table 4.1 and Figure 4.20 give an overview of the results and compare the percentage of the different households in Eastern Leipzig and in Western Wirral. They display the frequency of a given parameter, the valid precentage (without the missing values) of all respondents and the confidence intervals (CI) on a 95% level. The CI shows high figures with sometimes about half of the computed frequency values in cases where the sample sizes are very small. Conclusions should be drawn with caution.

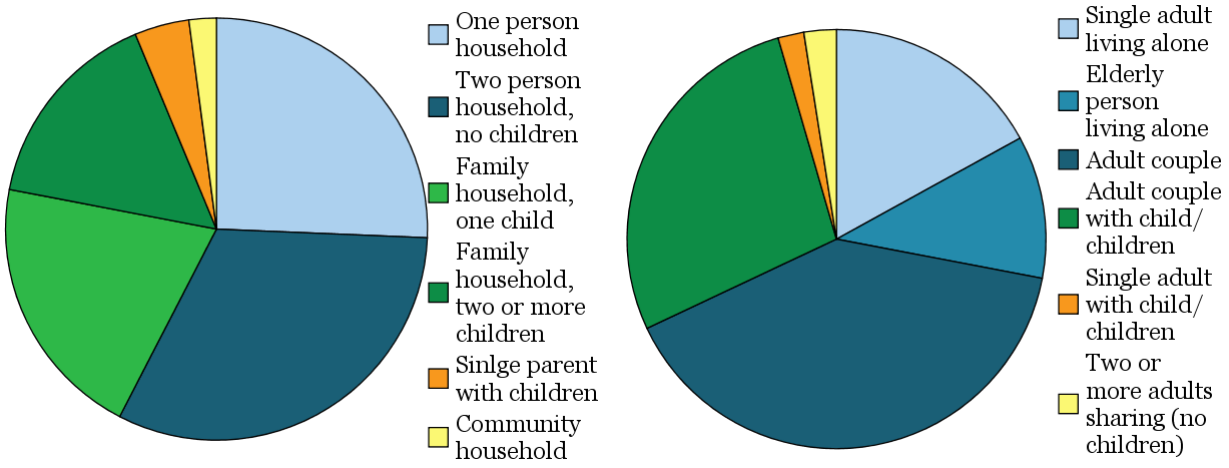


Figure 4.20: Household types in Eastern Leipzig (left) and Western Wirral (right), [% of respondents]. Sources: Author's survey, Couch's & Karecha's survey.

The χ^2-test (Table 4.2) reveals that the two samples belong to one statistical population. So it can be assumed that the distribution of household types is similar in Wirral and

Eastern Leipzig		N	Valid %		CI in %
Valid	One person household	49	25.7		[19.6-32.5]
	Two person household, no children	61	31.9		[25.4-39.1]
	Family household, one child	39	20.4	36.1	[29.3-43.3]
	Family household, two or more children	30	15.7		
	Single parent with children	8	4.2		[1.3-8.1]
	Community household	4	2.1		[0.6-5.3]
	Total	191	100.0		
Missing		3			
Total		194			

Western Wirral		N	Valid %		CI in %
Valid	Single adult living alone	34	17.0	28.0	[21.7-34.5]
	Elderly person living alone	22	11.0		
	Adult couple	80	40.0		[33.2-47.1]
	Adult couple with child/ children	55	27.5		[21.4-34.2]
	Single adult with child/ children	4	2.0		[0.5-5.0]
	Two or more adults sharing (no children)	5	2.5		[0.8-5.7]
	Total	200	100.0		
Missing		3			
Total		203			

Table 4.1: Household types in Eastern Leipzig (left) and Western Wirral (right). Sources: Author's survey, Couch's & Karecha's survey.

df	4
x^2	1.36
$x^2_{(4,0.05)}$	9.49
$x^2 < x^2_{(4,0.05)}$	

Table 4.2: χ^2-statistic of homogeneity (see also section 3.3.6.1).

Leipzig. There is a slight difference in the questionnaires regarding the household types as the Wirral questionnaire distinguishes between single adults and single elderly. This is in line with the habits of the enquiries undertaken by the Office for National Statistics in the UK and enables a good comparison with the national figures. However, it is not similar to the enquiries commonly undertaken in the official German statistics which do not use elderly living alone as a single category. An adequate interpretation can allow for this difference and enables a full comparison of the results, e.g. by selecting the single adults who are elderly living alone into one category.

One can see that a significant proportion of people and more than half of the respondents in both case studies belong to childless households (all blue colours), although the share of this group is some 10% higher in Wirral (68%) than in Leipzig (57.6%). The single households (the light blue colour in Leipzig and the two lighter blue colours in Wirral) from all age groups make up for 25.7% in Eastern Leipzig and 28.0% of the responding households in Western Wirral.

17.0% of the respondents in Western Wirral are single person households of people who are not pensioners, whereas 11.0% are pensioners. This 28% compares with 32.4% one-person households in Wirral as a whole and 30.1% in England (ONS - census 2001). Therefore, relatively many singles live in Wirral when compared to other parts of England but fewer in the case study area Western Wirral. 11.0% of the respondents in Western Wirral are pensioners living alone, which compares to 16.8% for all of the Wirral households and with 14.4% in England and Wales (ONS - census 2001). This means that the sample shows a lower share of single elderly compared to other parts of Wirral and the English/Welsh average. However, in general there are more elderly in Wirral than in England and Wales.

In contrast, in Eastern Leipzig the 25.7% single person households compare with 46.5% single person households in the whole of Leipzig (based on the year 2003, Stadt Leipzig 2004), reflecting the higher percentages of single households in the inner parts. This means also that in both case studies the singles are lower in the outer than the inner urban areas, second that there are more single person households overall in Leipzig than in Wirral (46.5% to 32.4%, the sum of 15.7% and 16.7%) and, third that the difference between the shares of single person households among the respondents in Western Wirral and the whole of Wirral is smaller (28.0% of the sample households to 32.4% of the households in the whole of Wirral) than between Eastern Leipzig and the whole of Leipzig (25.0% of the sample households to 46.5% of the households in entire Leipzig). The single households gather more in the inner areas of Leipzig than they do in Wirral, where they are more evenly distributed across the district (figures for Leipzig: Amt für Statistik und Wahlen, figures for Wirral: ONS UK).

Couple households make up the majority of all households in Western Wirral and the second biggest cluster in Eastern Leipzig. The 40.0% couple households in Western Wirral compares with 32.2% in the whole of Wirral and 34.5% in England (ONS UK). These figures underline the predominance of couple households in the Western Wirral area. In Eastern Leipzig the 31.9% couple households compares with 32.9% in all Leipzig. There are fewer couple households in Eastern Leipzig than compared to the city average.

27.5% of the respondents in Western Wirral (all Wirral 20.0%) and 36.1% of the respondents in Leipzig (20.8% for the whole of Leipzig) represent classic family households with one or more child. The share of families is therefore higher in the suburban areas as compared to the whole city averages in Leipzig and Wirral. This also means that there are fewer family households in the suburban area of Wirral than in the corresponding part of Leipzig. Families represent the majority of households in Eastern Leipzig but they are not the majority of suburban households in Western Wirral: adult couple households are the most prominent respondents there. With respect to the total number of households included in the study the family households are however not the most numerous, childless households dominate in both case areas. Single parent families and shared accommodation are very small groups in both case regions.

The average size of households in Wirral was 2.3 people compared with an average of 2.4 people for England and Wales (ONS - census 2001). The figure for Leipzig is 1.8 person per household (Stadt Leipzig 2004). It underlines the observation that there are substantially more single households in the whole of Leipzig compared to the whole of Wirral.

4.2.1.2 Distribution of tenure

The type of housing and accommodation often relates to tenure. In both case studies the questionnaire gave answer to the percentages of owner occupants and tenants in the case study regions. The relation is displayed in Table 4.3.

Eastern Leipzig		N	Valid %	CI in %
Valid	Owner occupant	44	23.2	[17.4-29.8]
	Tenant	146	76.8	[70.2-82.6]
	Total	190	100.0	
Missing		4		
Total		194		

Western Wirral		N	Valid %	CI in %
Valid	Owner occupant	184	90.6	[85.8-94.3]
	Tenant	19	9.4	[5.3-14.2]
	Total	203	100.0	

Table 4.3: Tenure structure in Eastern Leipzig (left) and Western Wirral (right). Sources: Author's survey, Couch's & Karecha's survey

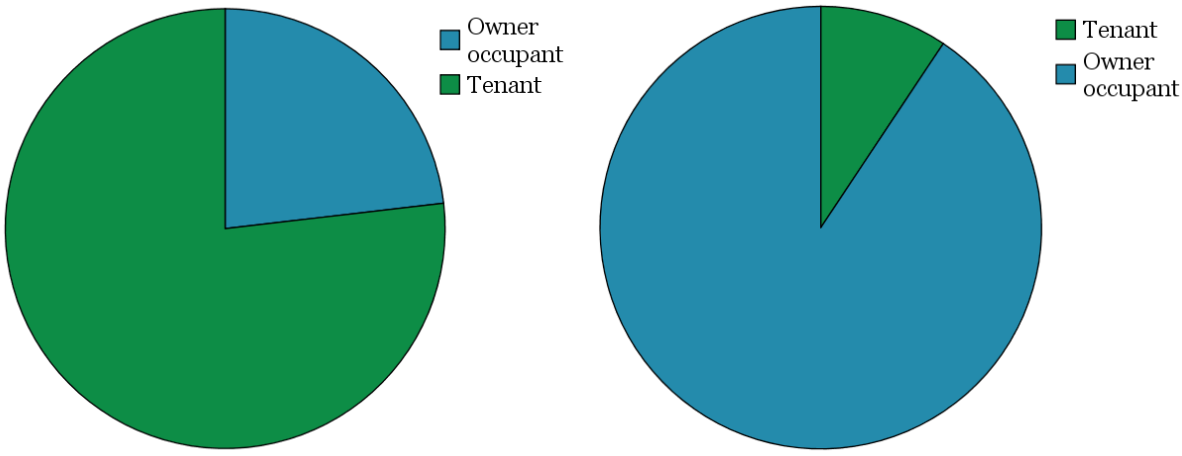


Figure 4.21: Distribution of tenure in Eastern Leipzig (left) and Western Wirral, [% of respondents]. Sources: Author's survey, Couch's & Karecha's survey.

df	1
x^2	183.48
$x^2_{(1,0.05)}$	3.84
	$x^2 > x_{(1,0.05)}$

Table 4.4: χ^2-statistic of homogeneity (see also section 3.3.6.1).

The χ^2-test (Table 4.4) shows that the Wirral and Leipzig respondents behave differently with respect to tenure. In this case the case studies cannot be assumed to belong to the same statistical population, the null hypothesis has to be rejected. Not surprisingly, the

number of people renting accommodation is much higher in Eastern Leipzig and lower in Western Wirral. Only 23.2% of the respondents from Eastern Leipzig own their dwellings whereas in Western Wirral this makes up to 90.6% of all households (cf. Figure 4.21). The fact can be explained by the differing political backgrounds characteristic to the regions. The political systems favoured the almost opposite approach to property. Although more than 15 years after re-unification have passed this is to be seen as a legacy to the property markets, which cannot adjust so fast. Additionally, a substantial part of the population in eastern Germany lacks the financial resources to adapt to the property relations as shown in old-capitalist countries. The figure in Annex 16 displays the distribution of tenure in Germany. One can see that owner occupation is relatively low in Eastern Germany but much higher in the West where it can reach up to 55% of the households or more. Still it does match England and Wales where the average lies at a rate of 68.3% of all households. Even more, the 90.6% of the sample households are owner occupier in Western Wirral which has to be compared with 72.6% of the households in the whole of Wirral and 68.3% of households in England and Wales (ONS - census 2001). Therefore the share of owner occupants is substantially higher in the Wirral sample than compared to the regional or English/Welsh average. The distribution of owner occupation in England and Wales is given in Annex 17.

4.2.1.3 Age structure

Table 4.5 and Figure 4.22 give an overview of the age structure of the heads of the responding households in Eastern Leipzig and Western Wirral.

Eastern Leipzig		N	Valid %	CI in %
Valid	Up to 34 years old	64	33.9	[27.2-41.1]
	35-59 years old	83	43.9	[36.7-51.3]
	Older than 60 years	42	22.2	[16.5-28.8]
	Total	189	100.0	
Missing		5		
Total		194		

Western Wirral		N	Valid %	CI in %
Valid	Up to 34 years old	37	18.2	[13.1-24.2]
	35–59 years old	95	46.8	[39.8-53.9]
	Over 60 years old	71	35.0	[28.4-42.0]
	Total	203	100.0	

Table 4.5: Age structure in Eastern Leipzig (left) and Western Wirral. Sources: Author's survey, Couch's & Karecha's survey.

df	2
x^2	14.99
$x^2_{(2,0.05)}$	5.99
$x^2 > x^2_{(2,0.05)}$	

Table 4.6: χ^2-statistic of homogeneity (see also section 3.3.6.1).

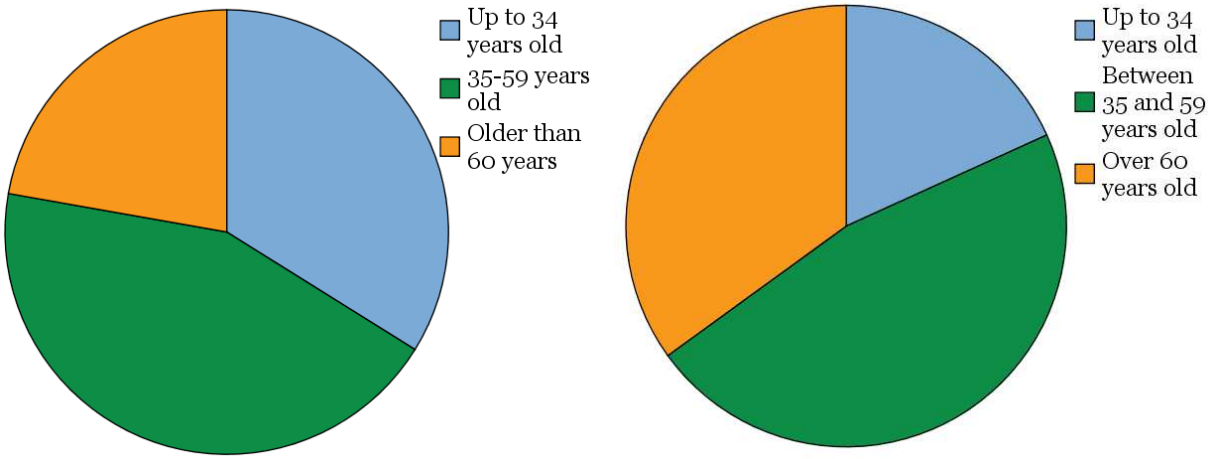


Figure 4.22: Age structure in Eastern Leipzig (left) and Western Wirral (right), [% of respondents]. Sources: Author's survey, Couch's & Karecha's survey.

The χ^2-test shows (Table 4.6) that the Wirral and Leipzig respondents do not belong to the same statistical population, the null hypothesis has to be rejected. The age distribution is different in the two case studies. According to the respondents of the survey, the residential population is much younger in Eastern Leipzig than in Western Wirral. 33.9% of the heads of household are younger than 34 years old in Leipzig whereas in Wirral this group does not reach more than 18.2%. The higher share of younger people in Eastern Leipzig does also reflect on the share of the elderly. The general European trend is towards an increase of the elderly persons - a trend that has been documented in Germany and England/Wales as well (ONS UK, BBR 2005). According to official statistics the share of elderly in Wirral increased from about 17.7% in 2001 to 21.1% in the mid of 2003. The increase in the North West region of England is documented from 16.0% to 18.7% whereas the share in England rose from 16.0% to 18.5%. The Wirral district already has a higher share of elderly than the regional and national average and a larger increase. The case study sample consists of an even higher share of elderly but shows the percentage for the heads of household. In the case of Western Wirral 35.0% of the heads of household are older than 60 years of age. In the suburban area of Leipzig only 22.2% of the heads of household belong to this group. In Annex 28 and Annex 29 one can see an overview to the most current German age distribution as well as a projection of the trend until 2020. A continued increase of elderly is especially projected for the eastern parts of Germany.

The population of medium age, which comprises the respondents between 35 and 59 years old, shows a fairly similar distribution in both regions. They account for 43.9% in Eastern Leipzig and 46.8% in Western Wirral. The difference in the younger population strata is therefore compensated for by the elderly. One has to keep in mind that these figures do not represent the average age of the household or the population which would be modified by the inclusion of children and other persons in the household. Instead it represents the age of the heads of household. The head of a household is defined by the highest wage earner.

The average age of the residents in Wirral as a whole is 40.0 years. This compares with an average for England and Wales of 38.7 years (ONS - census 2001). According to the mid-2003 population estimates 5.7% were children under five, which is similar to the share in England and Wales (5.7% under five)(ONS - census 2001). This indicates that if the questionnaire respondents are a representative sample there are more elderly people in the case study region Western Wirral than in the whole of Wirral. Additionally, the average age of the population in Wirral as a whole is higher than compared to the national average. The trend towards more elderly is amplified in the case region.

In 2003, the average age in Leipzig was 42.9 years old and therefore higher than in Wirral. In Leipzig as a whole, 3.8% of the population are under 5 years old and 18.9% are 65 and older (Stadt Leipzig 2004). In a comparison to the German figures, the whole of Leipzig shows smaller proportions of children under 5 as compared to the national average (4.5% of the population being under five years old).

The trend towards more elderly in Western societies has found to be pronounced in the case study regions. One could assume that this is a feature of old industrial regions. The migration of young people to other regions with better prospects and fewer people coming for jobs make this finding comprehensible.

4.2.1.4 Occupation of the highest wage earner

The occupation of the highest wage earner serves as an indicator for the socio-economic status of the household. It gives an idea about the possible income available to the household. The Tables 4.7 and Figures 4.23 mirror the distribution between the occupation clusters.

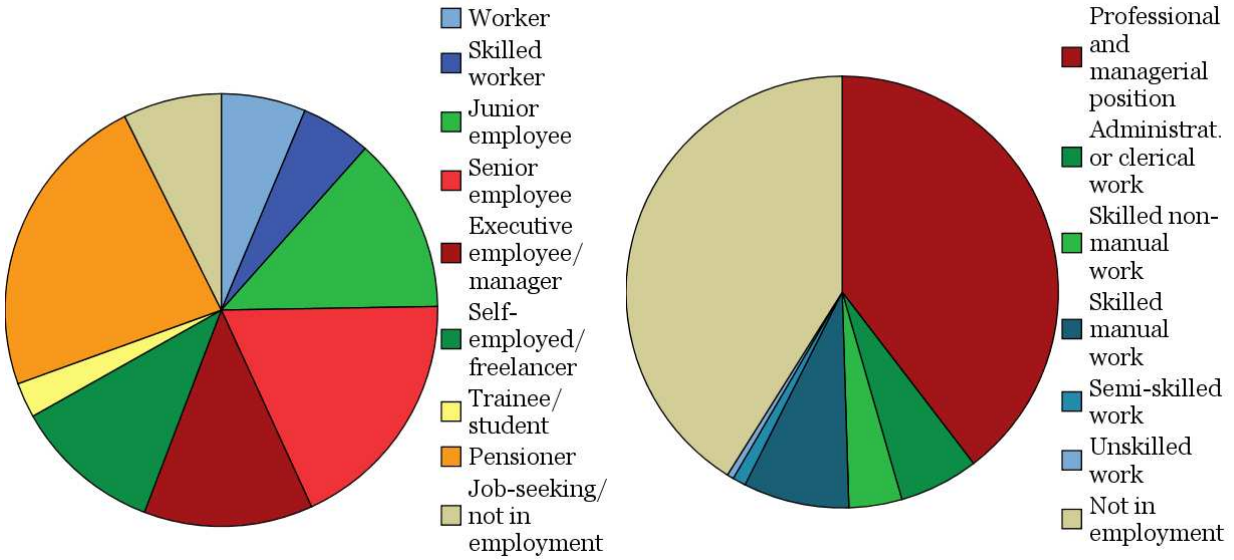


Figure 4.23: Occupation of the highest wage earners in households in Eastern Leipzig (left) and Western Wirral (right), [% of respondents]. Sources: Author's survey, Couch & Karecha's survey.

It should be pointed out that a comparison between these clusters of occupation in the two case studies has to be undertaken with caution as it involves some difficulties. The case studies are embedded in different legal systems with different political structures. The

Eastern Leipzig		N	Valid %		CI in %
Valid	Worker	12	6.3	11.6	[7.4-17.0]
	Skilled worker	10	5.3		
	Junior employee	25	13.2		[8.7-18.8]
	Senior employee	35	18.4		[13.2-24.7]
	Executive employee/ manager	24	12.6		[8.3-18.2]
	Self-employed/ freelancer	21	11.1		[7.0-16.4]
	Trainee/ student	5	2.6		[0.9-6.0]
	Pensioner	44	23.2		[17.4-29.8]
	Job-seeking/ not in employment	14	7.4		[4.1-12.1]
	Total	190	100.0		
Missing		4			
Total		194			

Western Wirral		N	Valid %		CI in %
Valid	Professional and managerial position	80	39.6		[32.8-46.7]
	Administrative or clerical work	12	5.9		[3.1-10.1]
	Skilled non-manual work	8	4.0	13.4	[9.0-18.8]
	Skilled manual work	16	7.9		
	Semi-skilled work	2	1.0		
	Unskilled work	1	0.5		
	Not in employment	83	41.1		[34.2-48.2]
	Total	202	100.0		
Missing		1			
Total		203			

Table 4.7: Occupation of the highest wage earners in households in Eastern Leipzig (left) and Western Wirral (right). Sources: Author's survey; Couch & Karecha's survey.

differing clusters of occupation as employed in the questionnaires show this clearly. This is also why a χ^2-square test of homogeneity cannot be performed here. The clusters for the Wirral questionnaire were developed by the English researchers, Prof. Chris Couch and Jay Karecha who undertook the enquiry to the primary data set. With respect to the German questionnaire, the groups of occupations are similar to those ones utilised in an investigation undertaken in 1997 by various research institutions[12] in Saxony and co-ordinated by the Institut für Länderkunde in Leipzig. A questionnaire was used as the basis of the investigation which had a similar focus to the investigation undertaken in this work. Their occupation clusters are taken here. They are therefore decided by native and local research groups which respect the particular national and regional circumstances. Despite these problems it was aimed to compare as many similar clusters as possible highlighted with similar colours.

Another peculiarity was mentioned earlier. The Wirral questionnaire cannot distinguish between pensioners and people who are not in employment, at least not in the question of occupations. One has to assume that the people subsumed under the category 'not in

[12]The author is grateful for the permission to fully use the questionnaire and the primary data as a supplement to this study. Many thanks go to Dr. Herfert - IfL Leipzig, Prof. Kowalke - TU Dresden, Prof. Jurczek - TU Chemnitz, Prof. Wiessner - Uni Leipzig, Dr. Wiechmann - IÖR Dresden.

employment' in Wirral are represented first, by people in retirement, second, by people without wage labour and third, by students and trainees which are all accounted a separate category in the Leipzig questionnaire.

Against this background the number of people without wage labour are not as different in Western Wirral and Eastern Leipzig. In Western Wirral, 41.1% of the heads of household are without wage labour, in Leipzig this group is somewhat smaller and represents 33.2%. The number of workers, the strongest occupation cluster in the industrial past, is similar also. 11.6% in Eastern Leipzig and 13.4% in Western Wirral, both figures indicate the relative unimportance of industrial jobs (as the proportion of households reliant on an industrial job) in recent times. Taking the two former categories together, in both case regions a similar percentage of the heads of household earn their money in an employed position: 55.3% in Leipzig and 49.5% in Wirral. A more detailed comparison across all the employees does not seem meaningful with the questionnaires being based on different occupational clusters.

According to the evaluation in section 4.1.2 the official employment rate in Liverpool decreased slightly over the last 5 years, whereas employment could improve its performance quite substantially in Wirral where it has reached national average in Summer 2004. According to the 2001 Census, of the people in Wirral who are unemployed, 21% are aged 50 and over and 36% are long-term unemployed. This compares with England and Wales as a whole, where 19% of unemployed people are aged 50 or over and 30% are long-term unemployed (ONS UK). Annex 19 shows that these figures are relatively high as compared to other regions in England and Wales but similar to other old-industrial regions. In Leipzig, the comparative figures for 2003 reveal that 47.4% of all unemployed have already been without a job for a long time. 13.3% of the economically active population is unemployed, which is about three times as many as in Wirral. The employment rate was 45.0% at the end of June 2003 – much lower than in Wirral. The figure in Annex 18 shows the Leipzig performance against the German average. One can see that mostly the old industrial regions, such as many regions in the former GDR as well as the Rhur-area and additionally the region around Bremerhaven on the North Sea coast are characterised by high proportions of long-term unemployment.

Another aspect with respect to the single case studies, the distribution of the occupations in the Western Wirral sample is astonishing. Although a certain amount of explanation could be attributed to the kind of clusters chosen, it is remarkable that the occupations of the highest wage earner in the sample households split so clearly between the professional and managerial positions and those not in employment. The latter will include mostly the retired. Of all heads of household 41.1% are not in employment in the Western Wirral sample. As 35% of all respondents are 60+ years old the majority of the people not in employment might be the retired. Wirral seems to account for a strong accumulation of first, the successful population strata and second, the elderly (probably in this case also well off).

In the household sample of Eastern Leipzig the heads of household distribute more evenly across the occupational clusters. Though the retired people do also make up for a considerable proportion of the heads of household: 23.2%. It is the highest fraction of all clusters in the Leipzig survey, though more than 10% smaller than in the Wirral sample.

4.2.2 Mobility

As a second strand of information to the socio-economic aspects of the survey certain parameters for the mobility of the household samples and the case study and the regions will be considered. This includes the amount of cars per households and the commuting time.

4.2.2.1 Cars per household

The following Tables 4.8 and Figures 4.24 provide information about the amount of cars per household in the samples.

Eastern Leipzig		N	Valid %		CI in %
Valid	No car	28	14.8		[10.1-20.7]
	One car	90	47.6		[40.3-55.0]
	Two cars	63	33.3	37.5	[1.8-8.2]
	Three cars	7	3.7		
	Four and more cars	1	0.5		
	Total	189	100.0		
Missing		5			
Total		194			

Western Wirral		N	Valid %	CI in %
Valid	No cars	34	16.7	[11.9-22.6]
	One car	90	44.3	[37.4-51.5]
	Two and more cars	79	38.9	[32.2-46.0]
	Total	203	100.0	

Table 4.8: Cars per household in Eastern Leipzig (left) and Western Wirral (right), Sources: Author's survey, Couch & Karecha's survey.

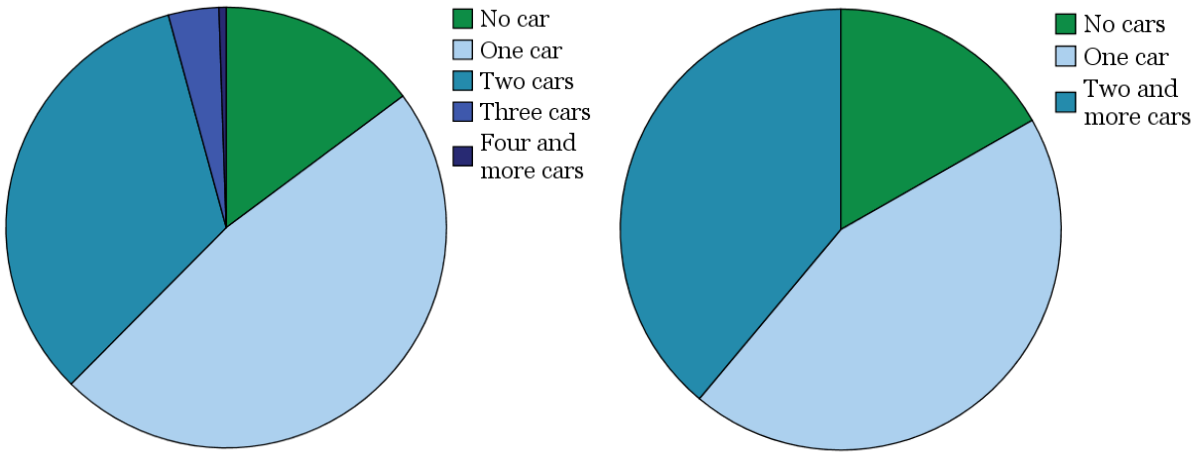


Figure 4.24: Cars per household in Eastern Leipzig (left) and Western Wirral (right), [% of respondents]. Sources: Author's survey, Couch & Karecha's survey.

df	2
x^2	0.51
$x^2_{(2,0.05)}$	5.99
$x^2 < x^2_{(2,0.05)}$	

Table 4.9: χ^2-statistic of homogeneity (see also section 3.3.6.1).

The analysis reveals that the distribution of cars is highly similar in the sample regions. This could also be proven by the χ^2-square test for homogeneity (Table 4.9). The shares for 'no car' differ by 1.9% and comprise 14.8% in Eastern Leipzig and 16.7% in the case of Western Wirral. In Annex 18 the share of households with no car in the responding households are compared to the distribution in England and Wales. It shows that there are substantially more households without cars in big cities as well as in the old industrial and mining regions, such as the Liverpool and Wirral and other regions in the middle of England. The figures for the category 'one car' between the case studies differ by 3.3%: Eastern Leipzig's respondents declare in 47.6% of the cases that the household possesses one car, in Wirral the respective figure is 44.3%. This leaves 37.5% in Eastern Leipzig and 38.9% in Western Wirral with two or more cars. This is the majority of all households in both regions.

In the analysis for Eastern Leipzig, the questionnaire is sufficient to specify further 'three cars' and 'four and more cars'. One can see that not many households possess more than two cars. They represent 4% of all households only. This can either relate to a lack of financial resources, a well provision with public transport, other personal reasons such as the wish to use different means of transport for the reason of health, and also the relatively low share (36.1%) of households with three or more persons per household at all (family household with one child, family household with two or more children). However, as one can see, there is also a high uncertainty connected to the figures.

As a comparison again the official statistics for Wirral and Leipzig. In Leipzig, the rate of motorisation is 353 cars per 1000 people or 0.6 cars per household. This compares with an average motorisation of 492 cars per 1000 people or an average of 1.1 cars per households in the case study area in Leipzig. There are almost the double the amount of cars available to the households in the case study area than to the average of households in the rest of the city (figures for 2003; Stadt Leipzig 2004). The figure in Annex 20 reveals that this is still lower than in many other regions of Germany, as e.g. regions in the south-west. As a comparison it shall be referred to the share of multiple-car households in Wirral. 24.8% of the households possess two cars or more in all Wirral whereas in the case study wards this amounts to 30.5% of the households (ONS- based on 2001 census) and compares to 38.9% in the responding households. It shows that also here the average household in the case study area is supplied with more cars than the district's average.

4.2.2.2 Commuting time

Another aspect of mobility concerns the commuting. The aspect is covered by the Table 4.10 and Figure 4.25.

Eastern Leipzig		N	Valid %	CI in %
Valid	Less than 20 minutes	58	44.3	[35.6-53.2]
	Between 21 and 40 minutes	46	35.1	[27.0-44.0]
	Between 41 and 60 minutes	20	15.3	[9.6-22.6]
	Above one hour	7	5.3	[2.2-10.7]
	Total	131	100.0	
Missing		63		
Total		194		

Western Wirral		N	Valid %	CI in %
Valid	Less than 20 minutes	48	42.5	[33.2-52.1]
	Between 21 and 40 minutes	44	38.9	[30.0-48.6]
	Between 41 and 60 minutes	12	10.6	[5.6-17.8]
	Over one hour	9	8.0	[3.7-14.6]
	Total	113	100.0	
Missing		90		
Total		203		

Table 4.10: Commuting time in Eastern Leipzig (left) and Western Wirral (right); Sources: Author's survey, Couch & Karecha's survey.

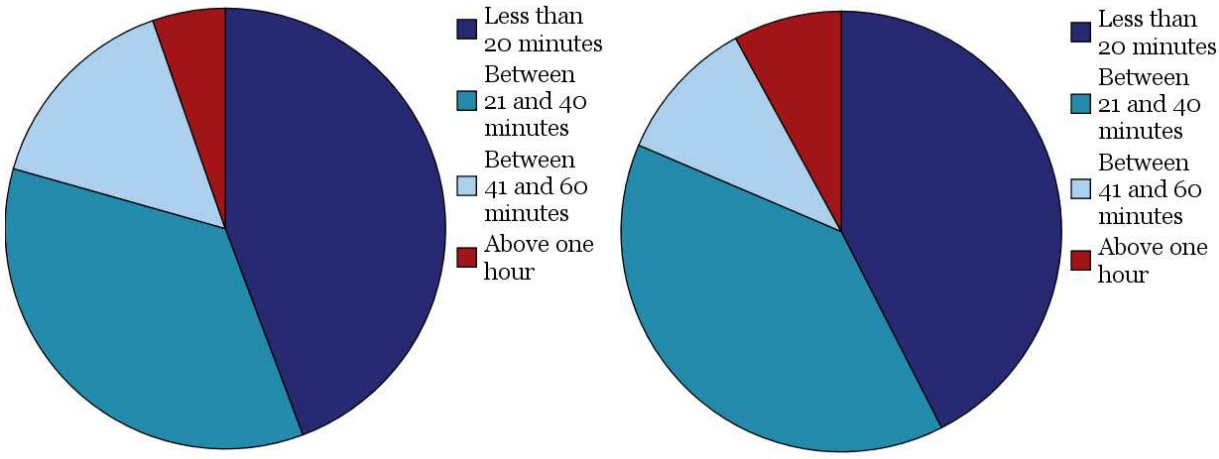


Figure 4.25: Commuting time from Eastern Leipzig (left) and Western Wirral (right), [% of respondents]. Sources: Author's survey, Couch & Karecha's survey.

Both regions belong to the same statistical population. One can assume that the commuting behaviour in both regions is similar. In both regions the majority of people need less than 20 minutes to go or drive to work. The high figures of missing values are again an expression of the significant number of retired people among the sample. There are few more households (seen as percentages of the whole sample) in Eastern Leipzig than in Western Wirral with

df	3
x^2	1.92
$x^2_{(3,0.05)}$	7.81
	$x^2 < x^2_{(3,0.05)}$

Table 4.11: χ^2-statistic of homogeneity (see also section 3.3.6.1).

a commute of less than 20 minutes to work and a slightly higher percentage of households in Wirral as compared to Eastern Leipzig which need between 21 and 40 minutes. The relations change when one looks at the distribution of households taking between 41 and 60 minutes, which is more frequent in the Leipzig region. However, there are more heads of household that need above one hour to get to work in the Wirral. All in all, this suggests that the commuting patterns are fairly similar, as the differences between the shares are very small.

The figures for Leipzig can be compared with the national picture of commuting distances which is as the commuting distance relative to the community average of all people under National Security in Annex 22. It is clear visible that the average commuting time is very much dependent on the region throughout Germany. Leipzig seems to be below average, most people drive less than 15km. A similar statement can be given for Wirral. According to data from the National Statistics there are less people in Wirral than the UK average who drive less than 2 and more than 10km, whereas the proportion of people driving between 2-10km is above average. With a certain relation between distance and time one could conclude that there are possibly less than average people in Wirral investing (that have to invest) much time to go to work.

With these examplary aspects to the socio-economic and living conditions of recent sprawlers in mind it shall be investigated how the population dynamics between the inner and the outer urban areas developed over time. The life cycle theory will be tested in the areas before the reasons for moving for the recent sprawlers are illuminated.

4.3 Research Question 1: On the Life cycle theory of cities

Research Question 1: Process oriented
Did the population development in the case studies follow the sequences of the life cycle theory of urban areas and is a re-urbanisation trend visible in both regions?

Hypothesis:
As a result of the political history of Leipzig, which limited an urban development on the fringes and which also controlled and acted against decentralisation, it is assumed that the city development in Leipzig has not followed the phases of the life cycle model of cities over the past six decades. Re-urbanisation is visible in both regions as a new trend after a period of inner city population decline. However, there are reasons why this could happen earlier and easier in Leipzig.

4.3.1 Leipzig

In a following step the population of Leipzig has to be compared as a percentage change between the inner and the outer urban part. For the Leipzig agglomeration suitable data was available for the years 1950, 1960, 1971, 1981, 1989, 2000-2005. The population figures for the years are shown in Annex 8. Table 4.12 displays the decennial population change in Leipzig since 1950.

	Spatial attribution						
	Inner Leipzig		**Outer Leipzig**		**Overall development**		**Representation in the life cycle model**
Time Period	% change	Feature of population change	% change	Feature of population change	% change	Feature of population change	
1950-1960	-4.5	–	-15.5	– –	-5.6	– – –	Re-Urbanisation
1960-1971	-0.9	–	-3.7	– –	-1.2	– – –	Re-Urbanisation
1971-1981	-4.2	–	-11.1	– –	-4.9	– – –	Re-Urbanisation
1981-1989	-8.2	–	-9.3	– –	-8.3	– –	Re-Urbanisation

Table 4.12: Population development in the urban and suburban area of Leipzig between 1950 and 1989 and in relation to the life cycle model. Note: +,++,+++ represents population growth from slow (+) to fast (+++); –,– –,– – – represents population decline from slow (–) to fast (– – –). Source: Own draft; Data: Statistisches Landesamt Sachsen, Amt für Statistik und Wahlen Leipzig, Staatsarchiv Leipzig.

As already documented by other authors, the results confirm the decline in population on the level of the entire agglomeration in Leipzig since 1950. Additionally the calculations of the decennial populations trends in the inner and the outer urban areas of Leipzig reveal

that this observation also holds true on the level of the defined sub-city areas: Inner and Outer Leipzig decreased in population throughout the entire period from 1950 to 1989. Furthermore, the population decline was more pronounced in Outer Leipzig - the suburban area, which belonged to adjacent communities of Leipzig at that time. With reference to the phases of the life cycle model of urban areas this translates into a re-urbanising trend during the whole of the GDR period (see Figure 4.26).

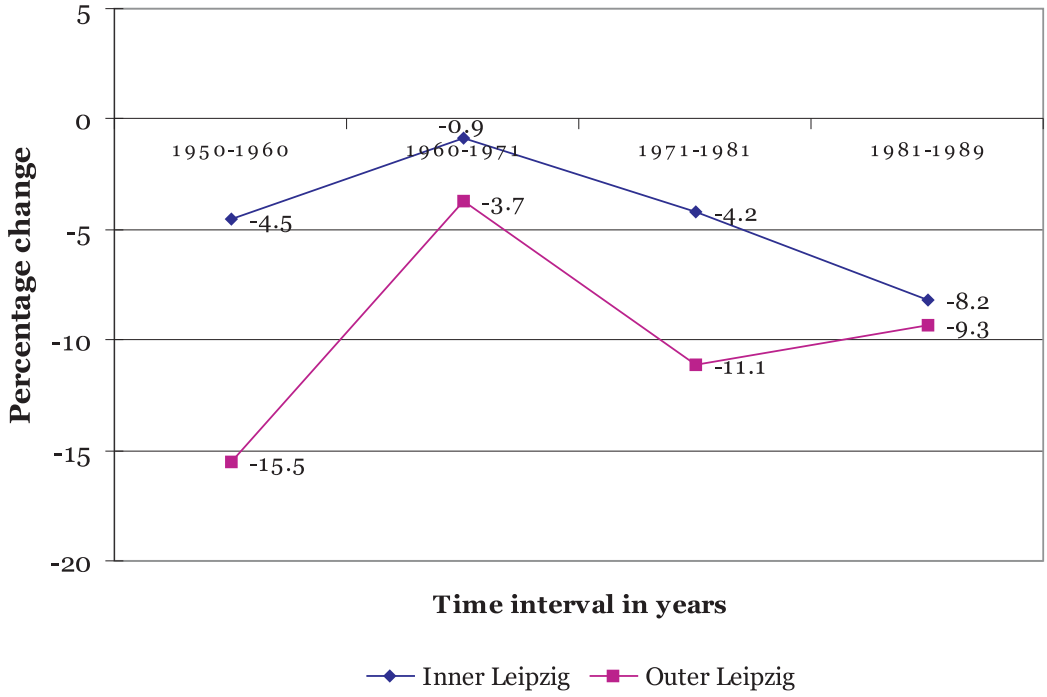


Figure 4.26: Decennial rates of population change 1950-1989. Source: Author's draft.

Although the population development remains similar, Figure 4.26 reveals that the trend changes differed over the peiod. Whereas the rate of population change in the inner urban areas decreased from the first to the second decade, in the following decade the population decline increased. Whereas a similar relation of trend change in the outer urban areas is visible for the first two decades, the trend develops differently in the latter decade - Outer Leipzig's population loss slowed down between 1981 and 1989, when it almost reached the same extent as the inner urban parts which speaks for a decrease in re-urbanisation.

Table 4.13 and Figure 4.27 show the population development[13] after the political change. One can see that the population development in the time after the political change is completely different from that before. With a 'freely' developing housing and property market Leipzig shows a suburbanisation trend in most of the years investigated. As a first result, the development in the entire agglomeration is positive since the year 2000. However, Leipzig's phase of suburbanisation has not come to an end. Though small in extent, the population increase has been constantly higher in Outer Leipzig than in Inner Leipzig except for the period 2002-2003.

[13]Note, the basis of this calculation is data to the resident population of first and secondary residences.

	Spatial attribution						
	Inner Leipzig		Outer Leipzig		Overall development		Representation in the life cycle model
Time Period	% change	Feature of population change	% change	Feature of population change	% change	Feature of population change	
2000-2001	0.2	+	1.0	++	0.3	+++	Sub-Urbanisation
2001-2002	0.5	+	0.7	++	0.5	+++	Sub-Urbanisation
2002-2003	0.6	++	0.4	+	0.6	+++	Urbanisation
2003-2004	0.4	+	0.9	++	0.5	+++	Sub-Urbanisation
2004-2005	0.1	+	0.2	++	0.1	+++	Sub-Urbanisation

Table 4.13: Population development in Inner and Outer Leipzig between 2000-2005 in relation to the life cycle model. Note: +,++,+++ represents population growth from slow (+) to fast (+++), –,– –,– – – represents population decline from slow (–) to fast (– – –). Source: Author's draft; Data: Amt für Statistik und Wahlen Leipzig.

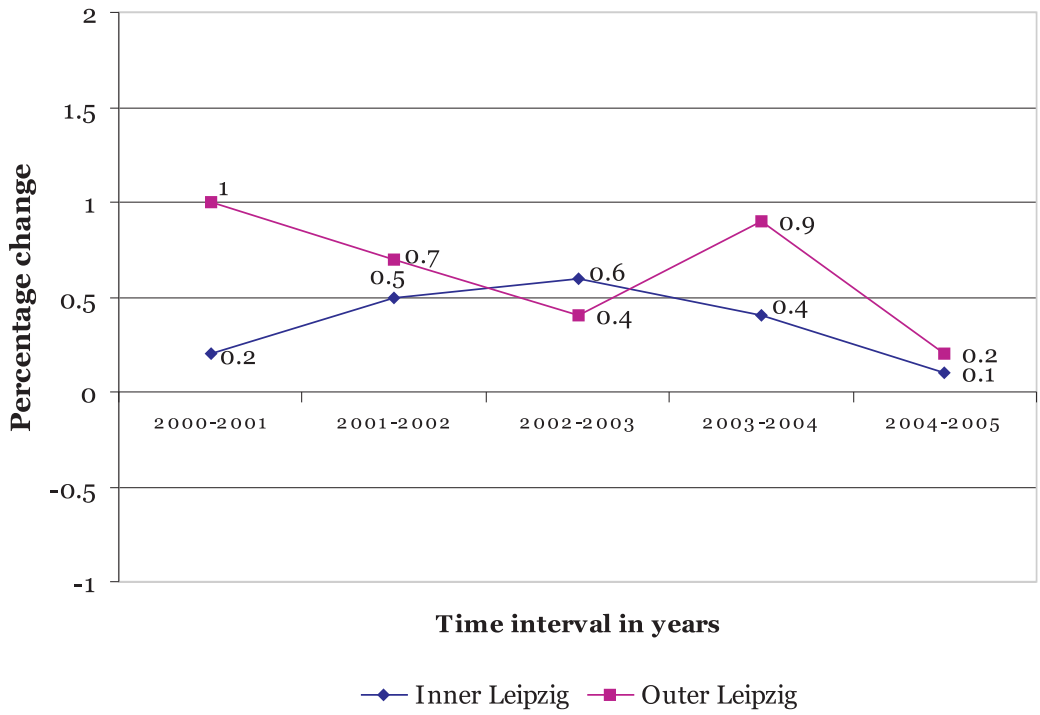


Figure 4.27: Population development in Inner and Outer Leipzig between 2000 and 2005. Source: Author's draft, Data: Amt für Statistik und Wahlen Leipzig.

One has to note that the change in population since 2000 is firstly very small and secondly sometimes only slightly different between the sub-city regions. Additionally, the trends are relatively unstable switching three times in this short period. Longer time slices

are necessary to give more certain statements about trends. Furthermore the original data includes a number of residences which cannot be assigned to Inner or Outer Leipzig filling mistakes at the Amt für Statistik und Wahlen. These account for 0.15% of the population in 2000, 0.08% of the population in 2001 and 2002, 0.07% of the population in 2003, and 0.05% of the population in 2004 and 2005 (see Annex 8). The figures had to be excluded from the calculation. But, these the percentages are so small that it does not affect the results obtained in this chapter.

4.3.2 Wirral

Here too, the population trend in Inner Wirral will be compared to the trend in Outer Wirral. Table 4.14 lists the degree of population change in the respective years and zones.

	Spatial attribution						
	Inner Wirral		**Outer Wirral**		**Overall development**		**Representation in the life cycle model**
Time Period	% change	Feature of population change	% change	Feature of population change	% change	Feature of population change	
1951-1961	3.8	+	12.0	++	6.1	+++	Sub-Urbanisation
1961-1971	-6.8	–	12.3	++	-1.1	–	Sub-Urbanisation
1971-1981	-9.6	– –	4.0	+	-5.0	–	Dis-Urbanisation
1981-1991	-4.4	– –	1.0	+	-2.4	–	Dis-Urbanisation
1991-2001	-6.6	– –	-4.0	–	-5.6	– – –	Dis-Urbanisation

Table 4.14: Population development in Inner and Outer Wirral between 1951-2001. Note: +,++,+++ represents population growth from slow (+) to fast (+++), –,– –,– – – represents population decline from slow (–) to fast (– – –). Source: National Statistics UK, Data: National Statistics UK.

The table shows that the overall population development in Wirral was positive in one decade since 1951, namely between 1951 and 1961. This contrasts to the on-going population decline in Liverpool since 1931 but might underline the role of Wirral as suburban destination in the Liverpool agglomeration. In the first decade after 1951 both Inner and Outer Wirral grew in population whereas in the following 3 decades the inner areas lost and the outer urban areas gained in population. The urban development moves from a suburbanising to a dis-urbanising state. Another result concerns the pace of population change. Whereas in the early decades investigated the increase in population in Outer Wirral is highly positive, it is only slightly positive between 1971 and 1991 and even turns to a negative trend in the last decade of 1991 to 2001. The inner urban parts show first a slight positive trend, which switches to a negative population development already in 1961-1971. They continue declining from than on and increase in the pace of decline when compared to the trend in the outer parts. This sequence of trend relations and trend change is as proposed by the theory of urban life cycles. For a better overview the results are plotted

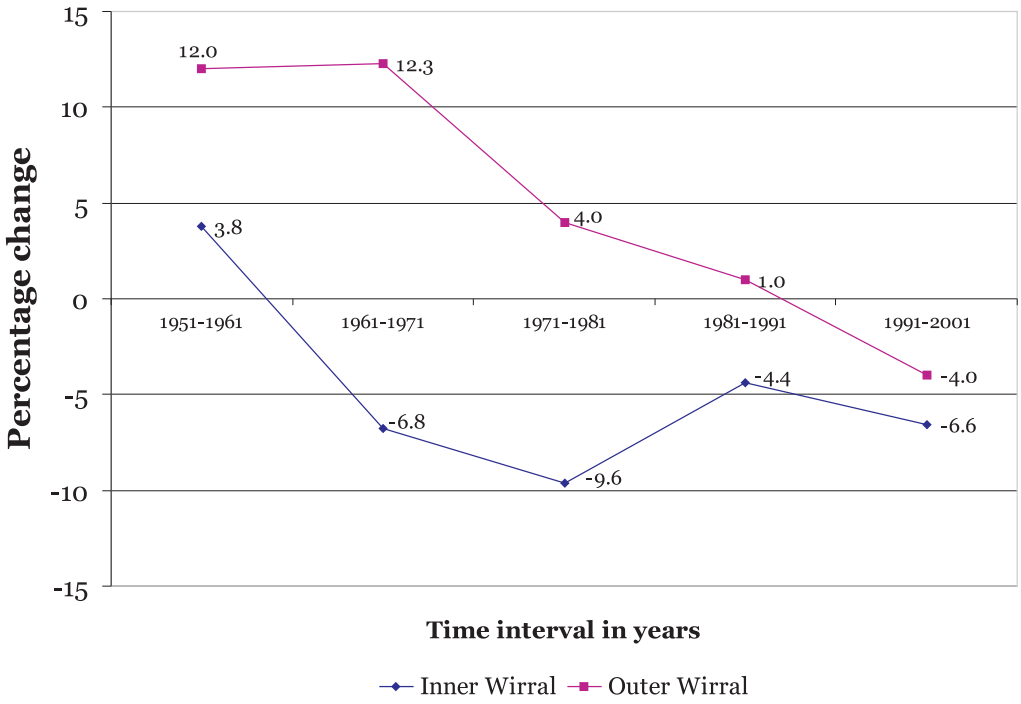


Figure 4.28: Decennial population change in Inner and Outer Wirral since 1951. Source: Author's draft, Data: National Statistics UK.

against time. Figure 4.28 shows clearly that Outer Wirral is decreasing in the population trends throughout most of the entire period investigated (only a small increase from 1951/1961 to 1961/1971). Inner Wirral is characterised by a declining trend in population figure also in the early years but slows down in the decrease of population between the decades 1971/1981 and 1981/1991. The trend decreases again slightly in the last decade.

4.4 Research Question 2: Reasons for moving

4.4.1 Reasons for leaving - Push factors of the former place of residence

This section will be used to focus on the individual reasons to leave the former place of living. The research question was formulated as:

Research Question 2: Causes oriented
What are the main reasons for people in old industrial regions to move to the urban fringes? What is more important in the decision to move:

- the characteristics of the inner cities with their mostly negative evaluation as strong push factors, or
- the characteristics of the outer urban areas, mostly positively evaluated as stronger pull factors?

Hypothesis:
If the latter is less important than the former, this will indicate that the inner city problems/ the urban environments in former industrial cities are more important in the evaluation of residential attractivity of sites than the pull factors of the surrounding. Against the comparison of other investigations a stronger weight of push factors than pull factors is expected. This in turn would suggest that formerly industrialised cities might generate more sprawl than non-industrial cities.

The households in the suburban areas of Western Wirral and Eastern Leipzig were asked to indicate the importance of a given subset of parameters which might have contributed to their decision to move. The following tables mirror the answers as the percentages of all households. The push factors are given in the left and the right hand column of Table 4.15. Furthermore a division has been made according to important versus unimportant factors in the decision to move (for the method of this separation see Chapter 3). Here only the important issues are named and their frequencies shown. Due to the χ^2-test (Table 4.16) it is not to be expected that the two samples belong to the same statistical population. Therefore it seems that Wirral and Leipzig do not evaluate the different push factors similar. The null hypothesis on homogeneity has to be rejected. Still a closer look shall be paid to the data.

On average the respondents from Eastern Leipzig indicated more factors being important in the decision to move as compared to their counterparts in Western Wirral: 19.4% in Eastern Leipzig versus 13.1% in Western Wirral. In Eastern Leipzig the change of the work place is the most important reason: 30.5% of all respondents named this parameter as important. For 26.8% of the respondents, the wish to change tenure is an important parameter. The third reason given is a change in household size. It is named important by 25.3% of the respondents in Leipzig.

Evaluation of Eastern Leipzig respondents				**Evaluation of Western Wirral respondents**			
Push factors	N	CI [%]	Mentioned important [%]	Mentioned important [%]	CI [%]	N	**Push factors**
Home too small	39	[15.0-27.0]	20.5	**24.1**	[18.4-30.6]	49	Home too small
Home too big	14	[4.1-12.1]	7.4	13.3	[9.0-18.8]	27	Home too large
Without garden/ garden too small	33	[12.3-23.5]	17.4	13.3	[9.0-18.8]	27	Home had no/ too small garden
Quality of schools/ child-care facilities	22	[7.4-17.0]	11.6	9.4	[10.2-20.4]	30	Quality of schools
Noise pollution/ air pollution	45	[17.8-30.4]	23.7	10.3	[5.7-14.2]	19	Noise and air pollution
Too few green spaces	27	[9.6-20.0]	14.2	6.9	[6.5-15.4]	21	Lack of greenery
Traffic intrusion	39	[15.0-27.0]	20.5	8.9	[5.3-13.7]	18	Traffic intrusion
Crime rate	27	[9.6-20.0]	14.2	14.8	[3.8-11.3]	14	Crime level
Neighbours, social problems	39	[15.0-27.0]	20.5	14.3	[9.8-19.9]	29	Neighbours, social problems
Change in place of work	58	[24.1-37.6]	**30.5**	7.9	[4.6-12.5]	16	Change in place of work
Wish to change tenure	51	[20.7-33.7]	**26.8**	6.4	[3.5-10.7]	13	Wish to change tenure
Wish to trade up to a better/more expensive home	42	[16.4-28.7]	22.1	**27.6**	[21.6-34.3]	56	Wish to 'trade up' to a more expensive home
Wish to set up first home	36	[13.6-25.3]	18.9	11.8	[7.7-17.1]	24	Wish to set up first home
Relationship breakdown	32	[11.8-22.9]	16.8	5.4	[2.7-9.5]	11	Relationship breakdown
Change of household size	48	[19.3-32.1]	**25.3**	**21.7**	[16.2-28.0]	44	Change of household size
MEAN		[14.1-25.8]	19.4	13.1	[9.0-18.8]		MEAN
N = 190							N = 203

Table 4.15: Reasons for LEAVING the former place of living for the respondents from Eastern Leipzig (left) and Western Wirral (right). Sources: Author's survey, Couch & Karecha's survey.

df	14
x^2	57.08
$x^2_{(14,0.05)}$	23.68
$x^2 > x^2_{(14,0.05)}$	

Table 4.16: χ^2-statistic of homogeneity (see also section 3.3.6.1).

In Western Wirral, the most important reason in the decision to move came from the wish to trade up to a more expensive home. It was the most important reason for 27.6% of the respondents. As a second reason, 24.1% of the people indicated the dwelling was too small. The third most important reason is given by the change in household size. This seems equally important in both case studies: the change in household size is attributed the third most important aspect in Eastern Leipzig and in Western Wirral.

Differences exist with respect to the two other issues. The change of the place of work is highly important in Leipzig but very unimportant in Western Wirral. The same counts for the wish to change tenure: it is highly important in Leipzig but not at all valued important in Wirral. Both issues seem in some respect relate to the political change in 1989. First, unemployment figures rose sharply during the first years of the 1990s but people were used to be in employment and to contribute to the countries economic performance from the years before the change. Taken on from the history, the job seems highly important for the people in East Germany, it was the most valued factor of integration into the society and enabled access to all social services during the GDR era. Furthermore and in particular the strong positive evaluation of this issue might show that there is a recent increase of jobs available in the region.

On the other hand, as unemployment is a long companion of the Merseyside residents, employment might be considered as unamenable or uncertain and therefore less important in the decision to move. Additionally there might be fewer jobs on offer to attract people from other regions to get them moving closer to the job. It could also be explained by a well-functioning transport system which allows to commute efficiently and attach less importance to a consideration of job-housing distance.

The other aspect that was mentioned as important by the Leipzig respondents seems to relate to the socialist past even stronger. People in socialist countries were not allowed to freely buy and sell land and building property as it was under central governmental control. The wish to change tenure can be seen as a remaining consequence: people in former socialist countries seem to aspire the adaptation to the west European circumstances, or just to do what they were not allowed to do before, increasing owner-occupation.

Apart from the differences in these 2 of the 15 push factors one can see that the other evaluations are very much alike in both case studies. First, the relation between importance and unimportance points in the same direction and, secondly, also rating is often very similar. The average percentage difference between the answers from people in Eastern Leipzig and Western Wirral accounts for 6.29% (excluding the issue of 'wish to change tenure' and 'change of workplace'). Further, if one wants to evaluate the differences between the push factors of the dwelling, the push factors of the neighbourhood and personal reasons in migration, the set should be separated along these lines. Table 4.17 displays the division.

Evaluation of Eastern Leipzig respondents			**Evaluation of Western Wirral respondents**		
Push factors of the dwelling and the neighbourhood	CI [%]	Mentioned important [%]	Mentioned important [%]	CI [%]	**Push factors of the dwelling and the neighbourhood**
Home too small	[15.0-27.0]	**20.5**	**24.1**	[18.4-30.6]	Home too small
Home too big	[4.1-12.1]	7.4	13.3	[9.0-18.8]	Home too large
Without garden/garden too small	[12.3-23.5]	17.4	13.3	[9.0-18.8]	Home had no/ too small garden
Quality of schools/ child-care facilities	[7.4-17.0]	11.6	9.4	[10.2-20.4]	Quality of schools
Noise pollution/air pollution	[17.8-30.4]	**23.7**	10.3	[5.7-14.2]	Noise and air pollution
Too few green spaces	[9.6-20.0]	14.2	6.9	[6.5-15.4]	Lack of greenery
Traffic intrusion	[15.0-27.0]	**20.5**	8.9	[5.3-13.7]	Traffic intrusion
Crime rate	[9.6-20.0]	14.2	**14.8**	[3.8-11.3]	Crime level
Neighbours, social problems	[15.0-27.0]	**20.5**	14.3	[9.8-19.9]	Neighbours, social problems
MEAN	[11.8-22.9]	16.7	12.8	[8.5-18.2]	MEAN
Push factors from personal circumstances					**Push factors from personal circumstances**
Change of work place	[24.1-37.6]	**30.5**	7.9	[4.6-12.5]	Change in place of work
Wish to change tenure	[20.7-33.7]	**26.8**	6.4	[3.5-10.7]	Wish to change tenure
Wish to trade up to a better/ more expensive home	[16.4-28.7]	22.1	**27.6**	[21.6-34.3]	Wish to 'trade up' to a more expensive home
Wish to set up first home	[13.6-25.3]	18.9	11.8	[7.7-17.1]	Wish to set up first home
Relationship breakdown	[11.8-22.9]	16.8	5.4	[2.7-9.5]	Relationship breakdown
Change of household size	[19.3-32.1]	25.3	**21.7**	[16.2-28.0]	Change of household size
MEAN	[17.4-29.8]	23.4	13.5	[9.0-18.8]	MEAN
N = 190					N =203

Table 4.17: Reasons for LEAVING the former place of living according to a grouping of push factors. Source: Author's survey, Couch & Karecha's survey.

df	9
x^2	137.28
$x^2_{(9,0.05)}$	16.92
	$x^2 > x^2_{(9,0.05)}$

df	4
x^2	27.78
$x^2_{(4,0.05)}$	9.49
	$x^2 > x^2_{(4,0.05)}$

Table 4.18: χ^2-statistic of homogeneity (see also section 3.3.6.1).

Table 4.17 portrays the most important reasons for leaving the last residence, divided by push factors of the dwelling and the neighbourhood as well as the push factors from personal circumstances (the two most important issues per group are indicated with bold font). The χ^2-test of homogeneity reveals a similar result (Table 4.18) as before. According to a division of push factors one still has to assume that the respondents of the two case studies do not belong to the same statistical population and evaluate the push factor of either the dwelling and the neighbourhood as well as the social circumstances differently.

The division reveals that the stronger indication of push factors from the Leipzig respondents which was found previously holds with respect to the categories formed. However, the differences of average important/unimportant indications are much higher with respect to the parameters belonging to the personal circumstances of the respondents (lower part of the table). The difference in importance amounts to 10.1% (23.4% for Leipzig and 13.5% for Wirral) between the respondents of Eastern Leipzig and Western Wirral. The push factors from the dwelling and the neighbourhood show a difference in average importance of only 4.1% (16.7% in the Leipzig case and 12.8% for the Wirral case).

The push factor of the dwelling or neighbourhood mentioned most often in the Leipzig case study is air/noise pollution. One can assume that this strong indication relates to the noise pollution from traffic. The inner city is recovering from its severe environmental situation during the GDR era and is, in comparison to the surrounding area, advantageously supplied with green spaces. Altogether this might result in an ameliorated situation of air pollution after the political change and in the inner city. On the other hand, the respondents indicated that the traffic pollution is a major push factor. It becomes clear, that noise pollution from traffic seems a major drawback to the living quality of residential areas. The problems with neighbours and a too small dwelling are mentioned equally often as the traffic intrusion as important contributory factor to leaving the former place of living. The size of the dwelling is a very important reason to move to the suburban surroundings in both case studies and might be explained by the slow dynamic in the house building development and refurbishment characteristic of old industrial cities. The housing stock might be relatively old (if not taken away by slum clearance) and furthermore effectively calculated with, e.g., respect to the given space per dwelling as the housing stock was targeted mostly for the working class. Another contributory factor might be the tight financial situation in old industrial regions for both the public budgets as well as the private resources. These circumstances might result in a lower dynamic of the housing market with respect, e.g. to renovation and as compared to non-(old-)industrial regions. However, this cannot be proven by the investigation in the case study areas.

The housing situation in the post-socialist city of Leipzig was similarly undynamic as in former industrial cities of the West. Additionally, during GDR-times hardly any investments

were allocated to the maintenance and refurbishment of the old tenement housing stock. Instead, new pre-fab blocks were established at the urban fringes - which is very unfavoured today. Taken together, the housing situation after the political change is characterised by an old, low standard housing stock in the more central areas and pre-fab blocks at the fringe. Against this background one can understand the push factor 'home too small' in both case studies.

The results of the investigation show that an investment in the refurbishment of old buildings seems to be a key factor in city development without sprawl. It is not necessarily the construction of new buildings as they bear the risk of becoming unpopular shortly after due to fast changes in preferences. It is rather the possibility to change the existing housing stock which seems the more successful and sustainable alternative to city development without sprawl.

Apart from these issues, the crime level was indicated as an important push factor for the people in Western Wirral moving to the suburban realm. It is the second most important reason in Wirral, though the percentage of people who indicated this factor does not considerably differ from those in Leipzig. The relative strong indication as second most important reason seems to refer to a national specific. The signal of crime as a push factor is related to two things: actual crime rates and perceived crime rates. The perception of crime being a problem can prevail even if the actual crime rates does not justify this fear. Sometimes the perceived and the actual crime rates contrast considerably as has been shown in the case of Merseyside (Oswalt 2005). It has, in contrast to the national perception, one of the lowest crime rates compared to other agglomerations in Britain (People not profit newssheet, 5/2001[14]) (Oswalt 2005). It is also likely that these observations underline an especially sensitive character of English-speaking societies (observed highest in the United States of America, but also in the United Kingdom) towards crime, fear of crime and perception of crime in contrast to non-native English-speaking societies (Taylor and Jamieson 1998). Causes are ascribed to the newspaper press and mass media practise as well as to the 'well-being' of the national economy as a whole. These issues seem to influence a grown and growing fear of crime and the 'fear of falling' (Taylor and Jamieson 1998). The personal fear is aggravated by the media which reflects back onto the perception. However, the perceived and the actual crime rates can contrast considerably as has been shown (Oswalt 2005).

As an additional examination the push factors of the inner cities will be investigated, those respondents which came from other suburban regions or elsewhere are excluded. The sample will decrease to a figure of N=25 households in Leipzig and N=31 households in Wirral. These numbers are relatively small but it is assumed that they are still a representative sample. Table 4.19 shows the results of push factors as given by the respondents who moved from the inner to the outer urban parts.

In contrast to the push factors for the entire household samples, those for the households that move from the inner to the outer areas of town are quite similar (see the bold figures in Table 4.20). The χ^2-test of homogeneity revealed that the null hypothesis to a similar statistical population of both samples cannot be rejected. The reasons to leave the inner cities seem to be alike in both case studies. One can see that the disruptions from traffic

[14] www.peoplenotprofit.co.uk

Evaluation of respondents from Inner Leipzig				**Evaluation of respondents from Inner Wirral**			
Push factors of the dwelling and the neighbourhood	N	CI [%]	Mentioned important [%]	Mentioned important [%]	CI [%]	N	**Push factors of the dwelling and the neighbourhood**
Home too small	7	[12.1-49.4]	28.0	16.1	[5.5-33.7]	5	Home too small
Home too big	3	[2.5-31.2]	12.0	6.5	[0.8-21.4]	2	Home too large
Without garden/garden too small	6	[9.4-45.1]	24.0	**19.4**	[7.5-37.5]	6	Home had no/ too small garden
Quality of schools/ child-care facilities	4	[4.5-36.1]	16.0	12.9	[3.6-29.8]	4	Quality of schools
Noise pollution/air pollution	13	[31.3-72.2]	**52.0**	12.9	[3.6-29.8]	4	Noise and air pollution
Too few green spaces	7	[12.1-49.4]	28.0	**19.4**	[7.5-37.5]	6	Lack of greenery
Traffic intrusion	12	[27.8-68.7]	**48.0**	16.1	[5.5-33.7]	5	Traffic intrusion
Crime rate	8	[15.0-53.5]	32.0	**35.5**	[19.2-54.6]	11	Crime level
Neighbours, social problems	9	[18.0-57.4]	36.0	16.1	[5.5-33.7]	5	Neighbours, social problems
MEAN		[14.9-53.5]	30.7	17.2	[5.5-33.7]		MEAN
Push factors from personal circumstances							**Push factors from personal circumstances**
Change of work place	3	[2.5-31.2]	12.0	3.2	[0.1-16.7]	1	Change in place of work
Wish to change tenure	10	[21.1-61.3]	**40.0**	9.7	[2.0-25.8]	3	Wish to change tenure
Wish to trade up to a better/ more expensive home	8	[15.0-53.5]	**32.0**	**29.0**	[14.2-48.0]	9	Wish to 'trade up' to a more expensive home
Wish to set up first home	4	[4.5-36.1]	16.0	**19.4**	[7.5-37.5]	6	Wish to set up first home
Relationship breakdown	1	[0.1-20.4]	4.0	9.7	[2.0-25.8]	3	Relationship breakdown
Change of household size	8	[15.0-53.5]	**32.0**	12.9	[3.6-29.8]	4	Change of household size
MEAN		[12.1-49.4]	22.7	14.0	[3.6-29.8]		MEAN
N = 25							N = 31

Table 4.19: Reasons for LEAVING the inner urban areas according to a grouping of push factors. Source: Author's survey, Couch & Karecha's survey.

df	8
x^2	6.31
$x^2_{(8,0.05)}$	15.51
$x^2 < x^2_{(8,0.05)}$	

df	5
x^2	6.61
$x^2_{(5,0.05)}$	11.07
$x^2 < x^2_{(5,0.05)}$	

Table 4.20: χ^2-statistic of homogeneity (see also section 3.3.6.1).

and traffic noise is the most important push factors for people in Leipzig to leave the inner urban parts for the suburbs. In Wirral the factors mentioned important most often are the level of crime as well as a lack of green space and the small size or the lack of a garden. The size of the dwelling loses relevance. It seems that people from outer urban parts in Wirral and from regions further away did indicate the size of dwelling as important. Additionally, for the Leipzig respondents the formerly mentioned problems with neighbours and social problems in the neighbourhood are not any more regarded as one of the most important push factors.

With respect to the push factors by personal circumstances, the case study areas also show similarities. In both cities the people wanted to trade up to a more expensive or a better home. The standard of housing in the inner cities seems therefore a drawback in both regions. However, the wish to change tenure is the most frequently reported push factor in Leipzig. As explained above, this can be seen as a legacy from the socialist past. Additionally, households in Leipzig often move from the inner to the outer parts of town when the household size changes.

Astonishingly, in Wirral the wish to set up the first home is also a very prominent reason to leave the inner city. This is a new phenomenon and has not been documented by others to the knowledge of the author. Table 4.21 extends the investigation with respect to this issue. As shown, 6 of the 31 respondents (19.4%) wanted to set up their first home. About every tenth person that moves from the inner to the outer parts does so as single person setting up their first home (3 of 31). However there are more than double the number of singles who move from Inner to Outer Wirral for other reasons (wish to set up first home unimportant).

Again and especially here the conclusions drawn are highly uncertain, as the numbers are sometimes very small. The results shown in Table 4.21 are first taken from the frequency distribution of very small samples. In most cases the CI is half of the percentage value. Therefore the results should be regarded as an indication only. Additionally, the χ^2-square tests reveal that the variables cannot be regarded as interrelated (cf. Table 4.22).

df	5
x^2	0.06
$x^2_{(5,0.05)}$	11.07
$x^2 < x^2_{(5,0.05)}$	

Table 4.22: χ^2-statistic of homogeneity (see also section 3.3.6.1).

Western Wirral			**Wish to set up first home**		**Total**
			Unimportant	**Important**	
Household type	Single adult living alone	N	**7**	**3**	10
		Column %, CI in %	28.0 [12.1-49.4]	50.0 [11.8-88.2]	32.3 [16.7-51.4]
	Elderly person living alone	N	3	0	3
		Column %, CI in %	12.0 [2.5-31.2]	0.0%	9.7 [2.0-25.8]
	Adult couple	N	8	2	10
		Column %, CI in %	32.0 [15.0-53.5]	33.3 [4.3-77.7]	32.3 [16.7-51.4]
	Adult couple with child/children	N	5	1	6
		Column %, CI in %	20.0 [6.8-40.7]	16.7 [0.4-64.1]	19.4 [7.5-37.5]
	Single adult with child/children	N	1	0	1
		Column %, CI in %	4.0 [0.1-20.4]	0.0%	3.2 [0.1-16.7]
	Two or more adults sharing (with no children)	N	1	0	1
		Column %, CI in %	4.0 [0.1-20.4]	0.0%	3.2 [0.1-16.7]
Total		N	25	6	31
		Column %	100.0%	100.0%	100.0%

Table 4.21: Wish to set up the first home in dependence to the household type in Western Wirral. Source: Author's draft, Couch & Karecha's survey.

The null hypothesis says that the wish to set up the first home is independent of the household type. It has to be adopted. The households stating 'unimportant' belong to the same statistical population as those stating 'important'. No interrelation can be found between household type and the wish to set up the first home.

As a comparison between the push factors attributed to the two clusters (personal circumstances, neighbourhood and dwelling) in Table 4.19 and within one of the case study regions, the push factors from the neighbourhood and the dwelling are more important than the push factors from personal circumstances. The households seem to be leaving because of dissatisfaction with their surrounding more than from a change in their personal situation. However, the difference between the two groups is relatively small in Wirral (17.2% to 14.0%) and little bigger in Leipzig (30.7% to 22.7%). Especially under the consideration of the relatively large confidence intervals such a statement bears uncertainty. In the following the reasons for moving to the selected areas in suburban locations in Eastern Leipzig and in Western Wirral shall be investigated.

4.4.2 Reasons for choosing - Pull factors of the current place of living

Similar to the push factors the pull factors are now to be investigated. Table 4.23 document the results. As mentioned ealier the questionnaires were slightly different because the second survey was to be ameliorated after the first and because of adjustments to the regional and national specifics. The χ^2-test reveals (Table 4.24) that both samples belong to a different statistical population. The null hypothesis has to be rejected, the households in Western Wirral and Eastern Leipzig evaluate the pull factors of the suburban areas differently. However, as an average across all households the reasons for choosing the new place are very similar in Eastern Leipzig and in Western Wirral.

df	9
x^2	41.35
$x^2_{(9,0.05)}$	16.92
	$x^2 > x^2_{(9,0.05)}$

Table 4.24: χ^2-statistic of homogeneity (see section 3.3.6.1).

A safe and low-crime neighbourhood ranks highest among all respondents and in both case studies. Against the background that this aspect is not indicated as a strong push factor among the Leipzig respondents, one has to assume that the indication of that preference was biased in some way. It certainly is a very important factor as nobody wants to live in fear of their own safety. However the question that was raised in the questionnaire addressed the importance of the different aspects in the decision to choose the respective living place but did not asked for a general requirement of residential places in the eye of the movers. In fact, in this case it seems hardly possible to formulate a question about crime without a bias. It is rather assumed that the answers to this question do not reveal much information to the research question here. Different with the other aspects mentioned. This one question shows that hindcasting questionnaires have to be formulated with great carefulness.

Quietness has been evaluated extremely important to the sample households in both case studies. Furthermore the proximity to nature and landscape is very valuable to people that move to the suburban surroundings. Also here, both case studies show a high similarity. A good road network is not mentioned as important by the sample households from Western Wirral but from those of Eastern Leipzig.

Least important among the Leipzig respondents is the price for building land. Also the proximity to leisure places is not a criteria for attractivity, neither for the respondents from Leipzig nor to those from Wirral. Unimportant for the respondents from Wirral is also the proximity to a park.

All these issues relate to the characteristics of the neighbourhood or the dwelling to a certain extent. Only the issue 'being near to friends and family' points towards a closer connection to the personal situation. All aspects are assumed to contribute to the attractivity of a place, they will be considered as residential attractivity dimensions herafter. The data are also investigated with respect to the former place of living. The households that moved from the inner to the outer urban areas are most interesting. Households that moved within the suburban areas or newly entered the region are excluded.

Evaluation of respondents from Eastern Leipzig				Evaluation of respondents from Western Wirral			
Pull factors/ Attractivity dimension	N	CI [%]	Mentioned important [%]	Mentioned important [%]	CI [%]	N	**Pull factors/ Attractivity dimension**
Proximity to work	73	[31.1-45.3]	38.0	11.8	[7.7-17.1]	24	Proximity to work
Proximity to shopping	56	[22.9-36.1]	29.2	29.1	[22.9-35.8]	59	Proximity to food shopping
				18.7	[13.6-24.8]	38	Proximity other shopping
Proximity to leisure facilities	22	[7.3-16.8]	11.5	14.3	[9.8-19.9]	29	Proximity to leisure places
Proximity to nature and landscape	93	[41.2-55.7]	**48.4**	**53.2**	[46.1-60.2]	108	Proximity to areas of countryside and coast
Little environmental pollution	66	[27.7-41.6]	34.4				
Good road network	102	[45.8-60.3]	**53.1**	43.3	[36.4-50.4]	88	Good road connections
Good public transport	72	[30.6-44.8]	37.5	34.0	[27.5-41.0]	69	Proximity to a railway station
				32.5	[26.1-39.4]	66	Good bus links
Family friendly neighbourhood	71	[31.1-44.2]	37.0				
Good schools/child-care facilities	58	[23.8-37.2]	30.2	27.6	[21.6-34.3]	56	Proximity to good schools
Proximity to friends and family	76	[32.6-46.9]	39.6	39.9	[33.1-47.0]	81	Proximity to friends and family
Quiet neighbourhood	103	[46.3-60.9]	**53.6**	**68.5**	[61.6-74.8]	139	Quiet neighbourhood
Safe, low-crime neighbourhood	103	[46.3-60.9]	**53.6**	**71.9**	[65.2-78.0]	146	Low-crime neighbourhood
Affordable building land	15	[4.4-12.6]	7.8	40.9	[34.1-48.0]	83	Affordable housing
Affordable rents	48	[19.0-31.7]	25.0				
				14.3	[9.8-19.9]	29	Proximity to a park
Appropriate offer and supply	51	[20.5-33.4]	26.6				
MEAN		[28.8-42.1]	35.0	35.7	[30.8-44.5]		MEAN
N = 192							N = 203

Table 4.23: Reasons for CHOOSING the current place of living for the Eastern Leipzig (left) and Western Wirral (right) respondents. Sources: Author's survey, Couch & Karecha's survey.

Evaluation of respondents from Inner Leipzig				**Evaluation of respondents from Inner Wirral**			
Pull factors/ Attractivity dimension	N	CI [%]	Mentioned important [%]	Mentioned important [%]	CI [%]	N	**Pull factors/ Attractivity dimension**
Proximity to work	8	[14.9-53.5]	32.0	12.9	[3.6-29.8]	4	Proximity to work
Proximity to shopping	4	[4.5-36.1]	16.0	12.9	[3.6-29.8]	4	Proximity to food shopping
				9.7	[2.4-25.8]	3	Proximity to other shopping
Proximity to leisure facilities	2	[1.0-26.0]	8.0	9.7	[2.4-25.8]	3	Proximity to leisure places
Proximity to nature and landscape	15	[38.7-78.9]	**60.0**	38.7	[21.8-57.8]	12	Proximity to areas of countryside and coast
Little environmental pollution	13	[31.3-72.2]	52.0				
Good road network	14	[34.9-75.6]	**56.0**	25.8	[11.9-44.6]	8	Good road connections
Good public transport	9	[18.0-57.5]	36.0	12.9	[3.6-29.8]	4	Proximity to a railway station
				9.7	[2.4-25.8]	3	Good bus links
Family friendly neighbourhood	11	[24.8-64.8]	44.0				
Good schools/child-care facilities	9	[18.0-57.5]	36.0	16.1	[5.5-33.7]	5	Proximity to good schools
Proximity to friends and family	9	[18.0-57.5]	36.0	22.6	[9.6-41.1]	7	Proximity to friends and family
Quiet neighbourhood	12	[27.8-68.7]	**48.0**	**71.0**	[52.0-85.8]	22	Quiet neighbourhood
Safe, low-crime neighbourhood	15	[38.7-78.9]	**60.0**	**58.1**	[39.1-75.5]	18	Low-crime neighbourhood
Affordable building land	1	[0.1-20.4]	4.0	**51.6**	[33.1-69.8]	16	Affordable housing
Affordable rents	3	[2.5-31.2]	12.0				
				6.5	[33.1-69.8]	16	Proximity to a park
Appropriate offer and supply	9	[18.0-57.5]	36.0				
MEAN		[18.0-57.5]	35.7	25.6	[11.9-44.6]		MEAN
N = 25							N = 31

Table 4.25: Reasons for CHOOSING the current place of living for the people from Inner Leipzig and Inner Wirral. Sources: Author's survey, Couch & Karecha's survey.

df	9
x^2	16.10
$x^2_{(9,0.05)}$	16.92
$x^2 < x^2_{(9,0.05)}$	

Table 4.26: χ^2-statistic of homogeneity (see also section 3.3.6.1).

Table 4.25 amplifies the findings of important attractivity dimensions across all households while specifiying the attractivity dimensions for those that moved from the inner city areas to the out-lying parts of the case study regions. The same aspects are mentioned here: safe/low crime neighbourhood, quietness, proximity to nature and landscape as well as the road network for the Leipzig respondents. In contrast to the statistics for all the respondents this time the respondents seem to belong to the same statistical population (see Table 4.26). This means that the households that moved from Inner to Outer Leipzig and from Inner to Outer Wirral seem to evaluate the pull factors of the suburban areas similarly. This finding is not very robust as the χ^2 and the $\chi^2_{(9,0.05)}$ differ only slightly, additionally there are high confidence intervals connected to the percentages of importantly mentioned attractivity dimensions as shown in Table 4.25.

However, small differences exist with regard to the findings across all households and with respect to the ranking of the important attractivity dimensions. For example quietness was mentioned the most important aspect among all the Leipzig respondents above, here it only ranks third. Instead the proximity to nature and landscape as well as a good road network gain more importance with the people that move from the inner to the outer urban parts as compared to the percentage across all households. Furthermore, in the case of Wirral, affordable housing is very important, especially for the people that move from Inner to Outer Wirral. It was not very important for the households coming from other regions. Again one has to note, the calculations are based on small samples.

4.4.3 Comparison of the push and pull factors of the inner and outer urban areas

The findings described in the former sectionschapters are now evaluated in terms of relative importance of push and pull factors. Table 4.27 shows the results from previous tables.

	Eastern Leipzig	**Western Wirral**	
PUSH FACTORS of the inner urban areas	**30.7%** [14.9%-53.5%]	**17.2%** [5.5%-33.7%]	PUSH FACTORS of the inner urban areas
PULL FACTORS of the outer urban areas	**35.7%** [18.0%-57.5%]	**25.6%** [11.9%-44.6%]	PULL FACTORS of the outer urban areas
Difference	**5.0%**	**8.4%**	Difference

Table 4.27: Comparison between push and pull factors. Source: Author's draft, Author's survey, Couch & Karecha's survey.

The comparison between push and pull factors reveals that the sample households in both case studies show a stronger concentration on pull factors and a lower influence of push factors. Against this background one would assume that the aspiration to live in the suburban areas are stronger than the disamenities encountered in the inner urban parts. One could not conclude from these findings that the conditions in the inner urban areas of old industrial regions seem to be unfriendly in the eyes of those moving. However, the outcome of this evaluation cannot be stated with certainty as the study does not allow a comparison to a non-industrial city. The hypothesis to research question 2 has to be rejected.

Additionally, the extent of difference between push and pull factors is dissimilar in both case studies. In Leipzig, 5.0% of the sample households rated the pull factors more important than the push factors. In Wirral the difference was 8.4%. This might indicate that the living amenities between the inner and the outer urban areas differ more strongly in the British case study region.

4.5 Research Question 3: Consequences of urban sprawl with respect to car use and living space

Research question 3 and the hypothesis to it was formulated as follows:

Research Question 3: Consequences oriented
Can an increase in living space, the number of cars and the commuting distance be clearly attributed to the migration from an inner to an outer city location when both different households are compared at the same time (inner versus outer urban residents) and the same households are evaluated at different times (moving households from the inner to the outer urban areas)?

Hypothesis:
Against the background of the current literature it is assumed that the households which are living in outer urban areas have a higher amount of living space, number of cars and commuting distance in average. Also the preference to use the car is assumed to be larger. If one compares the situation in the same households before and after a move from the inner urban parts to the fringes, it is assumed that this will lead to an increase in living space, the preference to use tha car and the amount of cars per household. However, taking into consideration that the financial resources of residents in former industrial areas are small, a concentration of employment as a legacy from the GDR period remains, and the people especially in old industrial areas by cause of a constituted behaviour do not like to commute it is not assumed that the commuting distance changes much.

The possible change in mobility, with car ownership and commuting distance being the central variables, and the size of dwelling between the inner and the outer urban areas will be investigated in Leipzig and Wirral. Additional information is given by the assessment of means of transport as well as the number of newly constructed dwellings. These latter aspects will support the understanding of the dynamics in the suburban areas. There are many aspects that can influence the mobility of people, their commuting behaviour as well as the size of dwelling. It is potentially not only the place of residence. These places itself are conditioned, e.g. by the building structure, transport infrastructure, building regulations and other variables. For the case of Leipzig the current and the former place of living of the same households will form the basis of analysis. Regarding Wirral, different households in Inner Wirral and Outer Wirral are used for comparison. The analysis of Wirral precedes that of Leipzig in this section.

4.5.1 Mobility

4.5.1.1 Car ownership

Table 4.28 and Figure 4.29 show the distribution of car ownership in Inner and Outer Wirral.

Inner Wirral	N	Percent
No car or van	224547	37.8
One car or van	28373	43.7
Two cars or vans	10070	15.5
Three cars or vans	1575	2.4
Four and more cars or vans	419	0.6
Total	64984	100.0

Outer Wirral	N	Percent
No car or van	15911	23.3
One car or van	30696	44.9
Two cars or vans	17733	25.9
Three cars or vans	3233	4.7
Four and more cars or vans	780	1.1
Total	68353	100.0

Table 4.28: Number of cars per household in Inner (left) and Outer Wirral (right) in 2001. Source: Office for National Statistics UK.

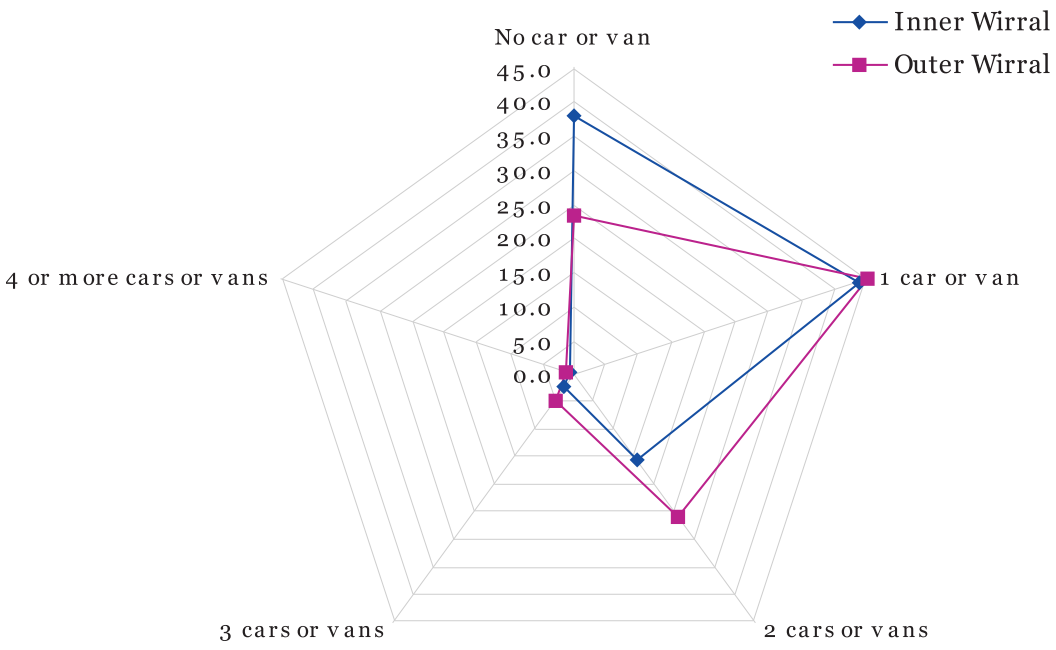


Figure 4.29: Number of cars per household in Inner and Outer Wirral [%]. Source: Author's draft, Data: Office for National Statistics UK.

There are significantly more households in Inner Wirral who do not possess a car as compared to those in Outer Wirral. The percentage distribution of households with one car is relatively equal in both areas, but those one with two cars live to a higher percentage in Outer Wirral. There, also the households with three cars as well as with four and more cars are more numerous than compared to Inner Wirral. This means that the car ownership is higher among the suburban households of Wirral than among those in the inner urban parts on average.

The distribution of car ownership in the sample households of Eastern Leipzig shows the Table 4.29 and the diagrams in Figure 4.30.

Eastern Leipzig - current home		N	Valid %	CI in %
Valid	No car	28	14.8	[10.1-20.7]
	One car	90	47.6	[40.3-55.0]
	Two cars	63	33.3	[26.7-40.5]
	Three cars	7	3.7	[1.5-7.4]
	Four and more cars	1	0.5	[0.0-2.9]
	Total	189	100.0	
Missing		5		
Total		194		

Eastern Leipzig - former home		N	Valid %	CI in %
Valid	No car	18	9.7	[5.9-14.9]
	One car	97	52.4	[45.0-59.8]
	Two cars	66	35.7	[28.8-43.0]
	Three cars	3	1.6	[0.3-4.7]
	Four and more cars	1	0.5	[0.0-3.0]
	Total	185	100.0	
Missing		9		
Total		194		

Table 4.29: Number of cars per household in the current (left) and the former home (right) in Eastern Leipzig. Source: Author's survey.

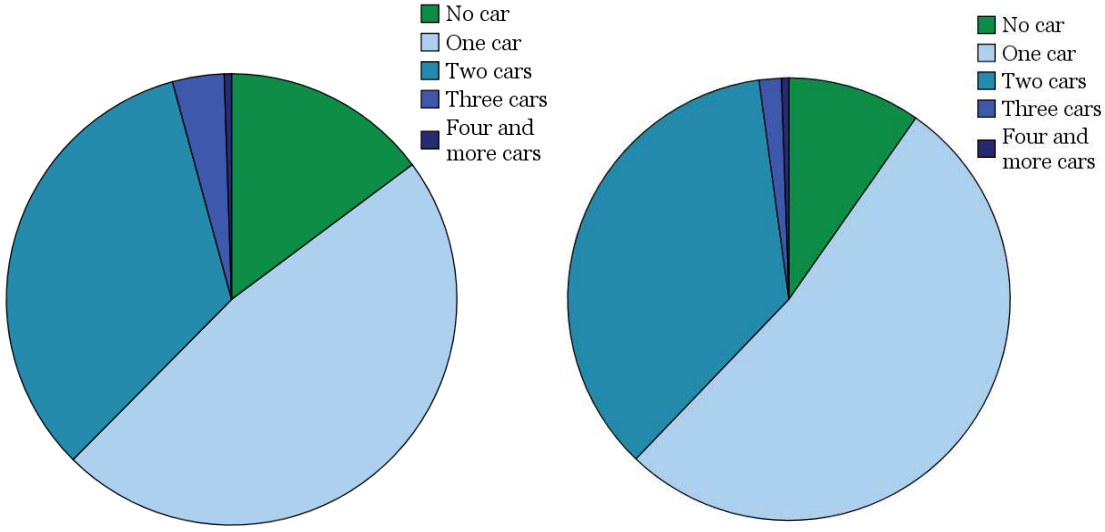


Figure 4.30: Number of cars per household in the current (left) and the former (right) home of respondents in Eastern Leipzig. Source: Author's draft, Data: Author's survey.

The questionnaire reveals that 14.8% of the responding households do not possess a car at their current place of residence whereas this counted for only 9.7% at their former place. Similarly the percentage of households with one car decreased from 52.4% in the former home to 47.6% of households in the current home, and for two cars also decreased from 35.7% to 33.3%. Only the households with three cars increased. They represented a share of 1.6% of the households before and 3.7% of the households after the move. Households with four and more cars remained the same. It shall be noted that the samples for the latter two categories are very small, no solid conclusion should be drawn from them.

According to these findings, a move to the suburban areas does not entail an increase in the number of cars. However, it shall also be tested whether there is a difference between the households moving from the inner parts of Leipzig and those households from the outer parts or from elsewhere. Tables 4.30 and 4.32 portray the outcomes of car ownership in dependence on the location of the former place of living, first in the current home (Table 4.30) and then in the former home (Table 4.32).

			Previous home			Total
			Inner Leipzig	**Outer Leipzig**	**Elsewhere**	
Cars per household	No car	N	3	2	22	27
		Column %, CI in %	12.0 [2.5-31.2]	10.0 [1.2-31.7]	15.5 [10.0-22.5]	14.4 [9.7-20.3]
	One car	N	14	9	66	89
		Column %, CI in %	56.0 [34.9-75.6]	45.0 [23.1-68.5]	46.5 [38.1-55.0]	47.6 [40.3-55.0]
	Two cars	N	6	8	49	63
		Column %, CI in %	24.0 [9.4-45.1]	40.0 [19.1-63.9]	34.5 [26.7-42.9]	33.7 [27.0-40.9]
	Three cars	N	2	1	4	7
		Column %, CI in %	8.0 [1.0-26.0]	5.0 [0.0-24.9]	2.8 [0.8-7.1]	3.7 [1.5-7.6]
	Four and more cars	N	0	0	1	1
		Column %, CI in %	0.0	0.0	0.7 [0.0-3.9]	0.5 [0.0-2.9]
Total		N	25	20	142	187
		Column %	100.0	100.0	100.0	100.0

Table 4.30: Number of cars per household in dependence of the former home. Source: Author's survey.

df	4
x^2	3.82
$x^2_{(4,0.05)}$	9.49
$x^2 < x^2_{(4,0.05)}$	

Table 4.31: χ^2-statistic of homogeneity (see also section 3.3.6.1).

According to the χ^2-test the null hypothesis cannot be rejected (Table 4.31). Instead it has to be adopted and says that there exists no relationship between the variables in rows and columns. It cannot be stated with certainty that the number of cars per household in the current home and the location of the last home are significantly related.

			Previous home			Total
			Inner Leipzig	**Outer Leipzig**	**Elsewhere**	
Cars per household in the last home	No car	N	3	2	12	17
		Column %, CI in %	12.0 [2.5-31.2]	10.0 [1.2-31.7]	8.7 [4.6-14.7]	9.3 [5.5-14.5]
	One car	N	15	9	72	96
		Column %, CI in %	60.0 [38.7-78.9]	45.0 [23.1-68.5]	52.2 [43.5-60.7]	52.5 [45.0-60.0]
	Two cars	N	6	9	51	66
		Column %, CI in %	24.0 [9.4-45.1]	45.0 [23.1-68.5]	37.0 [28.9-45.6]	36.1 [29.1-43.5]
	Three cars	N	1	0	2	3
		Column %, CI in %	4.0 [0.1-20.4]	0.0	1.4 [0.2-5.1]	1.6 [0.3-4.7]
	Four and more cars	N	0	0	1	1
		Column %, CI in %	0.0	0.0	0.7 [0.0-4.0]	0.5 [0.0-3.0]
Total		N	25	20	138	183
		Column %	100.0	100.0	100.0	100.0

Table 4.32: Number of cars per household in the former residence and in dependence of the former home. Source: Author's survey.

df	8
x^2	3.76
$x^2_{(8,0.05)}$	15.51
$x^2 < x^2_{(8,0.05)}$	

Table 4.33: χ^2-statistic of homogeneity (see also section 3.3.6.1).

Also in the case of car dependence and the former place of residence, there is a high degree of uncertainty that the columns and rows in Table 4.32 are related. The χ^2-test shows as well that the null hypothesis of independence has to be adopted at the 0.05 level (Table 4.33). Therefore it cannot be assumed that the car ownership depends on the part of town in which one lives. This might also be influenced by the small counts, the high confidence intervals make a conclusion difficult. Despite the high uncertainty, the results shall be looked at in some more depth, see Table 4.30 and Table 4.32.

The people formerly residing in Inner Leipzig mainly possess one car now (56.0%), to a lesser amount two cars (24.0%) and then no car (12.0%). The household which formerly lived in Outer Leipzig also possess one car (45.0%) but to a relatively much higher extent (40.0%) two cars. The share of households with no car or three and above cars is similar to those households that had their last residence in the inner city. Regarding the new Leipzig households, the percentage of households with one car is highest as well (46.5%). These

households possess two cars (34.5%) to a higher degree than to the households from Inner Leipzig but to a lesser degree than those from Outer Leipzig. They comprise the highest share of households without cars (15.5%), and also have the only household with four and more cars (0.7%).

In the former place of residence, the Inner Leipzig households had a higher percentage of one car (60.0% as compared to 56.0%) which is now taken up by the share of households with three cars (increase from 4.0% to 8.0% of the households from Inner Leipzig). This is an indication that a move from the inner to the outer parts of Leipzig might lead to a higher number of cars per household. With respect to the households which already lived in Outer Leipzig before, there is a decrease of households with two cars (from 45.0% to 40.0%) in favour of the households with three cars (from 0.0% to 5.0%). This means that not only the move from the inner parts of Leipzig to the suburban areas entails an increase in cars per household but also a move within the suburban realm. A decrease in the number of cars is noticeable with the households coming from outside of Leipzig. These households decreased the percentage with two cars (from 37.0% to 34.5%) and with one cars (from 52.2% formerly to 46.5% of the households now). The decrease was mainly compensated for by an increase in households with no car (increase from 8.7% to 15.5%) and to a little extent by the households with three cars (increase from 1.4% formerly to 2.8% in the current place). However, as one can see in the tables the counts and absolute number of changes are very small. The results presented here cannot serve as more than an indication to the development of car ownership by migration to the suburban areas. For a better comparison the described changes are shown in one diagram in Figure 4.31.

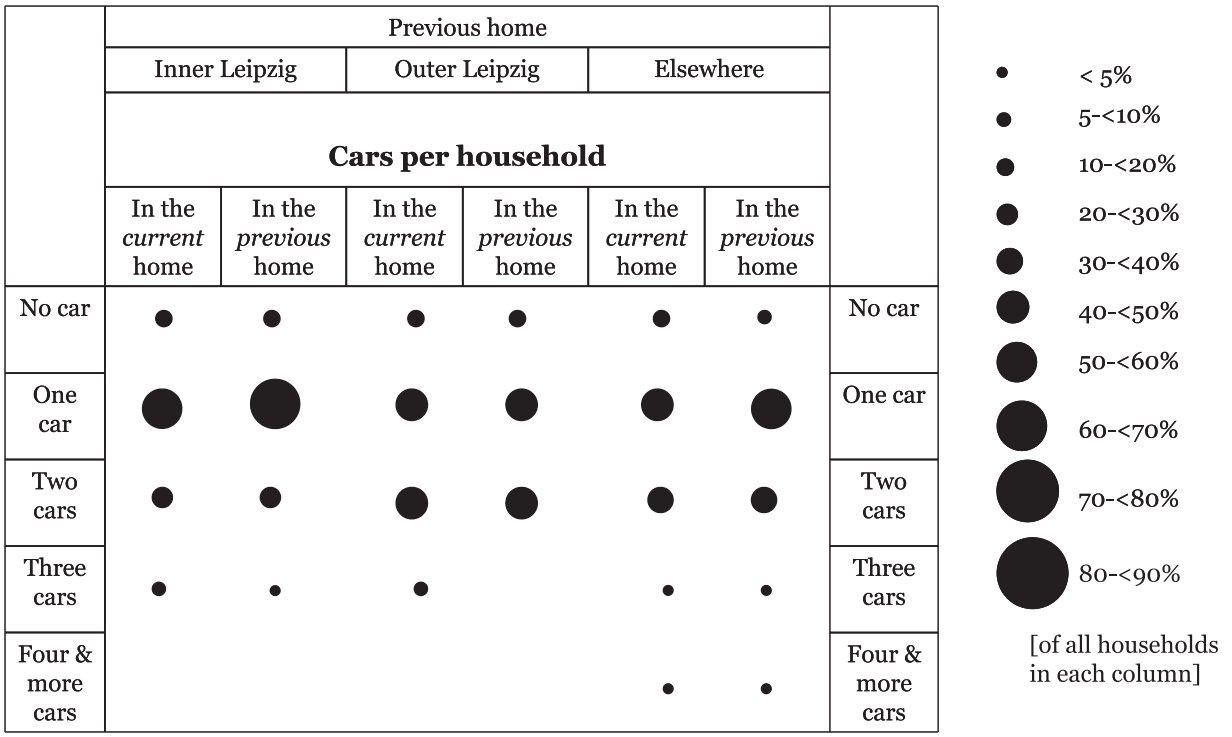


Figure 4.31: Relative distribution of cars in Eastern Leipzig depending on the place of residence. Source: Author's draft, Data: Author's survey.

The changes described can be evaluated against the comparison of an average car ownership of 0.72 cars/household in Leipzig whereby 0.62 cars/household are counted for the Inner Leipzig districts and 1.07 for the Outer Leipzig districts (Stadt Leipzig 2004). The distribution of car ownership in the districts of Eastern Leipzig is also shown in a map in Figure 4.32. The piecharts display the information gained by the questionnaire. Additional aspects possibly influencing the car ownership are also mapped, e.g. the household income and the percentage of district area dedicated to traffic, information which is retrieved from official statistics.

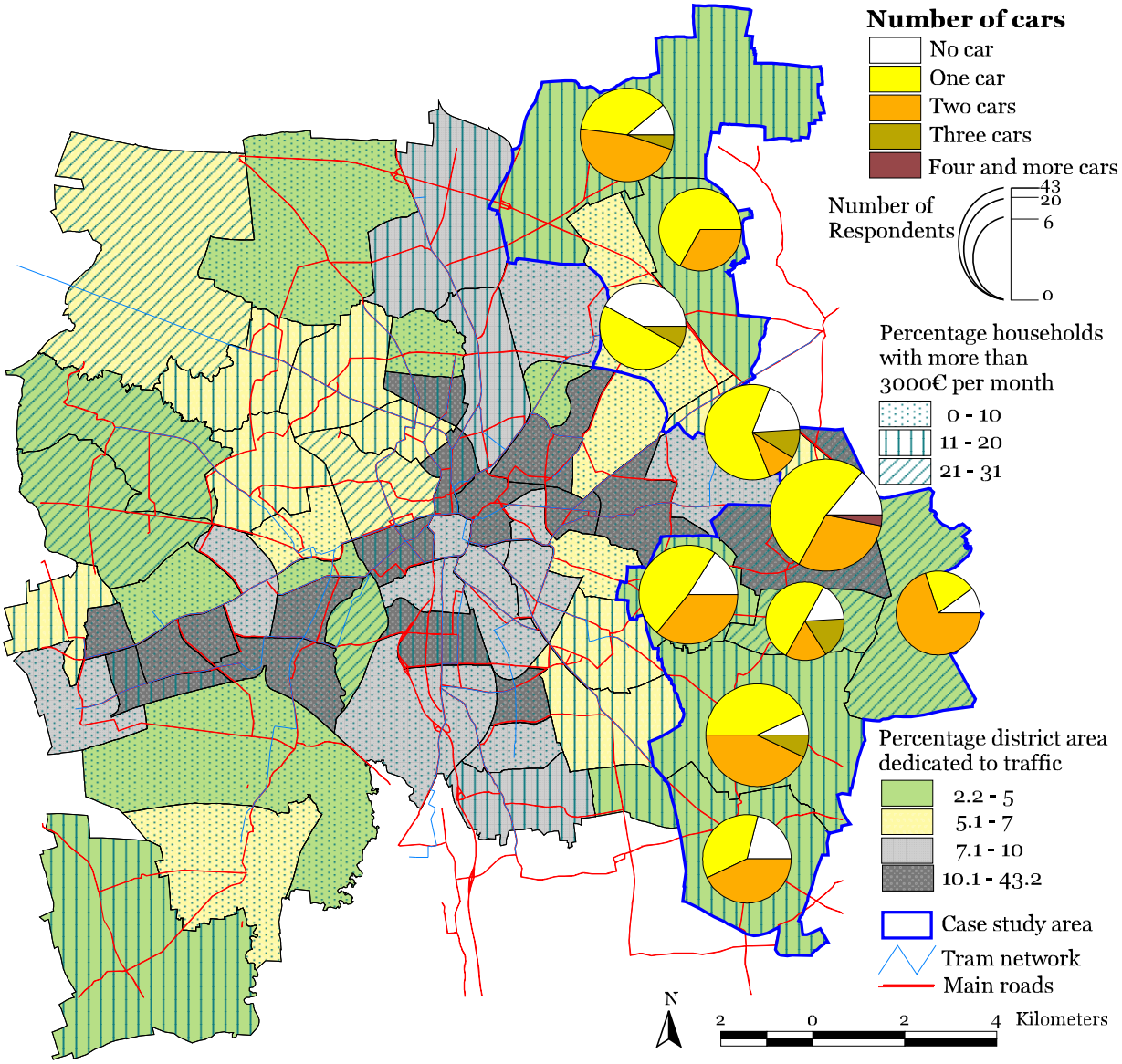


Figure 4.32: Car ownership in the case study area of Leipzig. Source: Author's draft, Data: Amt für Statistik und Wahlen Leipzig, Author's survey.

One can see that the average car ownership is higher in the districts of Outer Leipzig (as compared to Inner Leipzig) which show a high precentage of well-off households with more than 3000 household income per month. However, the increase in the number of cars per households among the moving ones was only very little. The percentage area dedicated to traffic seems not to be related. Additionally it shall be mentioned that all maps in

this section should only be used as a visualisation of certain aspects of mobility and living conditions. The data of the case study sample in Eastern Leipzig, those ones which are lying behind the pie-charts in the maps, are sometimes very small in numbers if one breaks it up into the different city districts.

4.5.1.2 Commuting distance

Again, the results are presented for the district of Wirral first (Table 4.34 and Figure 4.33).

Inner Wirral	N	Percent
Less than 5km	29055	56.4
5 -< 10km	12433	24.1
10 -< 20km	5318	10.3
20 -< 40km	2663	5.2
40km and more	2031	3.9
Total	51500	100.0

Outer Wirral	N	Percent
Less than 5km	20836	35.6
5 -< 10km	18250	31.2
10 -< 20km	12826	21.9
20 -< 40km	3547	6.1
40km and more	2988	5.1
Total	58477	100.0

Table 4.34: Commuting distance from Inner (left) and Outer Wirral (right) in 2001. Source: Author's draft. Data: Office for National Statistics UK.

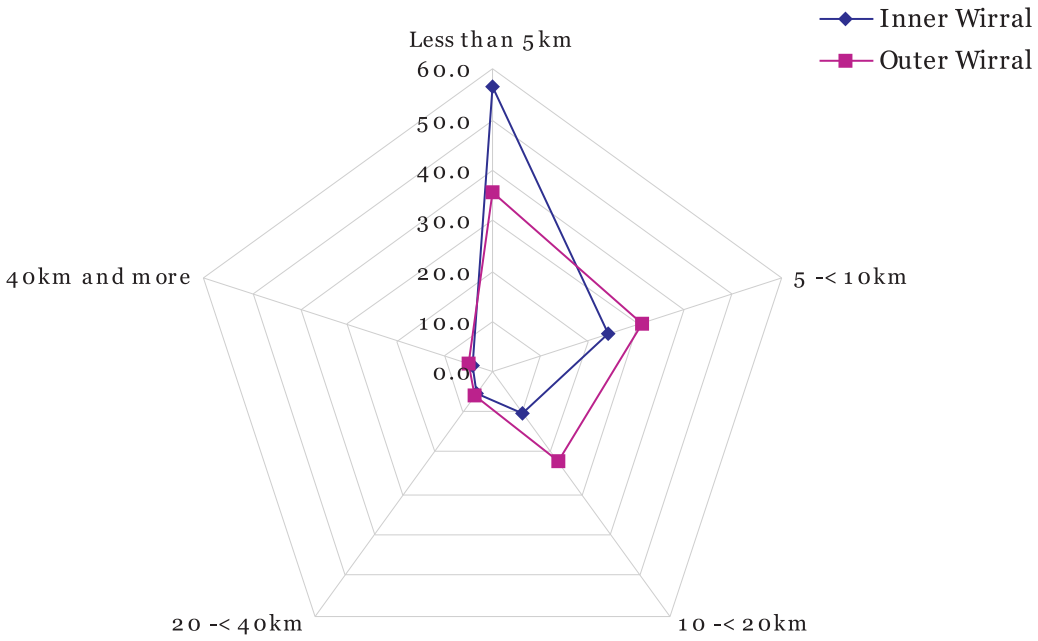


Figure 4.33: Number of cars per household in Inner and Outer Wirral [%]. Source: Author's draft, Data: Office for National Statistics UK.

The analysis reveals that the residents from Inner Wirral have a substantially shorter distance to work, most of them less than 5km. Also the majority of residents from Outer Wirral have to go less than 5km but there are more people driving 5 to 10 or up to 20km.

For the sample households in Eastern Leipzig the analysis yielded following results. For the respondents of the questionnaire, the distance to work changed by the last move as shown in Table 4.35.

N	Valid	128
	Missing	66
Mean		26.95
Median		10.00
Minimum		0
Maximum		500

N	Valid	120
	Missing	74
Mean		43.43
Median		16.50
Minimum		0
Maximum		740

Table 4.35: Distance to work from Eastern Leipzig [km] (left). Distance to work from former home [km] (right). Source: Author's draft. Data: Author's survey.

The range of commuting distance between the former place of living and the current place is high and varies between 0 and 500 kilometres. The mean across all respondents represents 26.95km with substantially more people driving shorter distances as the median of 10km shows. In the former place of living, the mean of the commuting distance was still 43.43km which is a substantial alteration, especially as it refers to the average.

Across all responding households in Eastern Leipzig the distance to work decreased with the migration to the suburban areas of Leipzig. The documented distances are still low as compared to the German average (see Annex 22). With most heads of household (around 11%), travelling about 10km to their place of work the sample results are in line with the official statistics (see Annex 22). It underlines the assumption that the sample of households in the case study area Eastern Leipzig are a representative sample of all households in the region. However, in most regions of Germany in recent years and especially in those of the former GDR the average commuting distance has increased (as shown in Annex 23).

In the light of the research question it is especially interesting to look at the distribution according to the households' previous place of living: Inner Leipzig, Outer Leipzig or elsewhere, addressed in Table 4.36.

Commuting distance from the current home Eastern Leipzig				**Commuting distance from the former home**			
Previously living in ...	Cumulative commuting distance [km]	N	Average commuting distance from current home [km]	**Previously living in ...**	Cumulative commuting distance [km]	N	Average commuting distance from current home [km]
Inner Leipzig	875	20	43.75	Inner Leipzig	179	20	8.95
Outer Leipzig	274	15	18.27	Outer Leipzig	257	14	18.36
Elsewhere	2297	92	24.97	Elsewhere	4635	85	54.53

Table 4.36: Commuting distances from the current (left) and the former home (right) in Eastern Leipzig dependent on the former place of living. Source: Author's draft. Data: Author's survey.

The full tables are listed in Annex 11 and Annex 12. Table 4.36 mirrors the changes in commuting distance from the former place of living to the current residential location. The heads of household who lived in the inner parts of Leipzig before have to travel 43.75km on average from their suburban neighbourhoods. From their previous dwellings they only had to commute for about an average of 8.95km. This is an increase of 34.80km or 388.8%. For the households that already lived in the suburban realms before, the differences were not substantial. On average the heads of households had to drive 18.36km from the former place and commute over 18.27km now. It explains a decrease in commuting distance of 0.09km or by 0.49%. The commuting behaviour of the heads of household from elsewhere in the region or other parts of Germany changed remarkably as well. Whereas the former distance to work summed up to 54.53km it has now decreased to 24.97km. This is a fall of 29.56km or a decrease by 54.21%. Figure 4.34 displays the reason for the drastic change of commuting distance for the people who moved from the inner to the outer urban areas.

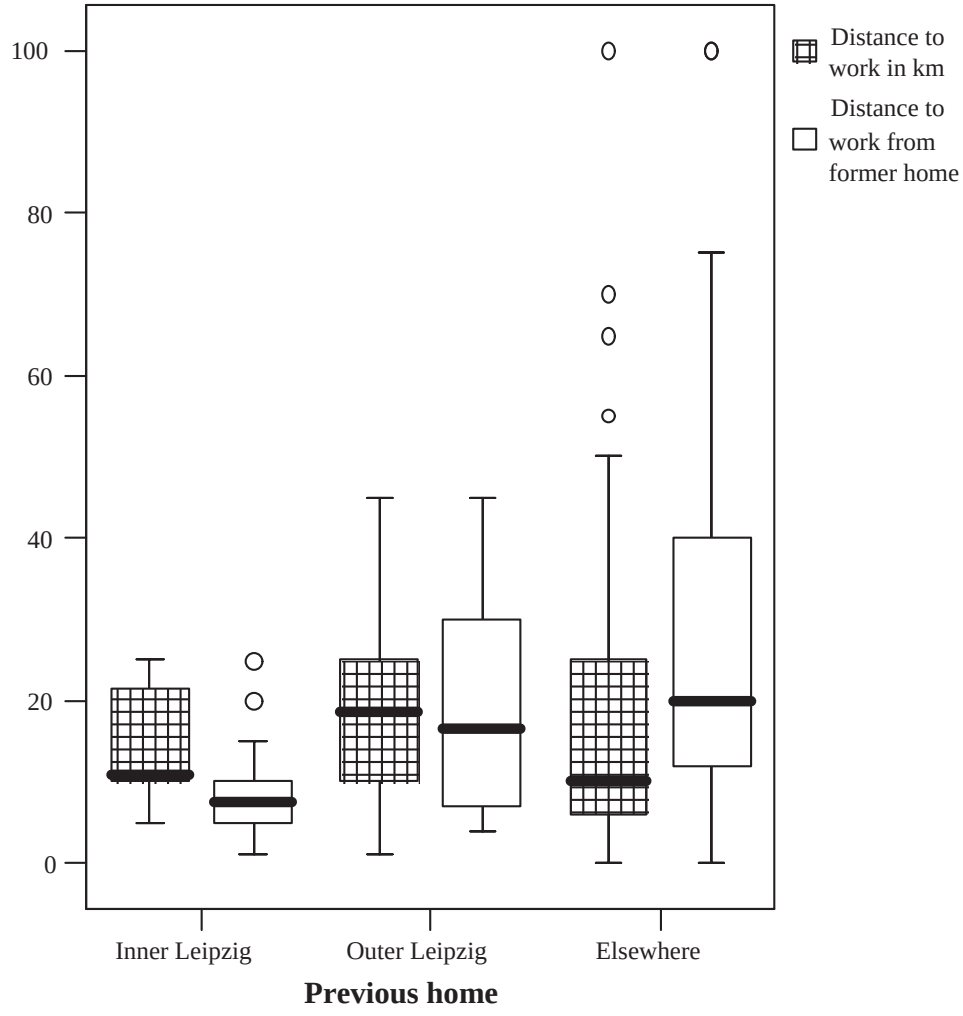


Figure 4.34: Distance to work from the current and the former home in dependence on the former place of residence. Source: Author's draft. Data: Author's survey. Note: Thick lines represent the median, the boxes the data within the upper and lower quintiles, the whiskers the data from the second up to the ninth deciles. Little circles are outliers.

The boxplot compares the commuting distance from the former in contrast to that of the current home as pairs and according to the last place of residence of the household. The

boxes show the data between the upper and lower quintile (20-80% of the data distribution) as an example for the spread of the answers. The thick lines within the boxes represent the median. The whiskers mark the second to the ninth deciles (10-90% of the data distribution) as an example for the spread of outliers. One can see that the average commuting distance of the respondents formerly living in Inner Leipzig increased. In this case certain outliers (little circles) are excluded from the boxplot, one at 135km and another at 500km. There are outliers in both the plotted distance from the current home as well as from the former home with the maximum being a commuting distance of 740km from the last home for one head of household who was formerly living elsewhere. Most outliers are not visible in Figure 4.34 because otherwise the scaling would make the bars very small and illegible. However, for most of the heads of household the average commuting distance seems to have increased from below to currently above 10km.

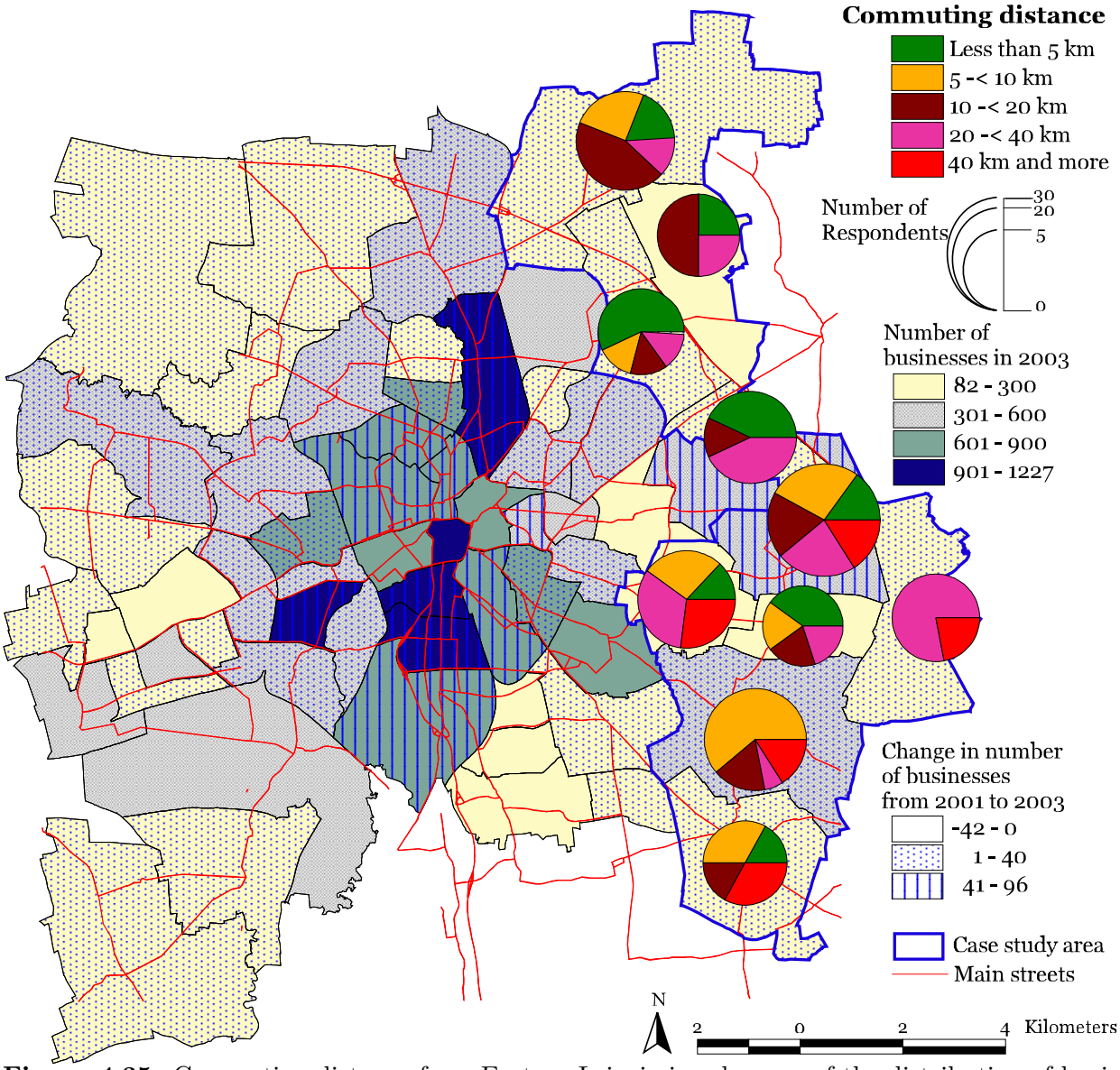


Figure 4.35: Commuting distance from Eastern Leipzig in relevance of the distribution of businesses. Source: Author's draft, Data: Amt für Statistik und Wahlen Leipzig, Author's survey.

A change of the commuting distance is dependent on several factors. The location of jobs in relation to the place of residence is a central one. A comparison between job locations in 2001 and 2003 give an indication about the trend in job distribution in Leipzig (see Figure 4.35). It reveals whether such issues have a remarkable influence on the commuting distance of people. It shows that the majority of businesses locate in the inner city parts of Leipzig. Also the change in business distribution reveals a focus on the inner urban areas, not especially the central ones but rather the fringes of the inner parts. Additionally there was a high increase in businesses in two city districts further out to the East, in Paunsdorf and Engelsdorf. Here the increase in businesses could be brought about by the big 'Paunsdorf centre' shopping mall which might form an attractive investment area. Furthermore one can see that an increase in businesses is documented in the northern parts and in some of the western districts of Leipzig. These are areas close to the motorway. The northern districts especially have been subject to huge investments in the recent past. Examples are the new businesses connected to the cargo transport centre, the extension of the airport, BMW and DHL, a courier service of the Deutsche Post (German Post). There is some proof of decentralisation but the concentration in the inner urban areas seems to be stronger than the centrifugal developments.

It was pointed out earlier that there are more variables to consider if one wants to assess the change in commuting behaviour of households in different locations. A further important issues is the preferred means of transport, which shall therefore be anlaysed hereafter.

4.5.1.3 Preferred means of transport

In the survey in Eastern Leipzig the heads of household were asked about their preferred means of transport. The official statistics do not normally compile such data. Therefore, the means of transport to work is used in the Wirral case instead. It is assumed that these data fairly well represent a preference. Table 4.37 accounts for the used means of transport among the employees in Wirral, Figure 4.36 displays the results graphically. Again a division is made between the residents from Outer and Inner Wirral.

Inner Wirral	N	Percent
Tram, train	3155	5.9
Bus, taxi	6700	12.6
Car, motorcycle	36644	69.1
Bicyle, on foot	7152	13.5
Total	53651	100.0

Outer Wirral	N	Percent
Tram, train	4080	6.4
Bus, taxi	4526	7.1
Car, motorcycle	49420	78.0
Bicyle, on foot	5657	8.9
Total	63683	100.0

Table 4.37: Means of transport to commute from Inner (left) and Outer Wirral (right) in 2001. Source: Office for National Statistics UK.

The analysis shows that there is no significant difference in the means of transport to work between Inner and Outer Wirral. Most people in both regions commute by car or motorcycle. The bicycle or the own feet are second, whereas the bus or taxi ranks third and the tram/train fourth in both regions. There is however a greater share of people in Inner Wirral that uses the bus or taxi. Also the percentage of people who walk or ride is higher in the inner urban area.

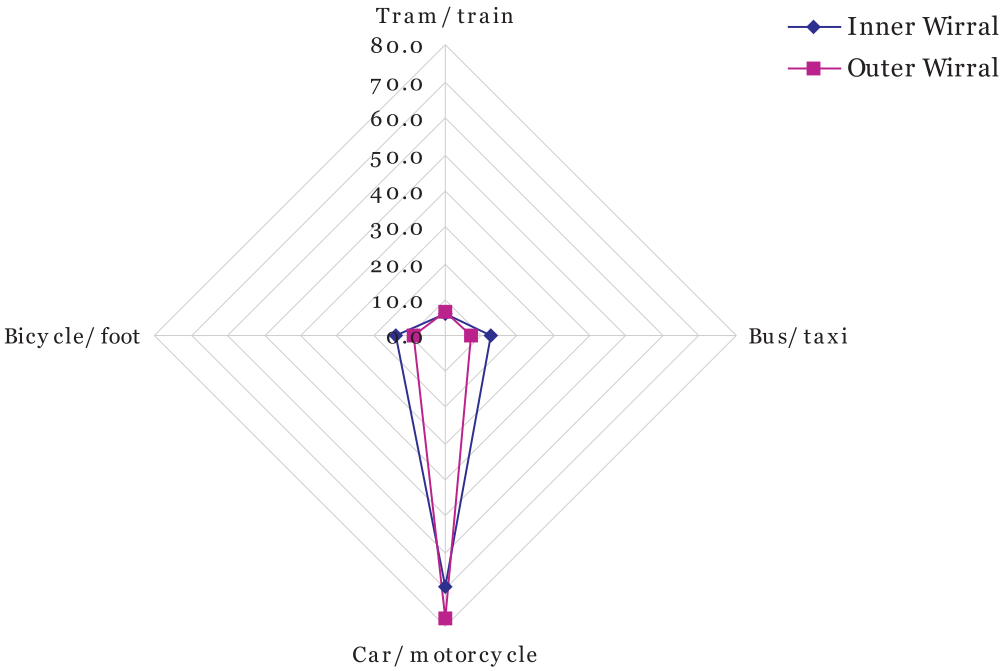


Figure 4.36: Number of cars per household in Inner and Outer Wirral [%]. Source: Author's draft, Data: Office for National Statistics UK.

As a following step the answers of the Leipzig household survey is given. The data is shown in Table 4.38 whereas a graphical representation is shown in Figure 4.37.

Eastern Leipzig - Current preference		N	Valid %	CI in %
Valid	**Car**	133	70.0	[62.9-76.4]
	Bus	25	13.2	[8.7-18.8]
	Bicyle	19	10.0	[6.1-15.1]
	Tram/Train	13	6.8	[3.7-11.4]
	Total	190	100.0	
Missing		4		
Total		194		

Eastern Leipzig - Former preference		N	Valid %	CI in %
Valid	**Car**	137	72.5	[65.5-78.7]
	Bus	13	6.9	[3.7-11.5]
	Bicycle	17	9.0	[5.3-14.0]
	Tram/Train	22	11.6	[7.4-17.1]
	Total	189	100.0	
Missing		5		
Total		194		

Table 4.38: Preferred means of transport for the Leipzig suburbanites from the current home (left) and the former place of residence (right). Source: Author's survey.

The car clearly dominates as the preferred means of transport among the suburbanites of Eastern Leipzig. 70.0% of the heads of household use preferably the car in contrast to only 13.2% who named the bus or 10.0% who appreciate the bike. As visible in Annex 24, Figure 4.37 is in line with the national aspirations as an average of all residents in either inner cities, suburban areas or rural settings. The stronger preference for the bus or the tram/train (as compared to the national average) seems to account for regional or local characteristics and might suggest a good bus and tram/train infrastructure in and around

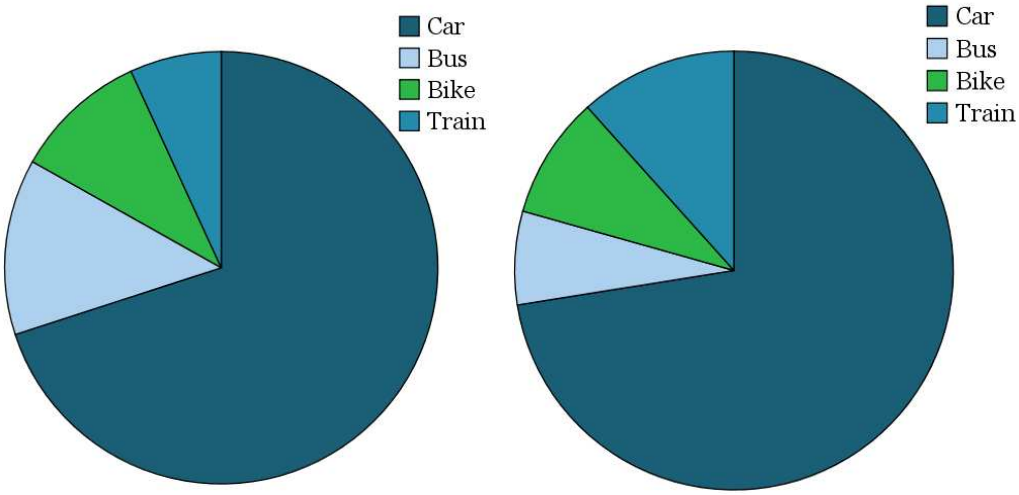


Figure 4.37: Preferred means of transport in Eastern Leipzig from the current (left) and the former place of residence (right), [% of respondents]. Source: Author's draft. Data: Author's survey.

Leipzig. However, while there is a good provision of roads as well as public infrastructure in most parts of the suburban areas most people decide for the more convenient alternative which seems to be the car. Table 4.38 and Figure 4.37 also document that there has been a decrease in the use of cars and trams and an increase in the use of buses when the sample households moved.

Again, these findings will be related to the statements of households coming from different parts of the region (see Table 4.39). People dominantly prefer the car but to much greater extent when they come from outside of Leipzig and from Outer Leipzig than from Inner Leipzig. Households that moved from the inner to the outer parts show a higher preference for buses and bikes as compared to the heads of household that moved within the outer areas of Leipzig or which came from elsewhere. However, attention shall be drawn to the latter statements as in these cases the confidence intervals for the standard deviation is about half of the percentage of people who stated this preference. Taking the χ^2-tests (Table 4.40) a relationship between the preferred means of transport and the location of the former home can be stated with some certainty. Table 4.41 shows how the preference was in the former place of residence. The χ^2-test still reveals that a dependence between preferred means of transport and place of former residence can be assumed (Table 4.42). However the x^2 and the $x^2_{(6,0.05)}$ do not differ very much. A comparison between Table 4.39 and Table 4.41 yields that especially the behaviour of the people moving from the inner to the outer parts changed. They much prefer to use buses (increase from 4.0% to 28.0%) now but use trams and trains less often in the suburban locations, decrease from 28.0% to 0.0%). The car lost slightly in its relevance as the most prominent means of transport (decrease from 56.0% to 52.0%) but keeps its primacy far beyond the buses. One can assume that this goes together with the increase in bikes as the preferred means in transport which increased from 12.0% to 20.0%.

			Previous home			Total
			Inner Leipzig	**Outer Leipzig**	**Elsewhere**	
Preferred means of transport	Car	N	13	17	103	133
		Column %, CI in %	52.0 [31.3-72.2]	85.0 [62.1-96.8]	72.0 [63.9-79.2]	70.7 [63.7-77.1]
	Bus	N	7	2	16	25
		Column %, CI in %	28.0 [12.1-49.4]	10.0 [1.2-31.7]	11.2 [6.5-17.5]	13.3 [8.8-19.0]
	Bike	N	5	1	12	18
		Column %, CI in %	20.0 [6.8-40.7]	5.0 [0.1-24.9]	8.4 [4.4-14.2]	9.6 [5.8-14.7]
	Tram/Train	N	0	0	12	12
		Column %, CI in %	0.0	0.0	8.4 [4.4-14.2]	6.4 [3.3-10.9]
Total		N	25	20	143	188
		Column %,	100.0	100.0	100.0	100.0

Table 4.39: Preferred means of transport in dependence of the location of the last residence. Source: Author's survey.

df	6
x^2	13.82
$x^2_{(6,0.05)}$	12.59
$x^2 < x^2_{(6,0.05)}$	

Table 4.40: χ^2-statistic of homogeneity (see also section 3.3.6.1).

The mobility behaviour of the other two groups changed only slightly. Households formerly living in Outer Leipzig give the car a higher predominance (increase from 80.0% to 85.0% of respondents) than before the move and correspondingly use fewer buses (drop from 15.0% to 10.0% of respondents). The people who moved into the city of Leipzig recently decreased their use of cars slightly, which is balanced by a rise in the use of buses. These changes are low but comprehensible. The national distribution which is portrayed in Annex 24 shows a similar relation between the use of cars and the residential location. Against this background Leipzig goes with the trend.

Although the figures might indicate a clear picture of change attention needs to be drawn to the low sample size. Sometimes the confidence intervals are higher than the given percentage. It cannot be generalised from these findings and only a weak conclusion can be drawn from the findings. They shall rather serve as an indication. Figure 4.38 mirrors the results to the preferred means of transport in Leipzig in a comparative and more general manner.

			Previous home			Total
			Inner Leipzig	**Outer Leipzig**	**Elsewhere**	
Preferred means of transport in the former home	Car	N	14	16	107	137
		Column %, CI in %	56.0 [34.9-75.6]	80.0 [56.3-94.3]	75.4 [67.4-82.2]	73.3 [66.3-79.5]
	Bus	N	1	3	9	13
		Column %, CI in %	4.0 [0.1-20.4]	15.0 [3.2-37.9]	6.3 [2.9-11.7]	7.0 [3.8-11.6]
	Bike	N	3	1	12	16
		Column %, CI in %	12.0 [2.5-31.2]	5.0 [0.1-24.9]	8.5 [4.4-14.3]	8.6 [5.0-13.5]
	Tram/Train	N	7	0	14	21
		Column %, CI in %	28.0 [12.1-49.4]	0.0	9.9 [5.5-16.0]	11.2 [7.1-16.7]
Total		N	25	20	142	187
		Column %,	100.0	100.0	100.0	100.0

Table 4.41: Preferred means of transport in the previous home and in dependence of the location of the last residence. Source: Author's survey.

df	6
x^2	12.87
$x^2_{(6,0.05)}$	12.59
$x^2 < x^2_{(6,0.05)}$	

Table 4.42: χ^2-statistic of homogeneity (see also section 3.3.6.1).

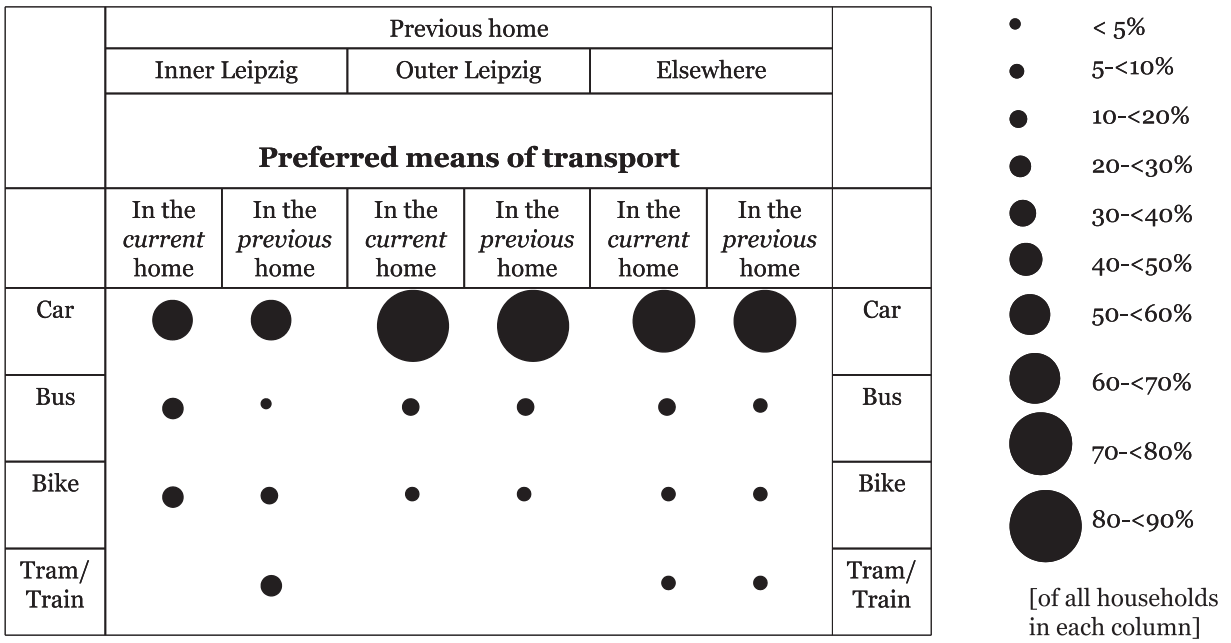


Figure 4.38: Comparison between the preferred means of transport in Eastern Leipzig. Source: Author's draft, Data: Author's survey.

Figure 4.39 puts the findings into the perspective of the Eastern Leipzig districts and the traffic conditions in Leipzig in general. The map contains the main roads, the train tracks and train stations, the tram lines and gives an overview of the percentage area dedicated to traffic in the different districts. The use of the car is especially high in the very outer districts. The preference for riding could be related to the percentage district area dedicated to traffic.

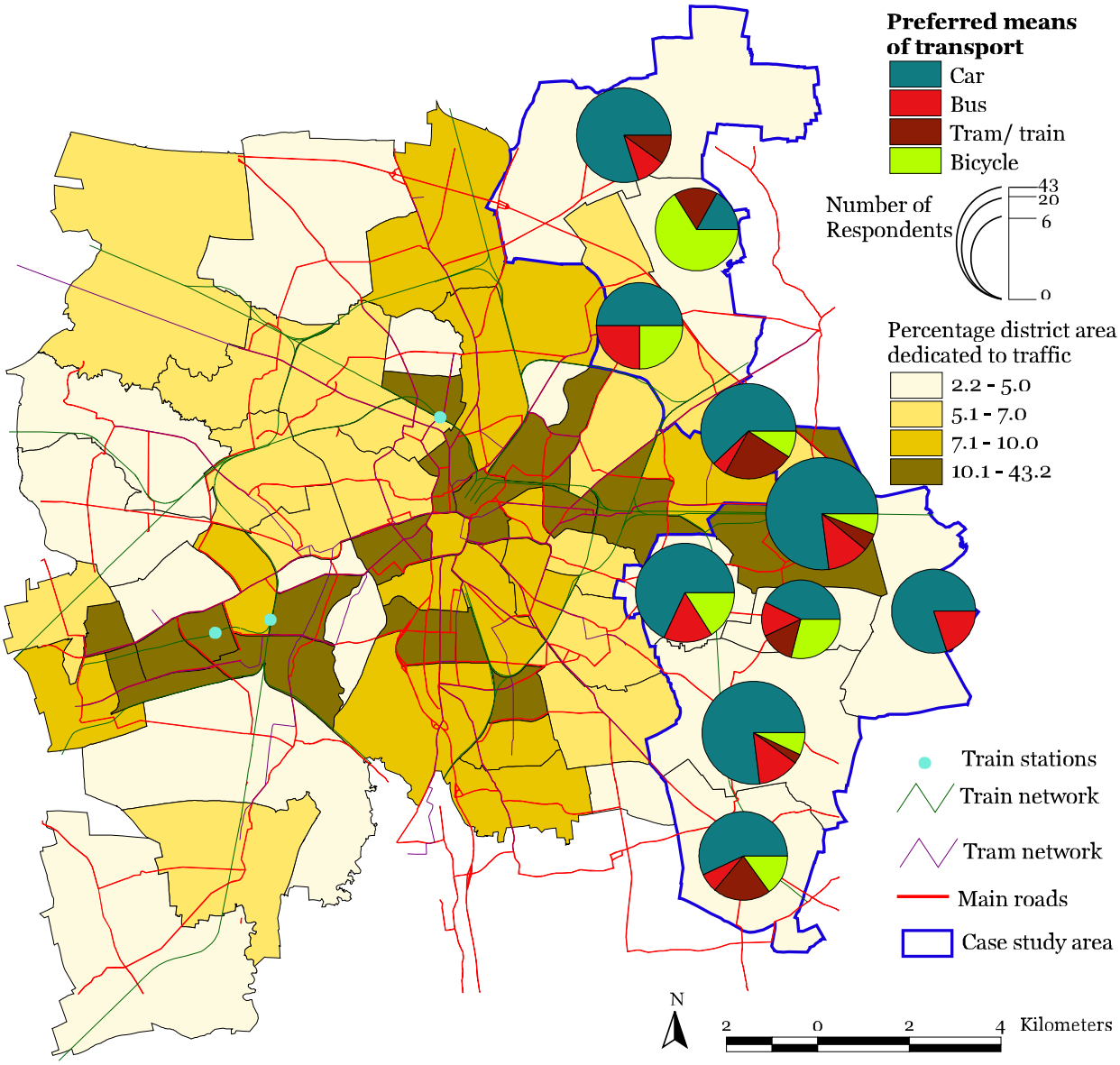


Figure 4.39: Map of the preferred means of transport in Eastern Leipzig. Source: Author's draft, Data: Amt für Statistik und Wahlen Leizig, Author's survey.

4.5.2 Living space

4.5.2.1 Size of living space

Next to mobility, a possible alteration in the size of dwellings will be analysed as a potential influence on land use consumption. The governments have set targets to reduce the land use consumption. Urban sprawl is blamed for the increase of this variable as it allows a low-density building structure in the formerly non-urban settings. For various reasons this kind of decentral development takes place on greenfield sites if restrictions do not hinder it. Table 4.43 and Figure 4.40 display the results of the analysis of the living space in Wirral.

Inner Wirral	N	Percent
One room	364	0.6
Two rooms	1231	1.9
Three rooms	5577	8.6
Four rooms	10411	16.0
Five rooms	15617	24.0
Six rooms	16879	26.0
Seven rooms	7255	11.2
Eight rooms and more	7670	11.8
Total	65004	100.0

Outer Wirral	N	Percent
One room	140	0.2
Two rooms	598	0.9
Three rooms	3474	5.1
Four rooms	9445	13.8
Five rooms	16839	24.6
Six rooms	19907	29.1
Seven rooms	8928	13.1
Eight rooms and more	8999	13.2
Total	68330	100.0

Table 4.43: Dwelling sizes in Inner (left) and Outer Wirral (right) in 2001. Source: Office for National Statistics UK.

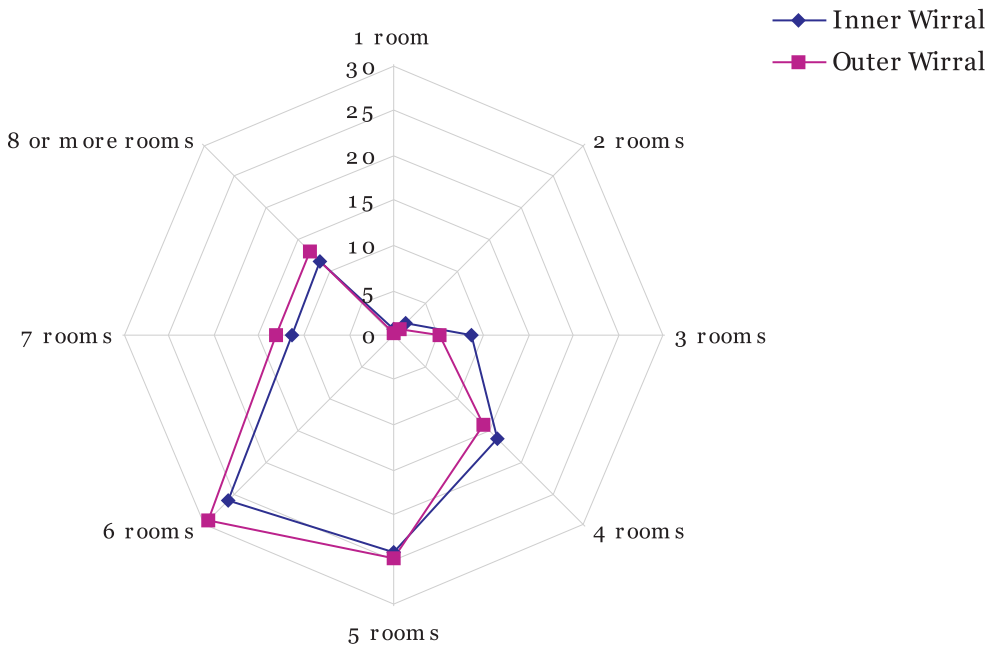


Figure 4.40: Living size of the households in Inner and Outer Wirral [% of all households in Inner and Outer Wirral]. Source: Author's draft. Data: Office for National Statistics UK.

A comparison between Inner and Outer Wirral is assumed to reveal whether people in suburban areas live in larger dwellings than those in inner urban areas. In the UK the dwelling size is given in number of rooms, in Germany normally as the area floor-space. The analysis for Wirral reveals that there is no remarkable difference between the living size of residents in the inner and outer parts of Wirral. This is at least the case if number of rooms are the basis of documentation. Small percentage differences point in the direction of larger dwellings in the suburban area with the highest difference in the number of 6-room-accomodations. In Inner Wirral the dwellings are smaller. The biggest difference is seen in the number of 3-room-homes which are more seldom in the outer parts.

In Leipzig, the questionnaire can illuminate whether indeed a migration from the urban centres to the low-density fringes has to be associated to an increase in living space. The dwelling sizes for all sample households developed as shown in Table 4.44 in the course of the migration to Eastern Leipzig.

N	Valid	187
	Missing	7
Mean		89.91
Median		80.00
Std. Deviation		42.94
Minimum		25
Maximum		300

N	Valid	180
	Missing	14
Mean		78.31
Median		70.00
Std. Deviation		34.43
Minimum		17
Maximum		200

Table 4.44: Living space per household in Leipzig in the current (left) and the previous home (right), [sqm]. Source: Author's survey.

Table 4.44 documents that there has been a substantial increase in living space per household with the move from the last to the current suburban area of Leipzig. The mean living space per household amounted to 78.31sqm in the last accommodation and sums up to a mean of 89.91sqm in the current dwelling. It seems to be due to an increase in the dwellings over 200sqm which was the maximum value in the previous house but which is surmounted by quite a few households in the present residence.

If one takes the mean of about 90sqm in the current home as a marker and devides the rest of the distribution into similar parts it is possible to evaluate in which parts of Leipzig households below and above the average living size reside. Figure 4.41 shows the distribution of spacious dwellings against the number of constructed dwellings in Leipzig between 2000 and 2003. One can see that the larger dwellings are not located necessarily in the developing parts of Leipzig as given with the number of newly constructed dwellings per districts. A tendency one can remark that the size of the dwellings rises with distance from the centre. Furthermore there seems to be more dwellings above the average living space in the districts which were incorporated after 1989 with the exception of one district in the north-east. This is Plaußig-Portitz with almost 45% of respondents living in dwellings above the average living space. This district also comprises to about half of its area of new Leipzig territory. Also the self-construction of new houses or/and the move into newly constructed

dwellings does not necessarily correspond with the developing areas in the case study area. In the rest of Leipzig much of the newly constructed dwellings are also situated in the north- and south-west of Leipzig, not only in the tradionally very attractive eastern part. Business development and large transport infrastructure projects charcterise the north of Leipzig.

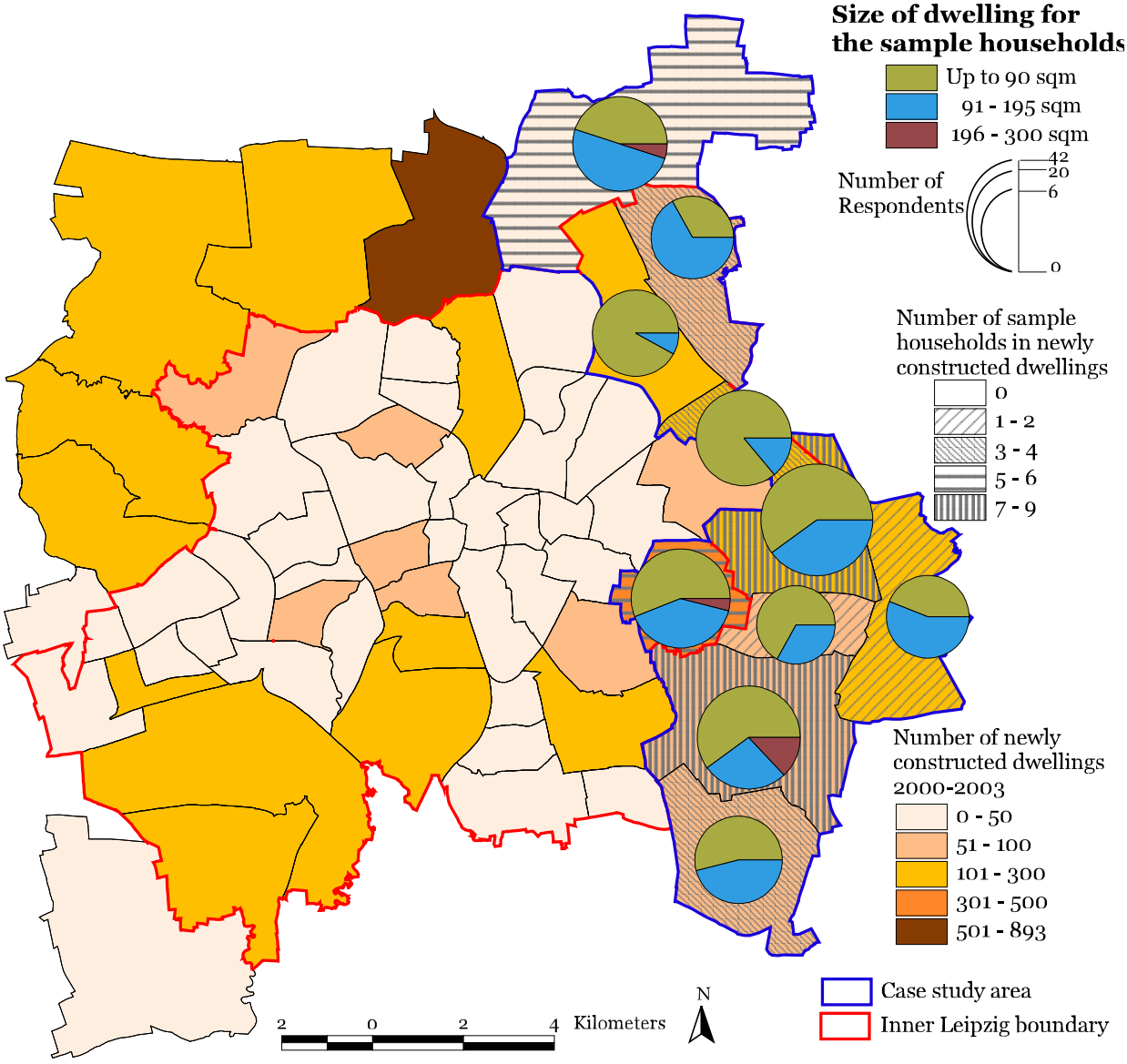


Figure 4.41: Map of the size of living space among the sample households in Eastern Leipzig. Source: Author's draft, Data: Amt für Statistik und Wahlen Leipzig, Author's survey.

One could further ask whether the findings from Table 4.44 might differ if one looks at the distribution with respect to tenure. Table 4.45 and Figure 4.40 puts the findings in relation to tenants versus owner occupants.

Tenure	Owner occupant			Tenant		
	Living space/hh [sqm]	Living space/hh in previous home [sqm]	Living space/ capita [sqm]	Living space/hh [sqm]	Living space/hh in previous home [sqm]	Living space/ capita [sqm]
N	44			146		
% of valid respondents	23.2% [17.4-29.8]			76.8% [70.2-82.6]		
Mean	130	88	46	78	75	40
Median	120	80	40	72	66	37
Minimum	70	40	23	25	17	8
Maximum	300	180	90	250	200	90

Table 4.45: Living space in relation to tenure in Eastern Leipzig. Source: Author's draft. Data: Author's survey.

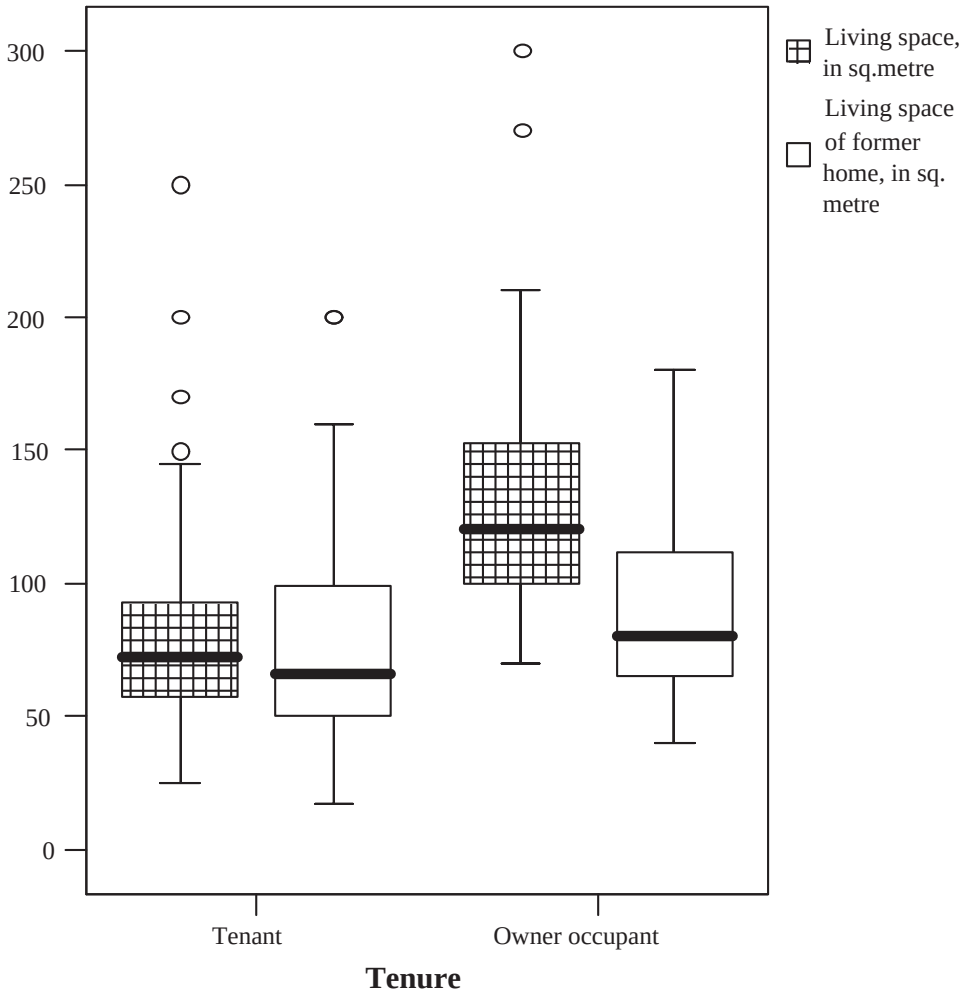


Figure 4.42: Boxplot diagram to the living space in Eastern Leipzig separated by tenure. Source: Author's draft, Data: Author's survey. Note: Thick lines represent the median, the boxes the data within the upper and lower quintiles, the whiskers the data from the second up to the ninth deciles. Little circles are outliers.

Unfortunately the per capita living space is not available for 'before – after' comparison, as the number of people in the previous household was not included in the questionnaire. For the current situation however, the data reveals that there is a slight difference only between the owner occupants and the tenants (46sqm to 40sqm respectively). Table 4.45 shows that there is a difference with respect to the mean living space per household in dependence of tenure: whereas the renting respondents increased their living space only slightly by the move (from 75sqm to 78sqm) the owner occupants show a remarkable increase in living space (from 88sqm in the previous home to 130sqm in the current one). The average increase in living space per household represents 47.7% for the owner occupants and only 4.0% for the renting households. An additional figure has been included in Table 4.45: living space per capita. It differs between 40sqm for the tenants and 46sqm for the owner occupants. Figure 4.42 gives the result in a boxplot. Here again, the median is given as thick line in the boxes while the boxes represent the quintile between 20% and 80% of the sample distribution. The whiskers give the spread of deciles excluding the upper and lower quantile. The bubbles represent outliers from the given deciles. One can see that tenants became more similar with respect to the spread. Owner occupants did not change much in distribution but rather remarkable in the average living space.

The increased living space per household could possibly be brought about by a higher number of persons in the households of owner occupants, which is shown by Table 4.46. Most owner occupants live in three-person households whereas the majority of tenants live in two person households. Again, some numbers of categories (all apart from 3- and 2-person households) for the owner occupants are quite small. The boxplot diagram in Figure 4.43 displays these results as the average size of the household with respect to the number of people. The tenants' households are smaller but show a larger variance.

		Number of persons in the household						Total
Tenure		**1**	**2**	**3**	**4**	**5**	**6**	
Owner	N	1	13	17	12	1	0	44
	Column %,	2.3	29.5	38.6	27.3	2.3	0.0	100.0
	CI in %	[0.0-12.0]	[16.8-45.2]	[24.4-54.5]	[15.0-42.8]	[0.0-12.0]		
Tenant	N	47	56	25	14	3	1	146
	Column %,	32.2	38.4	17.1	9.6	2.1	0.7	100.0
	CI in %	[24.7-40.4]	[30.4-46.8]	[11.4-24.2]	[5.3-15.6]	[0.4-5.9]	[0.0-3.8]	
Total	N	48	69	42	26	4	1	190
	Column %,	25.3	36.3	22.1	13.7	2.1	0.5	100.0
	CI in [%]	[19.3-32.1]	[29.5-43.6]	[16.4-28.7]	[9.1-19.4]	[0.6-5.3]	[0.0-2.9]	

Table 4.46: Number of persons in the household in relation to tenure in Eastern Leipzig. Source: Author's draft. Data: Author's survey.

df	5
x^2	27.82
$x^2_{(6,0.05)}$	11.07
	$x^2 > x^2_{(6,0.05)}$

Table 4.47: χ^2-statistic of homogeneity (see also section 3.3.6.1).

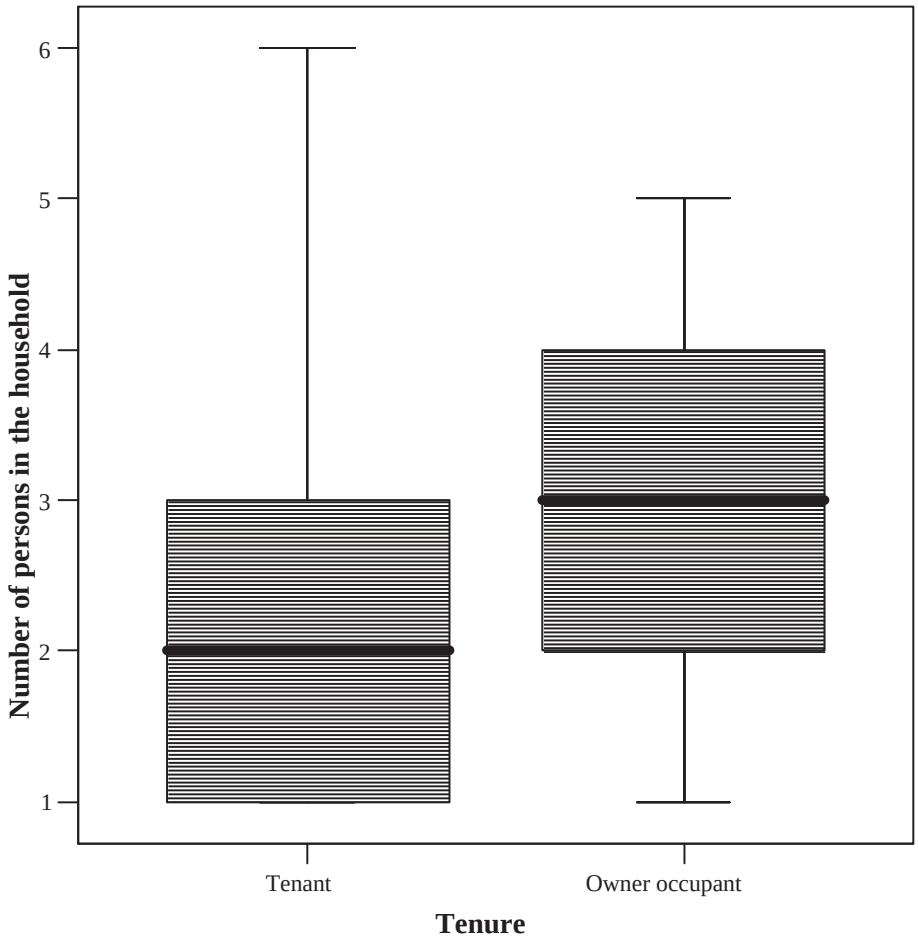


Figure 4.43: Boxplot diagram to the number of people in the households in Eastern Leipzig. Source: Author's draft, Data: Author's survey.Note: Thick lines represent the median, the boxes the data within the upper and lower quintiles, the whiskers the data from the second up to the ninth deciles. Little circles are outliers.

According to the x^2-statistic the null hypothesis has to be rejected at the 95% level (Table 4.47). Number of person in the households and tenure seem to be significantly related. As seen in Figure 4.43 tenants occupy smaller households in average. However also the range of the number of people in the tenant household is larger.

Also interesting might be the relation between the former place of living and the size of the dwelling which is analysed hereafter. The results are shown in Table 4.48. The

			Mean	Median	Min	Max	N	Table %
Previous home	Inner Leipzig	Current living space [sqm]	98	100	40	170	25	13.2 [8.7-18.9]
		Living space of previous home Inner Leipzig [sqm]	77	78	38	130		
		Living space per head	43	40	21	85		
	Outer Leipzig	Current living space [sqm]	91	84	40	180	20	10.6 [6.6-15.9]
		Living space of previous home Outer Leipzig [sqm]	69	69	30	140		
		Living space per head	38	37	21	68		
	Elsewhere	Current living space [sqm]	88	76	25	300	144	76.2 [69.5-82.1]
		Living space of previous home elsewhere [sqm]	80	70	17	200		
		Living space per head	42	38	8	90		

Table 4.48: Size of living space in Eastern Leipzig in relation to the former home. Source: Author's survey.

differences in the change of living space according to the previous address can be seen. Households formerly living in the inner areas of town show the highest living space per capita (43sqm) in the suburban home. Their dwelling size increased from 77sqm to 98sqm (27.3%). The households that previously lived in the suburban areas of Leipzig reveal an increase from 69sqm to 91sqm, which is a growth by 31.9%. The minimum and maximum values are relatively similar between the two categories of households formerly living in Leipzig. Although the increase of living space is higher among the households that changed the residential location within the suburban area. Their mean living space in the previous as well as in the current dwelling remains behind those of the households which came from Inner Leipzig. Households from Inner Leipzig had and still have the bigger flats as compared to the older suburbanites. This is in line with the findings to the suburbanisation process in Leipzig after re-unification where a broad middle-class strata left for suburbia. It was not necessarily the wealthy middle-class that moved out in about the first decade after the political change. The 'new' suburbanites seem to account for the more wealthy middle class, they inhabited bigger flats in the inner city area and do so in the outer parts of Leipzig now.

Households moving to suburbia from elsewhere in the region or the country are positioned in between the both other categories with respect to the mean, maximum and minimum values of the current place of living. This is an indication that the conditions of living space converge among the categories. The living space increases by 10% from formerly 80sqm to 88sqm. This is the smallest increase among all categories and might be due to the relatively large living space in the former dwelling of those households. Within the category 'elsewhere' there are to find the maximum values of living space in both the former and the current home, which can also be an indication that this group might be very heterogeneous. Again, a boxplot diagram (Figure 4.44) can be used to view these results more clearly. In all categories of former residence there is an increase in the living space after the move. However, the increase is highest with the households that move from the inner to the outer urban parts.

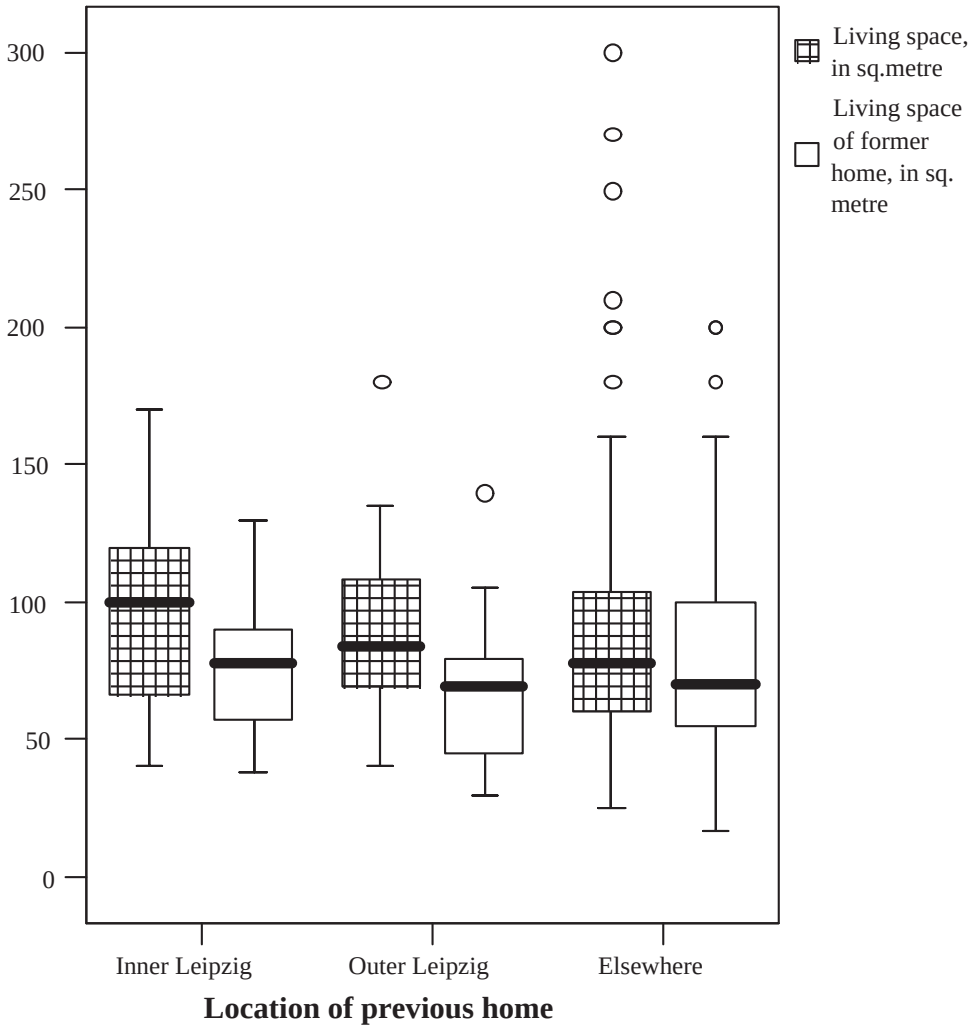


Figure 4.44: Boxplot diagram of the size of living space in dependence of the former place of residence. Source: Author's draft, Data: Author's survey. Note: Thick lines represent the median, the boxes the data within the upper and lower quintiles, the whiskers the data from the second up to the ninth deciles. Little circles are outliers.

A strong demand for living space in the suburban areas contributes to land use change, as developers can be expected to respond to the demand (assuming that the political circumstances and planning regulations allow it). Next to that aspect, the number of constructions on greenfield sites and the migration into newly built dwellings is of additional importance. If one wants to evaluate comprehensively the increase in living space in the light of sustainable development this aspect should be included.

4.5.2.2 Newly constructed dwellings

Data from the planning department in Wirral[15] and the questionnaire of Leipzig can be analysed to obtain information about sustainable development in the case study regions with respect to land use consumption.

[15]Special thanks to Richard Lewis, Forward Planning Manager, Wirral Borough Council

In Wirral, the addresses of people that moved into newly constructed dwellings were used for the questionnaire survey in selected wards. An overview of the house building development in the whole of the district can be achieved if all wards of Wirral are investigated over time. Figure 3.6 in chapter 3.3.2 shows the distribution of newly constructed dwellings in Wirral, 1997-2002, the time period of the questionnaire survey. One can see that most of the housing construction occurred in the outer urban wards. This is also revealed by the comparison of the data according to the Inner and Outer Wirral delineation in Table 4.49. It shows that the total number of newly constructed dwellings is higher in Outer Wirral over the whole time period investigated. A sustainable development state has not been reached if one judges according to the total numbers of newly constructed dwellings between 1997-2002. However, one can see as well that in the early years, 1997-1999, the number of new dwellings was higher in Inner Wirral and only became greater in Outer Wirral between 2000-2002. In the year 2000 the largest numbers of dwellings were constructed in the outer parts, after that year the percentage development decreased in Outer Wirral but is still higher there than in the inner urban parts. For a comprehensive reflection on the topic the construction of greenfield versus brownfield development, the area covered or sealed per dwelling and similar issues should additionally be investigated, but such information cannot be drawn from the questionnaire survey in Leipzig so that a direct comparison between statistical data in Wirral and empirical data in Leipzig is not possible within this framework. For the purposes of the research question elaborated here, the data of total numbers of newly constructed dwellings give valuable information about the housing development in the district.

Wirral		**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	Total 1997-2002
Inner Wirral	N	310	403	357	188	186	243	1687
	Percentage	**56.2**	**52.3**	**52.4**	**30.7**	**41.2**	**42.3**	**46.3**
Outer Wirral	N	242	367	324	425	266	332	1956
	Percentage	**43.8**	**47.7**	**47.6**	**69.3**	**58.8**	**57.7**	**53.7**
Total	N	552	770	681	613	452	575	3643

Table 4.49: Construction of newly constructed dwellings in Wirral between 1997-2002. Data: Wirral Borough Council. Source: Author's draft.

Again, as a second step the house building development in Leipzig shall be investigated and compared to the findings from Wirral. Especially in the early phase after German re-unification, with the shortage of building land in the inner areas of the city it is comprehensible that some construction of new houses might have occured on the urban fringe. However, it is not only restricted to this period as still in the years 2000-2003 the construction of new houses predominates in the outer urban areas, as Figure 3.4 and Figure 4.41 have already shown (see above and chapter 3.3.1). Figure 4.41 is based on official data from the boards of statistics and reveals that most of the newly constructed dwellings between 2000 and 2003 took place in the outer urban areas of Leipzig. Therefore the date of housing construction seemed worth to be questioned to the Leipzig suburbanites in the questionnaire. In the case study area the heads of household replied in 21.2% that they had moved into a newly constructed home (self-built or built by developers)(see Table 4.50).

Eastern Leipzig		N	Valid %	CI in %
Valid	Newly constructed	40	21.2	[15.6-27.7]
	Not newly constructed	149	78.8	[72.3-84.4]
	Total	189	100.0	
Missing		5		
Total		194		

Table 4.50: Movements into newly constructed dwellings in Leipzig between 2000-2003. Source: Author's survey.

A remarkable part of the 'older (not newly constructed) buildings' were built in the years between 1995 and 1997 as is documented by several sources (e.g. BBR, see Annex 25). It is the period of the building boom in suburban Leipzig with West German developers at the forefront. As mentioned earlier, they mostly built medium-storey apartement buildings in the suburban settings where building land was available, free of restitution claims and made easily accessible by the local authorities. This observation is reflected in the results of the questionnaire survey. A substantial proportion of the respondents said they lived in dwellings which were built in the years 1995 to 1997, portrayed in Figure 4.45. Of all respondents, 149 indicated the year of construction, 45 data points for this parameter were missing.

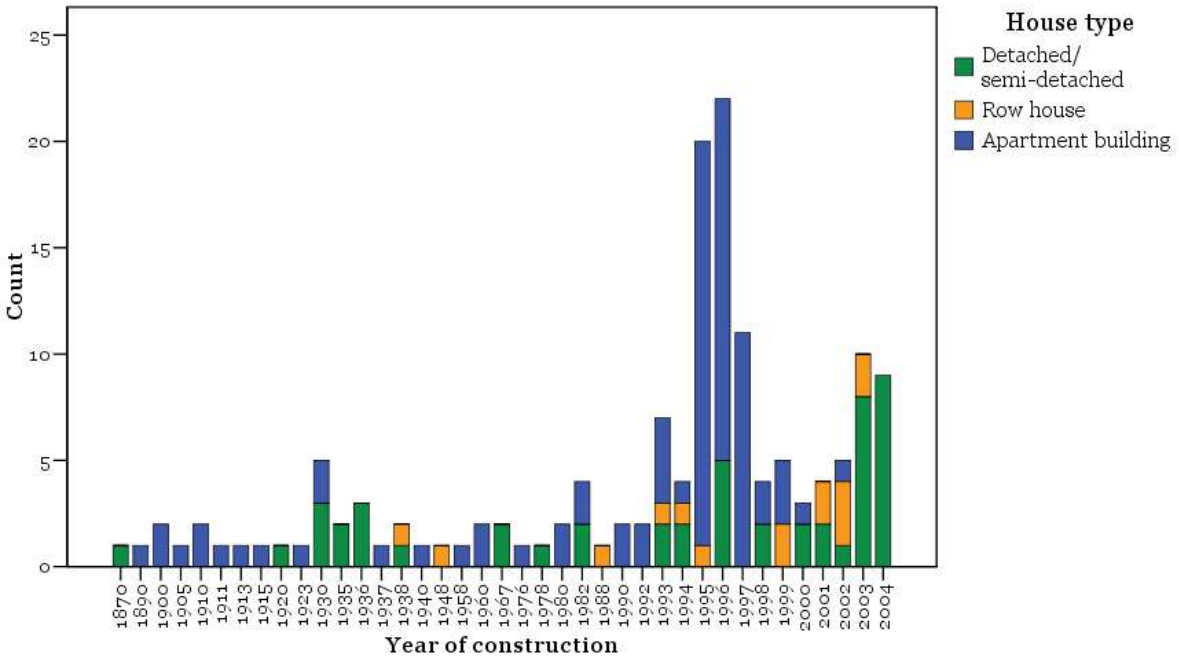


Figure 4.45: The year of housing construction in dependence of the house type. Source: Author's draft, Data: Author's survey.
Note: Please regard that the scale on the y-axis is not equidistant in Figures 4.45 and 4.46.

Figure 4.45 reveals that the suburban housing construction in Leipzig fell drastically from 1996 to 2000. However, since 2000 the number of newly constructed dwellings has

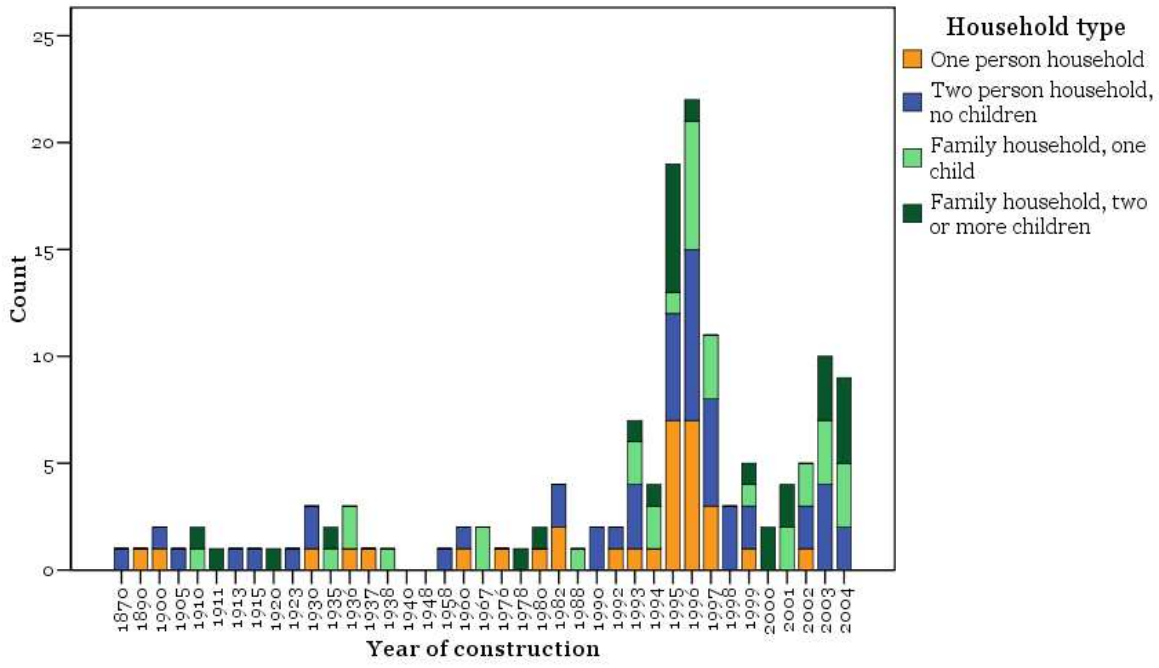


Figure 4.46: The year of housing construction according to the family status. Source: Author's draft, Data: Author's survey.

risen again. This might point towards a second wave of suburbanisation in the case study area - this time induced by suburban private family houses as Figure 4.45 reveals. Among all the respondents that moved with their family into newly constructed dwellings in 2004, 9 out of 10 did so as owner occupants (not shown in the figure).

The results here (Figure 4.45) compare with the national development shown in Annex 27. One can see that the construction of detached and semi-detached houses is very predominant in parts of eastern Germany and some selected regions of the western part. The development in eastern Germany does not step back from the rate of housing construction for single families as compared to that in western Germany.

Additional information in shown in Figure 4.46. As described for older capitalist systems and for Western Wirral earlier mainly two person households without children and family households with children have moved to the Eastern Leipzig area. In comparison with the first peak in suburban migration in about 1996, the second wave lacks the single person households. They had been still the second strongest socio-economic class that moved to the fringes in the middle of the 1990s.

This is a difference to the Western Wirral results where it was revealed that single persons have quite a remarkable share of movers into newly constructed dwellings (which was the whole sample). One possible interpretation is that the suburbs in Leipzig might start a similar suburbanisation as seen in older capitalist systems with well-off families in the majority. It seems that Leipzig is now, after the year 2000, changing the native of suburbanisation. The current development shows increasing construction of detached or semi-detached family houses in the suburban settings. Against this background, it is increasingly important to investigate an approach to a sustainable city development.

4.6 Research Question 4: Modelling and city planning

In this section it will be refleted upon the potential benefits that modelling can bring to urban planning and urban governance. The research question was formulated as follows:

Research Question 4: Planning / Governance oriented
What benefits can a modelling approach bring to the urban planning decisions with respect to the halt of urban sprawl in formerly industrialised regions, e.g. with reference to land use consumption?

Hypothesis:
It has been shown that the preferences for urban living might be blurred by subsidies and other planning decisions but also that urban sprawl is a social process and that the proponents of suburban living might be influenced by the behaviour of other people in the society or the neighbourhood. People who look for suburban living often do so for the reason of segregation, environmental qualities, and living space. Against this background a migration model that takes into account the preferences of the movers and the qualitative attractivity of the suburban areas in dependence of the presence of other movers should be able to supply important insights into the dynamics of residential migration. It is assumed that such a model can offer benefits for planning practise.

The urban-suburban migration not only influences the attractivity of the place of origin but also the attractivity of the place of destination. To improve the performance of the entire urban region, the dynamics and patterns in the areas have to be considered. Against the background of the methodology which was explained in the chapter Methods, the modelling presupposes a case study analysis in three stages:

1. Actor and actor classes determination - Who is involved in the urban sprawl processes, in the following called 'actors' of urban sprawl ?

2. Preference elicitation - What are the preferences of these actor classes with respect to the residential location, hereafter called the 'dimensions of attractivity' ?

3. Determination of interdependencies - How does the presence of actor classes reflect back onto the attractivity of the region for each actor ?

Taken together the results give sufficient information for the qualitative model.

4.6.1 Actors and actor classes

4.6.1.1 Actor class determination in Eastern Leipzig

The determination of actor classes involvesthe application of a cluster algorithm. The aim of the cluster analysis is to investigate whether there are actor classes with similar preferences for the characteristics of the residential area and with similar impacts on the attractivity of the region. The inclusion of the latter becomes necessary if one wants to derive information

about the influence of actors on the attractivity of the region. Therefore, the clustering was applied to the residential preferences (dimensions of attractivity) as requested in the questionnaire and to the social and economic attributes of the respondents. The result of the cluster analysis for Leipzig is given in Figure 4.47. The algorithm revealed the existence of five clearly distinguishable actor classes for Eastern Leipzig which are named in the bottom of Figure 4.47. An additional information is given by SI (the critical threshold and cluster similarity index). It is set to SI=0.8 in the case of Eastern Leipzig and acts as a parameter for the similarity in the given preferences and attributes of the respondents within one cluster. The incorporation of additional respondents into one cluster is decided by the rise or the decrease of SI as a mean over all given statements and respondents within this group. If SI becomes lower than 0.8, a new cluster is created. In Figure 4.47, the preferences of each actor class and its attributes are given with colours, one colour representing one actor class. The value on the x-axis gives the number of people that evaluated an attractivity dimension important or who are charcterised by a certain attribute in percent.

The retired and older childless households as well as the middle-aged families are the most prominent actor classes in the region. The sample numbers N are relatively high. The middle-aged couples, the young families and the one-person households are not as prominent in the area. The middle-aged couples have the lowest N, comprising only 10 households. One has to be careful to derive conclusions from the findings connected to this actor class as it bears a relatively high uncertainty. Table 4.51 summarises the cluster result in Eastern Leipzig showing the preference- and attribute-consistent actor classes.

Cluster	Actor class I	Actor class II	Actor class III	Actor class IV	Actor class V
Actor class description	Retired and older childless households	Middle-aged families	Middle-aged couples	Young families	Young one-person households

Table 4.51: Residential actor classes in Eastern Leipzig. Source: Author's draft, Data: Author's survey.

The good clustering result is a foundation of the existence of classes of actors with both similar preferences and similar attributes: people behave in groups rather than as individuals. In the following the characteristics of the households in each of the clusters will be named in more detail. The preferences of each group will be specified in a sectooion further down.

Actor class number I, Retired and older childless households, are characterised by 38% one person households, and 54% two person households. Almost 60% of the sample in this actor class are pensioners, another 11% are job seeker. 55% are older than 60 years but there is also a share of 30% of the households in this group where the head of household is younger (30% between 35 and 59 years of age). Those who have work (about 20% of all the respondents in this group) drive less than 20 minutes, no one drives further. People have mainly one car (79%) or no car (13% of the households in this group).

The Middle-aged families, consists of 84% family households with children (and 14% two person childless households). Almost a third of all heads of household are executive

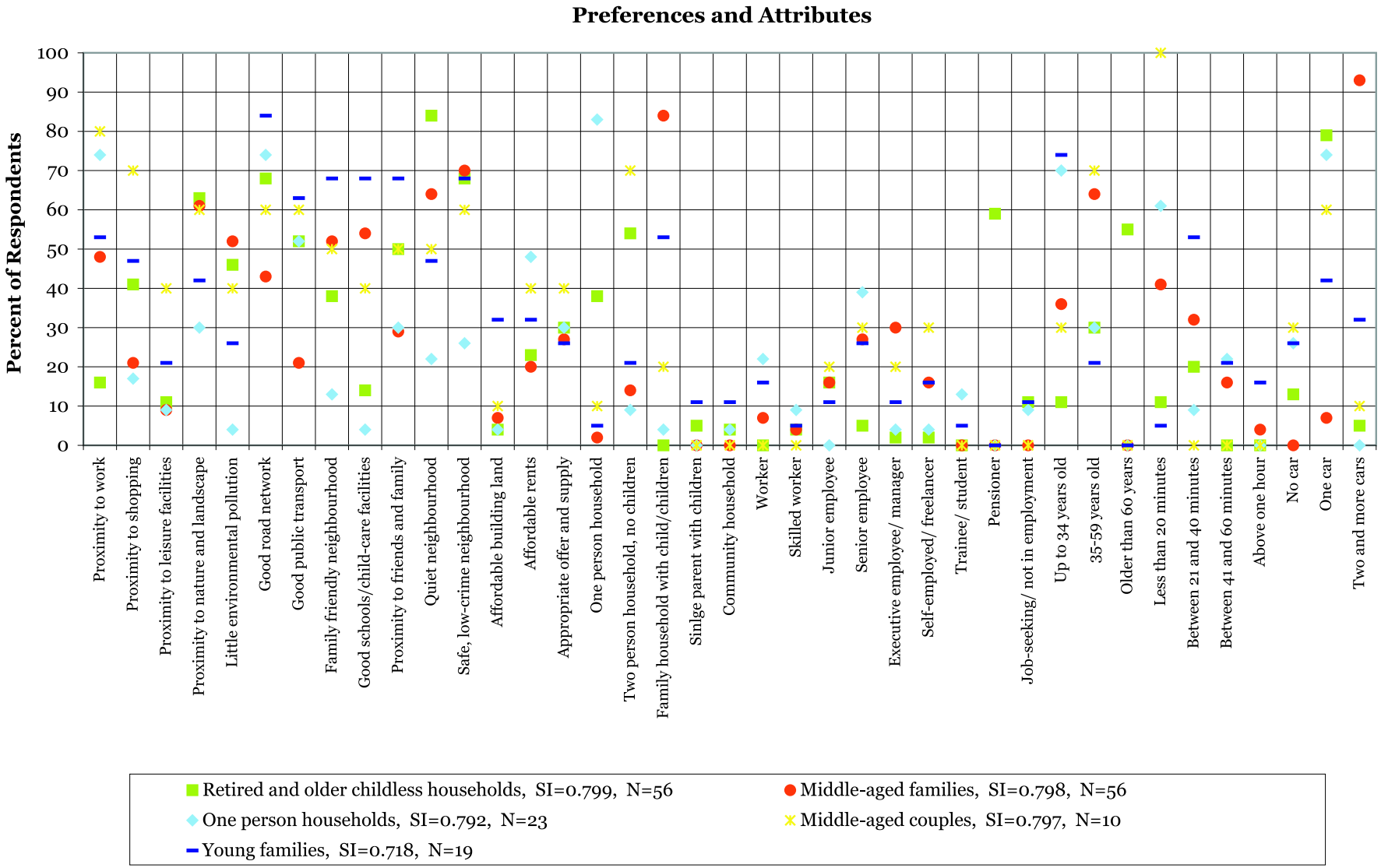


Figure 4.47: Cluster result for the households in Eastern Leipzig. Source: Author's draft, Data: Author's survey.

employees and 27% are senior employees. The majority of them are between 35 and 59 years of age but there are also some people below the age of 35 (36%). Most heads of household drive less than 20 minutes to work (41%) or 21 up to 40 minutes (32%). This is the group with the highest number of two cars per household, 93% possess two cars or more.

Actor class number III, the Middle-aged couples, comprise of 70% two person households. 30% are senior employees, another 30% self-employed. 70% of all heads of household in this group are 35-59 years old, the other 30% are younger than that. All heads of household commute less than 20 minutes. 60% of the households have one car and 30% of the households have no car (again note the cluster sample is very small).

The fourth actor class, the one described as Young families, comprise to 53% of families with one or more children (a share of also 21% belongs to couples households). The heads of household are relatively evenly distributed among occupations, senior employees (26%), workers (16%) or self-employed (16%) represent the highest shares. 74% of all households in this group are under 35 years old, 21% are 35-59 years of age. 53% of the heads of household drive more than 21 minutes to work and 21% drive 41 to 60 minutes. There is a relatively even distribution of car ownership: 26% of the households possess no car, 42% one car and 32% two.

The fifth actor class, the One-person households, comprises of one person households to 83% of which 39% are senior employees, 22% are workers and 13% are students or trainees. 70% of the respondents in this group are above 34 years old, approximately 1/3 are 35 to 59 years of age. Most of them (61%) commute less than 20 minutes, 74% have a car (note that the last two samples are relatively small).

4.6.1.2 Actor class determination in Western Wirral

The respondents of the questionnaire in Western Wirral were investigated in a similar fashion. All parameters in the cluster algorithm are set equal to those in Leipzig except from the similarity index SI. To gain a comparably consistent and firm result, the SI had to be lowered to 0.8 in the case of Leipzig and could be raised until 0.87 in the algorithm for Western Wirral. This small difference assured equal actor class numbers and sufficient samples for the single clusters in almost all cases. It also shows that the clusters formed for Western Wirral are more homogeneous than those formed for Eastern Leipzig. Figure 4.48 portrays the cluster result for Western Wirral: Two clusters are relatively small – the Middle-aged singles and the Young couples both comprise of a sample of only 17 households. Findings from these groups have to be taken with caution. Table 4.52 summarises the cluster result for Western Wirral.

Cluster	Actor class I	Actor class II	Actor class III	Actor class IV	Actor class V
Actor class description	Retired people households	Middle-aged families	Middle-aged singles	Lower to lower-middle class	Young couples

Table 4.52: Residential actor classes in Western Wirral. Source: Author's draft, Data: Couch & Karecha's survey.

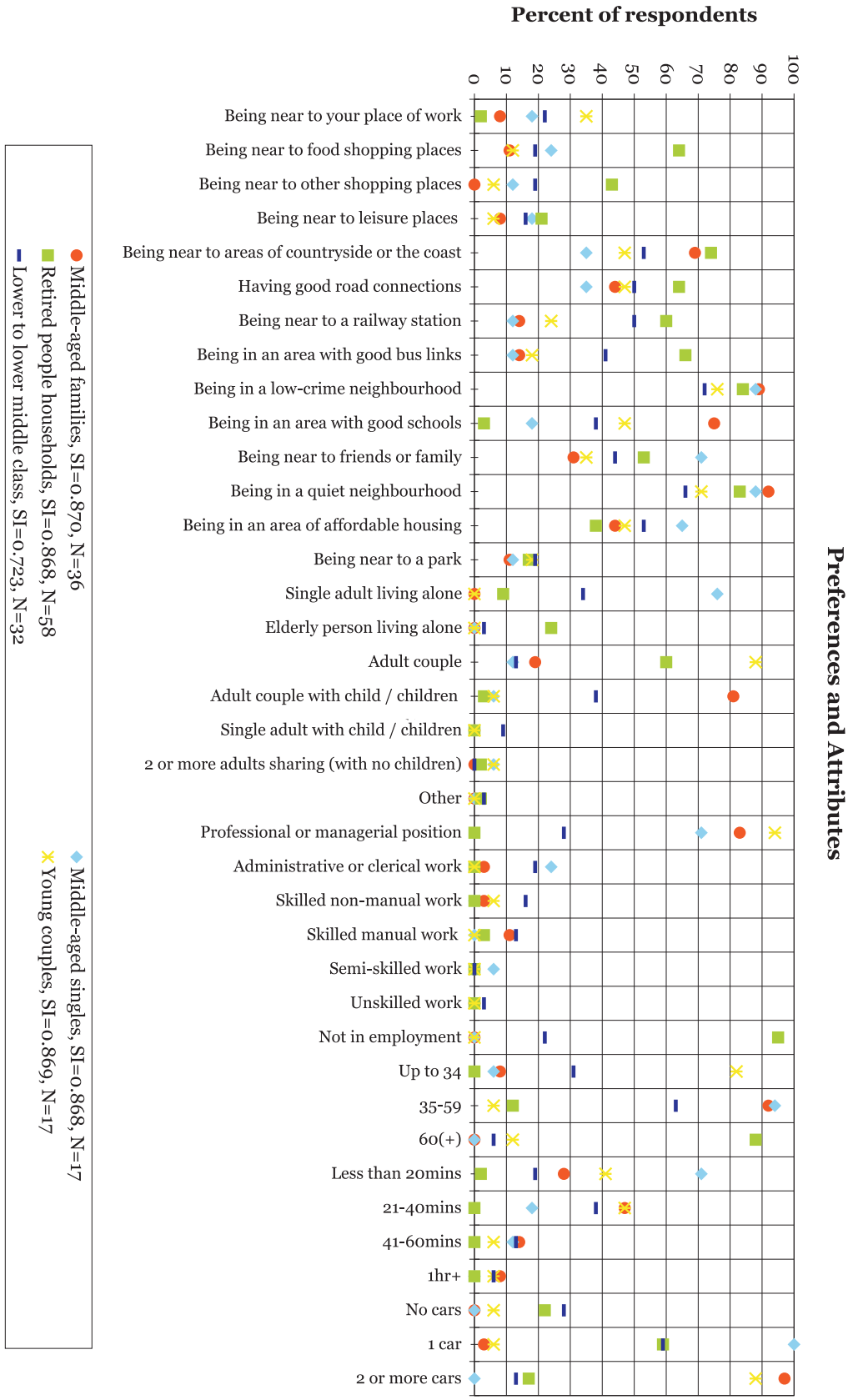


Figure 4.48: Cluster result for the households in Western Wirral. Source: Author's draft.

Similar as to Eastern Leipzig, there is a clearly distinguishable class of Retired households. This group consists of 60% adult couples and 24% elderly living alone. 95% of them were not in employment, but 88% are above 60 years of age. Most households in this group have one car (59%).

The second actor class, the Middle-aged families, comprise of adult couples with child or children in 81% of the cases. Most of the heads of households are in a professional or managerial position. 94% are between 35 and 59 years old. They commute for 21 to 40 minutes (47% of the heads of household in this group) or for less than 20 minutes (28% of the heads of household). A remarkable 97% of the households own two or more cars.

Actor class number III, the Middle-aged singles, comprise of 76% single adults living alone, in 71% of the cases working in managerial or professional positions. 94% are 35-59 years old. Most heads of household (71%) commute up to 20 minutes, all households possess one car. The number of samples in this cluster is relatively small.

The fourth actor class, the so called Lower to lower middle class, is a quite heterogeneous cluster as to the other ones described. It combines adult couples with children (38%) and single adults living alone (34%). The occupations are 28% managerial and professional, 19% administrational and clerical work, 16% skilled non-manual and 13% skilled manual positions. Another 22% of the heads of household in this cluster are not in employment. The heads of household are mostly of medium age (63% are 35-59 years old), some are younger (31% below 35 years of age). 38% commute for 21 to 40 minutes, a share of 19% less than that. Most households own one car (59%) but there is also a significant share with no cars (28%).

Cluster V, Young couples, consist of 88% adult couples. 94% of all households in this group are employed in a professional or managerial position. 82% of the heads of household are less than 35 years old. Most of the heads of household travel 21 to 40 minutes to work (47%), but 41% less than that. A significant number of 88% of the households have two cars.

The relative success of the cluster method proves the homogeneity in preferences and attributes. It justifies the grouping of the respondents according to the clusters mentioned.

4.6.2 Preference elicitation

4.6.2.1 Residential preferences for actor classes in Eastern Leipzig

Information about the preference structures of the actor classes can also be drawn from the cluster result. The methodological approach asked for residential actor classes that are attribute and preference homogeneous at the same time. Figure 4.47 shows the preference structure and the attributes of the residents' clusters for Eastern Leipzig.

In the questionnaire the issue of residential preferences is covered by question 1: What were the most important reasons to choose the current place of living? The list of possible influencing factors in the questionnaire from which the respondents had to choose can be regarded as pull factors or attractivity dimensions. Those, especially important to a certain actor class are the preferences of this actor class. The availability of these preferred characteristics in a given residential neighbourhood condition the attractivity of an area for each actor class. To get a better overview which of the attractivity dimensions are especially

important to each actor class they have been grouped. Table 4.53 shows the outcome for the actor classes in Eastern Leipzig. Dark grey stands for high importance, named by 60% or more of the sample in each actor class. The issues marked with light grey cells are marked as important by the respondents in the actor class with a frequency of 30-59%. White cells indicate that this dimension is only evaluated important by no more than 30% of the respondents in the respective actor class. This division is assumed to represent an appropriate overview of the issues that are very important, still important and not very important. A 0-30-60-100 division is often used in quantitative research where thresholds have to be set on a scale of 1 or any order of magnitude (e.g. see Massey and Denton 1988; Cutler, Glaeser et al. 1999; to investigations about the extent of segregation using 0-30-60-100-tailored indices of dissimilarity see also Meen and Meen 2003). Such a division can yield information about the consistency of the preference structure of each of the actor classes. The actor classes with a lot of preferences indicated by a frequency between 30-59% of respondents have to be assumed least consistent.

Actor class P_i: **Attractivity dimension:**	**I** Retired people & older childless HH	**II** Middle-aged family HH	**III** Middle-aged couple HH	**IV** Young family HH	**V** Young 1-person HH
Proximity to work					
Proximity to shopping					
Proximity to leisure facilities					
Proximity to nature/ landscape					
Little environmental pollution					
Good road network					
Good public transport					
Family friendly neighbourhood					
Good school/child-care facility					
Proximity to friends and family					
Quiet neighbourhood					
Safe, low-crime neighbourhood					
Affordable building land					
Affordable rents					
Appropriate offer and supply					

Table 4.53: Reasons for choosing the current place of living for the Eastern Leipzig actor classes: the preference structure of each actor class.
Note: Dark-grey: 60-100% of respondents evaluated the dimension important; Light-grey: 30-59% of respondents evaluated the dimension important; White: 0-29% of respondents evaluated the dimension important. Source: Author's draft. Data: Author's survey.

One can see that the preferences of the actor classes differ quite substantially. A safe and low-crime neighbourhood and a good road network was indicated by four of the five actor classes to be very important in the evaluation to choose the current place of living. The proximity to nature and landscape was still very important to three of the five actor classes. A quiet neighbourhood, the proximity to work and a good public transport system were very important to two of the five actor classes.

The one-person households are not very expressive, only two dimensions are very important to them: a good road network and the proximity to work. Middle-aged families evaluate three dimension as very important, the proximity to nature and landscape, a quiet and a safe, low-crime neighbourhood. The retired households value the same dimensions important but additionally prefer a good road network. The middle-aged couples and the young families are the most expressive actor classes. They regard six attractivity dimension as very important, these are the proximity to work, the proximity to shopping, the proximity to nature and landscape, a good road network and public transport network and a safe, low-crime neighbourhood. For the young families good road and public transport networks are appreciated, furthermore the proximity to friends as well as the vicinity to schools and child-care facilities, a family friendly and safe, low-crime neighbourhood are of additional importance.

Of all actor classes in Eastern Leipzig, the middle-aged couples are the least consistent. They show the largest number of grey cells. However, it is also the actor class with the smallest sample, therefore especially uncertain. On the other hand, the young families are most consistent with respect to what they appreciate as they name six attractivity dimensions with a frequency of over 60% of the respondents in the group. The young one-person households are the most consistent with reference to what attractivity dimensions they disregard (8 white cells). In all 45 cells are white or dark grey, 28 are light grey.

4.6.2.2 Residential preferences for actor classes in Western Wirral

Figure 4.48 shows the preference structure for the actor classes in Western Wirral. As for the actor classes in Eastern Leipzig, the most frequently indicated attractivity dimensions for the actor classes in Western Wirral will be portrayed (cf. Table 4.54). Again, an indication with colours will be used to show which dimensions are evaluated important by 60% or more of the respondents in an actor class (dark grey), by 30-60% of the respondents (light grey) and by less than 30%(white cells).

Table 4.54 reveals that the attractivity of a residential neighbourhood is substantially conditioned by the dimensions low-crime and quiet neighbourhood. In all five actor classes, 60% or more of the respondents indicate these two issues as very important reasons why they had chosen their current place of living. Another important preference to the characteristics of the living location is the vicinity to the countryside or coast, mentioned by 60% or more of the respondents in two actor classes.

Especially astonishing is the frequent indication of a safe and low-crime neighbourhood. Although the English-speaking countries are assumed to be more sensitive to crime and the fear of crime it is possible that the respondents are biased through the questionnaire, as nobody would probably say they preferred to live in a high-crime area. As mentioned earlier it seems more likely that the respondents in this case did not reflect on why they choose the current place of living but that they reflected it as a general demand for a place of residence. On the other hand it is hardly achievable to ask about crime and crime perception without a possible bias.

The class of retired people is the most expressive and consistent in terms of residential preferences. Seven attractivity dimensions are appreciated by 60% or more of the respondents in this class. The middle-aged families and the middle-aged singles indicated four dimensions as important for 60% or more of the respondents. For the lower to lower-middle class households and the young couple households two attractivity dimensions are very

Actor class P_i: / **Attractivity dimension:**	**I** Retired people HH	**II** Middle-aged family HH	**III** Middle-aged single HH	**IV** Lower to lower-middle class HH	**V** Young couple HH
Being near to your place of work					
Being near to food shopping					
Being near to other shopping					
Being near to leisure places					
Being near to countryside or coast					
Having good road connections					
Being near to a railway station					
Being in an area with good bus-links					
Being in a low-crime neighbourhood					
Being in an area with good schools					
Being near to friends or family					
Being in a quiet neighbourhood					
Affordable housing					
Being near to a park					

Table 4.54: Reasons for choosing the current place of living for the Western Wirral actor classes as a means for the preference structure of each actor class.
Note: Dark-grey: 60-100% of respondents evaluated the dimension important; Light-grey: 30-59% of respondents evaluated the dimension important; White: 0-29% of respondents evaluated the dimension important. Source: Author's draft, Data: Couch & Karecha's survey.

important for 60% or more of the cluster sample.

The lower to lower-middle class and young couple households are also those with the highest number of light grey cells, indicating that 30-59% of the respondents in these actor classes found the respective dimensions a very important reason to move to the current residential location. It is a measure for the consistency of the cluster. These two actor classes are least consistent in their preferences towards the characteristic of a residential location. But the young couple households comprise a relatively low cluster sample of only 17 households.

The retired people are the most consistent in terms of what they like (7 dark grey cells). The middel-aged single households are the most consistent with regard to what they do not like. Three dimensions are not important for no actor class: the proximity to work, the proximity to leisure places, and the proximity to a park. In all 48 cells are either white or dark grey (22 are light grey) which also shows the higher consistency within the clusters of Wirral[16].

As a next step assumptions about the interdependencies have to be made.

[16]This can only serve as an approximate measure to give an overview of the consistency of the actor classes. The given number of attractivity dimension to choose from in the questionnaire is 14 in Western Wirral and 15 in Eastern Leipzig. The number of white, grey, black cells were counted only for a rough estimation without taking into account a standardisation which would be necessary to fully compare the results. Despite the lower number of attractivity dimensions given in Wirral the data shows that the very important and the less important attractivity dimensions are more numerous in Western Wirral, showing that the cluster groups are more consistent.

4.6.3 Interdependencies

The cluster method allows a treatment of preferences towards the characteristics of the residential areas and attributes of the residents at the same time. This procedure is reasoned by the behavioural approach to action space as introduced in the beginning of this work. According to this approach: first, the actors' behaviour in space is limited to a given framework set by specific internal and external conditions, and second, their behaviour possibly changes the scope of action -the external and internal conditions- for other people. Such an understanding of behaviour and action presupposes feedback loops which apply to other people or even to the group which caused the initial impact.

This becomes very important with respect to the modelling. If one wants to yield information about a development in time one has to take into account both the initial impact and the feedback. It is assumed that a similarity in attributes and preferences accounts for both a similar spatial behaviour of the actor classes and a similar impact on themselves or other. The impact of an actor class is therefore considered close to the preferences of the people, which is comprehensible if one reflects on an example: people who prefer to live in natural, undisturbed surroundings will probably build houses in the open, green countryside - by that decreasing the value of 'natural, undisturbed surrounding' for others (or themselves).

Against this background, one has to reason the kind of impact the different actor classes can be assumed to have by their preferences. Such a reasoning is very much dependent on the local, regional or even national circumstances. It relates to culture, attitudes and education. Therefore the impacts can be different in the regions investigated and shall be treated separately.

4.6.3.1 Impacts of the behaviour of the Eastern Leipzig respondents

Each preference in the attractivity dimension can be assumed to be followed by a particular behaviour and to have a certain impact back onto the system and the attractivity evaluation of the same or other actor classes. Therefore each attractivity dimension needs to be investigated with respect to its potential impact. These are based on the attributes of the sample of each actor class as shown in Figure 4.47. Table 4.55 summarises these thoughts.

Explaining the assumptions made in Table 4.55: To the first attractivity dimension 'proximity to jobs', no feedback of migration is expected onto the availability of jobs in the suburban region. The number of jobs available is much more dependent on macro-economic variables or the growth/decline of dominant branches in the region. In an increasing globalised economy there is no indication that jobs follow people on a sub-city level.

The proximity to shopping is believed to be conditioned by the consumer pool of people in a region. Therefore the amount of shopping places or the floor space of shopping outlets might relate to the inhabitants to some extent. However, it is assumed that this relation rather regards a wider spatial scale comprising whole cities and their closer surroundings. The number of small shops is declining whereas the number of malls and shopping centres is rising (Herfert and Röhl 2001; Kulke 2001). This applies especially to the New German Länder where after the re-unification numerous shopping centres were built at the urban fringes of east German cities, e.g. Leipzig as a general trend in Germany and Leipzig (Herfert and Röhl 2001; Nuissl and Rink 2004; Nuissl and Rink 2005). These big shopping

Attractivity dimension:	**Assumed Impact** **+ : positive, attractivity increases,** **- : negative, attractivity decreases by in-migration of actor class #**
Proximity to work	No effect by in-migration
Proximity to shopping	No effect by in-migration
Proximity to leisure facilities	No effect by in-migration
Proximity to nature and landscape	...decreases by an in-migration of young families which is the actor class that most likely builds new houses (-P_{IV})
Little environmental pollution	No effect by in-migration
Good road network	No effect by in-migration
Good public transport	No effect by in-migration
Family friendly neighbourhood	....ameliorates with an in-migration of families (+P_{II} and +P_{IV})
Good school/child-care facility	No effect by in-migration
Proximity to friends and family	...increases with the same actor class (+the same class #)
Quiet neighbourhood	...is assumed to decrease with an in-migration of actor classes with many cars (-P_{II})
Safe, low-crime neighbourhood	No effect by in-migration
Affordable building land	No effect by in-migration
Affordable rents, lower segment	An increase of one-person households would negatively impact the apartment prices (-P_V)
Affordable rents, upper segment	No effect by in-migration
Appropriate offer and supply	No effect by in-migration

Table 4.55: Assumed impacts of actor classes' behaviour onto the attractivity dimensions in Eastern Leipzig. Source: Author's draft.

centres serve a whole agglomeration. Residential migration might therefore be of minor importance to the location decision of mall managers.

The development of leisure facilities also follows a rather European or Western trend towards big-event-facilities and indoor activities (Hatzfeld 2001; Herfert and Röhl 2001). They are provided as leisure centres, included in shopping mall facilities and might also serve a bigger spatial unit as the suburban areas investigated. Therefore it is assumed that if a relationship exists between residential mobility and the development of leisure centres, it is rather small. In effect, no impact of migration on the provision with leisure facilities is hypothesised here.

The proximity to nature and landscape is believed to decrease with an in-migration of the young families. The cluster result in Figure 4.47 reveals that this is the actor class most likely to build new houses on the urban fringe, as it is the actor class most interested in the prices for building land. Against this background the author supposes that the young families will impact negatively on the proximity to nature and landscape and reduce the attractivity of this dimension by an in-migration for themselves and the other actor classes.

Investigations in the surroundings of Leipzig have proven the dissatisfaction connected with the move to the suburban areas. The evaluation of living in undisturbed, green surroundings was oftenly tarnished after additional house-builders moved near by (Herfert 2003).

Little environmental pollution is not assumed to be under influence of residential migration as it rather refers to the general environmental conditions. At the turn from the socialist to the capitalist economic system the environment was particularly bad as an irresponsible economic practise during GDR times left the natural areas heavily polluted. After the strong de-industrialisation in Leipzig since the re-unification the environmental situation improved quite remarkably (Nuissl and Rink 2004). These issues are not assumed to be under an immediate influence of residential migration. Long-term impacts, e.g. from traffic, might nevertheless be possible.

The dimension 'good road network' and 'good public transport net' are both not directly related to migration. The road infrastructure was enormously improved and extended after re-unification with national funds. An extensive road network is available today. The provision of a good infrastructure is often regarded a prerequisite to regeneration and economic upswing. Therefore most declining regions invest substantially in the development of road and transport infrastructure. Meanwhile this is debated. However, a migration of residents to the suburban area is not assumed to impact on the situation of the infrastructure in the suburban area of Leipzig.

The condition of the public transport network is assumed to possess a certain relation to migration as public transport is managed as an enterprise that counts in economic terms. In Leipzig public transport mostly translates into bus and tram. Therefore it is dependent on the number of its users. Middle-aged couples and young families are most interested in a good public transport network. However, the feedback of an in-migration of these actor classes will possibly be felt with a substantial time lag as transport companies might not establish new routes immediately. Therefore it is assumed that no direct effect will result from an in-migration of any actor class onto this attractivity dimension.

The proximity to family and friends can be expected to rise if people of the same actor class move in. Such a relationship might especially hold for the connection to friends but to a lesser extent to the relation to family members who might be of different age, occupation, etc. Due to peer group connections, it seems reasonable to assume that an increase of an actor class will decrease the distance to friends.

A family friendly neighbourhood, good schools and good child care facilities might be slightly influenced by an in-migration of families, the actor classes II and IV. In Germany the provision of child-care facilities is a communal obligation[17]. However, it is not defined how many crèche places etc. must be available. Additionally, as the case study area in Eastern Leipzig belongs to the city of Leipzig the same number or share of places will be available per family in Inner and Outer Leipzig. Calculations will probably be made city-wide. Therefore there is no additional incentive to increase the crèche places if people move to the urban fringes. An indirect link might exist with the migration of more or less affluent households. The more affluent households pay more local taxes. However, this influence is regarded as marginal, indirect and delayed. Therefore a migration of families is not assumed to impact the amount or quality of child-care facilities provided in the suburban areas of Leipzig.

[17] `http://www.datenschutz.hessen.de/tb25/k6p5.htm`, 12.05.2006

With respect to the attractivity dimension 'quiet neighbourhood', additional information became necessary as it is not clear what noise might be most disturbing to the Eastern Leipzig residents. An enquiry of the Federal Environmental Agency[18](Umweltbundesamt) to the noise pollution of German residents revealed that noise is in fact a problem in German communities. The most annoying source of noise is traffic. Noise from air planes and thirdly noise from neighbours are additional disruptions. This is also in line with the results of the questionnaire revealing a high share of people who are annoyed by traffic and noise pollution. Consequently, it is assumed that the actor class that possesses the most cars is impacting the attractivity of the neighbourhood negatively. This is the actor class middle-aged families.

A potential impact on the attractivity dimension 'safe, low-crime neighbourhood' can probably not be ascribed to a certain in- or out-migration of residents to a significant extent as the actual crime rate in a neighbourhood seems to be of lesser importance (people not profit newssheet, 5/2001; Oswalt 2005). Instead, people's perception of the crime levels seems more important (Taylor and Jamieson 1998) which is not assumed to be directly influenced by migration.

The dimension 'affordable building land' is dependent on the supply-demand ratio of building land and therefore follows an economic reasoning. This would imply that an in-migration of households that asked for building land would increase the prices. However, as reported in various sources (Lichtenberger 1995c; Herfert and Röhl 2001; Nuissl and Rink 2004) the property market in east Germany is not yet fully functioning. Furthermore, the peculiarities after the change (no space in inner city and subsidies to build new houses, necessarily at the fringe) resulted in the coverage of large parts of the suburban area which then became abundant as the inner city problems were solved (mainly ownership clarification). Additionally the demand for building land was not as big as one might expect as Leipzig had to face an enormous loss of residents after the political change that moved to the western parts of Germany (Faßmann 1995; Herfert and Röhl 2001; Nuissl and Rink 2004). Recently the population figures for Leipzig have been slightly positive as shown earlier. The financial background of the remaining population can be assumed low, which further decreases the demand for owner occupied dwellings. The prices for real estate have gone down in the recent past and can be assumed to drop further in the near future (Nuissl and Rink 2005, p.32). To account for the post-socialist and low-demand anomalies it will be assumed that no (strong) effect remains from residential migration on the prices of building land.

Due to the peculiarities after the re-unification and the "over-relaxed housing market" (Nuissl and Rink 2005, p.31) the rents in Leipzig are especially low. There are 50000 flats empty and available for renting (Nuissl and Rink 2005). This decreased the apartment prices especially for the upper market segment. The lower market segment however did not show this development in the recent past, prices rose slightly (Nuissl and Rink 2005). Therefore one can expect that an in-migration of residents will further decrease supply in the lower market segment and increase prices for the inexpensive apartments. It is assumed that an increase of one-person households could further increase the prices for the lower segment of the rented property market. They are especially interested in affordable apartments (see Figure 4.47).

[18]`http://www.umweltbundesamt.de/uba-info-presse/presse-informationen/pd12602.htm`, 03.04.2006

The dimension 'appropriate offer and supply' is not directly affected by migration. Although some connection from supply-demand reasoning exists. This dimension does relate more to the availability of plots as offered by local planning boards. It was included as a reflection of the abundant offer of building land and apartment blocks on the urban fringes.

4.6.3.2 Impacts of the behaviour of the Western Wirral respondents

As mentioned, the impacts and feedbacks of movement onto the same or other actor classes can be very specific to the local, regional or national situation. Therefore it will be elaborated on the potential impacts of migration of the actor classes in Western Wirral also. Table 4.56 summarises the assumption made.

Attractivity dimension:	**Assumed Impact** **+ : positive, attractivity increases,** **− : negative, attractivity decreases by in-migration of actor class #**
Being near to your place of work	No effect by in-migration
Being near to food shopping	No effect by in-migration
Being near to other shopping	No effect by in-migration
Being near to leisure places	No effect by in-migration
Being near to countryside or coast	No effect by in-migration
Having good road connections	No effect by in-migration
Being near to a railway station	No effect by in-migration
Being in an area with good bus links	...is assumed to be positively impacted by the increase of retired people (+P_I)
Being in a low-crime neighbourhood	No effect by in-migration
Being in an area with good schools	No effect by in-migration
Being near to friends or family	...will increase with an in-migration of the same actor class (+ the same #)
Being in a quiet neighbourhood	...assumed to be negatively impacted by an increase of the young couple households (-P_V)
Affordable housing	...is assumed to be negatively impacted by an in-migration of the middle-aged families (-P_{II})
Being near to a park	No effect by in-migration

Table 4.56: Assumed impacts of actor classes' behaviour onto the attractivity dimensions in Western Wirral. Source: Author's draft.

The attractivity dimension 'being near to the place of work' is not assumed to be related to any change of actor class populations. As hypothesised in the case of Leipzig it is rather a macro variable dependent on the national or regional development of the economy but not as much under influence of the sub-city population trends.

The vicinity to food and other shopping places might also be under restricted influence from population migration. Similarly to the Western European and West German trend

towards bigger shopping facilities with a development of increasing numbers of shopping malls and shopping centres over the past 50 years (Kulke 2001), it is expected that Wirral confirms to this trend as it is set in a free market for a longer period than Leipzig. These malls and centres serve bigger catchment. With that in mind the availability of food or other shopping facilities is probably under no influence of migration on a sub-city level.

The same reasoning counts for the proximity to leisure places. The Western trend towards event facilities, large scale cinemas etc. (Hatzfeld 2001) does not apply to a catchment on a sub-city level. Therefore an in- or out-migration of certain actor classes is not assumed to affect the provision with leisure facilities.

The proximity to the countryside and coast is also not presumed to be influenced by a change of actor class populations. The coastline is not expected to change within the assessed time period whereas the countryside might not be influenced by in-migration either. The English countryside is comprehensively 'developed' and anthropogenically over-formed. The implementation of Greenbelts around the existing urban areas is a proof of the need to protect natural areas from development. Other protected areas, e.g. the coastline or at rivers, are small areas widely left untouched. They are outside of the development plans and therefore not influenced by in-migration. This is especially comprehensible if one bears in mind that 96.1% of all new build housing commitments in Wirral in 2001 were on brownfield sites (Wirral Borough Council, Planning Department). Therefore it is assumed that residential migration does not impact on the accessibility of the countryside or coast.

Also the provision of the road infrastructure is probably not directly influenced by an in-migration of certain actor classes. This assumption is backed up by the argument that infrastructural developments bear a long time lag: a necessary extension is probably recognised long after the situation has deteriorated and additional time is necessary before new roads are built. Furthermore, only massive problems with the traffic might stimulate a discussion about the building of new roads. Because of this no impact on the road infrastructure is assumed by residential migration of any actor class.

The provision with railways might not be impacted by migration immediately, although the railway infrastructure is subject to economic factors in England as the railway companies are private businesses. The development of the railway system decreased substantially since the beginning of the privatisation phase during the Thatcher era in the 1980s. Furthermore the provision of services does not only depend on sub-city or neighbourhood developments, as railways serve larger areas. An amelioration of the performance is therefore not assumed to be subject to a change of actor class populations on ward level.

The bus service is oriented towards a regional or local demand. It is assumed that a use of the service will probably result in an increase of the performance without a substantial time lag. It is positively influenced by an increase of the actor populations of the retired people households which prefer the proximity to bus links.

Being in a low-crime neighbourhood is probably not affected by any change in actor class populations formed here. As shown above this dimension relates more to the perception of crime, which can have various reasons. It does not correlate to the reported crime rates in the case of Merseyside (Oswalt 2005).

The attractivity dimension 'being in an area with good schools' can be assumed positively related to affluent families. In contrast to Germany, school attendance in England is substantially organised over school fees. Families who can afford expensive schools will pos-

itively increase the quality of schools. Furthermore it is believed that affluent families might establish a lobby or other more informal organisations to improve the school performance. The dimension is positively related to an increase in middle-aged families.

As mentioned for Leipzig, the proximity to friends and family is believed to increase with an increase of the same actor class. Whereas family members might not always account to the same actor class, this can be assumed to be valid for most of the friends of a household.

The quietness in a neighbourhood is most commonly affected by traffic noise or noise from neighbours. A study on behalf of the Department of the Environment, Transport and the Regions (DETR)[19] in 1999 and another on behalf of the Department for Environment, Food and Rural Affairs (DEFRA)[20] revealed that domestic noise from neighbours is the most frequently reported annoyance connected to noise in British cities. Amplified music during the evenings and night, shouting and banging were the most frequent causes of annoyance (MORI Grimwood and Ling 1999; 2003). These surveys give reason to assume that especially young neighbours could cause noise disruptions which would mean that a negative influence of quietness is expected from the young couple households.

There is no indication from the literature that the housing market in Wirral is separated as it was documented for Leipzig. This does not necessarily imply that a division according to a lower and an upper housing market does not exist. However the analysis relies on the division in the questionnaire (which was developed by researchers knowing the area). Recently (2002-2003) there has been an increase of 21% in the average housing prices for the North West region (ONS UK), whereas the average increase in England was only 12%. In a regional comparison, however, Wirral has higher prices than Liverpool and the North West region as a whole but lower as compared with the English and Wales average (Annex 32). Because of the higher price structure in Wirral than in other parts of the North West one might assume that the market is sensitive to supply and demand. Therefore, the prices of premises might rise with an in-migration of a wealthier population. Calculations of a distribution of household types and occupations in the different property areas of Wirral supported following assumption (please see Annex 13): the dimension of 'affordable housing' can be assumed to be negatively influenced by an in-migration of the middle-aged families. The results of the questionnaire have been grouped according to different price bands of the property values in different areas of Wirral. One can see that the household type 'adult couple with child/children' is most clearly distinguishable in forms of properties in areas. 81.0% of the middle-aged families are adult couples with child/children and 35.7% of them live in more expensive areas, only 21.9% in the moderate priced housing area and 8.5% in relatively cheap housing locations. In comparison, 38.7% of the 'adult couples' live in the highest and an additional 37.7% in the middle price band. It is not possible to assign the 'adult couples' clearly to any of the actor classes, therefore implications are uncertain. Not so with the middle-aged families, as they belong to the wealthier population strata. One can assume that an in-migration of this actor class would result in an increase in the property prices.

The proximity to parks is not relevant for any actor class in Western Wirral. It is assumed not under influence of residential migration, especially if one looks at the suburban development as parks are commomly a means to improve the inner urban environments.

With this information the qualitative modelling can be performed.

[19] `www.defra.gov.uk/environment/noise/research/domestic/index.htm`, 03.04.2006

[20] `www.defra.gov.uk/environment/noise/research/mori/index.htm`, 03.04.2006

4.6.4 Qualitative Modelling

4.6.4.1 Qualitative Modelling for Eastern Leipzig

Qualitative modelling seems an appropriate method to derive information about a possible suburban development against the behavioural approach of action space, the approach which sufficiently covers the process elements comprising migration patterns on a sub-city level. To account for the internal and external constraints that might delimit the space of action for residents, the impacts and feedbacks of action have to be considered jointly. A matrix structure is the most appropriate way to picture this. One can start like portrayed in Table 4.57 where the attractivity dimensions of the questionnaire sent around in Eastern Leipzig are plotted against the preferences of each actor class and the impacts of each actor class back onto the state of the attractivity dimension.

Actor class P_i: **Attractivity dimension:**	**I** Retired people & older childless HH	**II** Middle-aged family HH	**III** Middle-aged couple HH	**IV** Young family HH	**V** Young 1-person HH	**Assumed Impact**
Proximity to work						NE
Proximity to shopping						NE
Proximity to leisure facilities						NE
Proximity to nature and landscape						(-P_{IV})
Little environmental pollution						NE
Good road network						NE
Good public transport						NE
Family friendly neighbourhood						(+P_{II} and +P_{IV})
Good schools/child-care facilities						NE
Proximity to friends and family						(+same class#)
Quiet neighbourhood						(-P_{II})
Safe, low-crime neighbourhood						NE
Affordable building land						NE
Affordable rents						(-P_V)
Appropriate offer and supply						NE

Table 4.57: Attractivity dimensions, preferences and immpacts of actor classes in Eastern Leipzig.
Note: Dark-grey: 60-100% of respondents evaluated the dimension important; Light-grey: 30-59% of respondents evaluated the dimension important; White: 0-29% of respondents evaluated the dimension important. NE = No effect. Source: Author's draft. Data: Author's survey.

To account for the share of respondents that indicated certain attractivity dimension less or more often important, there will be made a difference in the strength of influence in the model. This appears with dark grey or light grey letters in the next table. Table 4.58 is a different visualisation of Table 4.57 giving the preferred attractivity dimension and

assumed impacts per actor class. Each column in Table 4.57 that indicates the preferences of actor classes is now displayed down the left hand column of Table 4.58. Additionally, the impact column (right hand side) in Table 4.57 is split up in five columns in Table 4.58 to show the influence of each actor class against the mentioned preference. All attractivity dimensions that are at least important to 30% of the respondents are included, but only if they are influenced by any actor class population changes (the blue cells in Table 4.57).

Actor class P_i: **Preferred Attractivity dimensions:**	**I** Retired people & older childless HH	**II** Middle-aged family HH	**III** Middle-aged couple HH	**IV** Young family HH	**V** Young 1-person HH
Attractivity of P_I					
- Proximity to nature and landscape				(-P_{IV})	
- Family friendly neighbourhood		(+P_{II})		(+P_{IV})	
- Proximity to friends and family	(+P_I)				
- Quiet neighbourhood		(-P_{II})			
*Aggregated effect onto **P_I***	+	-	o	-	o
Attractivity of P_{II}					
- Proximity to nature and landscape				(-P_{IV})	
- Family friendly neighbourhood		(+P_{II})		(+P_{IV})	
- Quiet neighbourhood		(-P_{II})			
*Aggregated effect onto **P_{II}***	o	-	o	-	o
Attractivity of P_{III}					
- Proximity to nature and landscape				(-P_{IV})	
- Family friendly neighbourhood		(+P_{II})		(+P_{IV})	
- Proximity to friends and family			(+P_{III})		
- Quiet neighbourhood		(-P_{II})			
- Affordable rents					(-P_V)
*Aggregated effect onto **P_{III}***	o	-	+	-	-
Attractivity of P_{IV}					
- Proximity to nature and landscape				(-P_{IV})	
- Family friendly neighbourhood		(+P_{II})		(+P_{IV})	
- Proximity to friends and family				(+P_{IV})	
- Quiet neighbourhood		(-P_{II})			
- Affordable rents					(-P_V)
*Aggregated effect onto **P_{IV}***	o	+	o	+	-
Attractivity of P_V					
- Proximity to nature and landscape				(-P_{IV})	
- Proximity to friends and family					(+P_V)
- Affordable rents					(-P_V)
*Aggregated effect onto **P_V***	o	o	o	-	-

Table 4.58: Attractivity matrix for Eastern Leipzig. Source: Author's draft, Author's survey. Note: Dark-grey: 60-100% / Light-grey: 30-59% of respondents regard the dimension important; + indicates a positive impact: the variables are re-inforcing; - indicates a negative impact: the increase in one actor class leads to a decrease of the area's attractivity for the other.

If one then summarises the influence of actor class populations per actor class (looking at columns in Table 4.58 an aggregated attractivity matrix can be derived, displaying the aggregated impacts of all actor classes onto the attractivity of the area for each actor. This is necessary as input to the modelling. The single impacts have to be weighed in terms of importance. This can be supported, first, by the cluster result. Secondly, and as noted above, the very frequently preferred attractivity dimensions within one actor class are most important. They are believed to rule out those which are mentioned less frequently in all cases. It is possible however, that competing influences might in reality lead to a different qualitative impact than hypothesised. The orange cell in Table 4.58 displays such an example. As suggested, the impact of (-P_{II}) is evaluated negative in the aggregated effect while there is one attractivity dimension which assumes a positive impact. As the latter is only of importance to 30-60% of the respondents in this actor class, but the former for more than 60%, the negative impact rules out the positive one.

Where grey cells are not competing with black ones, the smaller influence is taken as additional impact. In some cases, this will lead to virtually the same impact of preferred attractivity dimensions whether they were mentioned by 30-60% or more than 60% of the respondents of an actor class. The model cannot distinguish between the strength of the deduced impact. It is nonetheless assumed a reasonable decision since also the attractivity dimensions that are less important still relate to the opinion of 30-60% of the respondents in an actor class. The aggregated attractivity matrix for Eastern Leipzig shows Table 4.59.

Actor class P_i:	**I** Retired people & older childless households (HH)	**II** Middle-aged family HH	**III** Middle-aged couple HH	**IV** Young family HH	**V** Young one-person HH
Attractivity:					
A_I	+	–	**0**	–	**0**
A_{II}	**0**	–	**0**	–	**0**
A_{III}	**0**	–	+	–	–
A_{IV}	**0**	+	**0**	+	–
A_V	**0**	**0**	**0**	–	–

Table 4.59: Aggregated Attractivity matrix for Eastern Leipzig.
Note: + indicates a positive impact: if one actor class increases, the attractivity of the area for the other does so as well; – indicates a negative impact: if one actor class increases, the attractivity of the area for the other class decreases. Source: Author's draft.

4.6.4.2 Qualitative Modelling for Western Wirral

Similarly for Western Wirral, Table 4.60 displays the attractivity dimensions, the preferences of each actor class and the assumed impacts on the attractivity dimensions as discussed above. The next step is shown one page further: the preferred attractivity dimensions of each actor class are summarised in the left hand column of Table 4.62, the assumed impacts from the right hand column of Table 4.60 are then displayed in the columns of the assumed impacting actor class in Table 4.62. The aggregated attractivity matrix as end-result for the modelling input is given on the next page already, Table 4.61.

Actor class P_i: / Attractivity dimension:	I Retired people HH	II Middle-aged family HH	III Middle-aged single HH	IV Lower to lower-middle class HH	V Young couple HH	Assumed Impact
Being near to your place of work						NE
Being near to food shopping						NE
Being near to other shopping						NE
Being near to leisure places						NE
Being near to countryside or coast						NE
Having good road connections						NE
Being near to a railway station						NE
Being in an area with good bus links						(+P_I)
Being in a low-crime neighbourhood						NE
Being in an area with good schools						(+P_{II})
Being near to friends or family						(+same class #)
Being in a quiet neighbourhood						(-P_V)
Affordable housing						(-P_{II})
Being near to a park						NE

Table 4.60: Attractivity dimensions, preferences and impacts of actor classes in Western Wirral. Note: Dark-grey: 60-100% of respondents evaluated the dimension important; Light-grey: 30-59% of respondents evaluated the dimension important; White: 0-29% of respondents evaluated the dimension important. NE = No effect. Source: Author's draft. Data: Couch and Karecha's survey.

Actor class P_i: / **Attractivity:**	**I** Retired people households (HH)	**II** Middle-aged HH	**III** Middle-aged single HH	**IV** Lower to lower-middle class HH	**V** Young couple HH
A_I	+	−	**0**	**0**	−
A_{II}	**0**	+	**0**	**0**	−
A_{III}	**0**	−	+	**0**	−
A_{IV}	+	−	**0**	+	−
A_V	**0**	+	**0**	**0**	−

Table 4.61: Aggregated attractivity matrix for Western Wirral.
Note: + indicates a positive impact: if one actor class increases, the attractivity of the region for the other does so as well; − indicates a negative impact: if one actor class increases, the attractivity of the region for the other class decreases. Source: Author's draft.

The aggregated attractivity matrix summarises the overall impact of a change of certain populations on the attractivity by actor class. One can see that most actor classes are disturbed by an in-migration of the young couples (last row), the actor class P_V, including their own. This is due to the strongly expressed wish to live in a quiet neighbourhood.

Actor class P_i: **Preferred Attractivity dimension:**	**I** Retired people HH	**II** Middle-aged family HH	**III** Middle-aged single HH	**IV** Lower to lower-middle class HH	**V** Young couple HH
Attractivity of P_I					
- Being in an area with good bus links	(+P_I)				
- Being near to friends or family	(+P_I)				
- Being in a quiet neighbourhood					(-P_V)
- Affordable housing		(-P_{II})			
*Aggregated effect onto **P_I***	+	-	o	o	-
Attractivity of P_{II}					
- Being in an area with good schools		(+P_{II})			
- Being near to friends or family		(+P_{II})			
-Being in a quiet neighbourhood					(-P_V)
- Affordable housing		(-P_{II})			
*Aggregated effect onto **P_{II}***	o	+	o	o	-
Attractivity of P_{III}					
- Being near to friends or family			(+P_{III})		
- Being in a quiet neighbourhood					(-P_V)
- Affordable housing		(-P_{II})			
*Aggregated effect onto **P_{III}***	o	-	+	o	-
Attractivity of P_{IV}					
- Being in an area with good bus links	(+P_I)				
- Being in an area with good schools		(+P_{II})			
- Being near to friends or family				(+P_{IV})	
- Being in a quiet neighbourhood					(-P_V)
- Affordable housing		(-P_{II})			
*Aggregated effect onto **P_{IV}***	+	-	o	+	-
Attractivity of P_V					
- Being in an area with good schools		(+P_{II})			
- Being near to friends or family					(-P_V)
- Being in a quiet neighbourhood					(-P_V)
- Affordable housing		(-P_{II})			
*Aggregated effect onto **P_V***	o	+	o	o	-

Table 4.62: Attractivity matrix for Western Wirral.
Note: Dark-grey: 60-100% of respondents evaluated the dimension important; Light-grey: 30-59% of respondents rated the dimension important; + indicates a positive impact: if the actor class increases, the attractivity of the region for the other does so as well; – indicates a negative impact: if the one actor class increases the attractivity of the region for the other class decreases. Source: Author's draft. Data: Couch and Karecha's survey.

4.6.5 Model Results

The output of a qualitative model is not a quantitative one. It can be displayed as a qualitative graph with states of the modelled system and their relations. It displays the changes of actor population trends (the population increases or decreases) instead of providing exact numbers that specify the degree of change. No quantitative figures are given. From the qualitative graphs one can draw conclusions about the state of the system, possible trend successions but also qualitative states which cannot be reached from one to another state, the possible imminent developments as well as the farer future states. The qualitative graphs for the model of Western Wirral and Eastern Leipzig will be described below.

4.6.5.1 Model results for Eastern Leipzig

According to the internal dynamics of the suburbanisation process in Leipzig as formulated above and summarised in the matrix of Table 4.59, the following output of the modelling for Eastern Leipzig has been projected (cf. Figure 4.49).

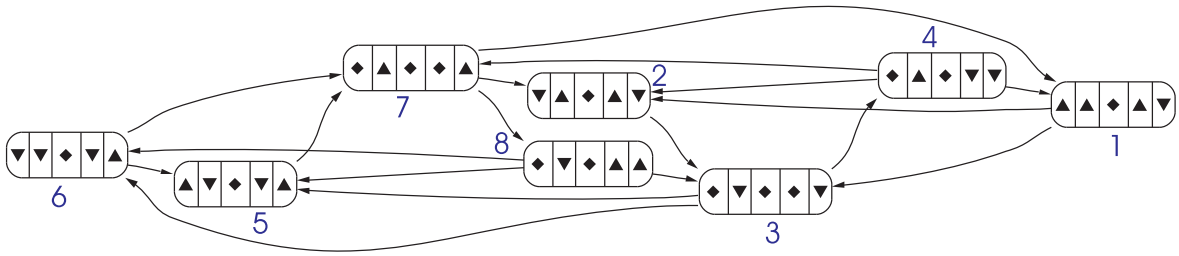


Figure 4.49: Possible trend successions for Eastern Leipzig. Source: Author's draft.
Actor classes per ellipse: Retired households | Middle aged family households | Middle aged couple households | Young family households | Young one-person households.

The ellipses represent qualitative states of the system. The columns in the qualitative states stand for the different actor classes from left to right: retired households, middle-aged families, middle-aged couples, young families, young one-person households. The symbols in the columns represent an increasing (upward arrow), decreasing (downward arrow) or unstable (diamond) trend of the respective population. One can start to read such a qualitative graph by looking at or searching for the state possibly representing **the current situation**.

Of use are the analyses of previous sections. There the population trend in the case study regions was of major concern, the trend in the household structure is now of central interest. The actor classes in the model are formed on the basis of households. However, there is a certain relation between population and households, since an increase in population figures mostly corresponds to an increase in households also, especially in Western societies where the birth rates are low. Currently (covering the years 2000-2004 approximately) there is an increase in the suburban population of Leipzig. Therefore we might expect that the number of all households in the modelled region increases. However this can vary considerably among the actor classes investigated. The BBR (2005) has documented the development of certain household types within Germany over the period 1990 to 2002 and projected the

trend until the year 2020 depending on the level Eastern/Western Germany. These graphs are visible in Annex 31. It is shown that the young family households decreased, the middle-aged family households decreased, and the retired households increased. However, in the light of the investigations and especially against the light of the questionnaire results, it is assumed that the young family households are increasing in Eastern Leipzig. The middle-aged families might do so as well. This is reasoned by the second wave of private housing construction in the Eastern areas of Leipzig which is shown in the three last figures of the chapter covering research question 3. Young families and middle-aged families are assumed to form prominent suburbanites. They have the resources to move and built private family houses. The retired households have increased in the whole of Germany but especially in the New German Länder since 1990 (see Annex 28) and are believed to do so further until 2020, in accordance to the national figures also in Leipzig (see Annex 29) and to the official statistics (Amt für Statistik und Wahlen Leipzig, Stadt Leipzig 2004). The single person households are considered to decrease in the outer areas of Leipzig, though they might increase in the inner urban parts. The percentage of single persons is substantially higher in the inner urban areas. Given the regenerating urban centre this division is assumed to strengthen. The development of the middle-aged couples is not clear. Against this background the current situation is displayed in state #1 (see Figure 4.49).

Two successor states are possible which represent **the nearer future** of the development in Eastern Leipzig (indicated with #2 and #3). From that follows that the trend direction of the retired households might change first: it decreases (in #2). But this is only a forerunner to the other possibility (state #3) in which the middle-aged families start to decrease. The young one-person households remain decreasing and the trends of the other actor classes become highly uncertain. Therefore, the region might experience a decreasing trend of the retired which can lead to a rather unstable development very quickly where it is only clear that the middle-aged families and the young singles will leave the region.

After state #3 three successor states are possible for **the farer future** (#4, #5, and #6). Accordingly, the middle-aged families might increase again whereas the young one-person households and the young families decrease (in #4). Another possibility leads to a decreasing trend of the family households (P_{II} and P_{IV}) and an increasing trend of the retired and one-person households (in #5). However, it is also possible that only the single households increase while all other actor classes decrease (according to #6). The middle aged couples are uncertain in its trend in all three lately mentioned states.

From the latest mentioned states the population development can follow different paths which lead to various circle movements projected from the model. This means that the internal dynamics do not produce a single state (or more than one) in which the development remains until a certain external influence is added to change the internal dynamics. Instead the population in Eastern Leipzig develops in a perpetuating, circular behaviour (the development cannot come to a halt in one state if an outgoing arrow exists - instead it has to follow the drawn development but one cannot say when. Persistent states without further development would be drawn as a state without an outgoing arrow).

Smaller circles are also possible, e.g. in the upper right part of the graph (from #1 to #2 and #3 to #4 and back). On the other hand it is also possible to stay in a circle drawn

in the lower left (from #5 to #8.) The two parts are indicated with blue and green colours in Figure 4.50. They can be walked along independently, and they can even be followed via shorter or longer ways within one colour.

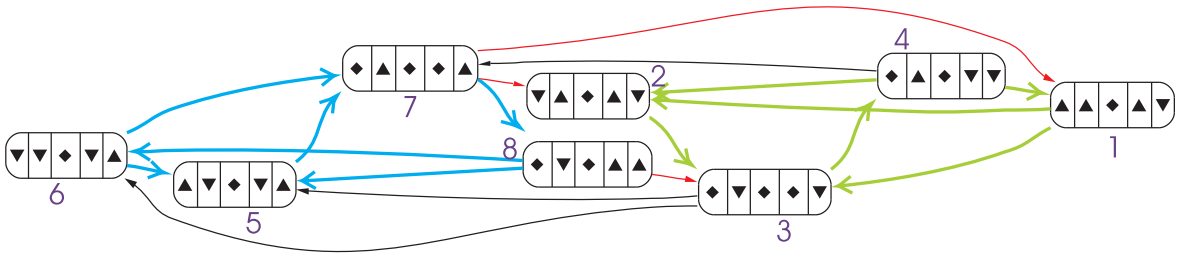


Figure 4.50: The two independent circles in the population developments of Leipzig. Source: Author's draft.
Actor classes per ellipse: Retired households | Middle-aged family households | Middle-aged couple households | Young family households | Young one-person households.

Interpretation I: Land use change

Under the light of a sustainable land use development it is envisaged to cut the amount of land consumption for urban (and other) uses drastically until the year 2020. This is an approved aim of the German government (Bundesministerium für Raumordnung 1996; Bundesregierung 2004). As discussed earlier, the young families are the actor class most interested in affordable building land. They might drive land use consumption. Therefore one would try to keep this actor class decreasing in the suburban area. This is clearly the case in #5, #6 and #4. However, as these states do not belong to the same-coloured circle it does not seem possible to account for a decrease of the young families all the time. In the light blue circle, two states are marked with a decreasing trend of the young families. Therefore this one would possibly be favoured if one wants to plan for small land use change. To stay within the blue circle attention should be paid to the crossovers to the green one (arrows marked in red, from #7 to #1 and #2 and from #8 to #3). This means that especially in times when middle-aged families and young one-person households increase in the suburban areas (state #7) the one-person households would need to be made staying in the region, more so they should remain with an increasing trend whereas it is important that the number of middle-aged families should not increase further in the region - their trend should become decreasing in the suburban areas first. The locational attractivity for the middle-aged families should be raised in other parts of the agglomeration instead, e.g. in the inner city. If this cannot be achieved at that point in time the development of the system flows into the light green circle. A decline of land use consumption will be ever more difficult. Additionally, one should be aware of the possibility to reach the green circle from #8 to #3 (arrow marked in red). To get around this crossover the single-person households should further increase (the difference between the state #3 and #5 or #6). The area should be made continuously attractive to the young one-person households which is a common feature of all states in the blue circle. If it can be achieved to keep the single households increasing especially in times when middle-aged families decrease and young families increase also (in #8), the young families will from then on start to move to other

regions (in #5 and #6) potentially the inner urban areas if the living conditions can be increased there. It would however also be possible that the young families move further out. Attention needs to be paid to that point in time. A major difference between the blue and green circle is the different trend of the one-person households. They increase constantly in the blue but decrease constantly in the green circle. Against the background of the current trend of decreasing single households in the suburban area as seen in section 4.5.2.2 it is not very comprehensible that the suburban development would follow the blue circle or that it is easy to influence it in the direction of the blue circle. Therefore it seems rather complicated to reach a more sustainable suburban development with less land use change at the moment (according to the current internal dynamics). It is more comprehensible that the green circle is followed which means an increase in single households in other parts of the region, a re-urbanisation is possible. But re-urbanisation seems to lead to a relatively higher land use change in the suburbs. To reach a more sustainable development state at present, the planning board has to intervene strongly to either direct the current dynamics to a chosen path in the qualitative graph (to the blue circle) or to change the development overall (by changing either the internal or external variables of the model).

However, the general trend towards higher shares of single households might affect the suburban areas of Leipzig in the future. This seems possible especially against the general projection of a stable to decreasing trend of family households in the eastern parts of Germany (see Annex 31) and the projection of increasing single-person households which might in the course of time also affect the suburban areas (Annex 29). Therefore the blue circle might indeed reflect the most probable population development in Eastern Leipzig in the future. This would mean that a slightly lower land use change in the suburbs seems possible in the future when the shares of single households might increase in the outer urban areas.

Interpretation II: Land use change under an aging population

In previous sections it was revealed that an increase in retired households might be a particular feature of old industrial areas. Additionally, an increase in the retired households is projected for the respective case study cities and countries (BBR 2005, ONS UK). Therefore the qualitative model shall be looked at once more to find possibilities for a decrease in land use change, and a more sustainable development under an aging population. It is assumed that the trend towards more elderly in the case study area continues constantly. An additional model run has been performed that prescribes the trend of single actor classes to 'no-change-in-trend-possible' (see the source code in Annex 14; e.g. trennd=1 to fix the retired households). This means that one can evaluate the model output according to a constantly increasing (or decreasing) actor class, e.g. here a constantly increasing retired household sample. A particularity of this feature is that the new model output will be an extraction of the former model result but this time only showing the paths that comply with the additional assumptions made, e.g. increasing retired households. The previous assumptions concerning the attraction between actor classes remain nonetheless. For the Leipzig case Figure 4.51 displays the model outcome if the trend of the retired households is always increasing.

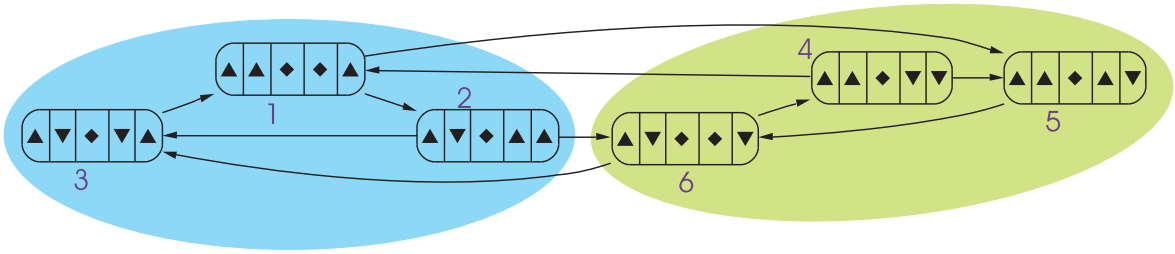


Figure 4.51: Qualitative graph for the Eastern Leipzig population dynamics if the retired households are constantly increasing. Source: Author's draft.
Actor classes per ellipse: Retired households | Middle-aged family households | Middle-aged couple households | Young family households | Young one-person households.

In the figure one can see that beside the overall increasing trend of the retired households the graph separates according to increasing versus decreasing young one-person households, indicated by the green and blue coloured areas. If an increase of single households would also affect the suburban area Eastern Leipzig (although an increase in single households could not yet be shown by the analysis of the household movements within this work but it is projected by the BBR (2005)) the development would follow the circle in the blue coloured area (from #1 to #3). This would suggest that the suburban region develops from an increasing trend of the retired, middle-aged families and single person households (in #1; the middle-aged couples and young families are uncertain, either decreasing or increasing and may be fluctuating) to a decrease of the middle-aged families (#2). This state is followed by one which shows a decline in the middle-aged and young family households (#3) to then move back to state #1. Eastern Leipzig would be a relatively attractive region with a relatively strong segregation at one point. If it happens that the single households do not increase in the suburban regions, which might be expected following the current trend, Leipzig also develops quite heterogeneously (from #4 to #6). From one state where the retired and middle-aged families increase while the young families and single households decrease (#4), which could be assumed the current situation, it will then move to a state where the young families also start to get more numerous (#5). From there, the development will probably flow into a state with decreasing middle-aged families and single households (while the trend of the couples and young families is not clear, #6). These projections seem plausible and indicate that planning strategies and instruments should be implemented that aim at an alteration of these internal dynamics still under an assumed aging population and from a free-flow of interactions between the residents no sustainable development can be expected. In both circles there are fluctuating increasing and decreasing young family households.

The blue circle on the left does not represent a very sustainable urban development, also the green circle is not very promising. However with respect to the total number of actor classes that are decreasing in the suburban areas the green circle seems slightly better. This part of the graph is characterised by a decrease of young one-person households in all states of the small circle (#4 to #6), which is also with respect to the current trend a reasonable scenario. This means that under a projected increase of retired households in the case study region the single households should be attracted to other areas, preferably to the urban centres. The inner urban parts might offer the most suitable accomodation for

the single households and seem to work in favour of a lower land use consumption by single households in the suburban areas. However, in the green circle there are also two states (instead of only one in the blue circle) indicating an increase of middle-aged families. One has to make sure that the decrease in land use change brought about by decreasing single households in three states would not be surmounted by a higher land use change of the middle-aged family households in two states. This is not easy to evaluate with the model but needs to be monitored in the region. Therefore a provision of accomodation for single households in the inner urban areas can only be a first step towards sustainability as no one true sustainable development state after it seems possible with the current preferences. The model results demonstrate that interventions from the planning boards are needed to change the internal dynamics defined through attraction and repulsion between the actor classes as no single sustainable state has been projected. The current forces would not lead to sustainable suburban development in the long-term. For the nearer future the provision of suitable housing for one-person households would lead to re-urbanisation and a slightly lower land use change in the suburbs. The stated space preferences of residents can be used to plan and potentially direct population movements.

4.6.5.2 Model results for Western Wirral

The internal dynamics driving the population development in Western Wirral is displayed in Table 4.61. The qualitative graph of the population development is shown in Figure 4.52.

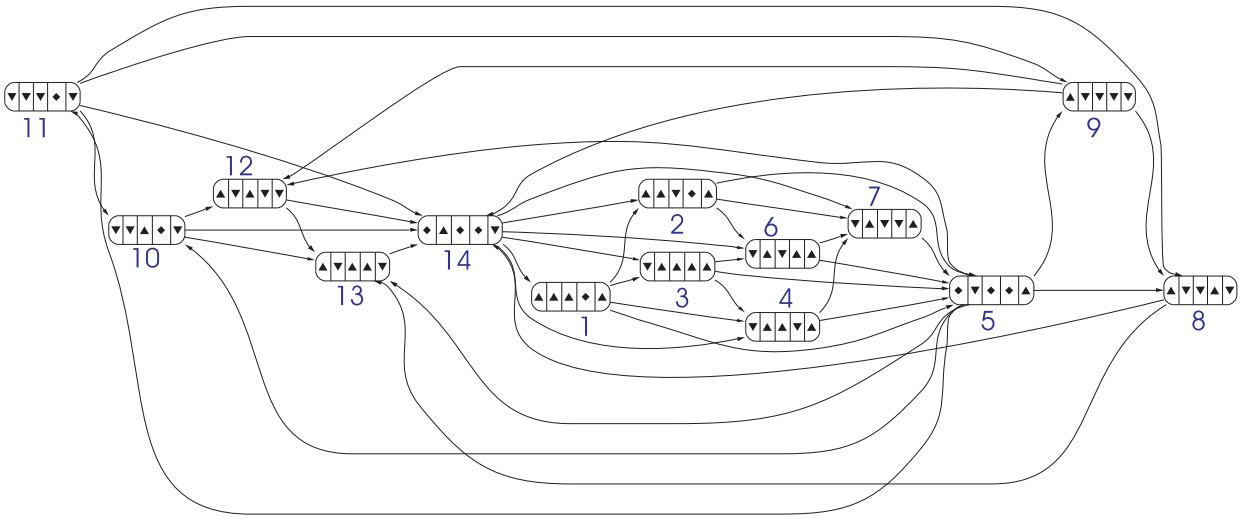


Figure 4.52: Possible trend successions for Western Wirral. Source: Author's draft.
Actor classes per ellipse: Retired households | Middle-aged family households | Middle-aged single households | Lower to lower-middle class households | Young couple households.

Again the search for the most probable **present state** (roughly the years 1997-2003) is of importance first. In the case study region of Wirral the number of retired people are increasing. They are represented with higher shares than the national average already

and have again been rising from the census in April 2001 to the mid-year estimate of 2003 (ONS 2005)[21]. Another indication can result from the employment figures in Wirral. From the summer of 1999 to the summer of 2004 the employment rate among the people in working age (men:16-64, women:16-59) increased by 11%. If this trend continues the lower to lower-middle class might increase in Western Wirral. It is the actor class with the smallest financial budget and might therefore get the possibility to move. On the other hand, if these households can strengthen their financial base it is also possible that this actor class decreases in the whole of Wirral, at least as it is defined at the moment. They might have the resources to convert to middle-aged families, middle aged singles or young couples. Therefore the trend is unclear. Another hint can be derived from the percentages of age bands in Wirral and the Northwest. According to the mid-year estimates 2003 the percentage of children aged 5-15 is slightly higher than the Northwest average and the average for the whole of England and Wales[22]. This is probably due to the reputation of Wirral as a nice suburban neighbourhood close to Liverpool where families move. Against this background the middle-aged families might currently increase as well. For the other actor classes less statistical material is available. However, between 1991 and 2001 the case study regions showed among the highest percentage population increases as compared to the whole of Wirral. This might reflect on the household figures especially as on the trend to smaller households. Therefore it is assumed that the middle-aged singles and the young couples increase as well. Against this reasoning #1 in Figure 4.52 marks the present state in the projected population dynamics of Wirral.

From state #1 several alternative succession states remain which represent the **nearer future** of the population dynamics in Western Wirral (indicated with #2,#3,#4 and #5). However, all development passes state #5, either directly or indirectly before any other trend combination becomes possible. This means that the development will lead to a point in which many possibilities remain (three unclear trends) but the middle-aged families will clearly decrease and the young couples clearly increase. The way between the present state and the 'bottleneck' in #5 is characterised by a constant trend of increasing young couples. The trends in population figures of other actor classes become successively decreasing. The middle-aged families stay increasing for the most time but finally decrease in #5 too (although then the population trends of many other classes are not decreasing any more but unclear and can therefore be increasing or decreasing).

From the described state #5 new possibilities appear which can be described as **the farer future** (the paths to #8, #9, #10 and #11). In one direction (#8 and #9) the retired households are increasing whereas the middle-aged families, the middle-aged singles and young couples are declining. The lower to lower-middle class can either rise (in #8) or fall (in #9). These states picture a phase in which the area is relatively unattractive for all classes apart the retired households. In the other direction (#10 and #11) the area is unattractive to all populations but the middle-aged singles (in #10), whereas the trend of the lower to lower-middle class remains unclear.

[21] `http://www.neighbourhood.statistics.gov.uk/dissemination/AreaProfile2.do?tab=2`; 02.05.2006

[22] `http://www.neighbourhood.statistics.gov.uk/dissemination/AreaProfile2.do?tab=2`; 02.05.2006

After additional ways all development moves into #14 which is another gathering point. It is characterised by increasing middle-aged families and decreasing young couples whereas the other trends are unclear. #14 represents the mirror to #5. It starts a new circle movement. The explanation shows like Leipzig there is no persistent development state which would fix the trends into a certain direction. Instead, a perpetuating process can also be seen in Wirral.

If one looks closer at the graph, the dynamics show that the circle movement always has to pass the centre part (the ellipses between #14 and #5). This marks a process from increasing actor classes to more and more decreasing ones with a relative uncertainty in #5 where it is still possible that all actor classes increase apart from the middle-aged families. Therefore the middle part of the graph represents a kind of prospering region. It is marked light green in the following picture (Figure 4.53).

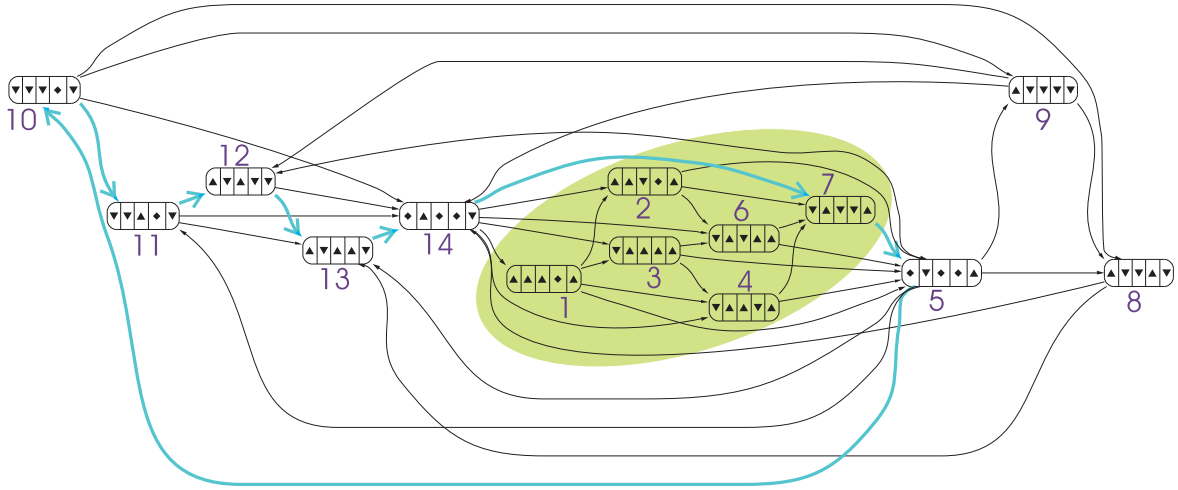


Figure 4.53: Prospering development states and sustainable development path in Western Wirral. Source: Author's draft.
Actor classes per ellipse: Retired households | Middle-aged family households | Middle-aged single households | Lower to lower-middle class households | Young couple households.

Interpretation I: Land use change

In contrast, outside of the centre part the majority of actor class populations is marked with a decreasing trend. Important to mention, this does not stand for an overall decrease of households in the region as the modelling cannot allow for a quantification of the trends. It is not possible to say which trend might have a steeper slope and outweigh another. However, a common characteristic of the states outside the centre is that they feature a decreasing number of the middle-aged families and young couples. These are the most prominent residents buying or building new houses. If one wants to decrease the land use change the development should remain as long as possible outside of the centre and as short as possible within. This would imply that the population development in Wirral would need to follow the path indicated with blue in Figure 4.53.

This means that there remain multiple points of possible interaction for politics and

planning. To follow the so-called sustainable development path (the blue lines) during the period of growth (centre part), the suburbs might decrease in attractivity for all actor classes which is possible as prices might become too high for all to afford moving there. The young couple households might stay for the longest time increasing but will then also move to other areas. Especially important at this stage (after #7 and #5), when only the middle-aged families and young couples increase but all other actor classes decrease, is it to provide better housing for the retired households in other areas than the suburbs. The needs of the elderly should be attended to, e.g. with adequate investments in the inner urban areas (it assures that the development moves along to #10 or #11 instead of #8 or #9 which would probably shorten the time outside of the centre part). After the period of relative low attractivity for approximately all actor classes (state #11) it is best to support an increase in attractivity for the middle-aged singles. Little later also the elderly should find it attractive to move to the suburbs. Appropriate means should be adopted to assure a housing supply oriented towards their needs. This again attracts the lower to lower-middle class which possibly starts to increase shortly after (#13). It should be avoided as long as possible (in #11 and in #9) that the middle-aged families move in first or early (the development goes directly to #14). It would shorten the development outside the blue centre and lead earlier to these prospering states in the centre. After the retired households, the middle-aged singles, and the lower to lower-middle class are succesively moving into the suburban region also the middle-aged families could enter - #14 has been reached and the propsering phase of Western Wirral begins.

It was additionally mentioned that the development phase within the green centre should be shortened. This is best possible if the development after a state in which the middle-aged families increase (#14) and the young-couple households decrease would directly move into #7. This can be pursued only when it could be achieved that the retired households, the middle-aged singles and the lower to lower-middle class jointly start to decrease in the suburbs, while for this period the middle-aged families and the young couples continue to increase. Jointly, the retired households, the middle-aged singles and the lower to lower-middle class should be attracted to the inner cities. This seems fairly comprehensible and in line with the literature of urban regeneration and gentrification. Mostly, the less affluent (have to) choose the inner urban areas to live in, also singles often remain in the inner urban parts for amusement amd the retired sometimes for reasons of the social and medical infrastructure. If the mentioned actor classes all leave the region, the middle-aged families move out later also. If the described development phases can be followed the land use change can be expected to be less severe.

There are specific circumstances that have to be born in mind when interpreting the results. The model cannot indicate the length of a development state. This means that the urban area can remain in one state longer than in the other. Strictly speaking it cannot therefore be stated with certainty that the passage through the green centre with only two steps will take less time than the movement along six steps outside it.

Additionally and as already mentioned for the case of Leipzig, if the population development is decreasing in the suburban areas one strong emphasis should be paid to the development in the surrounding spaces. The model yields a decreasing trend in the suburbs so it can be assumed that this out-migration needs to be answered with an increase in

population somewhere else. These points in time are exactly those where it is important to respond to the preferred attractivity dimensions as revealed in the preceding case study analysis. This is when the actor classes that move out of suburbia could be attracted to the urban centres. Very much attention should be paid to the direction of moves as it is also the time when the actor classes could move even further out of the agglomeration, possibly increasing land use change there.

Interpreation II: Land use change under the assumption of constantly increasing retired households

As in the Leipzig case, the additional assumption of increasing retired households has been implemented in the model. This trend is projected for the English society (ONS UK) and might impact on the old industrial areas especially strongly. If the retired households are always increasing in the Wirral model, the cut-out of the entire model result looks as shown in Figure 4.54.

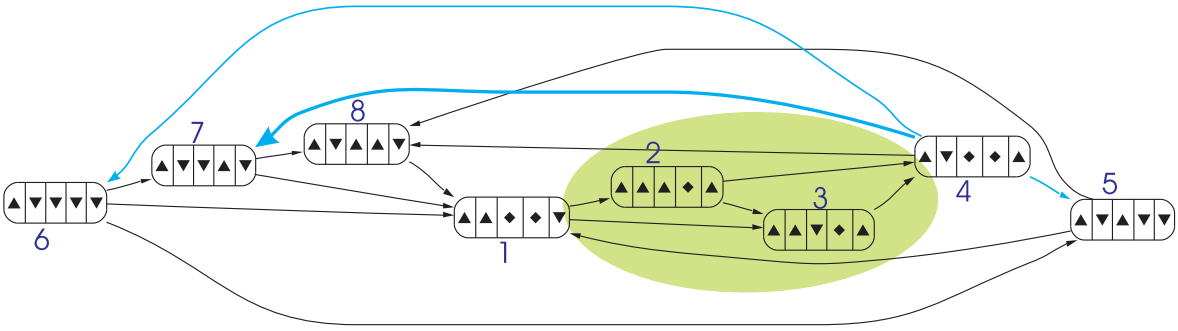


Figure 4.54: Qualitative graph for the Western Wirral population dynamics if the retired households are constantly increasing. Source: Author's draft.
Actor classes per ellipse: Retired households | Middle-aged family households | Middle-aged single households | Lower to lower-middle class households | Young couple households.

The structure remains the same: the centre of Figure 4.54 displays the more attractive phases of Western Wirral (indicated in green, approximately states #1 to #4) and this part has to be passed to follow the circle development suggested by the internal dynamics. In the case of Wirral, one cannot identify a certain path of trajectories which feature an increase of single households (this is the actor class 3 - middle-aged singles in the Wirral case). But remarkable is that outside of the area, all states are characterised by a fall of the population of the young couple households (actor class #5). This means that they are the signal for a more sustainable development phase in Western Wirral. One could also assume that a decrease of this class could initiate a more sustainable state, e.g. if they are attracted to other places potentially the inner urban areas. Additionally if the time in the more sustainable phase outside of the green centre is to be prolonged either the area needs to be of low attractivity to all actor classes (to get to #6 after state #4), or on the other hand the middle-aged singles (#5) or the lower to lower-middle class households should become more numerous (state #7). Whereas it might not be easy to attract the middle-aged singles to the suburbs it seems more likely with the lower to lower-middle class (follow the thick blue arrow). They seem to assure that the middle-aged families

are not attracted to the suburbs soon after. Middle-aged families should not increase in the suburbs as long as possible as they initiate another boom period. In that period of relatively low demand, when young couples are decreasing in suburbia, the same could be attracted to the inner urban areas. It seems comprehensible or possible that they could start a re-urbanisation process. This would probably lead to both a lower land use change in the suburban areas due to an initialisation of a low-demand-phase and a revitalisation of the inner urban areas which is often evaluated positive from the planning point of view. Housing for the young couple households in the inner urban parts is therefore one way to plan for a more sustainable region. As a second means a lowering of the house prices in the outer urban areas seems promising. This could enable more lower to lower-middle class households moving to the suburbs and would thereby prolong the low-demand-phase and reduce the rate of land use change. Again, the preference structures can offer support. An increase in social mixing is clearly suggested as one means to reduce the interest for middle-aged families and to hinder a new boom period with high attractivities, increasing prices and land use change in the suburbs.

However, a very sustainable development path has not been revealed - in every state outside of the green centre some actor classes are increasing in numbers and the development suggests a moving on (circle behaviour). So it will nevertheless be indispensable for politics and planning to influence the dynamics with planning policies. To reach and keep a sustainable state the internal dynamics will have to be changed, also because the current projected development continues fluctuating.

Chapter 5

Discussion and conclusion

5.1 City life cycles of former industrialised capitalist and socialist cities

The research question was formulated in the following way:

Research Question 1: Process oriented
Did the population development in the case studies follow the sequences of the life cycle theory of urban areas and is a re-urbanisation trend visible in both regions?

Hypothesis:
As a result of the political history of Leipzig, which limited an urban development on the fringes and which also controlled and acted against decentralisation, it is assumed that the city development in Leipzig has not followed the phases of the life cycle model of cities over the past six decades. Re-urbanisation is visible in both regions as a new trend after a period of inner city population decline. However, there are reasons why this could happen earlier and easier in Leipzig.

The life cycle theory of urban areas claims to describe the intra-regional population dynamics between an urban and a suburban area. It proposes that a city is undergoing stages of urbanisation, suburbanisation, dis-urbanisation and re-urbanisation. Although it is accepted widely in the mid-European context, there is some evidence that this does not apply to all European cities and regions alike. It does not hold for the Mediterranean cities, and there are differences in between the Northern and Southern European agglomerations with respect to the time and the sequence of the phases. One of the case studies, Leipzig, differs from the mid-European context in that it is a city in a post-socialist context and therefore (still) in transition. The socialist mode of regulation and governing was different from the Western, the capitalist order and one could expect that the city development followed not the same pattern. No other investigations are known that look at the life cycle patterns of socialist or post-socialist cities. Leipzig was governed according to a socialist order between 1949 and 1989. The years of census within this period as well as the 17 years after the unification were subject to the analysis.

The change of a political system implies a change on all levels of society - the jurisdiction, the regulation, the money system, property relations, and very importantly the land market. Changes here take time. Additionally the specifics of transformation in Germany involved restitution of real estate to owners before 1949. Such a strategy lead to inner city shortages until restitution claims were solved and to a city development which mainly took place at the urban fringes, at least within the first decade after the change. Legacies remain, as this change had to be sustained by people who grew up in the former political system. They bring their knowledge, their habits and behaviour with them. The economy of many socialist states and of the former GDR strongly relied on the industrial sector which was heavily impacted by the political change as well. An opening to the western markets and an introduction of profitability in economic reasoning lead to a drastic cut-back in the industrial production. Paired with cuts in governmental support, the lack or inexperience of institutions and the application of inappropriate political strategies this resulted in a collapse of the established markets and a comprehensive de-industrialisation. Given these aspects and under the consideration that Eastern Germany is in the situation to benefit from enormous governmental subsidies several similarities between western old industrial cities and the post-socialist cities have been unfolded. Historically, both are cities of primitive accumulation entailing a strong urbanisation trend (though in different centuries) during the socialist period and early industrialising period in western cities. The living environments were correspondingly very poor. Being only industrial production centres, even the social interaction was organised over the big firms. A few large economic entities made the regions dependent and vulnerable. Nowadays in both types of city similar problems result: abundant brownfields from the de-industrialisation and the principle of reservesin the GDR, high unemployment figures, a shortage in the service sector and related jobs, differing qualifications of the work force in terms of what is needed in the new emerging service economy, a lack of entrepreneurs and a different mentality of workers as constituted behaviour from the industrial past. Both cities have substantial economic and structural similarities despite the differing political history.

Against this background it was highly interesting to look at the development sequence in terms of population and with respect to the life cycle theory of Leipzig in comparison to the Liverpool/Wirral case study. It was additionally interesting to evaluate whether in both regions re-urbanisation takes place after the long periods of regional but especially inner city population decline.

Calculations to the intra-regional decennial population change in Leipzig and Wirral since 1950/1951 revealed a stark difference in the development between the two regions. Throughout the entire GDR era, Leipzig's population decline was stronger in the outer urban areas (at that time the surrounding communities of Leipzig - these are now incorporated in the administrative area of Leipzig). A relative re-urbanisation took place as a consequence of the slower decline of population in Inner Leipzig and a stronger decline in Outer Leipzig. In the period 1981-1989 a decentralisation trend set in as the rate of population decrease in Outer Leipzig slowed down from 1971/1981 to 1981/1989 whereas the population decline continued to increase in Inner Leipzig. In the time period 1981/1989 the decrease in population in both Inner and Outer Leipzig was almost equal.

Both cities reveal a temporary interest in the urban areas after WW II. In Leipzig the fall in population slows down in the 1960s in both Inner and Outer Leipzig. It is also that decade

when Leipzig experiences the slowest population decrease in both sub-regions. In the decade 1961/1971 the overall population in Wirral already starts to decrease whereas in Leipzig a relative interest in the urban centre is most pronounced. The 'post-war interest' in urban areas seems to occur later in Leipzig (only in the 1960s). In Wirral a population increase in the urban centre is highest already in the 1950s (although the increase in population in Outer Wirral is higher still). One cannot say from these findings whether the population change is brought about by migration or by an increase in the birth rate. The birth rate is known to have risen soon after the war. However, further inquiries would be needed to clarify that point. In contrast to Outer Leipzig which experienced negative population trends throughout the period 1950 to 1989, in Outer Wirral the trend of population change is positive until 1981/1991 and only becomes negative in the last decade before the census in 2001.

In Wirral, the population trend strongly followed the phases suggested by the life cycle theory of urban areas. It showed a trend from suburbanisation to dis-urbanisation including all sub-categories since 1951. A lasting fall in population in Outer and Inner Wirral (with little variations) results in a sub-urbanising phase of Wirral in the first two decades covered and a dis-urbanising phase later on. Therefore, Wirral is another example supporting the relevance of the life cycle theory of urban areas with respect to capitalist regimes. It also suggests that the model cannot be rejected for old industrial cities in market oriented systems as Wirral is an example where it holds valid. In English and other Western cities decentralisation has continued since 1951 (Champion and Dorling 1994). The "1970s is internationally recognised as the 'decade of counterurbanisation' " (Champion and Dorling 1994, p.17) at least in Western cities, such as in the cities of the UK and Western Germany (Ott 2001). However, although the population dispersal was most pronounced in the 1970s it was also a feature of the later decades (Champion and Dorling 1994). The findings of the case study of Wirral are in line with the observations mentioned. Also in Wirral the rate of decentralisation was highest during the decade of 1961/1971. Since then the population increase in Outer Wirral decreased and turned into a negative trend from 1991/2001. Regarding the overall population decline which is a characteristic of the region since the decade 1961/1971 Wirral is not alone within the development of English agglomerations, as many formerly industrialised areas are decreasing in population. This is in accordance to findings of other authors (Champion and Dorling 1994) and can be seen by a comparison of English and Welsh agglomerations. With regard to re-urbanisation in Wirral no trend change away from dis-urbanisation can be documented until 1991/2001 although the population in the whole of the district has increased slightly in recent years (since 2001). Population figures at the ward level are not available for the years between the censuses. In these years only figures for the higher level of administration, the districts, are accessible. Therefore it cannot be said with certainty whether a re-urbanisation trend is occuring very recently in Wirral.

The population trends of the city of Leipzig did not follow those proposed by the life cycle theory of urban areas during the GDR era. The research hypothesis is confirmed. The strong planning influence curbed a development on the urban fringes. The theory seems not to provide a valid model of city development in post-socialist cities, such as Leipzig in former East Germany, where the application of a different political system comprises a differently oriented business structure and administration.

Despite the overall re-urbanisation trend in Leipzig between 1950-1989 the rate of decrease in the urban surroundings did slow down in relation to the population decrease of the centre. This indicates that a shift towards decentralisation might have set in during the period 1981/1989. However, whether this first indication towards decentralisation would have continued cannot be proven as it was closely before the political change where the spatial attribution of censuses and data extrapolations changed.

In line with the hypothesis these results are in contrast with what one would expect from the the land use maps of Magnucki and Haase as displayed in Annex 6 and in the results chapter 4.1.1. To clarify this contradition a further analysis was performed. If one looks at the change of land use between 1940 and 1985 in the maps it is especially noticeable that a decrease in the agricultural area is made up for by an increase in land for residential uses. Therefore one can assume that the decreasing population loss in Outer Leipzig between 1950 and 1989 is connected to some increase in residential area. The change in land use for the whole of Leipzig between 1940 and 1985 is displayed in Figure 5.1.

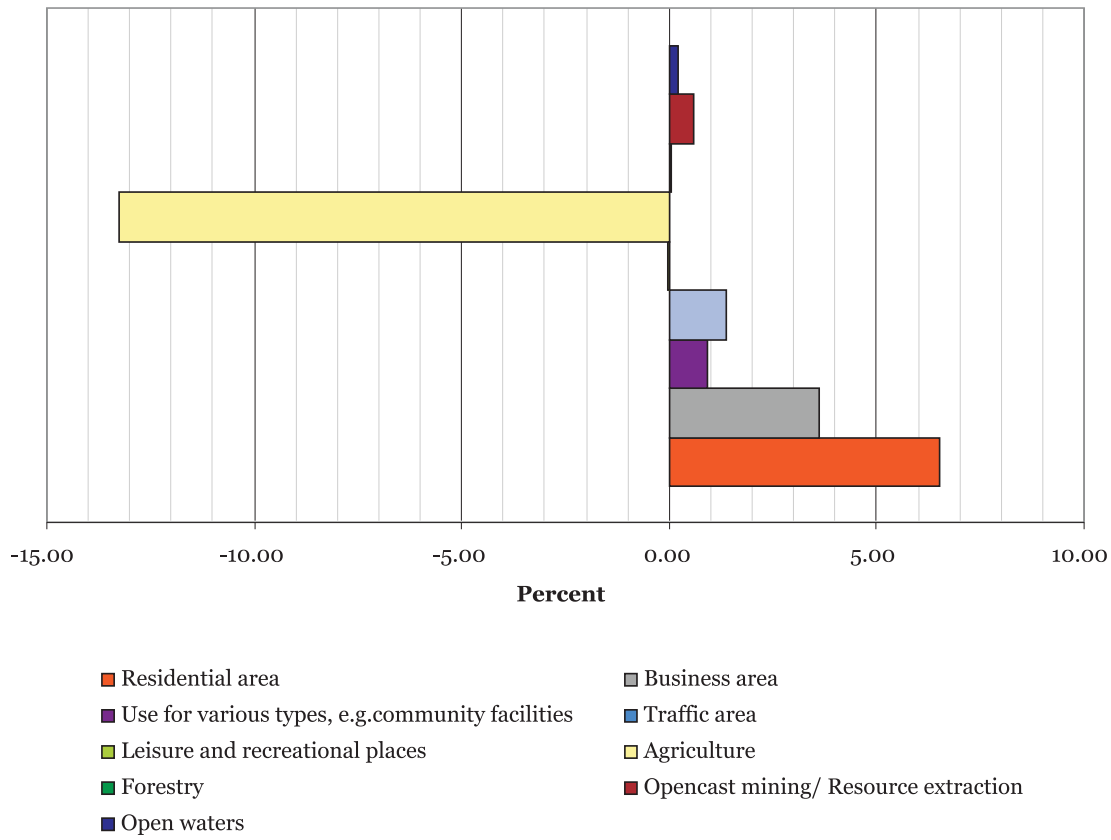


Figure 5.1: Land use change in Leipzig between 1940-1985. Source: Author's draft.

A decrease in agricultural area takes place in the outer urban areas where this land use type was abandoned. If one further analyses the increase of residential area one gets the result as shown in Figure 5.2. One can see that in the GDR an increase in land use change for residential purposes was mainly brought about by an increase in the area dedicated to detached and semi-detached housing (the category indicated in orange). This is especially

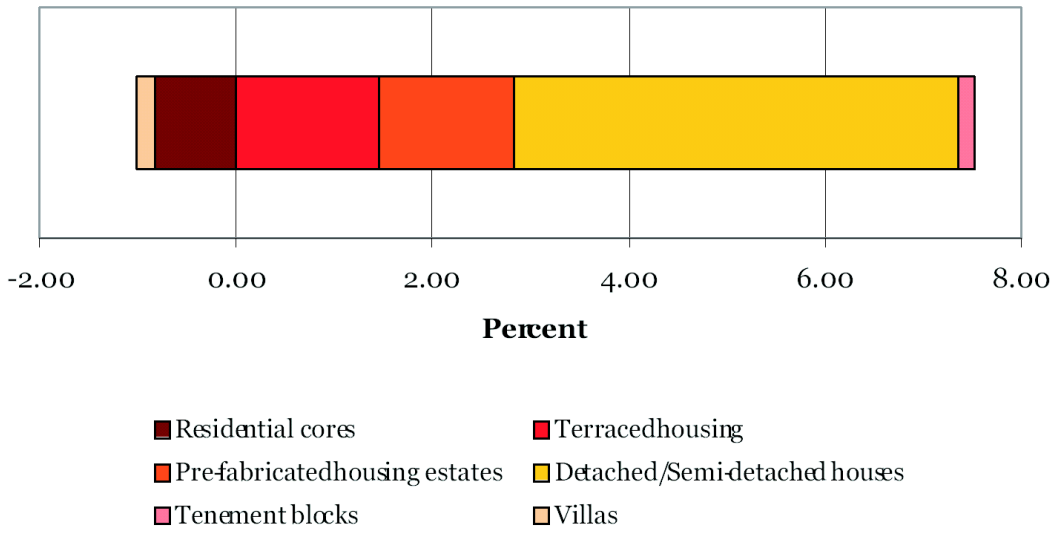


Figure 5.2: Residential land use change in Leipzig between 1940-1985. Source: Author's draft.

astonishing against the pronounced housing policy in the GDR. An individualisation and visible contrasts between socio-economic classes were not wanted (Ott 2001) - but a family house does account for some kind of individualisation much in contrast to the construction of the prefabricated housing estates. It appears that it was possible for families to build their own family house. Whereas prefabricated housing estates are not the prevailing type of urban change with respect to the amount of land converted (see Figure **??**) it might have accounted for a much bigger share in terms of number of dwellings and people housed.

Figure 5.2 also reveals that the older tenement buildings in the inner cities fell into decay. Therefore, one could speak of a particular kind of suburbanisation in the GDR. Tenement buildings brought a strong increase of population close to the urban fringes whereas family houses were also built but accounted for a higher share of land use change near urban areas. In contrast to the western suburbanisation as documented in Wirral, the decentralisation trend in Leipzig might not have reached as far out of the existing urban fabric as in Western cities but instead might have occurred relatively near to the urban fringe. These findings indicate why the life cycle theory of urban areas might not be a good model to document changes in the socialist cities. Their development followed a particular kind of suburbanisation which might not be captured by the model, or more precisely, by the analysis as it was undertaken here.

This conclusion leads to the spatial scale of research, which delivers some explanation for the found re-urbanisation trend of Leipzig during GDR times: the definition of Inner and Outer Leipzig might not appropriately display the border between a built-up inner urban part and a loosely populated outer urban area. This is comprehensible if one takes into account that the land allocation to different land uses was rather generous in the GDR (principle of reserves) (Faßmann 1995; Lichtenberger 1995). Figures 4.1 and 4.2 reveal that a substantial part of the development with detached and semi-detached houses occurs on the fringes but within the classified area Inner Leipzig. It seems that only because of the spatial delineation of Inner and Outer Leipzig re-urbanisation occurred there during GDR

times. This seems to be a major drawback of the theory for socialist cities. Depending on how a line between inner and outer urban areas is drawn, different results are to be expected.

The spatial scale is an important aspect in urban research and definitions to an urban or suburban area can differ between countries (Antrop 2004). Therefore a comparison between cross-national analysis deserves some attention. In this work the definition was supported by the assessment of local and regional researchers. Therefore it is assumed that a close representation of the actual situation of urban versus suburban characteristics of the agglomerations could be achieved. It was decided here to analyse the population development within one administrative area, other research differs in that point. Much work has been done on population change in 'functional urban regions' (FUR) (Champion and Dorling 1994; Champion 2001; Antrop 2004), a classification which exceeds single administrative boundaries. The implementation of functional urban regions can be understood as one answer to enable a better comparison by providing a uniform spatial scale for European urban research. In other investigations where a different city development was found than is assumed in the life cycle theory, as e.g. in the regions of Northern Europe, France and Northern Italy as well as Southern Europe (Antrop 2004), the FUR served as spatial basis. However also their borders might not sufficiently delineate urban settlements from their rural surroundings as cities develop over time, the surrounding countryside might be affected by an urbanisation trend through the transmission of life styles, functions and others. It seems a great challenge to any urban/suburban comparison to decide on an appropriate delineation.

Internationally, the definition of an urban area is dependent on the population size and the spatial clustering of housing (Antrop 2004). This aspect indicates that the aggregated number of households are an important variable in assessing urban versus suburban or rural areas. Especially in consideration of a projected continuation or/and an increase in single-person households the life cycle theory of urban areas might underestimate the importance of households within the urban/suburban agglomerations. Instead, it is possible that (absolute and relative) population figures might become inappropriate as a mirror of urban development. As the urban life style is increasingly spreading into the countryside as reported from other studies in Europe (see Pichler-Milanovic 2003) and urban regions are increasingly characterised by more functional relations over larger distances instead of a close vicinity of urban functions (Antrop 2004), e.g. proven by the increase in the average living space over the last century (in Germany from about 15 sqm/person in 1950 to 38 sqm/person in 2000, in urban England the ratio of dwellings per hectare changed from 10:1 between 1900-1999 and the ratio of people from 20:1), it might be more appropriate to develop an urban life cycle model on the basis of household trends. Also, there is a decreasing trend of housing construction in recent years in Germany but an increase in the amount of land converted for residential purposes (BBR 2000; BBR 2005). Household trends might in some respects better account for the urbanisation processes in terms of a functional understanding of urbanisation. A relative increase of households in the suburbs compared to the urban core might indicate a spreading of urban life-styles (if more single households are counted which are currently especially a phenomenon of inner urban areas as has been found in Leipzig and in Wirral (see chapter 4.4.1)) and of a suburbanisation trend. Additionally, an analysis of city development according to the trends of private

households might also give a better understanding of the land use change in urban areas, although then the number of persons living in one household and the land area occupied (apartment versus single houses) would need to be included for a comprehensive picture. Figure 5.3 shows that despite the recent decline in population in both sub-regions of Wirral the number of households is increasing and especially in Outer Wirral. A comparison of the last three decades reveals that the rate of increase is slowing down in both sub-regions. However, a longer time span should be investigated to derive long-term trends.

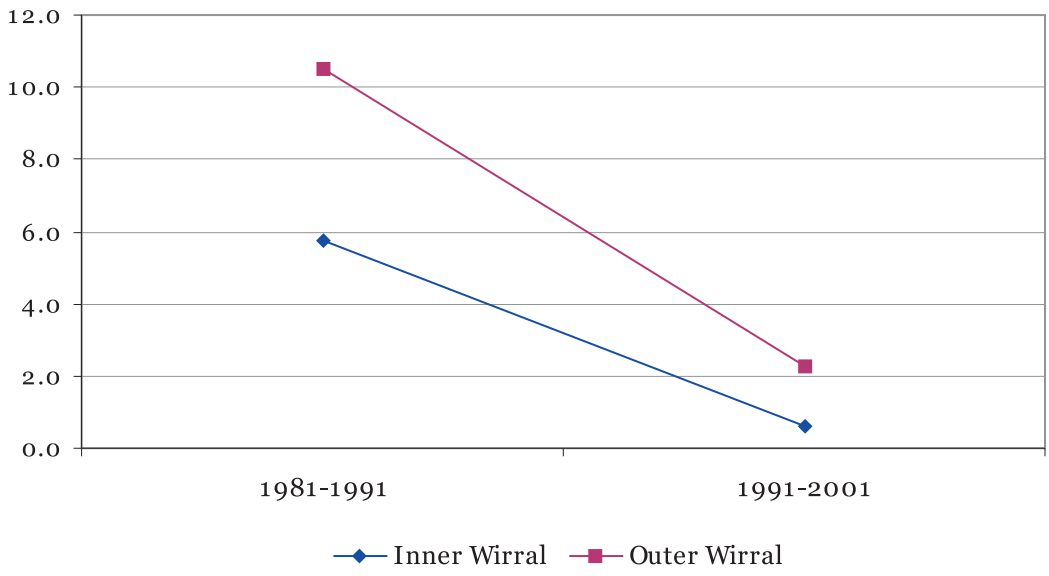


Figure 5.3: Decennial change of household figures for Inner and Outer Wirral. Source: Author's draft, Data: Office for National Statistics UK, NOMIS.

The comparison reveals an increase in household numbers in both cases (Figure 5.4). In Wirral, data was available for the time frame 1981 to 2001 whereas for Leipzig data could only be retrieved for the period 2000-2005. Additionally one can see that the increase in households is faster in the outer areas in both regions although the share of single households is higher in the inner urban areas. This shows that the increasing trend towards smaller households is even stronger in the outer parts. Whereas such a trend is visible in both, Eastern Leipzig and Western Wirral, the trend towards smaller households is increasing in Leipzig but decreases in Wirral. Nuissl and Rink (2005) remark that such a trend has been remarkably high since re-unification. Leipzig is characterised by a strong increase in households since 1990. Whereas an increase in households might point towards the increase in land use for residential purposes, one has to keep in mind that in the inner cities where there is a higher share of single households there is also a higher proportion of people living in apartment buildings. In Germany, and to a lesser extent in England multi-storey (3-4 storeys) apartment blocks prevail in these parts of town. On the urban fringes the land conversion from private single family homes is greatest (BBR 2005) (as documented for Germany; in England also the majority of detached and semi-detached houses is constructed in the suburban areas). In contrast, the outer urban areas are often

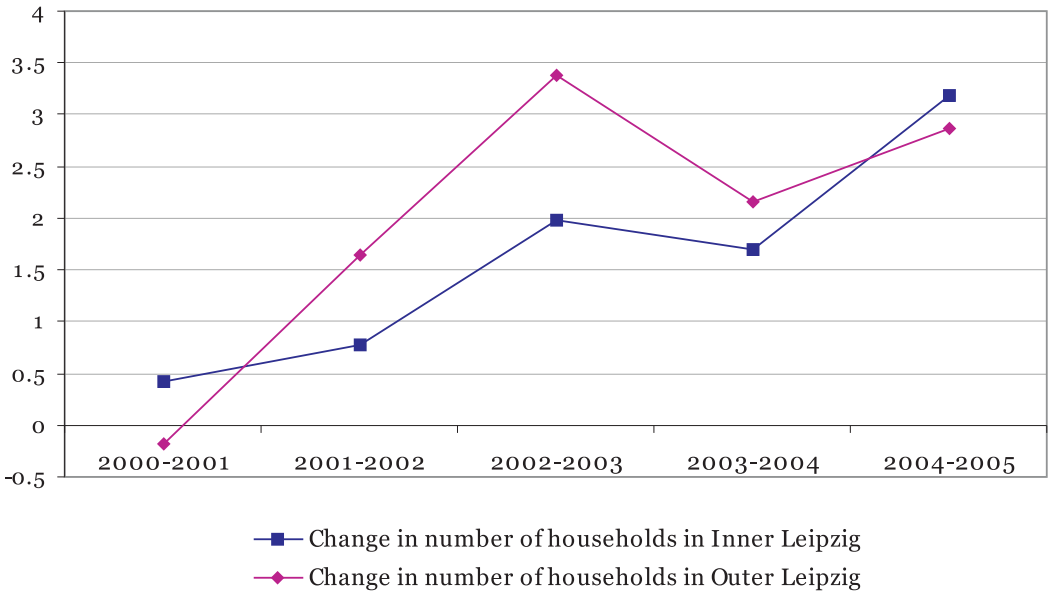


Figure 5.4: Change of household figures in Inner and Outer Leipzig between the years 2000-2005. Source: Author's draft. Data: Amt fr Statistik uund Wahlen Leipzig.

characterised by a larger number of people living in one household, and fewer multi-storey buildings. Additionally, housing construction on the outer urban areas does more often occur on greenfield sites. Therefore, it seems unclear whether the analysis of household development in the inner and outer urban regions can provide a clear picture of the land use development for residential purposes.

On the other hand, the trend change from a smaller rate of increase in the number of households in the inner areas to a higher rate of change in the last year investigated (Figure 5.4) might explain some of the statements of other authors that sprawl has almost ceased (Herfert 2005 - personal communication, Nuissl and Rink 2006). In terms of household numbers the inner city has been developing since 2004/2005.

More general critique to the life cycle theory concerns the relative and therefore more qualitative statements. As the change in population figures are given in percentages, any information about the change in absolute numbers in erased. This means that a population changes could appear similar in different cities if the percentage changes are alike. In fact, this is not the case and attention should be paid to the implications of the potentially differing absolute numbers of population in different regions. If percentages are compared between cities the relative change expressed in percentages can only give a weak impression of the situation. Total numbers of population change should not be disregarded if one wants to draw a comprehensive analysis of the urban development. Moreover the trade off between different percentages within the method itself limits the explanatory power within one case study. One has to keep in mind that percentages can result in misleading pictures with regard to the situation in absolute numbers.

Another issue of concern regards the time span. The censuses allow this analysis of changes within decades. Fluctuations between the years of censuses are not visible. Furthermore, the year of census, every tenth year, may be an outlier. This cannot be ruled out

by the method. In the case of Leipzig since re-unification single years are included. This was reasoned by the fact that the region is very dynamic as a result of the legacies from the past, but also by data availability. The remarks given apply for the single years as well, as fluctuation between them are possible and the analysis is based on single dates within these years as well. There is additionally the concern that an evaluation on single years might be too short to show a trend. Trends are indications of the general development and can therefore only be seen in longer time spans, one could argue.

Despite these drawbacks, the analysis in this work has shown that the life cycle theory is not fully applicable to socialist cities as the city development in Leipzig did not follow the suggested sequence in the last decades. In fact, it could not be proven or falsified as only re-urbanisation was documented. There was a decline in re-urbanisation in the last years of the socialist period and one cannot say whether a new trend would have been started shortly after. To be precise, one can say that the city development in Leipzig did not undergo the phases of the life cycle theory of urban areas between 1950 and 1989, the period when other cities in Europe did follow it. It cannot be shown from this analysis whether the phases might have been delayed or prolonged, or may not have taken place at all if socialism had continued. According to the results of this work, the urban life cycle model does not hold true for all cities in Eastern Europe during the times of the socialist government for which Leipzig serves as an example. It could be shown that Wirral complies with at least two of the four assumed development stages between 1951 and 2001. It was characterised by a suburbanisation trend until 1961/1971 and a dis-urbanising trend afterwards.

What the analysis also shows is that policy and planning can act as a powerful means to combat widespread suburban development. Despite the drawbacks to the spatial scale of research in Leipzig one can conclude that suburbanisation was minimal in the GDR in contrast to what was revealed for Wirral as Western city during the 50 years timeframe investigated. With it, the belief in the power of planning tools shall be one important outcome of the study. It presupposes and might be even more important an either strong political effort as planning is understood as one executive organ of political programmes.

With respect to the current trends and a possible re-urbanisation in Leipzig, difficulties in the data comparability affect the first decade after re-unification. Only since the year 2000, is data on a uniform compilation method and spatial area available. The overall population development in Leipzig has been positive since 2000. However, splitting the data according to the spatial areas Inner and Outer Leipzig one can see that the overall increase in population in Leipzig is rather due to suburbanisation than re-urbanisation. This is in contrast to statements of other authors (Herfert 2002; Herfert 2005 - personal communication; Nuissl 2005) who claim that sprawl in Leipzig has ceased. The recent migration pattern does confirm a re-urbanisation trend in four of the five years investigated since 2000. Only between 2002 and 2003 was the increase in population in Inner Leipzig higher than that in Outer Leipzig. However, one has to note that the total population changes within the whole period after 2000 are not substantial. The changes range from 1.0% at the most (2000-2001 for Outer Leipzig, it translates into a total change of 691 people) to 0.1% at the lowest (2004-2005 for Inner Leipzig which translates into a plus of 556 people). According to the results of the analysis it is possible that the processes in

post-socialist countries follow the life cycle model after the political change. The phase of suburbanisation is currently taking place and was much stronger in the first decade after the change. It is possible that the post-socialist cities are starting to follow the life cycle theory of cities under (more or less) free market conditions. This was proposed by authors in the mid-1990s (Faßmann 1995; Lichtenberger 1995). The development in the 1990s has given substantial reason to suggest such a trend. In Leipzig (Artmann 2000; Nuissl and Rink 2005) as well as in other cities in Eastern Germany, e.g. as documented from Erfurt (Ott 2001) most of the urban development after the political change occurred on the urban fringes. This concerned either residential, economic, retail but also recreational facilities and was conditioned by tax incentives, legal, and economic factors (poor planning, high interest of entrepreneurs and developing companies, 'return before compensation' legislation). Here, Leipzig is not unique within Eastern Germany. However, after the first decade after the political change has passed, Ott (2001) remarks that "It remains uncertain whether the suburbanisation in the years to come actually will reach the extent known in the West, or if it will be possible to slow down the exodus through a rapid modernisation and revaluation of the inner city residential areas" (Ott 2001, p.411). The analysis in this work shows that the suburbanisation at present is rather small but visible. There is no evidence of an American kind of sprawl with an extensive abandonment of the inner city (Nuissl and Rink 2005). The different interest in the outer versus inner urban areas of Leipzig during the last 17 years is also due to other influences than only households' preferences towards the suburban areas. The political circumstances, the planning practise, the fiscal support for home-ownership and the construction of new houses are substantially different than during the 1990s. Additionally the lower level of incomes of the East German households (as compared to those in Western Germany in the 1970s when suburbanisation and disurbanisation was most pronounced there)(Ott 2001) but also the increase of one- and two-person households as well as the growing number of elderly might all contribute to a higher interest in the inner urban areas of the cities in Eastern Germany. However, the analysis in this work does not allow to specify further whether the trend of suburbanisation will continue in the East and therefore follow the urban life cycle model as documented from Western cities, such as Wirral. Longer time periods are necessary to assess whether this will continue in the long-term. What can be said so far, is that suburbanisation has slowed down to a fairly low level but that it is continuing with mostly detached and semi-detached single family houses on the urban fringe of Leipzig. From the current perspective one could doubt the assumption that the extent of suburbanisation will reach the level in capitalist, Western cities in the 1970s.

On the other hand, Leipzig experienced re-urbanisation during the 50 years investigated, not urbanisation. Strictly speaking this means that the model does not specify about a possible development after that stage. In this context the model is not valid for any assumptions about the future urban development in Leipzig. And Leipzig's population trend since 1989 does not account for an appropriate example to further develop the theory. Data gaps and problems with data comparability are too large, the development was very fast and fluctuating so that a trend is hardly visible yet.

Also in Wirral no re-urbanisation trend is visible yet. However here the analysis is only able to investigate decennial trends. The current development since the last census in 2001 is therefore not documented. The second part of the hypothesis to research question 1 has to

be rejected. Neither in Wirral nor in Leipzig is re-urbanisaiton observable in the population data. However Leipzig's suburbanisation is not strong if one compares it to the extent of Wirral's dis-urbanisation, in absolute and relative terms. Additionally Leipzig eyperienced re-urbanisation in the year 2002/2003. Therefore a trend change towards re-urbanisation seems more likely in Leipzig which is in line with the hypothesis.

It should also be mentioned that it is not possible here to compare the potential differences between the phases in post-industrial and non-post-industrial agglomerations. Both the case studies have an industrial past and therefore can only account for the developments described.

With the current trends of dis-urbanisation in the decade until the last census in Wirral and suburbanisation in the last two years in Leipzig the second research question is of great interest. It was aimed to go deeper into the reasoning behind migration decisions.

5.2 Urban sprawl not a particular phenomenon in old industrial regions

Research Question 2 was:

Research Question 2: Causes oriented
What are the main reasons for people in old industrial regions to move to the urban fringes? What is more important in the decision to move:

- the characteristics of the inner cities with their mostly negative evaluation as strong push factors, or
- the characteristics of the outer urban areas, mostly positively evaluated as stronger pull factors?

Hypothesis:
If the latter is less important than the former, this will indicate that the inner city problems/ the urban environments in former industrial cities are more important in the evaluation of residential attractivity of sites than the pull factors of the surrounding. Against the comparison of other investigations a stronger weight of push factors than pull factors is expected. This in turn would suggest that formerly industrialised cities might generate more sprawl than non-industrial cities.

From the beginning of suburbanisation in the 18th century to the current sprawl processes, the individual residential preferences towards the suburban living locations and neighbourhoods seem to be a major cause for migration from the inner urban areas to outer urban or peripheral locations, as the theory suggests. Whereas suburbanisation was not a common urban development before the 18th century, the shortage of space in trading and industrial centres of that time made it necessary to look for alternative patterns of urbanity. Since then, living on urban fringes became increasingly popular and available to a larger share of the population.

However, the importance of consumer demand and residential preferences does not explain why the suburban development occurs in a scattered form, with leapfrog and multicentre developments instead of a more continuous form. The scattered form of development is sprawl at its most distinct (Sukora 2003; Chin 2002) and this might be promoted by other factors, such as the technological and economic progress, with changes in transportation and communication technologies. Political subsidies or income advances, or financial advantages in general, seem to support the de-concentration trends as well (Richards 1993). However, one might argue that financial aspects can not be the true cause of sprawl. They are framework variables enabling an out-migration. Subsidies can be regarded as the associated responses (of the political system) to the spatial, residential preferences of the population. An increase in incomes is often said to be connected to a rising standard of living and a higher demand for space (Chin 2002). This might often be found on the outskirts of cities only, though not necessarily comprehensible at the urban fringes of regions with a decline in population where space is abundant in the inner urban areas.

The explanations give reasons for the general, overall economic and social development. However, it has not been documented so far what specific circumstances lead to sprawl in dwindling regions. The evaluation of urban sprawl and population decline has shown to be a potentially reinforcing system. A number of interrelating forces that describe the simultaneous occurrence of urban sprawl and economic decline have been documented. These include: instituted behaviour and the loyalty to the place, a resistance against long-distance commuting, low property and dwelling prices following low demand, low environmental qualities as well as a lack of green space in the inner cities, a potentially deteriorating inner city building stock, poor housing conditions and other factors which contribute to the perception of disorder and crime. Instituted behaviour might speak against excessive sprawl in declining contexts. In contrast, inner city problems, and old, dark, small or decaying building stock and a lack of green space might argue in favour of it.

Several reasons for moving to another place need to be considered. A move to the suburbs does not necessarily imply an urban flight, but may reflect the lack of appropriate dwellings in the inner city. In general the personal preferences and financial resources are the most frequently mentioned influencing factors on the micro-level. These are especially important for the modelling described later.

The biggest advantage people see in the suburbs today is the availability of space (Ewing 1997), the green surroundings (Weichart 1983) and other environmental qualities e.g. lower noise and air pollution as well as the wish for segregation as it has been noted. Lower housing and living prices (relative to the value one receives) are also an important parameter included in the attractivity evaluation (Miller 2004; Peiser 2001; Squires 2002; Jackson 1985). These aspects are confirmed by the analysis in this work. However due to a low price policy to housing in the socialist countries, relatively spacious flats were cheap and available there in the inner cities. Many people had to move to smaller apartments in the post-socialist era due to price constraints. A side effect of the low-price policy was that a renovation of the housing stock was simply not possible due to constant financial shortages of the government. This resulted in a sometimes very low standard of apartments or an advanced decay, very similar to the situation in former industrial western cities. A wish for higher standards was in turn documented as an important reason for many who soon moved in the post-socialist era. Also this is confirmed by the study.

Apart from the mentioned parameters, with respect to post-industrial cities there are some unresolved issues. In economically declining regions there are not only to find low property prices (e.g. as compared to the national average) but also a higher share of people with a minimum of financial resources, and the environmental qualities that are often mentioned in connection to sprawl, might not differ much between the periphery of old industrial towns and the inner urban parts (e.g. in the case of open cast mining as found around Leipzig). Such issues can substantially alter the housing and locational preferences.

The analysis with regard to these issues yielded the following results. The overview to the socio-economic parameters of the respondents shows that there are significant similarities between the samples in the two case regions. This refers in particular to the household types, the household sizes, and also to the occupation of the highest wage earners although that comparison has to be treated with caution. It can only serve as an indicator for the upper social strata being dominant in the suburban regions as the clusters of professions are not fully comparable in both regions. On the other hand the retired are also a substantial group among the households, although their share is much higher among the Wirral respondents than the Leipzig ones. Both the well-off and the retired people are found to be dominant in terms of numbers. However, one has to keep in mind that it is these groups which might respond more frequently than average. In other studies it was found that the retired respond more frequently because of the availability of time, and the well-educated (which is assumed to have a certain correlation to the well-off population strata) do so because of a more pronounced attitude to have the right to be heard. They might also have a greater trust in their ability to understand questionnaires and answer "correctly". Although in general the outline of the questionnaire should be understandable for everybody.

The share of single households is similar for the responding households in Eastern Leipzig and Western Wirral, although it is substantially higher in the whole of Leipzig than in the whole of Wirral. They are less evenly distributed over the city in Leipzig and mainly accumulate in the inner parts. With respect to households with and without children, in both case studies the childless households (singles and couples) are more numerous than family households. However in a comparison of the size of the household clusters as seen in the questionnaire family households make up for the majority in Eastern Leipzig whereas couple households are the largest cluster in Western Wirral. Urban sprawl is not only driven by classical family households any more. There are substantially fewer families. However, the suburban case study areas show higher shares of families than the rest of the city, and Eastern Leipzig has more than Western Wirral. These findings are in line with the general European trend, and with the British and German household trends in particular (BBR 2000, BBR 2005, ONS UK). This shows overall that there are substantial similarities between the regions.

A difference is that in Leipzig the tenure structure is much more oriented towards the rented-housing sector, with some relation to the socialist past. In socialist times the possession of real estate and privately owned property in general was not a socially acknowledged desire. Differences have also been found with regard to the age structure of the heads of household with more younger people in Leipzig. However, as a similarity, the post-socialist cities experience, at least to some extent, suburban sprawl with similar household charac-

teristics in recent years as in saturated capitalist cities in past decades. Additionally, it has been found that in both regions high unemployment figures prevail, which corresponds to other old industrial regions in Britain and in Germany.

Furthermore, the number of cars and the commuting behaviour are highly similar among the samples in the two regions. As an indication of the general deprivation of the areas, the highest share of households possesses one car. The percentages with two cars were relatively low compared to the national or regional averages. The commuting pattern is especially interesting with respect to the constituted behaviour of residents of old industrial regions. In comparison to the average commuting distance for German employees, the figures in the case study area is relatively low. Similarly for the Wirral case, compared to the national average the commuting distances from Wirral area relatively small. As one aspect among several, this might reflect on the migration figures to the suburban areas.

With these socio-economic aspects and issues of living conditions in mind the reasons for leaving a residential area and in contrast the reasons for choosing another one were evaluated.

5.2.1 Reasons for leaving - Push factors of the inner urban areas

All respondents:
Among all the respondents from both case studies an important reason to leave their former **dwelling or neighbourhood** was that the dwelling was evaluated too small. This push factor might indicate a certain relation to old industrial areas as it was found that the older housing stock is often smaller than newly constructed dwellings. The results also yield that households that come from other suburban regions or from elsewhere move away for the reason of unsatisfactory dwelling space too. This is particularly interesting as it is not mentioned by people who formerly lived in the inner urban parts, where higher densities make such an issue more comprehensible. In the outer urban regions the dwelling sizes might be already higher than the average. This indicates that the suburban moves within Outer Wirral and Outer Leipzig seem to be a behaviour of the better-off population strata who possibly move for reasons of amenity and higher living standards. However, this factor is mentioned by other researchers to appear important in other studies too (Weichart 1983; Hassan, Zang et al. 1996; Senior, Webster et al. 2004). Demand for space implies (to a certain extent) lower density living. In regions of lower demand this could also be achieved in the inner areas. In a study conducted in Cardiff, similarly an old industrial and harbour city in Wales like Liverpool/Wirral in England, couple households or retired households also prefer the suburban locations (Senior, Webster et al. 2004). Compared to these observations, the findings in Wirral are similar.

With respect to the push factors of the dwelling and the neighbourhood in Leipzig, also the noise pollution from traffic and the disruptions from traffic were regarded negatively. However, one could expect that this aspect does not refer to any specific of old industrial regions. Additionally important as push factors of the neighbourhood is the crime rate in Wirral and the social problems with neighbours in Leipzig. There is no proof that these issues are especially prominant in old industrial areas as compared with non-industrial regions, although an appearance of physical disorder or a decaying building stock might impact on the perception of crime levels.

Among the push factors from **the personal circumstances**, the change of the place of work ranks highest in Eastern Leipzig. With the usual practise of almost full employment during GDR times a high personal value of being in employment becomes comprehensible. On the other hand, this result might reveal that there are places of work on offer in the region so that additional work force is needed and settles in the suburban areas. Another interpretation concerns the issue that work, if available, gives people the financial opportunity to move out of the inner urban areas. The change in place of work is the most important reason to move for households coming from other suburban areas of Leipzig or from elsewhere. The change in place of work is a marginal factor to consider moving in Western Wirral. Either, there is no work to change residence for or it is simply not an important reason for the households in Wirral. The latter seems more likely considering Table 5.2 (see following pages). It shows that the number of employees working in Outer Wirral has increased by almost 20% between 1984-1998.

The wish to change tenure is also important in Leipzig, reflecting the low rate of owner occupation in the Eastern regions of Germany. For the respondents from Western Wirral the wish to trade up to a more expensive home and the change of household size are named especially often as push factors from personal circumstances. This issue underlines the findings that the suburban area Western Wirral seems to be a prominant residential destinations for families. This is similar to Eastern Leipzig, where a change of household size was given as reason to leave Inner Leipzig. It is a factor mentioned and more often than in Western Wirral but it ranks lower in Eastern Leipzig than in Western Wirral (this is possible because the Eastern Leipzig respondents were more expressive and more extreme in ticking the issues in the questionnaire). Suburban places being prominant regions for families is very much what would be expected from the tenor in the literature.

For the results mentioned so far, the χ^2-tests could not reveal that the two samples belong to the same statistical population. This counts for the findings to the push factors of the entire household sample. In contrast for the sample of households that come from the inner urban areas in both regions the χ^2-test yielded homogeneity of both questionnaires. They have found to belong to the same statistical population, the results can be evaluated similar.

Respondents formerly living in the inner urban areas:
Among the reasons for leaving especially the **neighbourhoods and the dwelling** of the inner city areas the crime level, too few green spaces and the lack of a garden were important push factors in Wirral. In Leipzig the noise and air pollution as well as traffic intrusion were mentioned most often. Especially the aspects connected to a lack of greenery might reveal a relation to the old industrial areas. The other important push factors are not assumed to be especially pronounced in old industrial regions. Following from that one could conclude that Wirral shows a certain degree of connection between the leaving of inner city areas to the suburban surroundings and the characteristics of an old industrial region.

Crime was mentioned as the most important reason relating to the conditions of the neighbourhood and the dwelling. This is in line with other studies and reported as a special characteristic of English speaking socities (going back to media practise etc.)(Taylor and Jamieson 1998). For the people that moved from the Inner to the suburban region in Eastern Leipzig it was also important but only on rank fourth. Whereas it is assumed

that the expressed fear of crime is due to a particular sensibility of native English societies and their media practise, the study of Kuo and Sullivan (2001) offers another part of the explanation when they show that crime is also related to the amount of greenery. Additionally, links to different kinds of crime have been shown for unemployment of different population clusters [e.g. males, young males e.g. in England and the USA (Carmichael and Ward 2000; Carmichael and Ward 2001; Raphael and Winter-Ebmer 2001); young people without educational degree, without a relationship and with lower rates of marriage among men in the US (Lagrange 2003), increasing earning inequalities (Witt, Clarke et al. 1998)]. However, crime is not only about the incidences reported to the police. It is also about the perceived crime risk, and with disorganisation (Wilcox Rountree and Land 1996). This relation is described by the well-known broken window-effect of Wilson and Kelling (1982). It was tested and proved that a first indication of disorder such as a broken window invites further criminal acts. Against this background the strongly pronounced reason of moving from Inner to Outer Wirral being the crime rate does indicate that disorder might be greater in Inner Wirral. Other reasons such as a lower rate of marriages among men in the inner cities (indicated by the higher number of single households) might also be contributing aspects, as noted by others. There are a significant number of middle-aged singles in Wirral, even in the outer urban areas. Unemployment might also be a contributing factor although one would expect that people should be able to commute from Inner to Outer Wirral. Whereas the aspects mentioned speak in favour of a potentially increased crime level in Inner Wirral it is also possible that this is more a feeling than an actual fact. As noted earlier, other sources found that the crime rate in Merseyside is lower than compared to other cities of similar size in England (Oswalt 2004). Beside the 'wrong' perception (actually the perception cannot be wrong) another aspect could be the proportion of elderly. Investigations in the USA have revealed that the ageing of the population impacts positively on a decrease of property crime (Imrohoroglu et al. 2004) therefore influencing the total crime rates. However, if residents from both Inner and Outer Wirral become older at a similar rate this potential effect will be erased. Also there are many different kind of crimes which probably call for different strategies to decrease it. All contribute to the perception of criminal areas. Crime is the most important reason for the respondents in Outer Wirral to move there from the inner urban areas. This is in line with other findings suggesting that inner city crime encourages suburbanisation. In turn a reduction in crime can trigger gentrification, e.g. as shown for the USA (O'Sullivan 2005). This suggests that Wirral might foster a re-urbanisation trend when crime (perceived or actual) could be decreased in the inner urban areas. Ways to it are probably manifold, a first step could be a greening of the neighbourhoods.

Other authors have shown that the greening of a neighbourhood is significantly and negatively related to crime reported to the police - both property crime and violent crime (Kuo and Sullivan 2001; Snelgrove, Michael et al. 2004). In an investigation of selected neighbourhoods in Chicago/USA it was found that the greener the building's surroundings, the less the crime. In the study the vegetation accounted for 7-8% of the variance in the number of crimes reported per building. Also remarkably different is the occurrence of crime incidences in neighbourhoods with low and high levels of vegetation (according to different grass coverage and tree canopy): buildings with high levels of vegetation had 52% fewer total crimes, 48% fewer property crimes, and 56% fewer violent crimes than buildings with

low levels of vegetation. These findings hold independent of the number of apartments, the building height, the vacancy rate, and the number of occupied units per building. It was noted that certainly the largest reduction in crime will come from strategies that address the factors underlying crime but that in the meantime also a greening of the neighbourhoods could contribute to its reduction.

Indeed a lack of greenery of the urban areas is mentioned as the second most important reason for people from Inner Wirral to move to the Outer areas. A similarly important reason is the lack of garden space - all factors which indicate a need and a wish for more greenery within the inner urban parts of Wirral. This might also be one factor why terraced housing is increasingly unpopular in English cities (Senior, Webster et al. 2004).

With respect to the reported nuisance from noise/air pollution and traffic intrusions in Leipzig, this is in accordance to an enquiry of the Federal Environmental Agency (Umweltbundesamt) in the whole of Germany[1]. It also makes sense given the large infrastructural works around Leipzig after the political change aiming at a perfect provision with traffic infrastructure (Artmann 2000). Leipzig wants to profit from its central location within Germany and provide adequate highways, rail lines, cargo transport opportunities. The lack of green spaces was not mentioned as a very important reason to leave the inner city of Leipzig. Even more, it is noted that the city of Leipzig is well supplied with parks and open green spaces, even better than the surrounding of Leipzig where open-cast mining decreased the aesthetic value of the landscape (Artmann 2000). On the other hand for the respondents from Inner Wirral, traffic noise was not mentioned as frequently as the reason for leaving. It is only the fifth most important reason (concerning the neighbourhood) to leave the inner urban parts in Wirral. Here, Wirral seems to stand out from preferences reported in other old industrial cities in England, e.g. from Cardiff. There, as in Leipzig, noise was the most frequently mentioned nuisance (Senior, Webster et al. 2004). Noise pollution in Wirral stands back in comparison to crime factors and the lack of (public and private) greenery as push factors from the neighbourhood and the dwelling.

With respect to the **personal circumstances** further differences exist in Wirral and Leipzig. Personal reasons to leave the inner cities reflect much more the cultural and political backgrounds. As a similarity between the case studies, a certain share of the population wants to trade up to a more expensive or better home. This is also documented from other surveys in Western and Eastern cities (Hassan, Zang et al. 1996; Gentile 2006). In cities of the former socialist countries in Eastern Europe the wish to increase the standards of living, in particular with an increase in the standard of housing (often without sanitary facilities in the home, sometimes without electricity) was documented by several authors (Lichtenberger 1995; Lichtenberger 1995; Gentile 2006). Leipzig underlines these findings. It seems to have passed the phase of comprehensive suburbanisation as seen in the first decade after the political transformation when households from all socio-economic classes were included. It is now a more selective process. In Wirral, one has to assume that the aspect 'standard of housing' is differently understood and displays a wish for the increase in standards on a higher level. However all these respondents aspire to a better equipped dwelling with better relative to where they live at current. The trading up to a better home is important

[1] `http://www.umweltbundesamt.de`

in both regions and represents one classic reason for middle class suburbanisation. Despite this similarity, other factors vary between the case studies. In Leipzig, a certain share of households wants to change tenure, probably to owner occupation as this was not as easy in the GDR. However this has also been noted in other studies in Western cities, e.g. an Australian survey (Hassan, Zang et al. 1996). Also the change of household size is an important reason to move for the Leipzig respondents. In Western Wirral another important reason was the wish to set up the first home. This is quite remarkable, and has not found documented in other studies. Western Wirral seems to be an attractive place also if one establishes a first home, which suggests that migration to Western Wirral might not follow the stages of the residential life cycle. With an increasing number of single households this model seems to become outdated for most of the residents. Therefore, the households in Leipzig move when children arrive whereas the suburbanites in Wirral might already live there when a family is started. This is a new aspect in the literature to the knowledge of the author. The Wirral suburbs are an attractive destination for single households as well.

Another similarity is that the change of the place of work is of minor importance if households move from the inner to the outer urban areas in Wirral and in Leipzig. However the change of the place of work seems a more important reason to move for people from outside of the region or the suburban areas. It is not a cause to move house from the inner to the outer areas. The commuting behaviour is similar in both regions, but compared to other regions commuters drive shorter distances which might have a certain relation to the characteristics of old industrial areas. In an overall comparison the findings reveal that one cannot say that the change from a socialist to a capitalist system immediately results in similar attitudes and residential aspirations - in turn this argues against an immanent human desire for a single family house with garden as often declared in the literature. The author regards this as a very important outcome for policy and planning design.

5.2.2 Reasons for choosing - Pull factors of the suburban areas

All respondents:
The pull factors are assumed to represent the true attractivity dimensions of a certain place of residence. Whereas the reasons for leaving a home have somehow differed in the two regions the reasons for choosing a place of residence do not. Both household samples indicated most frequently the importance of a quiet neighbourhood, a safe, low-crime neighbourhood and the proximity to nature and landscape or the coast. This is the evaluation over the entire household samples coming from either the inner urban regions, the outer regions or elsewhere. Despite the different cultural and political backgrounds, these three dimensions are very important for the suburbanites in both agglomerations. This reveals a high degree of similarity of preferences between the different residential actors in the suburban locations. Also, these findings are very much in accordance with findings in other studies on suburbanisation in Western cities.

However, it has been hypothesised that the crime level was not a true factor to consider this particular area as residential destination, at least for Eastern Leipzig, as the crime rate is not a particular concern in the whole of Leipzig. It might rather have been understood as a general prerequisite to move to a certain neighbourhood as there are probably few people who would not state this as a desired factor and neighbourhood characteristic. Additionally important in Leipzig is the good road network.

Respondents formerly living in the inner urban areas:
This highly similar picture changes slighty if one looks only at the respondents that formerly lived in the inner areas of the cities. The preference for a quiet as well as low-crime neighbourhood remains. In Wirral, an affordable place to live is also important, whereas in Leipzig the proximity to nature and landscape becomes most important.

Households moving from Inner Leipzig to the suburban regions account for approximately the same preference structure as for households that move to Eastern Leipzig from other suburban regions or who enter the place from elsewhere. Only the level of priority changes with the proximity to nature and landscape becoming a higher priority as indicated with the entire household sample. In Western Wirral, the proximity to areas of countryside and the coast loses relevance whereas the provision with affordable housing is now rank 3. Again this underlines that there seem to be problems in the inner urban areas of Wirral that push the people outwards which surmount the classical reason of higher amenity living. However, the proximity to nature and landscape was found important by studies from other authors too (Weichart 1983; Senior, Webster et al. 2004). Here, both household samples comply to the findings in other Western cities. Similar with these other studies, the importance of facility-related aspects are lower, e.g. good schools and child-care facilities (Senior, Webster et al. 2004). One reason for the latter seems the increasing tendency of couples households and also single households to move to the suburban regions (Senior, Webster et al. 2004).

There is an increasing tendency of couple and also single households to move to the suburban regions (Senior, Webster et al. 2004), although these groups still prevail in the inner urban parts of Western cities. The families are one of the most prominent actor classes to move to the suburbs in both Eastern Leipzig and Western Wirral. They have shown to be the strongest class in terms of numbers in Eastern Leipzig and the second strongest in Western Wirral. This finding is somewhat unexpected and differs from other investigations in Western cities, e.g. by Hassan et. al. (1996) in (not especially industrialised) cities in Australia. One reason could be that higher percentages of elderly and single persons move to the suburban areas of post-industrial areas thereby reducing the share of families. In Western Wirral and Eastern Leipzig the number of retired households are above city average. This is not unexpected if one compares this finding with other old industrial cities, e.g. Cardiff (Senior, Webster et al. 2004). Taking the outcomes to the most prevalent household clusters together this might indicate that fewer families but more elderly and single households might move to suburban areas in old industrial cities as compared to non-industrial cities.

Despite the χ^2-tests which revealed that the two household samples from Eastern Leipzig and Western Wirral are comparable, it should be noted that the sample sizes are very small. In the case of Leipzig 25 questionnaires were analysed and 31 in the case of Wirral. According to general statistics, a good analysis should not be undertaken with fewer than 30 data points (Sachs 1992, Schönwiese 2006). As the sample sizes are close to that and the χ^2-tests have underlined the relation between the samples the results are, however, assumed to be sound.

Another point in this respect relates to the representativeness of the samples. In Wirral all households in newly constructed dwellings were approached, in Leipzig a sample of

only 5.6% of the newly registered residents could be included. Both household samples are assumed to be representative as the Leipzig sample has been drawn according to representative age and sex bands. However, small shifts might occur when different people respond. There might be more elderly people represented and more well-educated answerning the questionnaire. However, the results are in line with the theory and supporting the hypothesis.

5.2.3 Comparison between push and pull factors

Changing residence does not only result from a certain set of reasons for leaving the former place but further implies that one considers attractive residential areas for the new home. A division of these complexes of push and pull factors is commonly used in migration research (Weichart 1983). Here the reasons for leaving the inner cities and choosing the outer urban areas are considered only.

Comparing push and pull factors of the formerly inner city residents, it seems that the push factors in both inner cities are lower than the pull factors. If the hypothesis holds true that this relation indicates the relative unattractiveness of inner cities in old industrial settings, one needs to reject the hypothesis and state that in those areas the inner cities seem not to be the major reason for out-migration. According to the reasons for leaving a residential location and those for choosing a different one it cannot be concluded that the characteristics of the inner city neighbourhoods seem to stimulate suburbanisation in the case study regions. In Leipzig and Wirral, the pull factors have a stronger weight for the suburbanites than the push factors, indicated by the share of respondents and relative importance of the attractivity dimensions. Following from the approach, one could further conclude that the preferences for a suburban area are the result of a perceived increase in living quality and residential amenities if the household moves to the urban fringes. The actual disamenities were lower in the inner cities in comparison of what one expects to gain in living quality by the move.

This is however, not a method commonly applied in urban research and was implemented as a new aspect to quantify the relative attractivity of the inner versus the attractivity of the outer cities. Whereas it would be difficult to compare the push and pull factors across cities (e.g., cultural and societal or ethnological influences have to be allowed for) it is regarded to deliver a quantitative indication about the relation between push and pull factors if applied to a single city (only comparing the relative percentages within one city).

However, this comparison has some drawbacks. First, there is a degree of uncertainty connected to the data. The sample sizes of the households that moved from the inner to the outer urban parts are very small. The CI's are often about half the calculated value. The results should only be used as an indication to the issue investigated.

Secondly, another aspect is connected to the layout of the questionnaires. In both, the question to the reason for choosing the current place of living (pull factors) was posed first followed by the query to the reasons of leaving the former dwelling or neighbourhood (push factors). This might also reflect on the answers given, as people might be less motivated to respond to a (seemingly) very similar question again. This might turn out in a lower enthusiasm to answer the second question (push factors). The issues mentioned might be reflected in the strength of the evaluation of push and pull factors.

Thirdly, people might evaluate their living conditions in the current place as stronger than those in the former dwelling and neighbourhood. The initial reasons for moving to the suburban areas might therefore be altered or evaluated differently over time. People remember push and pull factors differently over time (Weichart 1983) - the impression of the strength of push factors might decrease. As people were asked after the household's move which could have been maximal as long as 7 years ago in Wirral and 5 years ago in Leipzig, the push factors of the former place of living (the inner urban areas) might not be as present as the suburban amenities currently experienced. To test whether this influence is strong one would need to investigate households exactly during their search for a new home. This is difficult to accomplish. This method was chosen to face some other difficulties reported from other studies. For instance, studies in which people were asked about a hypothetical move or expressed the willingness to move soon revealed to underestimate financial constraints. Weichart (1983) notes that most studies comply to a method that tries to deduce residential preferences from realised decisions and others that try to reveal attitudes by the help of interviews and questionnaires. The methodology applied in this work combines both. However, both methods have drawbacks. The first method is often said to disregard that moving reveals a surprisingly low standard of rationality, constraints of available financial means, incomplete knowledge and even more so the limited ability of individuals to handle multiattribute, multigoal choice decisions in a rational and optimising way. Choices are not necessarily based on preferences. Additionally, faulty recollections of the respondents might occur as the determinants of prior decisions might not be valid any more at the time of investigation. The latter method is criticised for the evident discrepancy between attitudes and behaviour and the often applied hypothetical choice situations (Weichart 1983). This fact is documented extensively in literature and several suggestions have been made how to consider this fact and handle this particularity (Fuguitt and Zuiches 1975; de Jong 1977; Jones and Zannaras 1978; Fredrickson, Heaton et al. 1980; White 1981; Lindberg, Gärling et al. 1989; Fuguitt and Brown 1990; Garvill, Gärling et al. 1992; Thill 1993; Filion, Bunting et al. 1999). In this work it was tried to decrease the shortcomings of both methods as much as possible, e.g. by asking residents, by asking soon after moving, by not asking about a hypothetical move, by including financial aspects into the attractivity dimensions. However, it is still possible that drawbacks remain.

Weichart (1983) further remarks that there is an astonishingly low congruence between the view of experts and the lay public, and between planners and the clients in terms of residential attractivity factors. One disadvantage comes about with questionnaires which mostly, as in this case, rely on closed questionnaires for reasons of practicability. The selection of offered space preferences as attractivity dimensions to the residential place have not been developed from the residents' perspective but rather from experts and researchers in the region. They might account for many particularities to the regional housing markets but might miss certain space preferences especially important to the residents. However, in the work presented here, there was the possibility to add space preferences not offered by the list given in the questionnaire for Western Wirral (not in Leipzig though). In Leipzig people sometimes added issues if they felt the need for it. In general, additional issues not given by the list were seldom mentioned. The questionnaire is assumed to cover a relatively broad spectrum of potentially important aspects to residents in the regions as they were developed by or from the work of local researchers - though not the lay public. To include

the residents in the development of a questionnaire could be an interesting strand of further research. This would not be an easy task and a full representation of all residents' opinions would nevertheless be difficult. Such investigations might face problems of comparability. Therefore, the method of investigation in this work might also account for some of the similarities found. However, against the problems of other methods the one applied is regarded as delivering reasonable and comparable results, especially for comparison between Wirral and Leipzig, as the χ^2-tests to the sample of households formerly living in the inner urban areas (which is the basis for the comparison in this section) revealed a statistical relationship between Wirral and Leipzig. A comparison of both is therefore supported.

A further note has to be made regarding a generalisation of old industrial versus non-industrial cities. Again, the comparison here does not allow for it. To do so, the analysis should be extended to a comparison of non-industrial with industrial cities, an undertaking which cannot be accomplished within this framwork mainly due to time constraints, but a possibility for further research which is thought to be very interesting and important.

Another point of caution relates to the interpretation of percentages as outlined above. A comparison between a percentage distribution of different samples can result in the impression that similar total changes are connected to it, which is not necessarily the case. Here however, not only the total sample is of similar size (N=194 in Leipzig, N=203 in Wirral) but also the sub-samples comprising movers from the inner to the outer areas are (N=25 in Leipzig, N=31 in Wirral). This leads to similar percentages being also comparable in total numbers.

The findings about space preferences are much in line with other studies in Western cities - post-industrial cities do not differ from other Western cities in terms of residential preferences. The attractivity of the suburban areas seems to be the most important factor for people to move there. In comparison, the push factors of the inner cities are not so influential even in old industrial regions. Eastern Leipzig reveals a much stronger expression of important factors than Western Wirral but shows a smaller difference between push and pull factors. This would indicate that the residential neighbourhoods between Inner and Outer Leipzig are more similar in terms of attractivity. In contrast, the neighbourhoods between Western Wirral and the inner urban parts seem to be more clearly separate in terms of residential attractivity. What consequences are carried with it will be addressed in the next section.

5.3 Sustainable city development and consequences of urban sprawl

Research question 3 was:

Research Question 3: Consequences oriented
Can an increase in living space, the number of cars and the commuting distance be clearly attributed to the migration from an inner to an outer city location when both different households are compared at the same time (inner versus outer urban residents) and the same households are evaluated at different times (moving households from the inner to the outer urban areas)?

Hypothesis:
Against the background of the current literature it is assumed that the households which are living in outer urban areas have a higher amount of living space, number of cars and commuting distance in average. Also the preference to use the car is assumed to be larger. If one compares the situation in the same households before and after a move from the inner urban parts to the fringes, it is assumed that this will lead to an increase in living space, the preference to use tha car and the amount of cars per household. However, taking into consideration that the financial resources of residents in former industrial areas are small, a concentration of employment as a legacy from the GDR period remains, and the people especially in old industrial areas by cause of a constituted behaviour do not like to commute it is not assumed that the commuting distance changes much.

Sprawl has often been blamed for a multitude of recent urban problems. It seems to be negative in many respects but also positive in others. It is often forgotten that sprawl is actually desired by the people who move. What makes it more problematic is the fact that the cause and the effect differ mostly between people, region, time and space.

In order to face the problems associated with sprawl, one has to notice first that a clear distinction is necessary between the sub-processes of sprawl and the consequences of it. Both are often intermixed in the literature. However what seems even more challenging is the clear attribution of certain aspects to sprawl, saying that a sprawl associated effect would clearly be less of a problem if the development took place in the inner city and all other parameters remained the same. In general, it is difficult to draw conclusions about the relation of certain variables if other possibly influential aspects change as well. It certainly refers to a lack of paradigm of what has to be regarded as a typically urban or typically suburban problem - a reference case is needed. This points to the need for clearer definitions, more quantitative measures of sprawl, a broader view both in time and space, and a greater comparison with alternative urban forms.

In the introduction, the problems of a common definition of sprawl in the European and international literature were considered. A lack in common understanding of the matter of investigation makes an attribution to sprawl rather difficult. As mentioned above, Galster et al. (2000; Galster 2001) developed a methodological approach towards its operationalisation. They define sprawl as a "pattern of land use in an urbanised area that exhibits low levels of some combination of eight distinct dimension: density, continuity, concentration,

clustering, centrality, nuclearity, mixed uses, and proximity" (Galster 2001, p.685). These eight dimensions are conditions of urban land use. It underlines that the physical characteristics of a place have to be included in an assessment of the consequences of urban sprawl. It furthermore refers to the debate about consequences and process elements. Parameters which are generally understood as consequences of urban sprawl can be process elements as well.

Among the many consequences generally attributed to urban sprawl, the most evident seem to be an increased dependency on cars and the increase in land consumption. The land consumption should be reduced, according to the national strategies of Britain and Germany. The German government sets a target of about 30ha/day by the year 2015 (currently there is a rate of about 93ha land use change per day in Germany[2]). Against the many difficulties encountered in an operationalisation of sprawl it is highly interesting whether (at least) an increase in living space and an increase in the number and use of cars can be clearly attributed to it. In the literature, statements about consequences of sprawl are mainly derived from a comparison of different people living in different places at the same time. This is assumed to be a drawback in order to proceed within the discussion of attribution problems of sprawl. Here, an analysis of the same people living in different urban areas, namely the inner and outer urban areas, has been included to enable findings regarding the consequences of sprawl to the same people.

It was also noted that the consequences of sprawl seem to be especially pronounced when there are market and regulatory failures. In fact, Peiser (2001) attributes all outcomes of sprawl to these failures and hypothesises that there are means, especially regulatory ones, that can substantially restrain the extent of sprawl. These issues can only be tested by a qualitative comparison between the sprawl processes in the Western example Wirral and the development in Leipzig during the GDR as described above. During the GDR, Leipzig experienced substantially less sprawl than today, a finding which can be attributed to the stronger regulation schemes and planning mechanisms during that time. However, one also has to remark that in a socialist mode of regulation land is state owned. This means that it is much easier for planning institutions to apply their power efficiently.

Different parameters of mobility and land use change were investigated with respect to the residential location. Car ownership, the distance to work, the preferred means of transport and the change of dwelling sizes are used as examples. The parameters were investigated first in the inner versus outer urban regions of Wirral for different households at the same time. Secondly, in Leipzig a comparison was undertaken with the same households before and after the move to compare the effects of moving to the suburbs with the same people. This is regarded as being more appropriate than the first analysis for statements about sprawl-related effects. The first cannot distinguish between reasons of, e.g. life style, but this method is frequently referred to in the literature. The here applied method allows for the mentioned issue as it is not assumed that the life style of people change fast and probably not within the time frame of moving. Instead the applied method offers the possibility to better investigate the contribution of sprawl when the life style is assumed to be equal before and after the move.

[2] `http://www.tu-bs.de:8080/ schroete/Bodenverbrauch/Aktueller_Stand.htm`, 25.10.2006

Indeed, **car ownership** in Inner Wirral was lower than in Outer Wirral. This is in line with notes from other authors (e.g. Thomas and Cousins 1996). This might also indicate that car ownership relates to the density of a settlement which was also noted by others (Newman and Kenworthy 1989; Newman 1992; Barrett 1996). Especially the number of households with no car was higher in the inner parts whereas the number of households with two or more cars was substantially higher in the outer areas. This supports the literature and the hypothesis.

In Leipzig, car ownership increased slightly within the households that formerly lived in the suburban areas of Leipzig and in the inner urban parts but decreased with those formerly living elsewhere. Also here, the findings by others suggesting that car ownership relates to the density of a settlement could be underlined (Newman and Kenworthy 1989; Newman 1992; Barrett 1996). However a high number of car ownership is not a clear feature of suburban areas. For the case study of Leipzig it seems that suburbanisation cannot be clearly associated with an increase in car ownership as a move within the suburban realms has the same outcome. The hypothesis has to be rejected and an increase in cars not clearly attributed to a move from higher to low density areas, from the inner urban to the outer urban locations.

However, the results can only serve as a weak indication, especially as the sample and the changes are very small and the χ^2-test could not reveal a relation between the car ownership and the former place of dwelling. Other aspects lead to an increase in car ownership as well, as a move within the suburban areas contributes to an increase in cars too. Further inquiries are needed to account for the issues that lead to an increase in car ownership among the suburbanites when they move within the suburban areas. This was not further investigated and cannot be derived from the analysis here. One could assume that life-style aspects, the financial background but also a larger household size be might contributing factors. These could be an increase in family members with cars, the purchase of cars for children, etc.

A move from the surrounding areas of the city or from elsewhere in the country and beyond into the suburban zone of Leipzig seems to bring about a decrease in car ownership per household. This speaks for a good provision with public transport and/or the possibilities to use other means of travel, e.g. the bike. It might also be related to urban density but the analysis does not allow to say from which regions the people came if they did not live in Leipzig before.

For issues such as a sustainable city development, the amount of traffic is an important indicator. Not only the number of cars but also the extent of the use of these deserves some attention. For an evaluation of air pollution and CO_2 emissions, the distance to work and the preferred means of transport are of interest. Such issues enable an additional insight in the transport behaviour. With respect to the settlement structures it is an indicator of the dispersion of the urban space.

The second parameter investigated is the **commuting distance**. Also here the analysis in Wirral complies with the tenor in the literature. Households in Inner Wirral drive substantially shorter distances to work than their counterparts in Outer Wirral. Also here the hypothesis is confirmed - households from different parts in the urban region show different commuting behaviour in terms of distances travelled if one compares different households at the same time.

For the case of Leipzig, a move from the inner to the outer parts of town also impacts strongly on the commuting behaviour. The heads of household moving to the suburbs had to cope with an almost 4-fold increase in commuting distance on average, although most of this increase is induced by two outliers. On the other hand, the heads of those households that moved from outside Leipzig into the suburban area of Leipzig experienced a halving of commuting distance. The distances to work of those heads of household that already lived in suburban Leipzig before changed marginally.

This shows that a move further away from the urban centre in Leipzig impacts on the commuting behaviour quite remarkably. Sprawl increases the distance travelled to work in Leipzig. This is against the hypothesis, which assumed that the financial constraints and a strong centralisation of employment resulting as a legacy from the GDR period might have limited a strong increase in commuting distance. Again the note that the sample of people formerly living in Inner Leipzig is small. The conclusions are therefore not very robust.

The **means of transport** to work is also different between the inner urban households and the suburban households in Wirral. More in the inner urban parts use bus or tram, walk, or cycle to work. More heads of household from Outer Wirral take the car. This result complies with the theory and the hypothesis in this work.

The results stand in contrast to the preference of the means of transport in Outer Leipzig. However, attention needs to be paid to the size of the samples which in all categories are very small. Keeping this in mind, the figures reveal a slight decrease in the preference to use cars and a quite remarkably increase in the preferences to take the bus or the bike. This seems to be compensated for by a drop in the preference for trams/trains if one moves from Inner to Outer Leipzig. That the preference for the use of trams/trains decreased is in line with other studies, e.g. in Britain (Thomas and Cousins 1996), but that cycling increased seems more astonishing. A tram network and train lines may be more easily accessible in the inner parts of town. Instead buses normally serve the outlying suburban and rural locations which all seems reasonable. However, an increase in the preference to use the bike was not suggested by other authors (e.g. Hillman 1996), it seems to be a particularity of the Leipzig respondents. This can mean several things. An increase in biking seems comprehensible when the suburban realms have a better scenic and more healthy appearance, which might not be absolutely true for Leipzig. Authors have noted that the environmental qualities of Leipzig are often better in the inner areas of the city with many gardens and parks. Due to open cast mining around Leipzig in the past sometimes the suburban but especially the more peripheral regions around the city are not of high environmental or scenic value (though artificial lakes are increasingly being created as many pits were flooded recently). Furthermore one aspect might be that people who move to the suburban areas are more wealthy, they might also care more about their health. Additionally, the outer urban areas might be more suitable to use the bike as there might be less traffic on smaller roads. The middle European cities, especially those of medium size, are often well provided with bike lanes or bike paths. It is also possible that the facilities (retailing, working, recreation facilities) increasingly decentralise to the urban fringes and that a decrease in the distances encourages the use of the bike there. This however, is not supported by the development of employment places from 2001 to 2003 in the urban districts of Leipzig. It has been shown that the highest increase in number of businesses was

in the more central parts of Leipzig. Additionally there is one spot of high increase in the eastern parts in the districts of Paunsdorf and Engelsdorf. Another positively developing part in terms of business allocation is the North and Northwest of Leipzig. These areas are close to the motorway and underwent a transformation since the end of the 1990s (airport, cargo centre etc.). In contrast, large parts of the Southwest and the Southeast of Leipzig are experiencing a decrease in the number of firms. Although the number of firms does not directly account for the available employment Figure 4.35 does not support a strong decentralisation trend in Leipzig since 2001, but rather centralisation.

Distribution of jobs in the eastern and western part of Germany	**Share [%]**		
Old Länder	**1983**	**1997**	**2003**
Inner cities	42.7	39.5	39.2
Outer cities	15.4	15.8	16.2
Peripheral areas around cities	19.6	21.0	21.2
...	...	...	...
	100	100	100
New Länder	**1993**	**1997**	**2003**
Inner cities	38.4	35.5	37.4
Outer cities	4.8	4.4	4.7
Peripheral areas around cities	12.3	12.4	11.3
...	...	...	...
	100	100	100

Table 5.1: Distribution of jobs according to social insurance contribution in Germany. Source: BBR (2005, p.43).

This is much in contrast to the observed decentralisation of businesses in Western Germany (BBR 2005) (see Table 5.1). It is documented that in 1983 the inner cities in Western Germany accounted for a number of jobs of 42.7% whereas in 1997 only 39.5% and in 2003 only 39.2% of the jobs subject to social insurance contribution were located in the inner urban areas. Accordingly, in the outer urban areas the distribution developed from 15.4% in 1983 to 15.8% in 1997 and 16.2% in 2003 (in the periphery between agglomerations: 19.6% in 1983, 21.0% in 1997 and 21.2% in 2003). Decentralisation of jobs is continuing in western Germany. In the East the figures developed from 38.4% in 1993 to 35.5% in 1997 and back to 37.4% in the inner urban areas. For the suburban regions correspondingly: 4.8 %in 1993, 4.4% in 1997 and 4.7% in 2003 (all figures BBR 2000; p.43). This shows that a concentration of employment prevails in the eastern part of Germany, although a small increase in jobs in the suburban realms was also documented. Against this background the decrease of commuting distance of people coming from outside of the city of Leipzig seems reasonable. Still further research is necessary, especially and also with other aspects that are attributed to sprawl. Whereas this work gives further indications about the consequences of sprawl, the debate about attribution (especially with respect to other variables not included here,

e.g. social consequences) remains valid. Further investigations are necessary to account for the consequences of sprawl in Europe.

One might ask whether the findings to job distribution in Leipzig might be a particularity of the post-socialist context or a feature of post-industrial areas in general (as most cities in eastern Germany can be classified as post-industrial)? As far as the analysis in this work can contribute, this does not seem to be a particularity of post-industrial areas. The job distribution in Wirral (Table 5.2) does not show the same pattern as in Leipzig as jobs decentralised substantially by 7.4% in Inner Wirral during the time 1984-1998 but increased in Outer Wirral by 19.9% during the same period (Couch and Karecha 2003).

	Employees 1984	**Employees 1998**	**Percentage change 1984-1998**
Inner Wirral	49147	45520	–7.4 %
Outer Wirral	38961	46729	+19.9 %
Total	88108	92249	+4.7 %

Table 5.2: Job distribution in Wirral. Source: Couch and Karecha (2003, p.9).

A strong difference between Leipzig and Wirral is therefore the ability to attract businesses to the urban centre. Although, efforts are made in Liverpool and Birkenhead to attract businesses (and residents) to the inner urban parts (Couch and Dennemann 2000) the applied might have not been particularly successful.

One reason could be that the inner urban areas of Wirral and Liverpool do not provide the characteristics preferred by residents and businesses. It has been noted that urban regeneration in Liverpool is substantially focused on the economic regeneration and especially on property redevelopment, but that there is a lack of investment in natural issues such as habitats for vegetation, wildlife, and the water balance (Couch and Dennemann 2000). Very little attention was paid to the greening of the particular area under redevelopment which served as a case study in the documented work. It was concluded that the concern with economic urban regeneration is understandable against the background of Liverpool being eligible for EU Objective One status. The city and its administration is much more concerned with poverty, unemployment and other aspects of social exclusion than with environmental sustainability. Although it sounds reasonable at first it might indeed miss the point as environmental attractiveness is important for residents but might also be a locational preference of firms. As documented from Leipzig, the environmental quality and appearance of green spaces is evaluated better in the inner parts of Leipzig than sometimes in the suburban places and especially in the periphery (Nuissl and Rink 2005).

In summary, it cannot be concluded from the findings here that urban sprawl increases the preference towards the use of cars - at least not for the Leipzig case. In turn, the results show that the availability of a certain transport network seems to determine its use. Whereas the preference for the use of cars did not change substantially the preference for the use of public transport and for cycling did. This is an important outcome when it comes to issues of public transport planning.

In terms of comparison between Leipzig and Wirral one has to note that the Wirral analysis is based on official data about the means of transport to work and the Leipzig questionnaire asked the respondents about the preferred means of transport (in general). It is assumed that at least people in work would commute with the means they prefer and therefore the two analsyses are comparing roughly the same indicator. Slight differences might occur with the preferred means of transport of the elderly or the unemployed, which is not included in the assessment of the means of commuting in Wirral. This might result in a slight shift towards the more frequent use of buses or trams in the case of Leipzig. The results are assumed to deliver sound results if one assesses the findings within one case study only but also the comparison between Leipzig and Wirral has yielded valuable information.

The preferred means of transport and the commuting distance might not be related to single variables only but to a full set of preferences, financial backgrounds, opportunities, the public transport net, etc., but it changed by migration as indicated from the sample households in Eastern Leipzig.

Concerning the **living space**, the findings reveal that in Inner Wirral the share of dwellings with one to four rooms is higher than the share in Outer Wirral – the share of dwellings with five and more rooms is higher in Outer Wirral than in Inner Wirral. Such findings have been expected if one follows the literature on consequences of sprawl. They are also supporting the formulated hypothesis.

In Leipzig, on average there was a rise in living space per household and also a rise in the living space per capita following the move. The most remarkable increase per household is with the owner occupants. However, owner occupants have relatively more persons per household and living space per capita does not differ substantially between tenant and owners.

The increase in living space per household is highest with the people coming from other suburban regions but only slightly higher as with households that lived in Inner Leipzig before. Additionally, the households from Inner Leipzig show the largest absolute living space per person and per household in their current home. People moving from the inner city parts to the suburban surroundings between 2000-2004 represent the more wealthy middle class. They already inhabited larger dwellings in the inner city and do so in the suburban case study area now. There has been a small increase of living space per households only if the respondents came from outside Leipzig. These households lived in relatively spacious dwellings before. Therefore it can be summarised that suburbanisation cannot be clearly linked to an increase in living space per capita and household. Although, the absolute and current living space per head and household is especially high with people moving from the Inner to the Outer parts, other influences are contributing as well since an increase is also found for the households coming from other suburban locations or from different regions outside Leipzig. An increase in living size cannot clearly be identified as a cause of urban sprawl in Leipzig. The hypothesis has to be rejected. Sprawl led to higher living space but other factors led to an even greater increase of the size of dwellings. This is most pronounced among the households moving within the suburban areas indicating that financial aspects and life styles are also contributing factors. In general, the living space in the case study region seems to converge among the households coming from either Inner Leipzig, Outer Leipzig or elsewhere.

Especially under the additional assumption of recently increasing detached and semi-detached houses in contrast to apartment houses as well as an increase in owner occupation (which also shows a positive relation to the living space per household) these trends indicate that the new suburbanites of Leipzig might contribute to an elevated land use consumption.

Whether these findings can be directly translated into an increase in land consumption not only depends on the living space per person and household but also on other variables such as the number of storeys, the size of the plot occupied, and whether the housing construction implied greenfield development. The latter is approached by the question to the **building date** of the houses. Although the construction of new houses does not necessarily imply the use of greenfield sites it is an indication about the dynamics of the housing market and the house building development. One can assume that a rise in housing construction will be accompanied by a certain share of greenfield use, indicating that an elevated amount of housing construction will increase the share of greenfield plots. This is based on the assumption that the distribution of greenfield versus brownfield development will probably not change fast within a few years but is dependent on longer-term political or cultural aspects. These findings point towards rising land consumption and an increasing importance of issues such as sustainable development in the region.

In Wirral, the questionnaire survey was sent to all households that moved into **newly constructed dwellings** in the selected wards between 1997-2002. Therefore the households approached contributed to a further development by demanding new houses. Whether that has occurred on greenfield or brownfield sites cannot be said precisely. According to data from the Wirral Borough Council/ Planning Department 78.0% of all units of new housing developments in Wirral occured on brownfield sites around the years of investigation (UK financial years 1999/2000-2002/2003). This translates into 62.9% of all developed area being brownfields before (1998/1999-2000/2001). Therefore the households investigated contributed to land use change by their move to Western Wirral. On can expect in general that 37.1% of the area was greenfield before. It was further revealed that most construction of new dwellings took place in the outer urban areas between 1997 and 2002. However, this relation is only due to a significant rise in newly constructed dwellings in the outer urban areas since 2000. Before that date more new dwellings were built in the inner urban areas of Wirral.

With respect to Leipzig, the issue of land use consumption is more ambiguous. During the period 2000-2004, the highest proportion of the suburbanites moved into apartment buildings. They were mostly built during the 1990s and did not involve a new development of greenfield sites. However, since about 2000, the construction of semi-detached and detached houses has risen sharply. A second wave of suburbanisation seems to start, with newly constructed family houses dominanting, the style known from older capitalist systems. As the small communities in the east of Leipzig consist of small villages in almost rural settings (until 1990 at least) one can assume that this new development involves the development of greenfield sites. In the light of an intended reduction of land use consumption, the developments seem worrying. Such an outcome underlines the suggestion to use a modelling approach as planning tool to reveal leverage points in successfully influence urban development.

5.4 Lessons from modelling: Implications for politics and plan-making towards a sustainable city development

The research question 4 was:

Research Question 4: Planning / Governance oriented
What benefits can a modelling approach bring to the urban planning decisions with respect to the halt of urban sprawl in formerly industrialised regions, e.g. with reference to land use consumption?

Hypothesis:
It has been shown that the preferences for urban living might be blurred by subsidies and other planning decisions but also that urban sprawl is a social process and that the proponents of suburban living might be influenced by the behaviour of other people in the society or the neighbourhood. People who look for suburban living often do so for the reason of segregation, environmental qualities, and living space. Against this background a migration model that takes into account the preferences of the movers and the qualitative attractivity of the suburban areas in dependence of the presence of other movers should be able to supply important insights into the dynamics of residential migration. It is assumed that such a model can offer benefits for planning practise.

The experience with urban regeneration over the past two decades approximately shows that re-urbanisation seems possible in some cities. There is also the strong belief that it can be induced by various measures available to the planning bodies. On the other hand, controversial views about many of the suggested efforts could also be cited, e.g. inner city revitalisation and employment attraction seems to increase the number of people moving out. This is of great interest to old industrial regions, as people try to flee the low-quality inner neighbourhoods as soon as financial resources allow them to. Therefore it seems to be of importance to ameliorate the conditions of inner city living, not only attract people back but also to hold the people currently living in the centres. The satisfaction of people with their neighbourhood could be an indicator for the living conditions and should not be disregarded.

In both planning systems investigated different means are at hand to influence the urban developments. The difference between the British and the German planning systems are pronounced.

The British approach is very distinctive and developed in isolation from the continent. There are only two levels of government and a sharp division between them, but with a high degree of centralised monitoring and control. The power of the local governments are defined by the central governments and are highly constrained. The British legal system of evolving case law finds its parallel in a planning system in which each application for planning permission is considered on its merits. The British approach to planning characterises a conflictual style of administration in which the two sides of a case, the authority and the applicant, are competing to win.

In Germany, the responsibilities of planning are split between more levels of government of which the highest responsibility is given to the lower levels. But the lower level plans have to comply with the upper level frameworks. There is an autonomy of the communes which relies on their ability to guide the development in their region. This results in considerable variations in the planning practise across the country, but all regulations have to comply with the national framework. The higher levels only step in when the lower levels have failed to perform their tasks.

Similar to the codification practise in German law there are rigorously formulated planning regulations. However, there is a partnership between the applicant for planning permission and the authority, the latter strengthened by its greater autonomy over the plan formulation and in comparison to the central government.

In both countries there is a noticeable trend towards an emphasis on the local and regional levels of authority and a greater responsibility on citizens' participation, community involvement and citizens' empowerment. It was initiated by a place-marketing approach of revitalisation and urban regeneration, an attitude which is still favoured in old industrial regions. But no successful methods are at hand that induce a re-urbanisation strategy. It is assumed that the methods available to the planners are not sufficient for the changed, demanding situations. Therefore a new means or planning approach has been introduced, a support tool for urban planning decisions: a qualitative attractivity migration model. It was assumed to be useful to assess the possibilities of modelling in the scope of urban planning.

Clustering of actor classes

The Qualitative Attractivity Migration Model is used to gain information about the households' dynamics dependent on the households' attravtivity evaluation of the selected case study regions Eastern Leipzig and Western Wirral. A first step involves the determination of residential actor classes, clusters of preference- and attribute-homogeneous households. For that a cluster algorithm was applied to the questionnaire findings – in both cases a selection of five clusters yielded sufficient results, with little improvement if the cluster number was set higher. A few clusters consist of a relatively small samples. The output of the cluster algorithm reveals the significance of groups of people with similar preferences towards the residential locational characteristics and with similar attributes. With it, actor classes acquire their justification, at least in this case as compared to an individual treatment of the respondents as single actors.

To gain a comparably consistent and firm result, the similarity index SI had to be lowered to 0.80 in the case of Eastern Leipzig whereas it accounts for 0.87 in the algorithm for Western Wirral. This small difference assured the achievement of relatively equal actor class numbers, but with sufficient samples for the single clusters. With a higher SI in Eastern Leipzig the clusters were extremely small and numerous and with a lower SI for Western Wirral there were a few very large clusters. The difference in SI reveals that the actor classes found in Eastern Leipzig are more (preference and attribute) similar across the clusters than those found for Western Wirral where the cluster separate more clearly. In the Wirral case the clusters distinguish more in terms of age, income and household type. This is a confirmation of the more homogeneous social range among households and people in post-socialist countries. The socio-economic strata are not as dominant and prevalent there

(yet) as, e.g. compared to older capitalist countries. These results underline the findings of other studies (Faßmann 1995; Lichtenberger 1995a). In the case studies the household clusters in the suburban areas show substantial similarities as Table 5.3 summarises.

Cluster	Actor class I	Actor class II	Actor class III	Actor class IV	Actor class V
Actor class description in Eastern Leipzig	Retired and older childless households n=56	Middle-aged families n=56	Middle-aged couples n=10	Young families n=19	Young one-person households n=23
Actor class description in Western Wirral	Retired people households n=58	Middle-aged families n=36	Middle-aged singles n=17	Lower to lower-middle class n=32	Young couples n=17

Table 5.3: Comparison of residential actor classes in both case studies. Source: Author's draft.

The retired and older childless households are a significant feature of both regions, with high samples. Furthermore the middle-aged families are prevalent in both suburban areas though the cluster is somewhat bigger in the Eastern Leipzig region. In Western Wirral, the retired occupy the strongest share, in Eastern Leipzig, the middle aged-families are more numerous. This agrees with other studies about residential preferences and suburban migration in Western cities (Senior, Webster et al. 2004). This is also consistent with the findings to the family structures in both regions as described in the chapter on the socio-economic situations in the case study regions. Additionally, there are smaller clusters described as young families, young-one person households and middle-aged couples. This was called an 'atypical balanced demographic structure' of suburbanites (after Herfert 1996 in Nuissl and Rink 2005). In Wirral, the found cluster 'lower to lower-middle class' is similar to the Leipzig's young families in terms of space preferences. But it is substantially bigger and an actor class with similar size, e.g. as compared to the middle-aged families' cluster. Therefore it is significant in the Wirral region.

All other actor classes are relatively small which means that conclusions have to be drawn with caution. Bearing this in mind one can see that in Leipzig with respect to age the middle-aged couples seem to cluster whereas in Wirral it is more the middle-aged singles. Conversely, in Wirral the young couples characterise similar attributes and preferences whereas in Eastern Leipzig this applies for the younger one-person households. The age structure shows an opposite relation between these groups (middle-aged couples versus young couples, and young singles versus middle-aged singles). The traditional middle-aged families are not the only prominent actor class moving to the suburbs any more - another hint that the model of residential locations according to the life cycle of residents no longer holds valid. With respect to the socio-economic background the lower to lower middle class in Western Wirral and the young families in Eastern Leipzig are both relatively mixed actor groups, at least with comparison to the other clusters. They show an important similarity with respect to affluence of the household, e.g. as indicated by the number of cars. However, differences exist in the age structure of the heads of household and with respect to the share of families in both clusters.

Although several cluster methods have been tested and several runs with each method have been performed and the results were in all runs very similar one needs to realise that in general the cluster result is heavily conditioned by these issues. A different method and a different run (e.g. with a different cluster seed) might bring a different result. Here the one with first the most homogeneous clusters (in terms of preferences and attributes) and second the most evenly spread in terms of size of the single clusters have been selected.

The residential preferences of the households in each cluster

In a second step the gained household clusters have been analysed and specified in terms of residential preferences and the households attributes per cluster. In general it was found that the preference structure of the actor classes in Eastern Leipzig is more diverse - there is a higher difference across the clusters with respect to the assessment of importance towards the one or other attractivity dimension. The clusters seperate more clearly. In Western Wirral the different actor classes show a more similar evaluation in appreciating certain attractivity dimensions across all actors groups.

Furthermore, the preference structures of the clusters in Eastern Leipzig is less consistent than found among the actor classes in Western Wirral. As an approximate measure one could use the number of light grey cells indicating a frequency of importance of 30-59% of the respondents, namely 29 in Eastern Leipzig and 22 in Western Wirral. In contrast, the number of dark grey or white cells (representing the importance for 60% or more in the case of dark grey or less than 30% of the respondents in the case of white cells) sums up to 45 in Eastern Leipzig and 48 in Western Wirral This observation underlines that the actor classes in Western Wirral are more consistent with respect to their preferences for the characteristics of a living location.

Whereas it is very much important for all actor classes in Western Wirral to live in a low-crime and quiet neighbourhood, these are not as strong preferences for the Eastern Leipzig actor classes. A safe and low-crime neighbourhood was also important and frequently mentioned in Eastern Leipzig, additionally the proximity to nature and landscape and a good road network are appreciated. Being near to the place of work was not mentioned as important by more than 30% of the respondents in either actor class of Western Wirral whereas this dimension is still relatively important among the Eastern Leipzig respondents. It was mentioned by more than 60% of the middle-aged couples and the one-person households in Eastern Leipzig.

Such a comparison can serve as an estimation and indication, but there are also other factors that might influence the strength of expression and the number of attractivity dimensions indicated. One factor could be the different political past. However, in the light of the found similarity in mentality that is reported for the people in old industrial areas, and from Wirral/Liverpool and Leipzig in particular, it is assumed that such an estimation can serve as the basis for a comparison.

For the modelling not only the preferences per actor class need to be specified but also the interdependencies between them. In the light of the behavioural approach to action space there exist mutual influences between the actors in space. They are not a result of the questionnaire surveys but had to be formulated as assumptions from literature and secondary knowledge about the case study regions.

Mutual influences between actor classes
In both case studies there are certain attractivity dimensions which can be assumed to be subject to change under the direct influence of an in-migration of particular actor classes. Three main effects can be made responsible for that:

A catchment-effect which mostly applies to the availability of food shopping, other shopping, the provision with public transport such as busses and trams/trains, the provision with good schools. Another effect can be related to the price of the premises which is believed to increase with further demand. It refers to the provision of affordable housing. Additionally a social effect can be extracted that corresponds to attractivity dimensions such as the low-crime neighbourhood, the quietness in a neighbourhood, and the proximity to friends and family.

These effects are believed to behave slightly different in the case study regions as impacts and feedback loops (which these impacts draw) are related to the local, regional or even national, sometimes cultural circumstances. As an example, the preference of a quiet neighbourhood which was mentioned very important in both case studies and among several actor classes seems more to be related to traffic noise in Leipzig as a German example whereas British studies show that English residents are more annoyed by noisy neighbours.

Another difference refers to the impact on the proximity of nature and landscape. In Britain strong governmental emphasis is placed on the re-use of Brownfield sites and hardly any development occurs on the remaining Greenfields adjacent to the urban areas. No change is expected by the change of actor class population in the suburban area of Wirral. In Leipzig the situation is different. The young families are the main households that build new houses on the urban fringes. However, it has been documented that the aspirations to live in a green and natural suburban setting could not be met with an increase of detached or semi-detached family houses in the suburban areas. Too often the houses were built very densily. An in-migration of the young families can therefore be assumed to be connected to a decrease of the surrounding nature and landscape.

Another difference needs to be expected with regard to the functioning of the housing market. In Leipzig it has been found that an upper and a lower housing market exist – two markets that rarely intersect. The upper housing market has eased over the last years whereas the lower housing market develops under market conditions. The prices for the inexpensive apartments have increased slightly over the recent years. These circumstances are assumed to result as a legacy from the post-socialist peculiarities and the low demand following the population decline during the 1990s. In Wirral both the upper and the lower housing market are developing relative to supply-demand patterns. However, also here the decline in population figures experienced over several decades has reduced the general prices for premises as compared to the English/Welsh average. Low housing prices seems to result from the low demand over decades. The low prices are a similarity of both regions.

With this information the qualitative modelling was performed.

5.4.1 Model results

Important to mention beforehand is that the revealed dynamics show the development in the case study regions. They picture the suburban trends not those of the whole city area or the inner urban parts. Strategies to the latter can only be deduced. In both regions the internal dynamics reveal that the urban development seems to follow a circle

movement. There is not a single state which predicts that the dynamics might stop in a specific trend combination (a qualitative state which would not have an abducent arrow to another ellipse). This means that in both regions planning contributes to a ruling set of interactions between the actors, attractions and rejections between actors in the urban space. As long as the current external conditions remain the same, the dynamics can be assumed to proceed as shown. In fact it is more likely that the external influences in Wirral may persist unchanged for a longer time, although political upheavals are not easy to predict. The urban development in Leipzig is still in transition, as noted by many (Lichtenberger 1995b, 1995c; Fassmann 1995a) and might therefore change either internally (means the variables included in the modelling) or externally, such as planning regulations and other possibly influential issues to the residents' attractivity evaluations (which would have an impact on the internal dynamics as well).

The model for **Western Wirral** reveals a development from a prospering region to a less desirable place and back to a more prosperous one. According to the internal dynamics it is not possible that Wirral either stays an attractive region for the residents or a very unattractive one. This is due to a strong repulsion between actor classes. Certain household clusters might repeatedly move away from others like chaser and chased. In Wirral this is the case with the young couple households. It can be assumed that they impact on the noise level and therefore are rejected by every other actor class. If the trend successions do not comply with the intended development, planning could implement strategies that cross the hypothesised dynamics between the Wirral actor classes. Any schemes which reduce the noise pollution would therefore be an effective way to alter the current rejection/attraction patterns. The hope of lower noise levels is the strongest pull factor of the suburban areas mentioned by all actor classes. Anti-noise schemes would also increase the social mixing in a neighbourhood as the current hypothesised dynamics translate into the separation of all households from the young couples. On the other hand it is possible that the currently prevailing dynamics show an urban development which is in line with the political aim, which one would need to check. Then no means should be implemented.

For the Wirral region, the perpetuating development brings times of high suburban attraction to all actor classes (suburbanisation or dis-urbanisation is continuing), followed by a period of low attraction. The phases of high attraction pertain until the living conditions deteriorate, e.g. due to high prices or high population density. Then the population moves out again. As the model includes cost attributes in the evaluation of residential attractivity it is also possible that a phase of lower attraction (decreasing population) is brought about by high property prices. They might be so high that most actor classes cannot afford to move or live in the region. Against this market-led reasoning, the model result seems to reflect a comprehensible situation for the Western Wirral neighbourhoods. If this is not an envisaged trend sequence, two possibilities remain for intervention: first changing the duration of the attractive versus unattractive periods of Western Wirral, or second an alteration of the underlying internal dynamics by external intervention of planning and policy, which might bring a totally different qualitative graph and development sequence. The latter possibility is a political consideration and therefore not discussed in this work, but only shows the applicability of the model in general. Instead, the first alternative will be elaborated. If one argues in favour of low land use change, then the attractive periods should be short. So how can the development be shortened in its high demand phases and prolonged when it stays in the low demand phase?

An attractive period will start when the number of middle-aged families increases while at the same time the young couples decrease in Western Wirral. Planning authorities have to be aware of that point in time as it marks the beginning of an excessive sprawl period. Planning measures then need to offer the possibility that middle-aged families and the young couples simultaneously increase in the suburban region while on the other hand the retired households, the middle-aged singles and the lower to lower-middle class households need to be turned away from the suburban areas. They should be attracted to the inner urban areas instead. This is exactly what urban regeneration measures try to achieve. It seems comprehensible if one considers that urban regeneration often originates with the attraction of a less affluent population strata to the urban centres. The model suggests a relatively short boom period of the suburban areas of Wirral if the less affluent start to move back to the inner cities. The longer the less affluent , the middle-aged singles and the retired stay the longer takes the high demand pahse. The model shows that it is possible that the retired households, the middle-aged singles and the lower to lower-middle class simultaneously move back to the city at that point in time. Therefore intelligent planning schemes should provide a high urban quality to all these three.

Additionally it should be envisaged to stay as long as possible in the period of lower demand for suburban residential locations. To the end of the boom period the young couples might still be attracted to the suburban areas whereas the middle-aged families are not any more, their population starts to decline according to the model. This is because of the assumption that the increasing young couples impact on the noise level. After the point when the middle-aged families decrease and the young couples still increase (there is only one state of that relation in the whole qualitative graph) it is very important to keep other regions than the suburbs, potentially the inner areas, attractive to the retired households. The retired households should not increase in Outer Wirral as the first actor class after the boom period. If this can be achieved, then a phase of relative decline follows and can be assumed to prolong the phase of low demand in the outer areas. Then after this period of relative decline, planning schemes need to address the residential preferences of the middle-aged singles which should increase as first actor class after the retired. Under these assumption that a period of relatively low demand can persist longer. A significant share of single households was documented as a result of the questionnaire survey in Wirral. Other investigations have documented the general increase of single households in the European societies (BBR 2005; Roberts 2000). Against this background the model outcome could be realistic. The qualitative states are seen as leverage points to the system (Meadows 1999). However it could be difficult to steer the household dynamics along the described way. The preferred attractivity dimensions as plotted in Figure 4.48 can help in the planning for a particular actor class, e.g. for providing adequate housing for the middle-aged singles in the suburbs.

An additional model run was performed under the additional assumption of an increasing cluster of retired households in the suburbs, which is in line with official household projections. It has also been found a particuliarity of the old industrial areas. The model yields that it is especially important to make the inner urban areas more attractive to the young people, in Wirral the young couple households. After a boom-period of the suburbs the young couple households should leave these parts of the district (best to the inner urban areas if possible). It is comprehensible that the young couple households leave also without

additional incentives from the planning authorities as a boom period is probably accompanied by rising property prices in the suburban area. This means that a decrease of young couple households seems to initiate a low-demand-phase or bears the possibility for it. In terms of land use change it is best if they could be attracted to the inner urban areas as this would also result in a re-urbanisation of the urban centre. Additionally, when the young couples decrease in suburbia it is important to either assure a low attractivity of the suburbs for all actor classes or to make them most attractive to the lower to lower-middle class. As it is not easy and comprehensible that Outer Wirral will be unattractive for all residents the latter strategy should be followed. An increase of the lower to lower-middle class would lead to a prolongation of the low-demand-phase and a lower land use consumption. The model suggests to leave the suburbs as long as possible unattractive to the middle-aged families. This in turn could be achieved by the implementation of incentives for and a higher population of the lower to lower-middle class in Outer Wirral. One possibility seems the reduction of property prices, may be with price caps, another the provision with affordable housing in the suburbs. Both would enable more households with smaller budgets to move to suburbia and thereby reduce land use change while prolonging the low-demand-phase of Outer Wirral. Social mixing is seems a very important planning strategy to prolong the low-demand-phase of Outer Wirral, and lower land use change in the suburban areas, most effectively when combined with re-urbanisation attempts aimed at the young couples.

In the case of **Eastern Leipzig** the perpetuating development does not identify that the main routes of the development sequence have to be passed continuously. Instead the model suggests that the development has two (possibly) independent parts. However neither of these parts accounts solely for a very prosperous versus a totally unprosperous area in terms of residential attractivity. Both parts comprise qualitative states where some actor classes are increasing and others decline. It follows that in the suburban region of Leipzig there is not a pattern of chaser and chased. The actor classes react to each other, but it is not a single actor class that is rejected by all others. This indicates that segregation is not as pronounced as in the Wirral case. Still, the different parts of the qualitative graph allow an interpretation towards certain aspects, such as the implications for land use consumption.

If one follows that idea the one part of the graph seems more favourable. According to the residential preference structure, the young family households can be perceived to be especially interested in land for building family houses. As Leipzig has numerous plots of derelict land within the city it seems feasible to try to shift these households to the already developed urban parts. Also the middle-aged families should become less attracted to the fringes but more to the inner urban areas. The one part of the graph contains more of these declining states for families than the other. Therefore planning schemes should aspire to follow the sequence with more states of a decreasing population of families. There are two leverage points to the system.

First, when the middle-aged families and the young one-person households both increase in the suburban areas then the middle-aged families should become less attracted to the suburban area shortly after. They need to be the next actor class that decreases. Therefore attractive neighbourhoods should be provided for them in other parts of the region, most suitably (for a low land use change) in the more inner urban areas. Secondly, when this is achieved, it is additionally necessary to retain the attraction for the young one-person households in the suburban area. If both conditions cannot be achieved, the suburban

region might follow the development path with more land use change. In fact, from the current point in time it seems hardly possible to meet both constraints. At the moment suburban Leipzig seems to be undergoing a second wave of attractivity, this time mostly applying to owner occupied family houses. Whereas the suburban areas were attractive to one-person households during the building boom of apartment buildings in the 1990s they are not particular attractive to them nowadays. The ongoing revitalisation of the inner city housing stock channels much of the demand from one-person households back into the inner city. As the trend of the one-person households appears as the decisive population trend to follow the one or the other part of the qualitative graph, a decrease of land use change from single or double family houses seems not to be an easy task according to the current internal dynamics. A re-urbanisation seems however possible. This in turn seems to increase the land use change in the suburbs at the moment.

These results call for the stronger involvement of planning schemes. The model suggests that the decrease of land use change is not possible without an additional planning intervention at the moment. This result is plausible, especially against the light of the current local situation. The desire for owner occupied family houses might be a legacy from the past, its consequences cannot be restricted without external planning interventions in the present. This was even stronger visible after an additional constraint was implemented in the model: constantly increasing retired households. The model yields that in such a case there is the possibility of constantly increasing or decreasing one-person households in the suburban part. Whereas both options are similar with respect to the land use change from young families the decrease of single-person households in the suburbs would result in a slightly lower land use change if one looks at all actor classes. To reach this more favourable option one would need to make the inner cities more attractive for the singles all the time. This would lead to re-urbanisation and possibly slightly lower land use change in the suburban area but can only be regarded as a short term strategy. Families do not lose the interest in the suburbs successively and especially the families with older children could move out to a higher extent as when no re-urbanisation would take place. In a longer term perspective an influence on the internal dynamics, the attraction and repulsion pattern should be envisaged as no sustainable state is projected. Strong planning intervention seems necessary to direct families' interest back to the inner urban parts.

5.4.2 Robustness of the model results and fault analysis

Different assumptions had to be made in order to run the model. Many of them could change in a shorter or longer period of time, which would alter the internal dynamics and could result in a different model output.

One of these assumptions is related to the formulated actor classes. It is hypothesised that the actor classes reflect a representative sample of the population in the region. This could change if people move in who differ from the actor classes formulated for the present situation. If new residents could not be assigned to any current actor class, they are not taken into account in the model (yet). Therefore they have to be treated like external interventions. This might change the whole picture of residential preferences and impacts for the model.

As long as the internal dynamics remain the same, the model output should hold valid. In terms of historical developments one could expect that at least one predecessor state might be valid. This is a situation with increasing middle-aged families and decreasing couple households in the case of Western Wirral and most possibly the state with increasing middle-aged families and increasing one-person households in the case of Eastern Leipzig (the other actor classes can increase or decrease, they might be fluctuating). There is additionally one more predecessor state in the case of Eastern Leipzig with increasing family households but decreasing young families and young one-person households, which does not seem to reflect the historical situation. Tracing back the household figures for a longer period might be complicated as we cannot rely on population figures. The model predicts household development. Second, the trends in the qualitative states only indicate the absolute change - the number of households can be increasing, decreasing or uncertain. It is not possible to derive from the model output whether the slope of one trend is higher or lower than another. It cannot be stated what population increases or decreases more if one compares the different trends of actor classes. Thirdly, even if one looks at a single actor class trend, it is not possible to say from the model output whether the rate of change is decreasing or increasing. A visible trend change in the qualitative states only accounts for the absolute population change. These might seem to be drawbacks to the method. However, it is what a qualitative model can gain from the very imprecise input one makes (see the aggregated attractivity matrices). As it is (still) impossible for modellers to quantify the magnitude of impacts between actor classes, like many other social processes, it is also not possible to feed the model with more precise statements to gain more precise results. Therefore the results of the modelling cannot reveal the strength between attraction and/or repulsion. The model makes it possible to gain significant information as to the development of actor classes although the relations between the actors are not quantifiable.

Additionally, and maybe more central to the question of benefits that this method can offer to planning, is the issue of time. It might be a severe drawback to the method that it is not possible to derive information about the temporal point of change. It is possible that the system remains a relatively long time in one state but a much shorter time in the next. Especially it is not possible to draw conclusions from the model which relate to legislative periods or temporal planning units, such as one or a certain number of years. Yet, it is possible to derive information about time, but possibly not in the way planners are used to. Instead, it is necessary to use the relative development between the populations of the actor classes as a timer. For an advancement of the model, the aspect of time is certainly one which, when improved, would possibly ease the application with planners. However, this would imply in the first instance that the input to the model would need to be more specific.

For the current situation a constant monitoring of urban development is needed to keep track with the relative point in the qualitative graph. Only if one knows where the development stands at the moment the right point of intervention can be revealed. This is very much needed to prevent or foster certain dynamics at specific points in time.

Another aspect where the model is quite open is the spatial scale. Planners are used to thinking in well-defined spatial scales, which is not fully supported by the model. However, geographical theory is moving away from the need for clear spatial and temporal definitions. It has been found that the land use models often developed in the past with a clear

distinction between the urban and the rural areas no longer reflect the current land use development. Therefore functional relations between geographical subjects are increasingly used. They do not rely on administrative areas and might be rather blurred with respect to spatial definition. This might increase the adoption of the method with planners. Functional relations should now be a familiar approach to them.

5.4.3 Application in the case studies and contextualisation in a wider scope

It has been noted that modelling methods and planning practise did not often meet since the 1960s when land use models were started to be developed which should have been potentially useful to planning matters. The model used in this work was able to give suggestions about what to do to reduce land use change, as an example. Within the research outline, the question remains whether such findings are of value for planning matters. First, it remains open what specific methods can be applied to achieve the suggested development paths especially as other investigations come to the conclusion that most households in Western cities do not wish to live in highly built-up areas, without gardens and on brownfield development (Senior, Webster et al. 2004).

One first thought goes to the degree of uncertainty with respect to cultural embeddedness of findings such as those cited from Senior et al. (2004). Studies in the post-socialist realm, in a medium-sized industrial city in Kazakhstan, have revealed that the residential preferences of households in these cities are substantially different from those stated in Western cities (Gentile 2006). That preferences differ between Western and post-socialist cities is underlined by others (Lichtenberger 1995a, 1995b). In a city in Kazakhstan a strong attraction to city centre living is documented across all households, socio-economic backgrounds and ethnicities. The accessibility to key urban functions and facilities was noted more important than the proximity to push factors in the closer surroundings (except if these implying severe impacts on health). Additionally a preference was found for areas with apartment buildings as they are of higher standard than most of the detached housing stock. This is in contrast to the patterns found in this work and also to those in other studies of Western cities, where spacious living and environmentally clean surroundings are found to outweigh the commuting costs of many suburban areas. The mentioned preferences which might be more ascribed to the socialist and therefore political favour of the ruling elite in the countries of Eastern Europe do prevail as residents' space preferences even in the post-socialist period. These factors show that preferences for residential living seem to be affected, at least to some extent, by cultural or societal circumstances. A similar attitude towards city centre living is also reported from Mediterranean cities (Colombino and Locatelli 2001), which shows that residential preferences might not be unalterable. Whether space preferences in Western cities and societies can be changed (easily) remains an open question. What can be deduced however, is that re-urbanisation might be more likely in post-socialist Leipzig than in Wirral as it has been a cultural accepted concept in the second half of the 20th century.

In general there seem to be three possible ways to handle or plan current urban developments: no influence by planning, aiming at a re-urbanisation of the inner urban areas or aiming at a densification of the suburbs.

Regeneration of inner cities and connected re-urbanisation is a main strategy of the British government to foster sustainable development. On the other hand, one could also argue that the suburban established neighbourhoods could/should be densified (see e.g. Sieverts 2004), which is suggested by some but not by other authors. Changing the attributes of the suburbs much, e.g. with higher densities might encourage people to move to further distant locations contributing to counter-urbanisation and even less sustainable development (Senior, Webster et al. 2004). Gentile (2006) proposes that it is much more important instead to increase the satisfaction of people in their current home, as this evaluation seems inversely proportional to the population's propensity to move. Then no change but a consolidation of existing urban structures is to be achieved. Gentile (2004) assumes that the residential satisfaction is at the base of the decision to move, independent of the spatial scale that is considered as satisfied dwellers are less likely to move. The questionnaire survey presented in this work allows a comparison of the different levels of satisfaction for Eastern Leipzig and Western Wirral (Table 5.4 and 5.5).

		Frequency	Percent	Valid Percent
Valid	Unsatisfied	32	16.5	16.9
	Very satisfied	157	80.9	83.1
	Total	189	97.4	100.0
Missing		5	2.6	
Total		194	100.0	

Table 5.4: Satisfaction with the current home of the respondents from Eastern Leipzig. Source: Own draft.

		Frequency	Percent	Valid Percent
Valid	Not satisfied	76	37.4	37.4
	Very satisfied	127	62.6	62.6
	Total	203	100.0	100.0

Table 5.5: Satisfaction among all respondents from Western Wirral. Source: Couch & Karecha's survey.

The tables reveal that potentially more people are dissatisfied with their overall living situation in Western Wirral than in Eastern Leipzig. It implies that there is a higher potential of moving among the people in Western Wirral than in Eastern Leipzig.

Satisfaction with the neighbourhood is assumed to be one indicator for the sustainability of an area. Senior et. al. (2004) uses parameters of sustainability that go back to the famous urbanist Jane Jacobs (1961). They define sustainability in a varying degree of "location, density (house type, parking and garden space), land use mix (as reflected in ability to access facilities on foot), neighbourhood social composition and the vitality of an area as reflected in passers-by and mix of uses" (Senior, Webster et al. 2004, p.342). Since these early times density was a common indicator for sustainability: it received an even

stronger interest since about the 1990s when urban compaction and re-urbanisation were newly advocated in planning policies (e.g. the report of the Urban Task Force "Towards an Urban Renaissance" in 2000 (ODPM), and the urban regeneration policies since the 1990s taking shape in Urban Development Corporations, Kühn 2005; Minton 2005). The compact city is not a new guiding principle of town planning in Europe but has been focused and re-evaluated since concerns about sustainability in European cities became stronger through the 1980s. The guiding principle 'Compact City' is most often applied in German planning departments and is an important part of the guiding principle of the European city (Hesse 2005). However one could ask whether the European compact city is still viable and appropriate in present times.

Breheny (1997) concludes that compaction of existing urban areas seems doubtful for economic reasons (hard to turn around the long-established process of decentralisation), political reasons (it would need substantial amounts of money to develop problematic Brownfield sites) and technical reasons (there is a limit to the use of brownfield sites) and that it is especially difficult to pursue when/as residents seem to aspire the very opposite of compact development. Breheny (1997) also notes that this seems unacceptable to many urban residents. Despite the clear advantages in reducing emissions and land use change and the conversion of natural areas it seems hard to implement from a realistic, dispassionate standpoint, he concludes. The aversion to densification of many residents is underlined by others (Jenks in Williams, Burton et al. 2000; Senior, Webster et al. 2004). However there are also aspects which speak in favour of the compact city, next to the agreed advantages of energy and land use reduction. It has been noted that a decline in population and urban performance leads to a decrease in trust to the open public space, it increases the fear of crime and might allow 'asocial' behaviour through the vacuum of social control (Jefferies and Swanson 2004). Therefore it is hypothesised here that an urban compaction is necessary (to some degree) to induce re-urbanisation.

As mentioned, the most famous concept proving this relation is the Broken-Window-Theory by Wilson and Kelling (1982). It initiated aggressive police strategies in cities such as New York or Chicago in which people could be arrested for misdemeanours (Oswalt 2005). However, it proved to be successful - New York and Chicago as examples have gained in population in the inner city areas since about the late 1990s after more than 50 years of decline (Fishman 2004). However, it is probably not the only circumstance which lead to the re-urbanisation trend.

Another strategy to induce re-urbanisation with some examples in Europe are flagship developments, such as art centres and big architectural 'masterpieces'. Flagship projects, re-urbanisation and inner city refurbishment can also help to overcome 'the inferiority complex' that possess most declining cities (Harden 2004), New York (I love NY-campaign) and Glasgow (Glasgow's miles better-campaign) are prominent examples here (Dürrschmidt 2004; Oswalt 2005). What is a similar feature of both former industrial and post-socialist cities is the lack of identity after the times of industrialisation have passed - both were 'cities as an annex to big industries' (Bittner 2004). A new face, a new identity is connected to change, either conversion or erasure. Often discussed within the context of design and architecture is also the need to demolish instead of only building up (Leeuwen 2004). This is not a course offered to planning and architecture students. But tearing building structures down can offer the possibility for anything new. An IRA-bomb in Manchester city centre

in 1996 destroyed several buildings - it is thought to have initiated the regeneration process (Oswalt 2004)(the author does not evaluate this at all as a good way to and does not suggest it as a possible way to start inner city refurbishment). However there is another, an economic problem to demolition. It conveys a kind of free-rider problem in Western property markets. Mostly the value of the property rises for all others in the surrounding if one old building is torn down. Therefore it leads to an inability of action in that no one wants to decide who will be the first and no one wants to lose property for the gain of others (Bernt 2004). This is only possible as capitalist systems are defined by real estate ownership. It shows in turn that capitalist systems are only oriented towards growth. In many declining regions different forms of property and ownership are discussed and implemented (Kantzow and Oswalt 2004) as growth cannot be a leading principle there. New concepts are e.g.: a wider application of long-term lease (Erbpacht), nonprofit foundations (Gemeinnützige Stiftungen), and neighbourhood cooperatives (Quartiersgenossenschaften). For example, to overcome the trap of real estate demolition in Leipzig, individual owners entered into a cooperative in which all benefits and burdens are shared, enabling demolition and minimising the costs for the former proprietor. Also the so called 'intermediate use of plots' ('Zwischennutzung') is used in Germany, especially East-German context (e.g. in Leipzig and Berlin, Lauinger 2005; Overmeyer 2005). Another idea is the taxation of disused property (Kantzow and Oswalt 2004 give a comprehensive overview). A similar idea exists in the UK since 1990 with the 'Land Assembly' which enables the regeneration of areas by the expropriation of owners. Tradable land use certificates are another approach discussed nowadays, e.g. in Germany and Switzerland, although the concept has existed since 1968 in the USA (Lauinger 2005).

What becomes clear is that new methods are needed to meet the challenges of urban revitalisation in shrinking contexts. The inner city conditions are unattractive to a great share of the population, some revealed push factors are certainly related to the industrial past. This results in an ongoing trend of decentralisation in Wirral and slight suburbanisation in Leipzig accelerating inner city decline. On the other hand, if decentralisation would continue new strategies are also in demand as infrastructure might increasingly be under-used (technical and public transport infrastructure, but also cultural and medical). Here new schemes as on-demand-bus or tele-medicine have been suggested (Böhm 2005). The under-use of infrastructure calls for a new understanding of supply and demand and an increased self-determination of the actors. This is especially important in the context of old industrial regions as it has been noted that people there have to learn a new innovative responsibility towards themselves (Bergmann 2005). This does not mean that planning and its role to contribute to urban development might cease. It still is important as a main facilitator of regulation. The extensive sprawl development in eastern Germany until 1996 is a demonstrative example of the power of politics and planning to influence population migration as the sprawl in those years is a reflection of national government failing to intervene. European urban sprawl has been found to be shaped by public policy and the public sector in general much more than in the USA (Nuissl and Rink 2005). This, however, does not prove that politics aiming to contain sprawl can be successful. Another example of the impact of planning on regional housing markets delivers a study in Central Scotland which showed that new construction of house building is strongly influenced by the amount of land which is available for planning permission (Leishman and Bramley 2005). Planning schemes can be successful. Therefore, innovative planning strategies and instruments

should be implemented and address problems in former industrial areas, especially as it is projected that the population decline might become more severe in the coming years, at least for Leipzig. The proportion of deaths and births will by all probability become even more unbalanced after 2010 and then the physical fabric will prove increasingly oversized (Nuissl and Rink 2005). It is important to know about the socio-economic conditions and the preferences of different groups of people if planning wants to successfully support a concentration and re-urbanisation.

There is an increasing frequency of single and retired households in both regions and countries investigated and especially in the case study areas. This is in line with findings of other studies and the demographic and household trends in Europe (BBR, EUROSTAT). It was concluded by the results in this study that a higher share of elderly could be a feature of old industrial areas.

A further model run was performed, with the additional assumption of increasing numbers of retired households. The other assumptions remain, suburbanisation was assumed to continue at least in the short run which would be a prolongation of the current trends. The analysis in Leipzig has revealed that there is a second phase of suburbanisation after the decline between 1996 and 2000, this time mainly caused by traditional suburbanites, family households with children who built their own houses. This is a tendency which was not assumed by other authors in the region, it was rather suggested that the population decline will stabilise the migration dynamics (Herfert 2002).

The general model results demonstrate that interventions from the planning boards are needed to change the internal dynamics defined through attraction and repulsion between the actor classes, and that the current forces would not lead to sustainable urban development. Without an intervention by the planning boards, the suburban regions will experience sequential phases of lower and higher attractivity (to different actor classes). With the additional assumption of an increasing trend of retired households this remains important. Additionally it has been found that according to the current dynamics the young one-person households seem to lead to the most sustainable urban development in the suburban region Eastern Leipzig if they live in other parts of the region, e.g. the inner urban areas. In the Wirral case, the young couples and the lower to lower-middle class seem to hold a key aspect in terms of sustainable urban development. If the young couples are living elsewhere in the region, most effectively in the inner urban areas, the presently most sustainable states for the region can be expected. It starts after a period of high interest in the suburbs in Outer Wirral when the young couples move out of suburbia possibly for the reason of high property prices. As gentrification and inner city refurbishment have often been documented as success factors to attract young people and to initiate re-urbanisation, such a strategy would go hand in hand with a more sustainable urban development with respect to land use consumption. After a period of high interest in the suburbs the young couples could initiate a re-urbanisation in the inner urban parts, additionally they have the possibility to start a low-demand-phase in the suburban areas. The area might already be too expensive to sustain its high attractivity for all actor classes. If in such a case the lower to lower-middle class households would be increasing in Outer Wirral, shortly after the boom-period, the low-demand-phase could be prolonged. This actor class seems to hinder a relatively fast increase of the middle-aged families and an anewed period of high interest in the suburbs. This especially speaks for the social mixing of residential areas. For example, price caps for property in the suburbs or the provision with affordable housing

by other means would enable more households with smaller budgets to move to the outer urban areas. Social mixing and re-urbanisation seem to be a strategy for a lower rate of land use change in the suburban parts of Wirral.

One has to note that this is the result of the current dynamics and the strategies would only remain promising if there was no change in the actor class' spatial preferences and interactions. With middle-class suburbanisation being an aspired process for many people, families and others, more and less wealthy, it is assumed that this would not be soon.

The results further reveal that in comparison to the Leipzig scenario it seems difficult in the Wirral case to reach a sustainable development state and even more difficult to keep it. To keep a sustainable state the internal dynamics would have to be changed as the current projected development continues fluctuating. Again, this calls for educational or cultural changes to support planning for a more sustainable society. Suburbanisation is a cultural phenomenon, nowadays as in the times of its proliferation in the 18th century.

Some potential applications of the qualitative modelling approach were presented in the context of residential migration. Whether this is a promising tool for planners to deliver usable and valuable information to their work remains to be examined elsewhere. First contacts to planning authorities have been undertaken during the course of this work (with respect to the 'pure' modelling approach as well as with the QuAM-game, see further down). The approach is a first step to building 'better' models for the planning practise. As one can imagine, there remains a lot of progress to be made. However, the results of the qualitative model are assumed to have revealed information to planners and urban policy in Leipzig and Wirral/Liverpool which can be potentially useful to the planning practise and which has not been found by other studies. The hypothesis to research question 4 is confirmed. Furthermore it was shown that the qualitative model can be applied to urban problems in former industrialised urban regions as e.g. those resulting from urban sprawl. Modelling could be a way to support urban policy and plan making in industrial regions.

The suggested model should be understood as a first step to make more use of modelling experience within the planning practise. Modelling approaches have rarely found the way to planners, architects or urban politicians. Authors suggest that there is a kind of fear of contact of planners towards models and also that the models available are not useful for planning design. What leads to this rare contact is a field of further, interesting and highly necessary research. One step has still be made within the context of this work. To contribute to a decrease of fear of contact with models of different kinds the proposed approach has been transformed into a role game. This game was used at a workshop with planning executives and also with students of different disciplines but all working in the field of sustainable development. The role play consists of people acting as a certain group of actors e.g. the actor classes in the model (the roles can be given or chosen by the player). They have to consider how they are attracted towards the two urban spaces URBIA and SUBURBIA depending on the characteristics and the present actor classes and need to announce this in designated rounds. Additionally, there are politicians and planning boards (one for each sub-region URBIA and SUBURBIA and an overall regional planner). These try to attract actors and alter the features of the area according to the desired development with ACTION points, representing planning instruments (a certain number for each round). Before deciding which instrument to use, they can discuss, argue, try to convince other actors in favour of their developments. These open discussions represent

the period of planning appeals and the release of planning schemes, where in Germany all actors in the urban system have the possibility to protest against the suggested projects. Figure 5.5 mirrors a possible urban sketch and starting point of the role play.

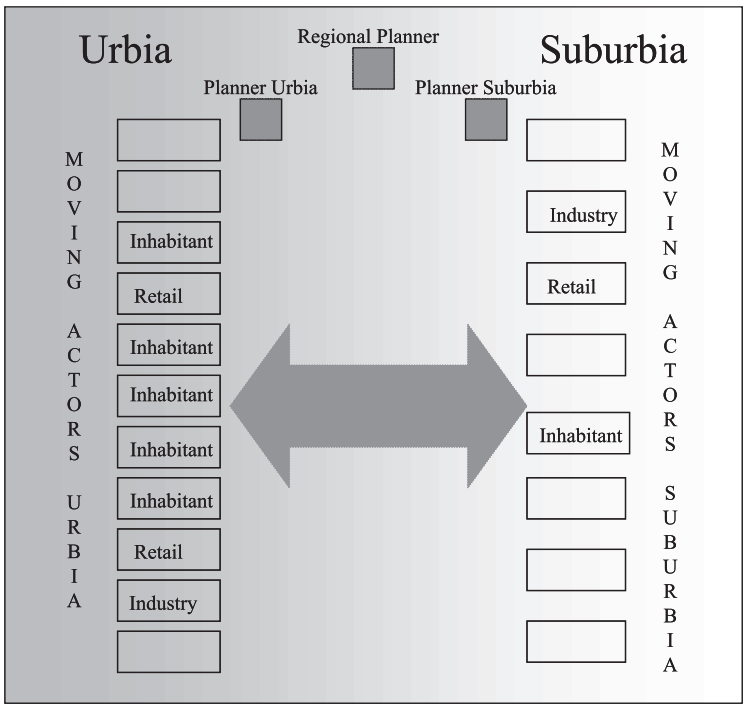


Figure 5.5: A possible distribution of actor classes in the QuAM-game. Source: Author's draft. Note: The left and the right space represent the urban and suburban area, the boxes (e.g. chairs) are possible building sites for different actor classes. When there is a name in a box this site is occupied = the land is used, when the box is empty it is a possible place to move to. Actors migrate in space according to their spatial attractivity dimensions. Planners can influence the attractivity by particular instruments (not to see in the figure).

The game is assumed to open up different perspectives, to try different means of planning while playing, to learn from possible interdependencies between actors, to decrease the fear of contact as it enhances the understanding of the model if both operations are explained jointly. Please see Reckien and Eisenack (2006) for a more detailed description of the game and the experiences during the sessions played so far. Using games in planning is/would be a rather new phenomenon. Although the merits of games are widely documented (Reckien and Eisenack 2006) it is not clear whether a role play is sufficient not only to sensitise stakeholders with modelling approaches but also to reduce the fear of contact with modelling. Further research would be necessary to test the merits of games in planning. However, the use of games in urban contexts is not new, it has a longer tradition, e.g. with Monopoly or SIM CITY (Borries 2005), but the use with professional planners is not common. Often the end of role plays does not offer a declared goal, instead they are a medium of communication between different actors which can resolve conflicts and different interests. For students, games can be a learning facility. The same applies for planners but additionally there is the confrontation with the unexpected, the production of new thoughts and at its best the easement of previously fixed positions. People might become more receptive - receptive for something new, receptive for a change, receptive to see an advantage out of a challenge.

Chapter 6

Overall Summary

This thesis aims to deliver comprehensive insight into the intra-regional migration patterns of formerly industrialised regions. It addresses a wide range of issues to discuss the extent and circumstances of urban sprawl, the causes, and consequences as well as potential planning strategies in sprawling areas. In order to contribute to a more sustainable development in old industrial regions, the aim was to develop potentially new and successful possibilities of influence for planning and policy. The work was motivated by the early hypothesis that suburbanisation might affect former industrial areas stronger but that this seems not comprehensible if evaluated after the amount of unused space in the inner cities. Many brownfields and idle land is often a characteristic of these inner urban areas.

The work is based on a comparison of two old industrial regions in Europe: Leipzig/ Germany and Wirral/Liverpool/UK. The selection was, among others, taken, first, on the basis of the economic importance of both cities in the past, most notably in the time of industrialisation and in the case of Leipzig also on its importance within the GDR, a country strongly relying on the industrial sector of economy. The second major selection criteria is connected to the occurrence of suburbanisation and urban sprawl, which was observed and revealed strongly in both case study regions although with a shift in time. Within these urban regions, suburban case study areas were chosen on the basis of the recent residential dynamics in terms of statistical data on population figures and newly constructed dwellings as well as opinion from researchers in the area. The selection gives also the possibility to contrast certain aspects of the urban development against the background of different political systems: Leipzig with its socialist history and Liverpool/Wirral as a city in a capitalist order. Statistical analyses of secondary data and questionnaire surveys were carried out, and a qualitative modelling approach was used to answer the research questions.

With the help of statistical analyses of secondary data covering the period 1950-2005 the intra-regional population developments of both regions were investigated with respect to their performance in the life cycle theory of cities. The population developments since 1950 were investigated in terms of the decennial population change between the inner and the outer urban parts. With respect to the population development during the time of the six last censuses, it was found that the English case study region Wirral developed according to the urban life cycle model. It passed through the suggested stages from suburbanisation to dis-urbanisation. A recent interest in the inner urban areas has been noted by other authors but cannot yet be seen in the data. In Leipzig, the population development during

the GDR period did not follow the life cycle theory of urban areas. The data shows that the population trends need to be attributed to the stage of re-urbanisation in the years between 1950 and 1989 if one follows the nomenclature of the life cycle theory of cities. In the years after the German re-unification Leipzig experienced a very strong wave of suburbanisation in the first decade. It slowed down in the second half of the 1990s but still continues. There is no dis-urbanisation documented so far.

The second main research question concerned the causes of suburbanisation and urban sprawl in the case study regions. Closed questionnaire surveys were undertaken with recently moved households in Eastern Leipzig and Western Wirral. Questions about the reasons for leaving the former home (push factors) as well as the reasons for choosing the current one (pull factors) were asked. The list of push factors was divided into push factors of the dwelling and the neighbourhood as well as the push factors from personal circumstances to separate the more from the less influential aspects for planning and policy. Recently moved households comprised movers between 2000-2004 in Eastern Leipzig and 1997-2002 in Western Wirral. It not only revealed the numbers of people moving to different parts of the urban region but also their motives, spatial preferences and attributes. For the heads of household in Eastern Leipzig noise ans air pollution as well as traffic intrusion were the main reasons from the neighbourhood and the dwelling to leave the inner city parts for the suburban regions. In Western Wirral, they were the crime level as well as the dissatisfactory or lacking garden space and the lack of greenery in the inner urban areas. The most important pull factors in Eastern Leipzig are proximity to nature and landscape, safe/low-crime neighbourhood, and a good road network. In the case of Wirral quietness and the low-crime attributes of the neighbourhood were the main reasons to move to the current residential area. The residential preferences are not very different in the two regions. In a comparison of the extent of the named push and pull factors (the residents had to choose on a scale of importance) the push factors of the inner urban areas were not stronger than the pull factors of the outer urban areas. This comparison was used to evaluate the strength of possibly negative inner city characteristics of old industrial areas with potentially older building stock, small and dark dwellings, less green space etc., in contrast to non-industrialised cities. It could not be concluded that former industrialised areas generate more sprawl than non-industrialised ones, although such a statement should be verified in a comparion with non-industrial cities.

Thirdly, the research addressed the consequences of urban sprawl in the case study areas. The variables car ownership, the commuting distance, the preferred means of transport, the size of living space, and the number of newly constructed dwellings were chosen for investigation and analysed for the inner and outer urban areas. Primary data from the Eastern Leipzig questionnaire and secondary statistical data in Wirral was analysed to confront the results of two methods: data from different households at the same time and data from the same households but at different times. This was to test whether conventional comparisons of inner city versus outer city residents yield the same results as a comparison of data before a move from the inner to the outer city areas and after it.

In Wirral, the comparison of inner urban versus outer urban households showed that car ownership, commuting distance, living space, and number of newly constructed dwellings are higher in the outer urban areas. The car is the preferred means of transport to work in both areas but it is used more in the suburban parts of the district.

In Eastern Leipzig, the comparison of households before and after a move from the inner to the outer urban parts revealed a slight increase in the number of cars, but also with the households that lived in other suburban areas before. With regard to the commuting distance, the distance travelled to work increased substantially for the sample households moving from Inner to Outer Leipzig. Households that moved within the suburban areas characterised only a small change. For households from outside of Leipzig the commuting distance decreased with the move to suburban Leipzig. The preferred means of transport is the car for all households but the preference decreased slightly when households lived in the inner urban areas before. This is very much in contrast to what was expected from the literature. Also the preference for trams decreased, while the use of buses and bikes was evaluated higher after the move to the suburban areas. This reflects the availability of transport. It also shows that the use of cars does not necesarily increase. A higher preference for bikes was not expected. The current living space in the outer urban areas and the former living space is highest with the households that formerly lived in the inner urban areas. This indicates that probably the more wealthy residents move out more often. However, an increase in living space was also revealed for households that formely lived in other parts of suburban Leipzig or elsewhere outside of Leipzig. The rate of increase was highest for the households moving within suburbia. In terms of newly constructed dwellings, a clear dominance is given to the outer urban parts where most of the development took place in recent years. After a first wave of strong suburbanisation in the mid-1990s (approximately 1995-1997), a second rise started in about 2000. A new dynamic in the construction of family houses and no apartment buildings are leading this out-migration. Leipzig could experience a similar development of suburbanisation as many cities in capitalist systems during the 1960s/1970s.

For the last research question a qualitative modelling approach was applied to the two case study areas Eastern Leipzig and Western Wirral. The information of questionnaire surveys was used to form actor classes of urban sprawl in the regions with similar socio-economic attributes and similar residential preferences. The qualitative modelling was implemented under the assumption of direct and indirect interactions between the actor classes, formulated with the help of secondary data. The hypothesis was that the attractivity of a residential area is also dependent on the presence of actor classes. A QUalitative Attractivity-Migration-(QUAM)-model was applied that relates the space preferences of each class of moving residents to the attraction or rejection of the area by present actor classes which are assumed to condition the attractivity of the place. This is performed by assumptions about the mutual influence of actor classes according to their socio-economic characteristics. Information is obtained about the most likely future developments with respect to the actor class populations. Following this exercise it was aimed to analyse the most recent population dynamics within the agglomerations and to contribute to the development of means of intervention to the population flows - all for a more sustainable organisation of urban functions and a more sustainable land use development in old-industrial agglom-

erations (in terms of land use conversion for residential purposes as well as the amount of living space in relation to the location of the dwelling within the urban agglomeration). In both case studies valuable results yielded intervention possibilities and intervention needs to direct the urban-suburban population development.

As an exemplary application the model output was investigated with respect to the possibilities of planning to reduce land use change. In Leipzig, it was found that external interventions from the planning boards or the present political bodies are necessary to change the internal dynamics between residential actors as the current internal dynamics seem to lead inevitably to an increased change in land use. Re-urbanisation seems possible according to the internal dynamics between actors and likely at the moment but re-urbanisation seems to drive land use change by the young families in the suburbs. Whereas it was not documented at present, in a longer term one-person households might also increase in the suburbs. This would lead to slightly lower land use change there. However both scenarios are not very much favourable with respect to land use change, to reach this goal planning needs to intervene strongly.

In Wirral, the model revealed a fluctuating interest in the suburban areas, potentially due to an up- and downward trend of prices in the area. The suburbs experience a continuing development of higher and lower demand. The model result shows that an alteration of the land use consumption according to the internal dynamics only seems possible from a shortening of the high demand phases and a prolongation of the low demand phases. However, an overall or long-lasting decrease in the land use consumption in Wirral only seems possible, as shown for Leipzig, when external, political interventions or planning schemes impacting the internal dynamics hinder the land use change. At the end of a boom period in Outer Wirral, when the house prices have become too expensive for most actor classes and only the middle-aged families and the young couples are still increasing in the suburbs it is important to make the inner cities more attractive to the retired households as this would opens up the way for a longer period of low demand in the suburbs. A prolongation of the low-demand-phase can then be achieved by leaving the suburbs as long as possible unattractive to the middle-aged families, which might not be easy. They initiate a new boom period.

In a second model exercise the results were evaluated under the additional assumption that the retired households are constantly increasing in the suburban areas. This is in line with the national and European trends and was revealed to affect former industrial areas and their suburban regions in particular. In Leipzig, the model brings the possibility for either increasing or decreasing single households in the suburbs. A decrease of one-person households seems to cause lower land use change by them but higher shares of middle-aged families. An increase of one-person.households might lead to a higher land use change by this class but also the increase of middle-aged families is slightly lower. Neither now with a decreasing share of single households in the suburbs nor in the future with a possible increase of singles (as a general increase in these households might in the future also affect the suburban areas) the interest of the young families for the suburbs decreases. Under an aging population a decrease of land use change seems not possible from the free development of the internal dynamics if not planning and policy influences the attractivity of the region. On the other hand, the model for Wirral with a constantly aging population yields that the young couples should be attracted to the inner areas as they could initiate re-urbanisation

there and a low-demand phase of the suburbs. After this point in time, the lower to lower-middle class should be able to move to the suburbs as they have been identied to prolong the low-demand-phase and hinder that a boom period with high attractivities and prices in the suburbs follows soon. Consequently, social mixing seems extremely important to reduce land use change and increase sustainability in the region.

Though leverage points for the urban system can be identified with the modelling approach it does not account for specific planning measures and their individual success in directing the movements of the population. The model can only reveal which population trends should be influenced to reach a certain planning goal - it does not say how. The elicited preference structures for residential locations of the actor classes can be used, they are a planning support in itself.

It could be shown that modelling can offer potentially valuable information for urban policy and plan making. However this should be tested with planners and the model further applied to other case studies. Attempts have been made to bring this modelling approach closer to urban planners, e.g. with planners being itself moving actors and experiencing the logics of models in a role game. Also policy and plan-making, not only the residents are in need to open up to a new situation, to new approaches and methods, to a changed environment when old concepts do not work. May be, one (including the author) needs to learn to use the change.

All results have been summarised in the following three tables for a comprehensive overview of the research questions (RQ), the hypotheses, the methods, the results.

	Subject		Time	Hypotheses	Assessed Parameters	Methods	Results
RQ 1	Leipzig	Life cycle theory of urban areas.	1950-1989 2000-2005	The urban development did not follow the urban life cycle model during GDR between 1951-1989 - since 2000 suburbanisation takes place.	Population and population distribution.	Data analysis of official local statistics: Comparison of decennial population change between definded inner and outer urban areas.	The hypothesis is confirmed. Leipzig did not follow the life cycle theory of urban areas between 1950-1989 - it showed only a re-urbanisation trend. Between 2000-2005 suburbanisation is visible but very small in extent.
	Wirral		1951-2001	Wirral's population development followed the phases of life cycle theory.			The hypothesis is confirmed Wirral's population distribution passed from suburbanisation to dis-urbanisation.
RQ 2	Leipzig	Causes of urban sprawl	2000-2004	Old industrial inner urban areas have due to the industrial past stronger push factors than their surroundings pull factors. Thereby they generate more sprawl than formerly non-industrial ones.	Push factors of the dwellings and the neighbourhood in the inner and pull factors of the dwellings and the neighbourhood in the outer urban areas; and a comparison between the two for movers from the inner to the outer urban parts.	Closed questionniare survey: Respondents had to indicate reasons for leaving and reasons for choosing the new neighbourhood, so called attractivity dimensions suggested in the literature and/or reflecting the regional situation.	Main push factors: Noise pollution, traffic intrusion. Main pull factors: Safe, low-crime neighbourhood, proximity to nature and landscape, good road network. Comparison between push and pull factors shows a stronger weight of pull factors, hypothesis is rejected.
	Wirral		1997-2002				Main push factors: Crime level, home had no/to small garden, lack of greenery. Main pull factors: Quiet neighbourhood, low-crime neighbourhood, affordable housing. The comparison between push and pull factors shows a stronger weight of pull factors, hypothesis is rejected.

Table 6.1: Overview of the research subjects, the research outline and results (1). Source: Author's draft.

	Subject		Time	Hypotheses	Assessed Parameters	Methods	Results
RQ 3	Leipzig	Consequences of urban sprawl	2000-2004	Looking at the same households before and after a move from the inner to the outer urban areas it is assumed that the number of cars, the preference to use the car, and the living space increases. It is not assumed that the commuting distance changes much while moving as it was found that people in old-industrial areas have a reluctance against commuting and a decentralisation of employment from the socialist period remains.	Number of cars, commuting distance, preferred means of transport, and living space.	Comparison of the parameter values before and after the move from the inner to the outer urban areas, within the suburban areas and from elsewhere to the suburban areas, which were revealed from the questionnaire survey.	There was an increase in the number of cars, but not only with a move from the inner to the outer areas, also while moving within the suburban areas. The commuting distance increased remarkably while the distance to work for the households that lived in the suburban areas before changed marginally, it approximately halved for the households moving into the suburbs from outside Leipzig. The preference to use the car and the tram decreased for the formerly Inner Leipzig residents, but increase with buses and bikes. The formerly suburban households raised their preference for the car and lowered it for the bus. The living space increased for all households. The increase was highest among the old-suburban households, but former residents of Inner Leipzig show the highest absolute living space per household. It is shown that not all attributed consequences of urban sprawl can clearly be ascribed to a move from the centres to the suburbs. However the hypotheses to a possible change of the selected parameters could not be confirmed in all cases.
	Wirral		1997-2002	Suburban residents have more cars, prefer to use the car more often, have a longer commuting distance and more living space than inner urban residents if one compares different households at the same time.		Comparison of statistical data to the parameters of different households in the inner and outer urban areas.	The suburban households had a higher number of cars and more living space, their residents a higher preference to use the car and to surpass a larger distance to work. The hypothesis is confirmed.

Table 6.2: Overview of the research subjects, the research outline and results (2). Source: Author's draft.

Subject			Time	Hypotheses	Assessed Parameters	Methods	Results
RQ 4	Leipzig	Qualitative modelling	2000-2004	Qualitative modelling can offer valuable information for urban poliy and plan-making.	Land use change (LUC), and land use change under an aging population.	A Qualitative-Attractivity-Migration-Model. It uses the residential actors in space, their space preferences and the interdependencies between them on the spatial attractivity evalutation.	LUC: Re-urbanisation is possible and likely at the moment but seems to drive LUC by the young families in the suburbs. In a longer term one-person households might also increase in the suburbs which would lead to slightly lower LUC there. LUC under an aging population: Then, decreasing one-person households in the suburbs seems to cause lower land use change by them but higher shares of middle-aged families. Neither now with a decreasing share of single households in the suburbs nor in the future with a possible increase of singles there the interest of the families for the suburbs decreases. Under an aging population a decrease of land use change seems not possible from the free development of the internal dynamics if not planning and policy influences the attractivity of the region.
	Wirral		1997-2002				LUC: At the end of a boom period in Outer Wirral, when the house prices have become too expensive for most actor classes and only the middle-aged families and the young couples are still increasing in the suburbs it is important to make the inner cities more attractive to the retired households. A prolongation of the low-demand-phase can then be achieved by leaving the suburbs as long as possible unattractive to the middle-aged families. They initiate a new boom period. LUC under an aging population: Young couples should be attracted to the inner areas initiating re-urbanisation and a low-demand phase in the suburbs. Then the lower to lower-middle class should be able to move to the suburbs as they prolong the low-demand-phase and hinder that a boom period with high attractivities and prices in the suburbs. Social mixing seems extremely important to reduce land use change and increase sustainability in the region.

Table 6.3: Overview of the research subjects, the research outline and results (3). Source: Author's draft.

Annex

1 Annex: Leipzig questionnaire

Figure F.1: Leipzig questionnaire

POTSDAM INSTITUT FÜR KLIMAFOLGENFORSCHUNG E.V.

Gefördert durch die Europäische Union

Forschungsgruppe Urbs Pandens/Suburbanisierung
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Ortsentscheidungen von Haushalten

Sehr geehrte(r) «MannFRAU» «Vorname» «Name»,

Das Potsdam Institut für Klimafolgenforschung (PIK) führt eine Studie zu den Umzugsentscheidungen von Haushalten aufgrund der Wohnortqualitäten durch, um die Zusammenhänge zur **Stadt- und Regionalentwicklung in Europa** und ihre **Auswirkungen auf das Lokal- und Regionalklima** abzuschätzen.
In den letzten drei Jahren haben wir Aspekte der Stadt- und Regionalentwicklung in sieben Städten Europas, darunter Athen, Leipzig, Liverpool, Ljubljana, Stockholm, Wien und Warschau untersucht. Dieses Projekt wurde von der EU gefördert. **Unser Ziel ist es**, die Erkenntnisse für eine nachhaltige Stadtentwicklung einzusetzen, die die Interessen und Vorlieben der Bewohner berücksichtigt.
Wir sind auf **Ihre Unterstützung** angewiesen.

Während des Projektes haben wir mit dem UFZ, dem Umweltforschungszentrum Leipzig/Halle zusammengearbeitet. Für weitere Einblicke in das Projekt besuchen Sie unsere Webseite unter www.pik-potsdam.de/urbs.

Wir wollen auch für die Region Leipzig ein nachhaltiges Stadtentwicklungsbild nach den Bedürfnissen der Bewohner erstellen. Um Einblicke in Umzugsentscheidungen, Wohnortqualitäten und Stadtentwicklung zu erhalten, bitten wir Sie diesen Fragebogen auszufüllen. Um Ihnen den Aufwand mit dem Fragebogen zu erleichtern, waren wir bemüht, die Fragen kurz und eindeutig zu halten.

Die Ergebnisse werden den Stadt- und Regionalplanungen und der EU zugute kommen, und in Form einer Doktorarbeit veröffentlicht, die Sie selbstverständlich nach der Fertigstellung einsehen können.

Sie sind aus dem Melderegister der Stadt Leipzig per Zufallsauswahl gewählt worden, an diesem Forschungsprojekt teilzunehmen. Dies ist für rein wissenschaftliche Zwecke möglich. Ihre Antworten werden streng vertraulich behandelt und in anonymisierter Form weiterverarbeitet. Schon bei der Dateneingabe werden alle Informationen, die Rückschlüsse auf Ihre Person zuließen, von der Zuordnung entkoppelt.

Wenn Sie noch weitere Fragen haben, **bitte** rufen Sie uns gerne an: tagsüber zwischen 11-17 Uhr sind wir unter oben genannter Telefonnummer im Institut zu erreichen. Wir wären Ihnen sehr dankbar, wenn Sie den Fragebogen ganz kurzfristig **bis zum 26. September** ausgefüllt an uns zurücksenden.

Mit freundlichen Grüßen,

Dr. Gerhard Petschel-Held
Stellvertretender Abteilungsleiter der Abteilung "Integrierte Systemanalyse" am Potsdam Institut für Klimafolgenforschung

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Erhebung zu den Ortsentscheidungen von Haushalten

in der östlichen Region Leipzigs, Ortsteile: Seehausen, Plaußig, Portitz, Thekla, Heiterblick, Engelsdorf, Mölkau, Baalsdorf, Althen-Kleinpösna, Holzhausen, Liebertwolkwitz.

1. Als Sie in Ihre jetzige Wohnung/Ihr Haus gezogen sind, wie wichtig waren die folgenden Faktoren beim Einfluss auf die Wahl des Wohnstandortes ?
Bitte kreuzen Sie die entsprechende Wertigkeit an:
1 = irrelevant für die Wahl des Wohnstandortes, 2 = schwache Bedeutung, 3 = bedeutend, 4 = sehr bedeutend, 5 = entscheidend für die Wahl des Wohnstandortes

	1	2	3	4	5
Nähe zum Arbeitsplatz	_	_	_	_	_
Nähe zu Einkaufsmöglichkeiten	_	_	_	_	_
Nähe zu Freizeitangeboten (Restaurants, Kino etc.)	_	_	_	_	_
Nähe zu Natur und Landschaft	_	_	_	_	_
Geringe Umweltbelastung	_	_	_	_	_
Gute Straßenverkehrsanbindung	_	_	_	_	_
Gute ÖPNV-Anbindung (Bus, Zug)	_	_	_	_	_
Familienfreundliche Wohngegend	_	_	_	_	_
Gute Schulen/ Kinderbetreuungsstädten	_	_	_	_	_
Nähe zu Familie oder Freunden	_	_	_	_	_
Ruhige Nachbarschaftsgegend	_	_	_	_	_
Sichere kriminalitätsarme Nachbarschaft	_	_	_	_	_
Billiges Bauland	_	_	_	_	_
Billige Mieten	_	_	_	_	_
Angemessene/Entsprechende Angebote	_	_	_	_	_

2. Würden sich die von Ihnen unter 1. angegebenen Faktoren durch einen Zuzug anderer Bewohner verändern? Ja 1_ Nein 2_
Wenn ja, welche, wie ? Bitte spezifizieren Sie:

3. Was waren Ihre Gründe für das Verlassen Ihres vorherigen Wohnstandortes ?
Bitte kreuzen Sie die entsprechende Wertigkeit für die Parameter in jeder Zeile an:
1 = irrelevant für die Entscheidung des Umzugs, 2 = schwache Bedeutung, 3 = ziemlich bedeutend, 4 = sehr bedeutend, 5 = entscheidend für den Umzug

	1	2	3	4	5
Ihr letztes Haus/ihre letzte Wohnung					
Zu klein.....	_	_	_	_	_
Zu groß.....	_	_	_	_	_
Ohne Garten/ mit zu kleinem Garten.....	_	_	_	_	_
Ihre vorige Nachbarschaftsgegend					
Qualität der Schulen/Kinderbetreuungseinrichtung....	_	_	_	_	_
Lärmbelastung/ Luftverschmutzung.....	_	_	_	_	_
Zu wenig Grün.....	_	_	_	_	_
Verkehrsbelastung.....	_	_	_	_	_
Kriminalitätsrate.....	_	_	_	_	_
Nachbarn, soziale Probleme.....	_	_	_	_	_
Ihre persönlichen Umstände					
Veränderung des Arbeitsplatzes.....	_	_	_	_	_
Wunsch, Besitzverhältnisse zu ändern (Mieter←→Eigentümer).....	_	_	_	_	_
Wunsch nach besserer/ teurerer Unterkunft.....	_	_	_	_	_
Wunsch nach eigenem Hausstand.....	_	_	_	_	_
Umzug nach Beendigung einer Partnerschaft.....	_	_	_	_	_
Änderung der Haushaltsgröße (Auszug der Kinder, Nachwuchs).....	_	_	_	_	_

4. Wo war Ihr voriger Wohnstandort? in Leipzig $_{1}$_ außerhalb Leipzigs $_{2}$_
4.1 Wenn Ihr voriger Wohnstandort Leipzig war, in welchem Ortsteil haben Sie gewohnt? .....

5. In welchem Stadtteil Leipzigs wohnen Sie jetzt ? .....

6. Welcher Haustyp trifft auf Ihr Haus/Ihre Wohnung zu?
Ein-/Zweifamilienhaus $_{1}$_ Reihenhaus $_{2}$_ Mehrfamilienhaus $_{3}$_

7. Ist Ihr Haus neu errichtet und Sie sind Erstbezieher des Hauses/ der Wohnung ?
Ja $_{1}$_ Nein $_{2}$_
7.1 Wann ist Ihr Haus gebaut worden? _ _ _ _

8. Sind Sie Mieter oder Besitzer Ihrer(s) jetzigen Wohnung/Hauses? *(Nur eine Antwort)*
Besitzer $_{1}$_ Mieter $_{2}$_

9. Welche Wohnfläche hat Ihre Wohnung bzw. Ihr Haus ? ..... qm
9.1 Welche Wohnfläche hatte Ihr(e) vorige(s) Wohnung/ Haus ? ..... qm

10. Welche der nachfolgenden Kategorien beschreibt Ihren Haushalt am besten ?
(Bitte kreuzen Sie nur eine Kategorie an)

Einpersonenhaushalt	_
Zwei-Personenhaushalt ohne Kinder	_
Familienhaushalt mit einem Kind	_
Familienhaushalt mit zwei oder mehr Kindern	_
Alleinerziehende(r) mit Kind/ Kindern	_
Wohngemeinschaft	_

11. Wie viele Personen leben in Ihrem Haushalt? ..... Personen

Bitte beantworten Sie noch einige Fragen zu Ihrer Person.
Am günstigsten vom Haushaltsvorstand auszufüllen.

12. Welche der nachfolgenden Kategorien beschreibt am besten die Tätigkeit des Haushaltsmitglieds mit dem höchsten Einkommen? *(Bitte nur ein Kreuz)*

ArbeiterIn	1_
FacharbeiterIn	2_
Einfache(r) Angestellte(r)/Beamte(r)	3_
Mittlere(r) Angestellte(r)/Beamte(r)	4_
Höhere(r) Angestellte(r)/Beamte(r)	5_
Selbständige(r), Freiberufle(r)	6_
Wehr-/Zivildienstleistende(r)	7_
Auszubildende(r)/ Student(in)	8_
Ruhestand/ Vorruhestand	9_
Arbeitssuchend	10_

13. Würden Sie Ihr Alter angeben ?

Bis 34 Jahre alt 1_ 35 bis 59 Jahre alt 2_ Über 60 Jahre alt 3_

14. Wenn Sie berufstätig sind, wieviel Fahrtzeit brauchen Sie zur Arbeitsstelle ? *(Eine Antwort)*

Weniger als 20 Minuten	1_	Zwischen 40 und 60 Minuten	3_
Zwischen 21 und 40 Minuten	2_	Über eine Stunde	4_

14.1 Wie groß ist die Distanz zum Arbeitsplatz ? etwa ..... km
14.2 Wie groß war Ihre Distanz zum Arbeitsplatz vorher ? etwa ..... km

15. Wieviele Autos stehen Ihrem Haushalt zur Verfügung ? *(Bitte nur eine Antwort)*

Kein Auto 0_ 1 Auto 1_ 2 Autos 2_ 3 Autos 3_ 4 oder mehr Autos 4_

15.1 Wieviele Autos besaß Ihr Haushalt am letzten Wohnstandort ?

Kein Auto 0_ 1 Auto 1_ 2 Autos 2_ 3 Autos 3_ 4 oder mehr Autos 4_

16. Welches ist Ihr bevorzugtes Verkehrsmittel ?

Auto _1 Bus 2_ Fahrrad 3_ Bahn 4_

16.1 Welches war Ihr bevorzugtes Verkehrsmittel am letzten Wohnort ?

Auto _1 Bus 2_ Fahrrad 3_ Bahn 4_

17. Wie zufrieden oder unzufrieden sind Sie mit dem Wohnstandort Ihrer(s) jetzigen Wohnung/Hauses ?
(Bitte umkreisen Sie eine Nummer → Bedeutung: 1 = sehr unzufrieden, 2 = ziemlich unzufrieden, 3 = weder unzufrieden noch zufrieden, 4 = ziemlich zufrieden, 5 = sehr zufrieden)

Sehr unzufrieden 1 2 3 4 5 Sehr zufrieden

VIELEN DANK für Ihre Bemühungen.

2 Annex: Wirral questionnaire

Figure F.2: Wirral questionnaire

SURVEY OF HOUSEHOLD LOCATION DECISIONS IN WIRRAL

This questionnaire should be completed by the head of household or highest wage earner

1. When you moved to your current home, how important were each of the following factors in influencing your choice of location?

   Please circle one number for EACH factor listed below

   NB: 1 = irrelevant to the choice of location, 2 = of slight importance, 3 = fairly important, 4 = very important, 5 = crucial to the choice of location

Being near to your place of work	1	2	3	4	5
Being near to food shopping places	1	2	3	4	5
Being near to other shopping places	1	2	3	4	5
Being near to leisure places (e.g. restaurants, pubs, the cinema, etc.)	1	2	3	4	5
Being near to areas of countryside or the coast	1	2	3	4	5
Having good road connections	1	2	3	4	5
Being near to a railway station	1	2	3	4	5
Being in an area with good bus links	1	2	3	4	5
Being in a low-crime neighbourhood	1	2	3	4	5
Being in an area with good schools	1	2	3	4	5
Being near to friends or family	1	2	3	4	5
Being in a quiet neighbourhood	1	2	3	4	5
Being in an area of affordable housing	1	2	3	4	5
Being near to a park	1	2	3	4	5

   Other (specify).....
   .....

2. What were your reasons for leaving your previous address?

   Please circle one number for EACH factor listed below

   NB: 1 = irrelevant to the decision to leave, 2 = of slight importance, 3 = fairly important, 4 = very important, 5 = crucial to the decision to leave

Your previous home					
too small	1	2	3	4	5
too large	1	2	3	4	5
had no garden/too small a garden	1	2	3	4	5
Your previous neighbourhood					
Crime levels	1	2	3	4	5
Quality of schools	1	2	3	4	5
Noise or air pollution	1	2	3	4	5
Traffic intrusion	1	2	3	4	5
Lack of greenery	1	2	3	4	5
Neighbours, social problems	1	2	3	4	5
Your personal circumstances					
My place of work changed	1	2	3	4	5
I wanted to change tenure (e.g. renting to owner occupation)	1	2	3	4	5
I wanted to 'trade up' to a more expensive home	1	2	3	4	5
I wanted to set up my first home	1	2	3	4	5
I needed to leave because of relationship breakdown	1	2	3	4	5
I wanted to move due to changes in household size (e.g. children leaving home, arrival of a new baby, etc.)	1	2	3	4	5

   Other (specify).....
   .....

3. What was the postcode of your previous address? (If you cannot remember it please give the name of the road and the area)

   __/__/__/__/__/__/__

4. Which of the following categories best describes your household? (Please tick only one answer)

Single adult living alone	_
Elderly person living alone	_
Adult couple	_
Adult couple with child / children	_
Single adult with child / children	_
2 or more adults sharing (with no children)	_
Other (specify).....	_
.....	

5. Which of the following categories best describes the occupation of the highest wage earner in the household? (Please tick only one answer)

Professional or managerial position	_
Administrative or clerical work	_
Skilled non-manual work	_
Skilled manual work	_
Semi-skilled work	_
Unskilled work	_
Not in employment	_

6. May we ask you to indicate your age by ticking one of these categories:

Up to 34 years old	_
Between 35 and 59 years old	_
Over 60 years old	_

7. How long does it take you to travel to work? (Please tick one category only)

Less than 20 minutes	_
Between 21& 40 minutes	_
Between 41& 60 minutes	_
Over one hour	_

8. How many cars are available to your household? (Please tick one number only)

No cars	_
I car	_
2 cars or more cars	_

9. In which year did you move to your current address? _____

10. What is the postcode of your current address? __/__/__/__/__/__/__

11. Are you an owner occupier or do you rent your present home? (Please tick one answer)

Owner occupier	_
Tenant	_

12. If you are an owner occupier, are you a 'first-time buyer'? Yes _ No _

13. Overall how satisfied or dissatisfied are you with the *location* of your current home? (Please circle only one number)

NB: 1 = very dissatisfied, 2 = fairly dissatisfied, 3 = neither satisfied nor dissatisfied, 4 = fairly satisfied and 5 = very satisfied

Very dissatisfied	1	2	3	4	5	Very satisfied

Thank you for your help

To enter the prize draw please write your name and address here.....
.....

Please could you return the completed questionnaire in the envelope provided, to Steve Bennett, School of the Built Environment, Liverpool John Moores University, Clarence Street, Liverpool, L3 5UG

3 Annex: Attractivity of a region

Attractivity A of a region $i(i = 1 \ldots, n)$ for an actor class $k(k = 1, ..., m)$ depends on the populations P_{ik} of all actor classes in this region: $A_{ik} = A_{ik}\,(P_{i1}, \ldots, P_{im})$.

Dynamic equations for the attractivity-migration approach for n regions and m actor classes:

$$\sum_i P_{ik} = P_k \qquad 0 \leqslant P_{ik} \leqslant P_k \qquad A_{ik} \geqslant 0$$

$$\tfrac{dP_{ik}}{dt} = \textstyle\sum_{l=1,\ l\neq i}^{n} A_{lk}\,(P_{l1}, \ldots, P_{lm}) - (n-1) \cdot A_{ik}\,(P_{i1}, \ldots, P_{im})$$

In its qualitative formulation the right hand sides of the above equations are only defined by the signs of their partial derivatives

$$s_{ikj} \;=\; sign\left(\frac{\partial A_{ik}}{\partial P_{ij}}\right)$$

which denote for each region i how its attractivity for actor class k is influenced by the population of actor class j in this region.

If one exogenises the attractivity development for all actor classes $k(k = 1, \ldots, m)$ in all regions except the investigated region the endogenous dynamics is described by the following m differential equations:

$$P_k \geqslant\ 0$$

$$\tfrac{dP_k}{dt} = A_k\,(P_1, \ldots, P_m)$$

Again, in its qualitative formulation the right hand sides of the above equations are only defined by the signs of their partial derivatives

$$s_{kj} \;=\; sign\left(\frac{\partial A_k}{\partial P_j}\right)$$

which denote how the attractivity for actor class k is influenced by the population of actor class j in the sprawl region.

4 Annex: Cluster algorithm for Leipzig

```
;proxim3he: Clustert nach Praeferenzen und Merkmalen fuer Leipzig
**************************
;"hierarchischer Algorithmus", gewichtung (unemployment)
;faengt bei pkrit neues cluster an (nich nach Anzahl)

function sprox,f,l
;Bestimmt die Proximitaetssumme von f
m=15
so=24
alpha=20
nie=0
s=0.
if l eq 1 then return,1.
for z1=0,l-1 do begin
 for z2=0,z1-1 do begin
  s=s+((m-sum( abs(f(0:m-1,z1)-f(0:m-1,z2)), 0))/float(m)+ $
    alpha* (so+nie-sum( abs(f(m:m+so-1,z1)-f(m:m+so-1,z2)),0) $
    - abs(f(m+13,z1)-f(m+13,z2))*float(nie))/float(so+nie))/(1.+alpha)
 endfor
endfor
return,s
end

function sproxzp,f,l,zzu
;Beitrag zur P-Summe aller Paare mit dem neu hinzugekommenen zzu
m=15
so=24
alpha=20
nie=0
s=0.
for z2=0,l-1 do begin
 s=s+(m-sum( abs(zzu(*)-f(*,z2)), 0))/float(m)
  s=s+((m-sum( abs(zzu(0:m-1)-f(0:m-1,z2)), 0))/float(m)+ $
 alpha* (so+nie-sum( abs(zzu(m:m+so-1)-f(m:m+so-1,z2)),0) $
  - abs(zzu(m+13)-f(m+13,z2))*float(nie))/float(so+nie))/(1.+alpha)
endfor
return,s
end

function npar,n
;Anzahl der Paare unabh. von der Reihenfolge
if n eq 1 then return,1.
return,float(n)*(n-1)/2.
end
```

```
function schizu,c,ncl,nz,h
;nimmt aus dem Cluster ncl das Element nz raus
;und schiebt den Rest zusammen
i=ncl-1
if nz le c(i,h)-2 then c(i,nz:c(i,h)-2)=c(i,nz+1:c(i,h)-1)
;Cluster i zusammenschieben
if nz le c(i,h)-2 then c(i,c(i,h)-1)=-99
if nz eq c(i,h)-1 then c(i,nz)=-99 ;Cluster i abschneiden
c(i,h)=c(i,h)-1 ;Zahl der Elemente aktualisieren
return,c
end

;HP**************************************************************************

m=15 ;Praeferenzen
so=24 ;soz./oek./dem. Merkmale
h=194 ;Befragte
pkrit=.8
maxl=100
ff=intarr(m+so,h)
openr,1,'dataLEi.txt'
readf,1,ff
close,1

;die rausschmeissen, die ihre Entscheidung nicht signifikant auf den
;angegebenen Praeferenzen aufgebaut haben

ii=0
fff=intarr(m+so,h)
for i=0,h-1 do begin
 if sum(ff(0:14,i),0) gt 1 and sum(ff(0:14,i),0) lt 14 then begin
  fff(*,ii)=ff(*,i)
  ii=ii+1
 endif
endfor

h=ii
ft=fff(0:14,0:h-1); h Praeferenzvektoren
st=fff(15:38,0:h-1); dazugehoerige Charakteristika

;relevantes Feld zum clustern: fff(m+so,h)

print,h
```

```
;Clusteralgorithmus
;c=intarr(nc,h+1)-99 enthaelt die Zeilennummern jedes Clusters,
;c(..,h)=Anzahl der Elemente

nc=5
c=intarr(nc,h+1)-99
;alle ins letzte cluster
cc=[indgen(h),h]
c(nc-1,*)=cc

;einen beliebigen ins erste cluster

index=nint(randomu(seed)*h)
if index eq h then index=h-1

;index=23

openw,1,'clLEi.asc'
ic=0 ;cluster zum Aufbauen

hopp:

c(ic,0)=c(nc-1,index)
c(ic,h)=1
c=schizu(c,nc,index,h) ; aus dem letzen cluster rausnehmen
;print,fff(*,c(ic,0)),format='(39i1)'

tast='0'
while tast ne 'q' do begin
  fic=fff(*,c(ic,0:c(ic,h)-1))
  ;print,fic,format='(15i2)'
  ps1=sprox(fic,c(ic,h))/npar(c(ic,h))
  print,ps1,c(ic,h)

  if ps1 lt pkrit then tast='q'
  ;nacheinander alle verbliebenen im letzten cluster (nc) zum ersten tun
  ;und auswerten
  dps=fltarr(c(nc-1,h))
    for i=0,c(nc-1,h)-1 do begin
    ;Beitrag zur P-Summe aller Paare mit dem neu hinzugekommenen zzu
      dps(i)=sproxzp( fic, c(ic,h),fff(*,c(nc-1,i) ) )
    endfor
   ma=max(dps,index)
   ib=c(nc-1,index)
   c(ic,c(ic,h))=ib ;den besten ans erste cluster haengen
```

```
   c(ic,h)=c(ic,h)+1
   c=schizu(c,nc,index,h) ; den besten aus dem letzen cluster rausnehmen
   if c(nc-1,h) eq 1 then tast='q'
   ;tast=get_kbrd(0)
   if c(ic,h) eq maxl then tast='q'
endwhile

print,'---'
printf,1,'---'
printf,1,ps1,c(ic,h)
;printf,1,fic,format='(39i1)'

sei=fltarr(so+m)
for j=0,so+m-1 do sei(j)=sum(fff(j,c(ic,0:c(ic,h)-1)),1)/float(c(ic,h))
 printf,1,nint(sei*100.),format='(39i4)'
 mi=min(dps,index)
 ic=ic+1

if ic lt nc-1 then goto,hopp
ic=nc-1
fic=fff(*,c(ic,0:c(ic,h)-1))
ps1=sprox(fic,c(ic,h))/npar(c(ic,h))

print,'----'
print,ps1,c(ic,h)
printf,1,'----'
printf,1,ps1,c(ic,h)

sei=fltarr(so+m)
for j=0,so+m-1 do sei(j)=sum(fff(j,c(ic,0:c(ic,h)-1)),1)/float(c(ic,h))
printf,1,nint(sei*100.),format='(39i4)'
printf,1,'----'
printf,1,c
close,1

end
```

5 Annex: Cluster algorithm for Wirral

```
;proxim3he: Clustert nach Praeferenzen und Merkamlen fuer Wirral
*******************************************************
;"hierarchischer Algorithmus", gewichtung (unemployment)
;faengt bei pkrit neues cluster an (nich nach Anzahl)

function sprox,f,l
;Bestimmt die Proximitaetssumme von f
m=14
so=24
alpha=20
nie=0
s=0.
if l eq 1 then return,1.
 for z1=0,l-1 do begin
  for z2=0,z1-1 do begin
    s=s+((m-sum( abs(f(0:m-1,z1)-f(0:m-1,z2)), 0))/float(m)+ $
    alpha* (so+nie-sum( abs(f(m:m+so-1,z1)-f(m:m+so-1,z2)),0) $
    - abs(f(m+13,z1)-f(m+13,z2))*float(nie))/float(so+nie))/(1.+alpha)
  endfor
 endfor
return,s
end

function sproxzp,f,l,zzu
;Beitrag zur P-Summe aller Paare mit dem neu hinzugekommenen zzu
m=14
so=24
alpha=20
nie=0
s=0.
for z2=0,l-1 do begin
 s=s+(m-sum( abs(zzu(*)-f(*,z2)), 0))/float(m)
 s=s+((m-sum( abs(zzu(0:m-1)-f(0:m-1,z2)), 0))/float(m)+ $
  alpha* (so+nie-sum( abs(zzu(m:m+so-1)-f(m:m+so-1,z2)),0) $
  - abs(zzu(m+13)-f(m+13,z2))*float(nie))/float(so+nie))/(1.+alpha)
endfor
return,s
end

function npar,n
;Anzahl der Paare unabh. von der Reihenfolge
if n eq 1 then return,1.
return,float(n)*(n-1)/2.
end
```

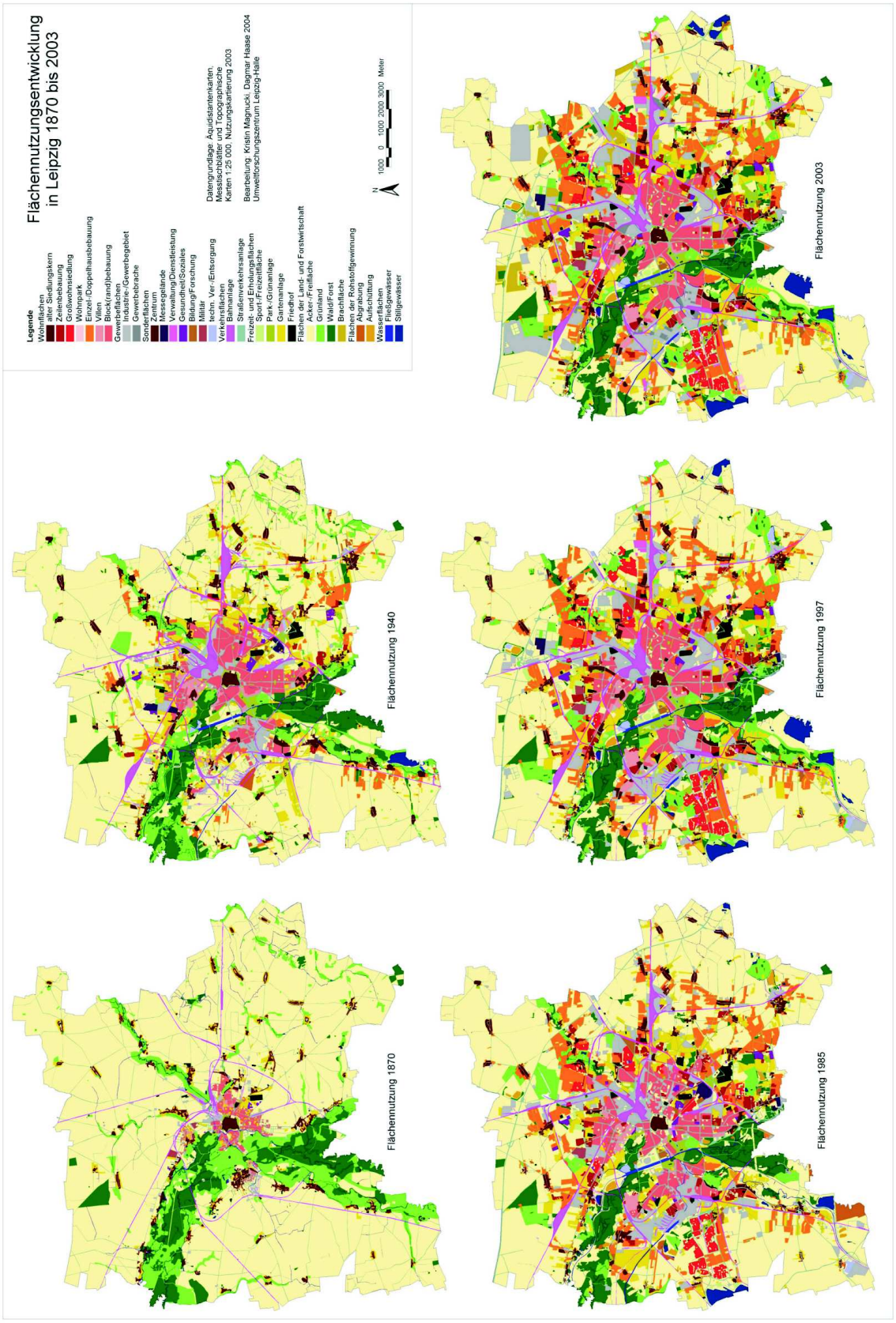
```
function schizu,c,ncl,nz,h
;nimmt aus dem Cluster ncl das Element nz raus
;und schiebt den Rest zusammen
i=ncl-1
if nz le c(i,h)-2 then c(i,nz:c(i,h)-2)=c(i,nz+1:c(i,h)-1)
;Cluster i zusammenschieben

if nz le c(i,h)-2 then c(i,c(i,h)-1)=-99
if nz eq c(i,h)-1 then c(i,nz)=-99 ;Cluster i abschneiden

c(i,h)=c(i,h)-1 ;Zahl der Elemente aktualisieren
return,c
end
;HP*************************************************************************
m=14 ;Praeferenzen Wirral
so=24 ;soz./oek./dem. Merkmale Wirral
h=203 ; Befragte in Wirral
pkrit=.87
maxl=100

ff=intarr(m+so,h)
openr,1,'fulltabout.txt'
readf,1,ff
close,1

;die rausschmeissen, die ihre Entscheidung nicht signifikant auf den
;angegebenen Praeferenzen aufgebaut haben;
;ii=0
;fff=intarr(m+so,h)
;for i=0,h-1 do begin
; if sum(ff(0:7,i),0) gt 2 and sum(ff(0:7,i),0) lt 12 then begin
; fff(*,ii)=ff(*,i)
; ii=ii+1
; endif
;endfor
;h=ii
;ft=fff(0:7,0:h-1); h Praeferenzvektoren
;st=fff(8:30,0:h-1); dazugehoerige Charakteristika

ii=0 ; fuer Wirral
fff=intarr(m+so,h)
for i=0,h-1 do begin
 if sum(ff(0:13,i),0) gt 2 and sum(ff(0:13,i),0) lt 12 then begin
  fff(*,ii)=ff(*,i)
```

```
  ii=ii+1
 endif
endfor

h=ii
ft=fff(0:13,0:h-1); h Praeferenzvektoren
st=fff(14:23,0:h-1); dazugehoerige Charakteristika

;relevantes Feld zum clustern: fff(m+so,h)
print,h
;Clusteralgorithmus
;c=intarr(nc,h+1)-99 enthaelt die Zeilennummern jedes Clusters,
;c(..,h)=Anzahl der Elemente

nc=5
c=intarr(nc,h+1)-99

;alle ins letzte cluster
cc=[indgen(h),h]
c(nc-1,*)=cc

;einen beliebigen ins erste cluster
index=nint(randomu(seed)*h)
if index eq h then index=h-1

;index=44
openw,1,'cl5.asc'
ic=0 ;cluster zum Aufbauen

hopp:

c(ic,0)=c(nc-1,index)
c(ic,h)=1
c=schizu(c,nc,index,h) ; aus dem letzen cluster rausnehmen

;print,fff(*,c(ic,0)),format='(38i1)'
tast='0'

while tast ne 'q' do begin
  fic=fff(*,c(ic,0:c(ic,h)-1))
  ;print,fic,format='(14i2)'
  ps1=sprox(fic,c(ic,h))/npar(c(ic,h))
  print,ps1,c(ic,h)
  if ps1 lt pkrit then tast='q'
  ;nacheinander alle verbliebenen im letzten cluster (nc) zum ersten tun
```

```
  ;und auswerten
  dps=fltarr(c(nc-1,h))
  for i=0,c(nc-1,h)-1 do begin
    ;Beitrag zur P-Summe aller Paare mit dem neu hinzugekommenen zzu
    dps(i)=sproxzp( fic, c(ic,h),fff(*,c(nc-1,i) ) )
  endfor
  ma=max(dps,index)
  ib=c(nc-1,index)
  c(ic,c(ic,h))=ib ;den besten ans erste cluster haengen
  c(ic,h)=c(ic,h)+1
  c=schizu(c,nc,index,h) ; den besten aus dem letzen cluster rausnehmen
  if c(nc-1,h) eq 1 then tast='q'
  ;tast=get_kbrd(0)
  if c(ic,h) eq maxl then tast='q'
endwhile

print,'---'
printf,1,'---'
printf,1,ps1,c(ic,h)
;printf,1,fic,format='(38i1)'

sei=fltarr(so+m)
for j=0,so+m-1 do sei(j)=sum(fff(j,c(ic,0:c(ic,h)-1)),1)/float(c(ic,h))
 printf,1,nint(sei*100.),format='(38i4)'
 mi=min(dps,index)
 ic=ic+1
if ic lt nc-1 then goto,hopp
ic=nc-1
fic=fff(*,c(ic,0:c(ic,h)-1))
ps1=sprox(fic,c(ic,h))/npar(c(ic,h))

print,'----'
print,ps1,c(ic,h)
printf,1,'----'
printf,1,ps1,c(ic,h)

sei=fltarr(so+m)
for j=0,so+m-1 do sei(j)=sum(fff(j,c(ic,0:c(ic,h)-1)),1)/float(c(ic,h))
printf,1,nint(sei*100.),format='(38i4)'

printf,1,'----'
printf,1,c
close,1

end
```

6 Annex: Land use in Leipzig

Figure F.3: Land use in Leipzig



7 Annex: Characterisation of Inner and Outer Leipzig

Table T.4: Characterisation of Inner and Outer Leipzig according to city districts. Source: Own draft, Data: Amt für Statistik und Wahlen Leipzig, Vermessungsamt Leipzig.

	Inner urban area	Area [ha]	Outer urban area	Area [ha]
City districts of Leipzig	Zentrum	70	Mölkau	520
	Zentrum-Ost	160	Engelsdorf	830
	Zentrum-Südost	310	Baalsdorf	390
	Zentrum-Süd	160	Althen-Kleinpösna	880
	Zentrum-West	160	Liebertwolkwitz	930
	Zentrum-Nordwest	400	Holzhausen	1290
	Zentrum-Nord	130	Hartmannsdorf-Knautnaundorf	1590
	Schönefeld-Abtnaundorf	290	Miltitz	300
	Schönefeld-Ost	320	Böhlitz-Ehrenberg	870
	Mockau-Süd	130	Burghausen-Rückmarsdorf	710
	Mockau-Nord	450	Lützschena- Stahmeln	1830
	Thekla	720	Lindenthal	1280
	Plaußig-Portitz	730	Seehausen	1800
	Neustadt-Neuschönefeld	90	Wiederitzsch	940
	Volkmarsdorf	100		
	Anger-Crottendorf	190		
	Sellerhausen-Stünz	300		
	Paunsdorf	390		
	Heiterblick	380		
	Reudnitz-Thonberg	200		
	Stötteritz	370		
	Probstheida	490		
	Meusdorf	200		
	Südvorstadt	240		
	Connewitz	730		
	Marienbrunn	120		
	Lößnig	180		
	Dölitz-Dösen	420		
	Schleußig	210		
	Plagwitz	170		
	Kleinzschoner	310		
	Großzschoner	1580		
	Knautkleeberg-Knauthain	800		
	Schönau	310		
	Grünau-Ost	110		
	Grünau-Mitte	120		
	Grünau-Siedlung	160		
	Lausen-Grünau	380		
	Grünau-Nord	90		
	Lindenau	100		
	Altlindenau	240		
	Neulindenau	250		
	Leutzsch	450		
	Möckern	490		
	Wahren	460		
	Gohlis-Süd	200		
	Gohlis-Mitte	130		
	Gohlis-Nord	200		
	Eutritzsch	460		
	Sum of area	**15650**		**14160**

8 Annex: Population figures for Leipzig

Table T.5: Population figures for the city districts in Leipzig between 1951-1989. Sources: * - Data: Statistisches Landesamt Sachsen ** - Data: Staatsarchiv Leipzig.

Year	1950*	1960*		1971*		1981**		1989*	
City District	Totals	Totals	% change	Totals	% change	Totals	% change	Totals	% change
Althen	554	514	-7.2	441	-14.2	387	-12.2	367	-5.2
Baalsdorf	1089	956	-12.2	967	1.2	958	-0.9	1045	9.1
Böhlitz-Ehrenberg	10795	10236	-5.2	10506	2.6	9472	-9.8	8622	-9.0
Burghausen	1523	1298	-14.8	1147	-11.6	1136	-1.0	1032	-9.2
Engelsdorf	9062	8010	-11.6	7827	-2.3	6950	-11.2	6050	-12.9
Hartmannsdorf	789	606	-23.2	590	-2.6	527	-10.7	613	16.3
Holzhausen	6784	6350	-6.4	6153	-3.1	5566	-9.5	5315	-4.5
Kleinpösna	560	271	-51.6	264	-2.6	351	33.0	372	6.0
Knautnaundorf	5646	380	-93.3	311	-18.2	434	39.5	562	29.5
Liebertwolkwitz	6320	5990	-5.2	5707	-4.7	5248	-8.0	4679	-10.8
Lindenthal	5658	4917	-13.1	4481	-8.9	3830	-14.5	3311	-13.6
Lützschena	3620	3530	-2.5	3139	-11.1	2653	-15.5	2362	-11.0
Miltitz	2581	2418	-6.3	2271	-6.1	1547	-31.9	1381	-10.7
Mölkau	5777	5247	-9.2	5004	-4.6	4478	-10.5	3889	-13.2
Rückmarsdorf	1701	1476	-13.2	1393	-5.6	1221	-12.3	1069	-12.4
Seehausen	1088	977	-10.2	899	-8.0	796	-11.5	694	-12.8
Stahmeln	1243	1120	-9.9	1036	-7.5	870	-16.0	762	-12.4
Wiederitzsch	5523	5137	-7.0	5088	-1.0	4449	-12.6	4036	-9.3
Suburban area of Leipzig	**70313**	**59433**	**-15.5**	**57224**	**-3.7**	**50873**	**-11. 1**	**46161**	**-9.3**
City of Leipzig	**617574**	**589632**	**-4.5**	**584365**	**-0.9**	**559574**	**-4.2**	**513574**	**-8.2**
Leipzig Agglomeration	**687887**	**649065**	**-5.6**	**641589**	**-1.2**	**610447**	**-4.9**	**559735**	**-8.3**

Table T.6: Number of first and secondary residencies in Leipzig between 2000-2005, Source: Amt für Statistik und Wahlen Leipzig.

# of city district	2000	2001	% change 2000/2001	2002	% change 2001/2002	2003	% change 2002/2003	2004	% change 2003/2004	2005	% change 2004/2005
0	2234	2371	6.1	2370	0.0	2298	-3.0	2177	-5.3	2130	-2.2
1	2981	3167	6.2	3370	6.4	3498	3.8	3350	-4.2	3552	6.0
2	13107	13112	0.0	13018	-0.7	12530	-3.7	12552	0.2	12561	0.1
3	9475	9698	2.4	10044	3.6	10333	2.9	10581	2.4	10707	1.2
4	8060	8597	6.7	8642	0.5	9102	5.3	9469	4.0	9638	1.8
5	7256	7835	8.0	8212	4.8	8557	4.2	8707	1.8	8964	3.0
6	7119	7470	4.9	7601	1.8	7648	0.6	7384	-3.5	7513	1.7
10	9909	9702	-2.1	9701	0.0	9666	-0.4	9644	-0.2	9574	-0.7
11	10884	10622	-2.4	10100	-4.9	10101	0.0	10008	-0.9	9957	-0.5
12	4390	4306	-1.9	4268	-0.9	4240	-0.7	4247	0.2	4191	-1.3
13	12142	11787	-2.9	11528	-2.2	11336	-1.7	11217	-1.0	10925	-2.6
14	6251	6133	-1.9	6138	0.1	6021	-1.9	6008	-0.2	6009	0.0
15	2701	2720	0.7	2782	2.3	2823	1.5	2843	0.7	2834	-0.3
20	9102	9272	1.9	9439	1.8	9685	2.6	9767	0.8	9969	2.1
21	8369	8069	-3.6	8133	0.8	8357	2.8	8458	1.2	8315	-1.7
22	9062	9324	2.9	9497	1.9	9678	1.9	9905	2.3	10010	1.1
23	8057	7890	-2.1	7963	0.9	8022	0.7	8096	0.9	8140	0.5
24	16216	15559	-4.1	15331	-1.5	15402	0.5	15070	-2.2	14985	-0.6
25	4101	4301	4.9	4367	1.5	4086	-6.4	4184	2.4	4188	0.1
30	17485	17520	0.2	17818	1.7	18039	1.2	18099	0.3	18143	0.2
31	13099	13574	3.6	13897	2.4	14354	3.3	14524	1.2	14612	0.6
32	5008	5256	5.0	5433	3.4	5706	5.0	5932	4.0	5965	0.6
33	3821	3802	-0.5	3764	-1.0	3722	-1.1	3659	-1.7	3624	-1.0
40	18856	19867	5.4	20578	3.6	21214	3.1	21794	2.7	22379	2.7
41	15123	15601	3.2	16177	3.7	16625	2.8	16860	1.4	16928	0.4
42	6626	6417	-3.2	6274	-2.2	6216	-0.9	6090	-2.0	6004	-1.4
43	13076	12850	-1.7	12708	-1.1	12536	-1.4	12180	-2.8	12161	-0.2

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44	4612	4640	0.6	4691	1.1	4538	-3.3	4422	-2.6	4105	-7.2
50	9529	9986	4.8	10463	4.8	10851	3.7	11161	2.9	11424	2.4
51	9303	9533	2.5	10002	4.9	10539	5.4	11002	4.4	11221	2.0
52	8141	8170	0.4	8269	1.2	8293	0.3	8375	1.0	8441	0.8
53	9104	9114	0.1	9017	-1.1	9084	0.7	9051	-0.4	9067	0.2
54	5179	5322	2.8	5414	1.7	5471	1.1	5636	3.0	5669	0.6
60	5358	4985	-7.0	4736	-5.0	4556	-3.8	4720	3.6	4824	2.2
61	10568	10084	-4.6	9761	-3.2	9317	-4.5	9213	-1.1	9047	-1.8
62	15653	14689	-6.2	14232	-3.1	13722	-3.6	13224	-3.6	13026	-1.5
63	4249	4274	0.6	4267	-0.2	4297	0.7	4335	0.9	4205	-3.0
64	16903	15962	-5.6	14999	-6.0	14445	-3.7	13880	-3.9	13775	-0.8
65	11472	11043	-3.7	10590	-4.1	10004	-5.5	9654	-3.5	9236	-4.3
70	5277	5377	1.9	5537	3.0	5717	3.3	5828	1.9	5933	1.8
71	12132	12150	0.1	12408	2.1	13022	4.9	13277	2.0	13224	-0.4
72	5451	5478	0.5	5459	-0.3	5366	-1.7	5322	-0.8	5384	1.2
73	8823	8627	-2.2	8667	0.5	8792	1.4	8886	1.1	8920	0.4
80	12853	12902	0.4	12883	-0.1	12743	-1.1	12810	0.5	12670	-1.1
81	6092	6042	-0.8	6165	2.0	6124	-0.7	6144	0.3	6035	-1.8
90	12942	13740	6.2	14385	4.7	14639	1.8	15052	2.8	15448	2.6
91	13080	13293	1.6	13566	2.1	13933	2.7	14127	1.4	14119	-0.1
92	8729	8566	-1.9	8486	-0.9	8486	0.0	8485	0.0	8355	-1.5
93	11224	11245	0.2	11101	-1.3	11405	2.7	11504	0.9	11363	-1.2
Inner Leipzig	**451184**	**452044**	**0.2**	**454251**	**0.5**	**457139**	**0.6**	**458913**	**0.4**	**459469**	**0.1**
26	6374	6327	-0.7	6279	-0.8	6214	-1.0	6265	0.8	6201	-1.0
27	8099	8157	0.7	8161	0.0	8194	0.4	8168	-0.3	8184	0.2
28	1405	1461	4.0	1514	3.6	1512	-0.1	1583	4.7	1584	0.1
29	2031	2107	3.7	2121	0.7	2147	1.2	2130	-0.8	2190	2.8
34	5312	5269	-0.8	5281	0.2	5297	0.3	5312	0.3	5308	-0.1

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35	6397	6397	0.0	6393	-0.1	6360	-0.5	6394	0.5	6372	-0.3
55	1218	1234	1.3	1220	-1.1	1208	-1.0	1218	0.8	1211	-0.6
66	2058	2054	-0.2	2060	0.3	2077	0.8	2078	0.0	2103	1.2
74	9272	9491	2.4	9527	0.4	9653	1.3	9779	1.3	9806	0.3
75	4527	4642	2.5	4754	2.4	4799	0.9	4870	1.5	4853	-0.3
82	4042	4129	2.2	4183	1.3	4199	0.4	4210	0.3	4242	0.8
83	6018	6001	-0.3	5996	-0.1	5898	-1.6	5938	0.7	5835	-1.7
94	2234	2227	-0.3	2244	0.8	2234	-0.4	2257	1.0	2259	0.1
95	7257	7439	2.5	7665	3.0	7877	2.8	8060	2.3	8275	2.7
Outer Leipzig	**66244**	**66935**	**1.0**	**67398**	**0.7**	**67669**	**0.4**	**68262**	**0.9**	**68423**	**0.2**
All Leipzig	**517428**	**518979**	**0.3**	**521649**	**0.5**	**524808**	**0.6**	**527175**	**0.5**	**527892**	**0.1**
not to ascribe to a certain district	754	441		424		353		286		264	
	518182	**519420**	**0.2**	**522073**	**0.5**	**525161**	**0.6**	**527461**	**0.4**	**528156**	**0.1**

Table T.7: Summary to population statistics in Leipzig. Source: Author's draft, Data: Amt für Statistik und Wahlen Leipzig.

	Inner Leipzig	Outer Leipzig	City of Leipzig
2000	451184	66244	517428
2001	452044	66935	518979
Percentage change 2000-2001	0.2	1.0	0.3
2002	454251	67398	521649
Percentage change 2001-2002	0.5	0.7	0.5
2003	457139	67669	524808
Percentage change 2002-2003	0.6	0.4	0.6
2004	458913	68262	527175
Percentage change 2003-2004	0.4	0.9	0.5
2005	459469	68423	527892
Percentage change 2004-2005	0.1	0.2	0.1

9 Annex: Classification of Inner and Outer Wirral

Table T.8: Classification of Inner and Outer Wirral along ward boundaries I. Source: Author's draft.

Old area classification until 1978, Characterising the census years 1951- 1971	**Ward classification for the census years 1981- 2001, Respective definition of Inner Wirral and Outer Wirral for research question 2-4**
Inner Wirral	**Inner Wirral**
Birkenhead County Borough	Bidston
Wallasay County Borough	Birkenhead
	Claughton
	Egerton
	Liscard
	New Brighton
	Oxton
	Seacombe
	Tranmere
	Wallasey
Outer Wirral	**Outer Wirral**
Bebington Municipal Borough	Bebington
Wirral Urban District	Bromborough
Hoylake Urban District	Clatterbridge
	Eastham
	Heswall
	Hoylake
	Leasowe
	Moreton
	Prenton
	Royden
	Thurstaston
	Upton

Table T.9: Classification of Inner and Outer Wirral along ward boundaries II. Source: Author's draft.
Note: The current wards Prenton, Upton, Leasowe and Moreton have to be assigned to Inner Wirral for research question 1 whereas they belong to Outer Wirral for research question 2-4. The spatial organisation of the Wirral district before 1974 demands this slight modification to enable comparison before and after that date.

Old area classification until 1978, Characterising the census years 1951-1971	**Ward classification for the census years 1981- 2001, Respective definition of Inner Wirral and Outer Wirral for research question 1**
Inner Wirral	**Inner Wirral**
Birkenhead County Borough	Bidston
Birkenhead County Borough	Birkenhead
Birkenhead County Borough	Claughton
Birkenhead County Borough	Egerton
Birkenhead County Borough	Oxton
Birkenhead County Borough	Prenton ←
Birkenhead County Borough	Tranmere
Birkenhead County Borough	Upton ←
Wallasay County Borough	Wallasey
Wallasay County Borough	Leasowe ←
Wallasay County Borough	Liscard
Wallasay County Borough	Moreton ←
Wallasay County Borough	New Brighton
Wallasay County Borough	Seacombe
Outer Wirral	**Outer Wirral**
Bebington Municipal Borough	Bebington
Bebington Municipal Borough	Bromborough
Bebington Municipal Borough	Clatterbridge
Bebington Municipal Borough	Eastham
Wirral Urban District	Heswall
Wirral Urban District	Thurstaston
Hoylake Urban District	Hoylake
Hoylake Urban District	Royden

10 Annex: Population figures for Inner and Outer Wirral

Table T.10: Population figures for Inner Wirral between 1951-1971 on ward level. Source: Office for National Statistics UK.

Birkenhead County Borough					
Ward Name	**Total Persons 1951**	**Total Persons 1961**	**Percentage change 1951-1961**	**Total Persons 1971**	**Percentage change 1961-1971**
No 1 Grange	7994	7086	-11.4	5723	-19.2
No 2 Holt	9167	7602	-17.1	8723	14.7
No 3 Devonshire	8704	8083	-7.1	7140	-11.7
No 4 Oxton	6891	7045	2.2	10701	51.9
No 5 Claughton	6633	6388	-3.7	6340	-0.8
No 6 St. James	11618	10286	-11.5	8560	-16.8
No 7 Gilbrook	7822	6699	-14.4	4911	-26.7
No 8 Cleveland	8918	6233	-30.1	3684	-40.9
No 9 Cathcart	9703	7810	-19.5	4261	-45.4
No 10 Argyle	7224	5143	-28.8	2207	-57.1
No 11 Clifton	9579	7836	-18.2	4809	-38.6
No 12 Mersey	9442	7727	-18.2	5631	-27.1
No 13 Bebington	9970	8681	-12.9	7333	-15.5
No 14 Egerton	11184	10174	-9.0	9406	-7.5
No 15 Prenton	7467	18801	151.8	22010	17.1
No 16 Upton	10185	16219	59.2	27644	70.4
	142501	141813	-0.5	139083	-1.9
Wallasey County Borough					
No 1 New Brighton	6649	6302	-5.2	5903	-6.3
No 2 Upper Brighton	6198	5725	-7.6	5020	-12.3
No 3 North Liscard	5969	5605	-6.1	4960	-11.5
No 3 South Liscard	5359	4759	-11.2	4052	-14.9
No 5 North Egremont	5228	4751	-9.1	4479	-5.7
No 6 South Egremont	5752	5209	-9.4	4550	-12.7
No 7 North Seacombe	5333	4196	-21.3	3625	-13.6
No 8 South Seacombe	5195	7013	35.0	3623	-48.3
No 9 Somerville	7061	9226	30.7	5352	-42.0
No 10 Poulton	6716	5870	-12.6	5127	-12.7
No 11 Marlowe	5714	5129	-10.2	4895	-4.6
No 12 St Hillary	6532	5632	-13.8	5313	-5.7
No 13 Warren	7411	7394	-0.2	7185	-2.8
No 14 Wallasey	4446	5426	22.0	5555	2.4
No 15 Leasowe	9560	15603	63.2	17873	14.5
No 16 Moreton and Saughall Massle	8606	13915	61.7	9673	-30.5
	101729	111755	9.9	97185	-13.0
Inner Wirral	**244230**	**253568**	**3.8**	**236268**	**-6.8**

Table T.11: Population figures for Outer Wirral between 1981-2001 on ward level. Source: Office for National Statistics UK.

Bebington Metropolitan Borough					
Ward Name	**Total Persons 1951**	**Total Persons 1961**	**Percentage change 1951-1961**	**Total Persons 1971**	**Percentage change 1961-1971**
No 1 Higher Bebington	5115	6413	25.4	6881	7.3
No 2 Woodbery	6108	6361	4.1	6291	-1.1
No 3 Bebington	4713	4350	-7.7	4306	-1.0
No 4 Park	4138	2916	-29.5	2966	1.7
No 5 New Ferry	4508	3829	-15.1	3162	-17.4
No 6 Sunlight	3742	3391	-9.4	3142	-7.3
No 7 North Bromborough	4022	5350	33.0	5080	-5.0
No 8 South Bromborough	5680	5902	3.9	9934	68.3
No 9 Eastham	5490	8939	62.8	13014	45.6
No 10 Poulton	4328	5363	23.9	6655	24.1
	47844	52814	10.4	61431	16.3
Hoylake Urban District					
Caldy and Frankby	1020	1078	5.7	1078	0.0
Central	3532	3466	-1.9	3087	-10.9
Grange	6563	5697	-13.2	6894	21.0
Greasby	4367	6978	59.8	6860	-1.7
Hoose	4327	3837	-11.3	3461	-9.8
Meols	4254	4864	14.3	4857	-0.1
Park	4145	3951	-4.7	3742	-5.3
South	2478	2402	-3.1	2298	-4.3
	30686	32273	5.2	32277	0.0
Wirral Urban District					
Barnston	2466	3784	53.4	4338	14.6
Gayton	2438	2939	20.5	3691	25.6
Heswall	2446	2445	0.0	2534	3.6
Irby and Thurstaton	2305	3124	35.5	3057	-2.1
Irby South	2620	4296	64.0	5086	18.4
Oldfield	2865	2791	-2.6	3781	35.5
Pensby	2274	2965	30.4	4398	48.3
	17414	22344	28.3	26885	20.3
Outer Wirral	**95944**	**107431**	**12.0**	**120593**	**12.3**

Table T.12: Population change in Inner and Outer Wirral between 1951-1971. Source: Office for National Statistics UK.

Area classification	Resident Population				
	1951	**1961**	**Percentage change 1951-1961**	**1971**	**Percentage change 1961-1971**
Birkenhead County Borough	142501	141813	-0.5	139083	-1.9
Wallasey County Borough	101729	111755	9.9	97185	-13.0
Inner Wirral	**244230**	**253568**	**3.8**	**236268**	**-6.8**
Bebington Municipal Borough	47844	52814	10.4	61431	16.3
Hoylake Urban District	30686	32273	5.2	32277	0.0
Wirral Urban District	17414	22344	28.3	26885	20.3
Outer Wirral	**95944**	**107431**	**12.0**	**120593**	**12.3**
Wirral	340174	360999	6.1	356861	-1.1

Table T.13: Population change in Inner and Outer Wirral between 1981-2001 for the respective definition of Inner and Outer Wirral in research question 1. Source: Office for National Statistics UK.

Ward	**Resident Population**					
	1981	**Percentage change 1971-1981**	**1991**	**Percentage change 1981-1991**	**2001**	**Percentage change 1991-2001**
Bidston	16264		12887	-20.8	10446	-18.9
Birkenhead	15665		14900	-4.9	12876	-13.6
Claughton	14408		14246	-1.1	13723	-3.7
Egerton	14597		14473	-0.8	13392	-7.5
Leasowe	15055		13282	-5.0	12591	-4.7
Liscard	15810		15012	-0.5	14301	3.7
Moreton	12140		12081	0.6	12532	-2.9
New Brighton	14794		14880	0.6	14450	-2.9
Oxton	15163		15326	1.1	14066	-8.2
Prenton	15969		15040	-5.8	14429	-4.1
Seacombe	16724		15877	-5.1	15158	-4.5
Tranmere	14816		13840	-6.6	11668	-15.7
Upton	16671		16640	-0.2	15731	-5.5
Wallasey	15503		15642	0.9	15316	-2.1
Inner Wirral	**213579**	**-9.6**	**204126**	**-4.4**	**190679**	**-6.6**
Bebington	14545		14179	-2.5	13720	-3.2
Bromborough	14960		14518	-3.0	13963	-3.8
Clatterbridge	17990		18127	0.8	16906	-6.7
Eastham	16314		15011	-8.0	13637	-9.2
Heswall	16243		16569	2.0	16012	-3.4
Hoylake	15376		15732	2.3	15662	-0.4
Royden	14678		16529	12.6	16166	-2.2
Thurstaston	15269		16004	4.8	15548	-2.8
Outer Wirral	**125375**	**4.0**	**126669**	**1.0**	**121614**	**-4.0**
All Wirral	**338954**	**-5.0**	**330795**	**-2.4**	**312293**	**-5.6**

11 Annex: Distances to work in Outer Leipzig

Table T.14: Distances to work in Outer Leipzig according to the previous home. Source: Author's survey.

		Previous home					
		Inner Leipzig		Outer Leipzig		Elsewhere	
		Count	Col %	Count	Col %	Count	Col %
Distance to work in km	0					2	2.2%
	1			1	6.7%	5	5.4%
	2					5	5.4%
	3					5	5.4%
	4					2	2.2%
	5	1	5.0%	1	6.7%	5	5.4%
	6			1	6.7%	4	4.3%
	7	2	10.0%			3	3.3%
	8	1	5.0%	1	6.7%	9	9.8%
	9					2	2.2%
	10	6	30.0%	1	6.7%	7	7.6%
	11					2	2.2%
	12	1	5.0%			4	4.3%
	13	1	5.0%			1	1.1%
	15	1	5.0%			7	7.6%
	16			2	13.3%		
	18			1	6.7%		
	19			1	6.7%		
	20	2	10.0%	1	6.7%	5	5.4%
	23	1	5.0%			2	2.2%
	25	2	10.0%	2	13.3%	6	6.5%
	30			2	13.3%	3	3.3%
	35					1	1.1%
	40					1	1.1%
	45			1	6.7%	2	2.2%
	50					2	2.2%
	55					1	1.1%
	65					1	1.1%
	70					1	1.1%
	100					1	1.1%
	135	1	5.0%				
	200					1	1.1%
	250					1	1.1%
	450					1	1.1%
	500	1	5.0%				
Total counts		20		15		92	
Total km		875		274		2297	
Average commuting distance across all respondents [km]		43.75		18.27		24.97	

12 Annex: Distances to work from the previous residential location/Leipzig

Table T.15: Distances to work from the previous residential location. Source: Author's survey.

		Previous home					
		Inner Leipzig		Outer Leipzig		Elsewhere	
		Count	Col %	Count	Col %	Count	Col %
Distance to work from former home in km	0					2	2.4%
	1	1	5.0%			1	1.2%
	2	1	5.0%				
	3					2	2.4%
	4			2	14.3%		
	5	4	20.0%	1	7.1%	5	5.9%
	6	3	15.0%			1	1.2%
	7	1	5.0%	1	7.1%	1	1.2%
	8	2	10.0%			2	2.4%
	9					1	1.2%
	10	4	20.0%	1	7.1%	3	3.5%
	11					1	1.2%
	12					7	8.2%
	13					2	2.4%
	15	2	10.0%	2	14.3%	6	7.1%
	16					1	1.2%
	17					1	1.2%
	18			1	7.1%	2	2.4%
	19			1	7.1%		
	20	1	5.0%			4	4.7%
	25	1	5.0%	1	7.1%	11	12.9%
	30			3	21.4%	3	3.5%
	35					5	5.9%
	40					6	7.1%
	41					1	1.2%
	45			1	7.1%	2	2.4%
	50					2	2.4%
	69					1	1.2%
	75					1	1.2%
	100					2	2.4%
	110					1	1.2%
	140					1	1.2%
	180					1	1.2%
	200					1	1.2%
	250					1	1.2%
	300					1	1.2%
	400					1	1.2%
	500					1	1.2%
	740					1	1.2%
Total counts		20		14		85	
Total km		179		257		4635	
Average commuting distance across all respondents [km]		8.95		18.36		54.53	

13 Annex: Properties in Areas for Wirral

Table T.16: Properties in areas for Wirral [% of respondents who mentioned the parameters important and very important]. Data: Land Registry, price bands taken from the Land Registry; Couch's & Karecha's survey (were provided at postcode sector level).

Important factors for the choice of location:	**Less than £100,000** = good value housing	**£100,000 - £150,000** = moderately priced housing	**£150,000 +** = expensive housing
Being near to your place of work	29.8	13.9	12.9
Being near to food shopping places	44.7	34.4	18.6
Being near to other shopping places	28.7	21.9	14.3
Being near to leisure places (e.g. restaurants, pubs, the cinema, etc.)	19.1	16.6	8.6
Being near to areas of countryside or the coast	16.0	47.0	60.0
Having good road connections	35.1	44.4	50.0
Being near to a railway station	31.9	31.8	35.7
Being in an area with good bus links	44.7	36.4	20.0
Being in a low-crime neighbourhood	57.4	68.2	78.6
Being in an area with good schools	21.3	21.9	44.3
Being near to friends or family	42.6	43.7	34.3
Being in a quiet neighbourhood	47.9	68.9	75.7
Being in an area of affordable housing	55.3	47.0	37.1
Being near to a park	18.1	16.6	8.6
Reasons for leaving:			
too small	12.8	21.9	32.9
too large	4.3	13.2	11.4
had no garden / too small a garden	9.6	13.2	14.3
crime levels	26.6	14.6	12.9
quality of schools	8.5	10.6	11.4
noise or air pollution	18.1	12.6	8.6
traffic intrusion	16.0	10.6	10.0
lack of greenery	9.6	9.3	4.3
neighbours, social problems	28.7	15.2	15.7
My place of work changed	14.9	6.0	15.7
I wanted to change tenure (e.g. renting to owner occupation)	17.0	11.3	1.4
I wanted to 'trade up' to a more expensive home	5.3	23.2	37.1
I wanted to set up my first home	24.5	17.9	1.4
I needed to leave because of relationship breakdown	23.4	7.9	1.4
I wanted to move due to changes in household size (e.g. children leaving home, arrival of a new baby, etc.)	10.6	20.5	22.9

continued on next page

continued from previous page			
Postcode of your previous address:			
Inner Wirral	59.1	20.8	11.6
Outer Wirral	25.8	55.7	55.1
Other	15.1	23.5	33.3
Household type:			
Single adult living alone	43.6	21.9	10.0
Elderly person living alone	3.2	12.6	4.3
Adult couple	21.3	37.7	38.6
Adult couple with child / children	8.5	21.9	35.7
Single adult with child / children	13.8	2.0	5.7
2 or more adults sharing (with no children)	8.5	3.3	2.9
Other	1.1	0.7	2.9
Occupation:			
Professional or managerial position	25.8	42.0	51.4
Administrative or clerical work	19.4	6.7	2.9
Skilled non-manual work	1.1	2.7	5.7
Skilled manual work	6.5	8.7	7.1
Semi-skilled work	4.3	2.0	0.0
Unskilled work	2.2	0.0	0.0
Not in employment	40.9	38.0	32.9
Age:			
Up to 34	37.2	21.9	17.1
35-59	46.8	42.4	58.6
60(+)	16.0	35.8	24.3
Commuting time:			
Less than 20mins	58.2	52.8	35.6
21-40mins	27.3	33.7	37.8
41-60mins	9.1	5.6	15.6
1hr+	5.5	7.9	11.1
Number of cars in the household:			
No cars	48.9	17.3	5.7
1car	40.0	53.3	27.1
2 or more cars	11.1	29.3	67.1
Postcode of current address (% in Inner Wirral)	92.6	16.6	12.6
Owner Occupier	26.6	94.0	88.6
Tenant	73.4	6.0	11.4
First-time buyer	68.0	26.2	3.2
Satisfaction / dissatisfaction with location of current home	43.6	57.6	60.0
Questionnaire completed correctly	91.5	95.4	97.1

14 Annex: QuAM-Model Source Code

```
;amzs5.txt
;Monotoniezellensequenz 5-d
;dot-output: Doppelpfeilcluster/Einzelzustaende und deren Verbindung
;Trendwechsel der Variable trennd kann veboten werden

d=5
trennd1=0 ;Vorzeichenwechsel fuer Trend "trennd" verboten
trennd2=0
trennd3=0
trennd4=0
trennd5=0

;Vorzeichen der Jakobi-Matrix
m=intarr(d,d)

;Liverpool/Wirral
;m(0,*)=[+1,-1, 0, 0,-1]
;m(1,*)=[ 0,+1, 0, 0,-1]
;m(2,*)=[ 0,-1,+1, 0,-1]
;m(3,*)=[+1,-1, 0,+1,-1]
;m(4,*)=[ 0,+1, 0, 0,-1]

;Leipzig
m(0,*)=[+1,+1, 0,-1, 0]
m(1,*)=[ 0,+1, 0,-1, 0]
m(2,*)=[ 0,+1,+1,-1,-1]
m(3,*)=[ 0,+1, 0,+1,-1]
m(4,*)=[ 0, 0, 0,-1,-1]

;Vektor aller moeglichen Zustaende "zst" generieren
zst=intarr(2^d,d)

i=0
for i1=-1,1,2 do for i2=-1,1,2 do for i3=-1,1,2 do for i4=-1,1,2 do for
i5=-1,1,2 do begin
  zst(i,*)=[i1,i2,i3,i4,i5]
  i=i+1
endfor

;fuer jede Trendzelle alle Uebergaenge bestimmen
tr=intarr(2^d,d,2) ;(Nr. Ausgangszelle, (Nr. Zielzelle, Ueberg.-Art) )

zzst=intar(d)
for itz=0,2^d-1 do begin
```

```
for id=0,d-1 do begin
 zzst=zst(itz,*)
 zzst(id)=-zzst(id)
 ;Nr. des Nachbarzustands, nzzst:
 for nzzst=0,2^d-1 do begin
   s=sum(abs(zzst-zst(nzzst,*)),1)
   if s(0) eq 0 then goto,gef
 endfor

gef:
;print,nzzst
a=intarr(d-1)
b=intarr(d-1)
mm=intarr(d)

if id eq 0 then begin
 a(*)=zzst(1:d-1)
 b(*)=m(0,1:d-1)
endif

if id eq d-1 then begin
 a(*)=zzst(0:d-2)
 b(*)=m(d-1,0:d-2)
endif

if id lt d-1 and id gt 0 then begin
  mm(*)=m(id,*)
  a(*)=[zzst(0:id-1),zzst(id+1:d-1)]
  b(*)=[mm(0:id-1),mm(id+1:d-1)]
endif

smi=min(a*b)
sma=max(a*b)

if smi ge 0 and sma eq 1 then r= 1
if smi eq -1 and sma le 0 then r=-1
if smi eq -1 and sma eq 1 then r= 0
if smi eq 0 and sma eq 0 then r=-2

tr(itz,id,0)=nzzst
if zst(itz,id)*r eq -1 then tr(itz,id,1)= 1
if zst(itz,id)*r eq 1 then tr(itz,id,1)=-1
if zst(itz,id)*r eq 0 then tr(itz,id,1)= 0
if r eq -2 then tr(itz,id,1)= -2
```

```
;fuer Trend "trennd" Uebergang verbieten
if id eq trennd1-1 then tr(itz,id,1)= -2
if id eq trennd2-1 then tr(itz,id,1)= -2
if id eq trennd3-1 then tr(itz,id,1)= -2
if id eq trennd4-1 then tr(itz,id,1)= -2
if id eq trennd5-1 then tr(itz,id,1)= -2
endfor
endfor

openw,1,'amzs5d.txt'
printf,1,'Matrix:'

for i=0,d-1 do printf,1,m(i,*),format='(5i3)'
 printf,1,'Zustaende:'
for i=0,2^d-1 do printf,1,i,zst(i,*),format='(i3,": ",5i3)'
 printf,1,'-----------'

for i=0,2^d-1 do begin
 printf,1,i,format='("Von Zst. ",i5," nach:")'
 for z=0,d-1 do printf,1,tr(i,z,0),tr(i,z,1),format='("Zst. ",i5," : ",i2)'
 ;for z=0,d-1 do print,i,tr(i,z,0),tr(i,z,1)
endfor

;A. Doppelpfeilcluster rausfinden
;1. Matrix aller durch Doppelpfeile verbundenen Zust\"{a}nde erstellen

vm=intarr(2^d,2^d)
zl=intarr(2^d*d,2)-99
nz=0

for i=0,2^d-1 do begin
 for z=0,d-1 do begin
  if tr(i,z,1) eq 0 then begin
   vm(i,tr(i,z,0))=1
   nz=nz+1
  endif
 endfor
endfor

;2. Von allen Anfangszustaenden iterieren, Resultat in dpf
dpf=intarr(2^d)

for i=0,2^d-1 do begin
 v=intarr(2^d)
```

```
  vv=intarr(2^d)
   v(i)=1
   for it=1,64 do begin
    inx=where(v gt 0,num)
     if num gt 0 then vv(inx)=1
    v=vm#v
   endfor
  dpf(where(vv eq 1))=i+1
endfor

print,'Doppelpfeilcluster:'
print,dpf,format='(8i3)'
printf,1,'Doppelpfeilcluster:'
printf,1,dpf,format='(8i3)'

;B. Wie sind die Doppelpfeilcluster verbunden?
vdpfc=intarr(3000,2)-1
h=intarr(d)
nr=0
for i=0,2^d-1 do for j=0,2^d-1 do begin
 if dpf(i) ne dpf(j) then begin
  h(*)=tr(i,*,0)
  ii=where(h eq j,num)
   if num eq 1 then if tr(i,ii(0),1) eq 1 then begin
    vdpfc(nr,*)=[dpf(i),dpf(j)]
    nr=nr+1
   endif
 endif
endfor

;C. Identische Verbindungen rausschmeissen
;1. Doppelte in vvdpfc schreiben und markieren

for i=0,nr-2 do for j=i+1,nr-1 do if vdpfc(i,0) eq vdpfc(j,0) $
and vdpfc(i,1) eq vdpfc(j,1) then vdpfc(j,*)=[-2,-2]

;2. Verbleibende in vdpf umsortieren
vdpf=intarr(3000,2)-1
nr2=0
for i=0,nr-1 do begin
  if vdpfc(i,0) ge 0 then begin
     vdpf(nr2,*)=vdpfc(i,*)
     nr2=nr2+1
  endif
endfor
```

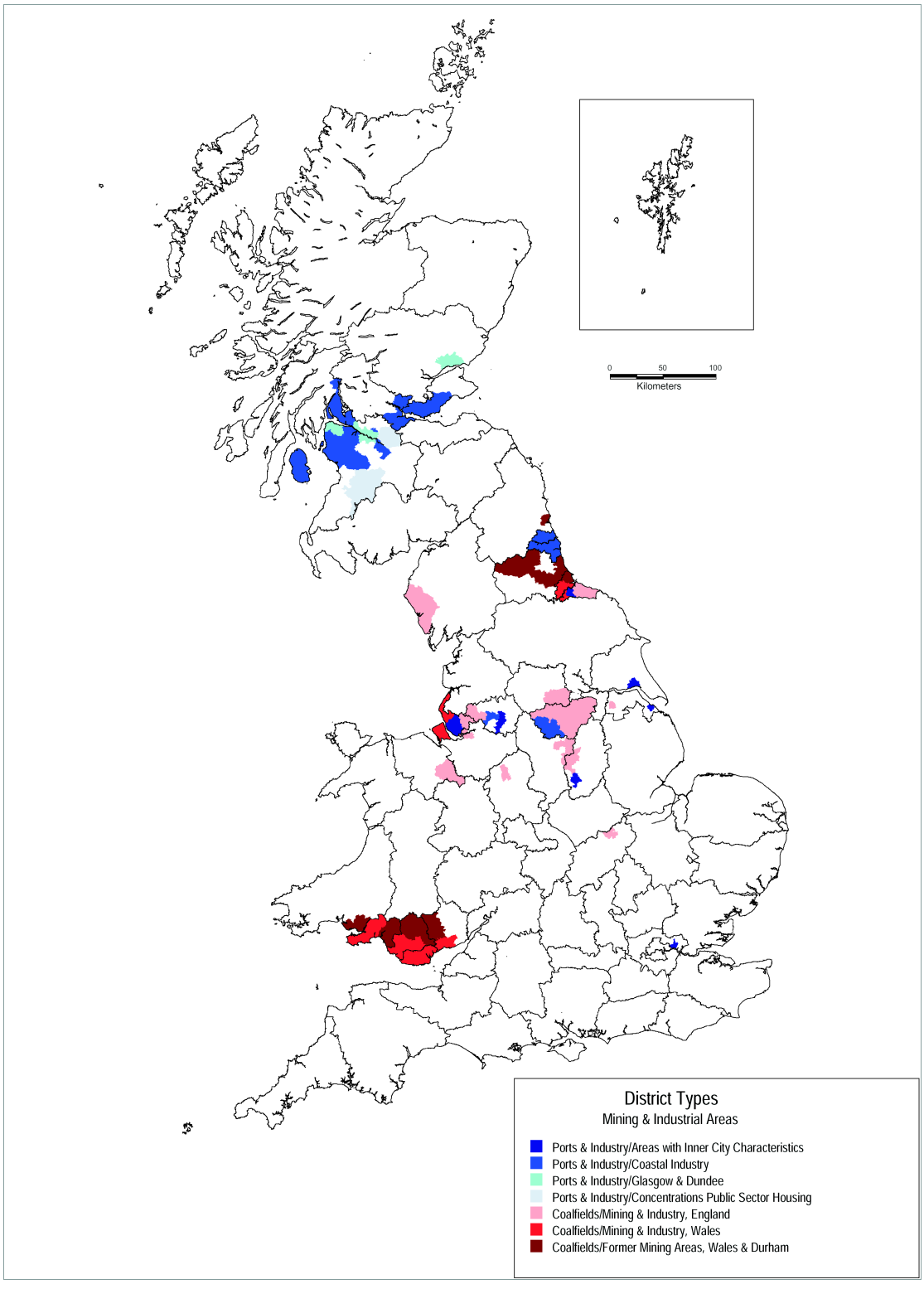
```
printf,1,'Uebergaenge zwischen den Doppelpfeilclustern'
print,'Uebergaenge zwischen den Doppelpfeilclustern'
for i=0,nr2-1 do begin
   print,vdpf(i,0),vdpf(i,1),format='(2i3)'
   printf,1,vdpf(i,0),vdpf(i,1),format='(2i3)'
endfor

;D. Hin- und Rueckverbindungen rausschmeissen
;1. Umspeichern in vvdpf und markieren
vvdpf=intarr(3000,2)-1
nr5=0
for i=0,nr2-2 do for j=i+1,nr2-1 do if vdpf(i,0) eq vdpf(j,1) $
and vdpf(i,1) eq vdpf(j,0) and max([vdpf(i,*),vdpf(j,*)]) $
gt 0 then begin
  vvdpf(nr5,*)=vdpf(j,*)
  nr5=nr5+1
  vdpf(i,*)=[-2,-2]
  vdpf(j,*)=[-2,-2]
endif

printf,1,'Uebergaenge in beide Richtungen zwischen den Doppelpfeilclustern'
print,'Uebergaenge in beide Richtungen zwischen zwischen den
Doppelpfeilclustern'

for i=0,nr5-1 do begin
  print,vvdpf(i,0),vvdpf(i,1),format='(2i3)'
  printf,1,vvdpf(i,0),vvdpf(i,1),format='(2i3)'
endfor

;2. Eindeutige in vdp umsortieren
vdp=intarr(3000,2)-1
nr3=0

for i=0,nr2-1 do begin
  if vdpf(i,0) ge 0 then begin
   vdp(nr3,*)=vdpf(i,*)
   nr3=nr3+1
  endif
endfor

printf,1,'Eindeutige Uebergaenge'
print,'Eindeutige Uebergaenge'
for i=0,nr3-1 do begin
  print,vdp(i,0),vdp(i,1),format='(2i3)'
```

```
  printf,1,vdp(i,0),vdp(i,1),format='(2i3)'
endfor

;dot-output**************************************
openw,2,'amzs5.dot'
printf,2,'digraph mzs5 {'

printf,2,'size="10,6";'
printf,2,'orientation=land;'
printf,2,'rankdir=LR;'
printf,2,'node [shape = box];'

;E. in den Doppelpfeilclustern enthaltene Zustaende und deren
Zusammenfassung

for i=0,2^d do begin
inx=where(dpf eq i,num)
if num gt 0 then begin
  printf,1,i,format='(" Doppelpfeilcluster Nr.:",i3)'
  zus=strarr(d)
  zusd=strarr(d)
  for k=0,d-1 do begin
    mi=min(zst(inx,k))
    ma=max(zst(inx,k))
    if mi ne ma then zus(k)=' ?'
    if mi eq -1 and ma eq -1 then zus(k)=' Y'
    if mi eq 1 and ma eq 1 then zus(k)=' A'
    if mi ne ma then zusd(k)='u'
    if mi eq -1 and ma eq -1 then zusd(k)='t'
    if mi eq 1 and ma eq 1 then zusd(k)='s'
  endfor
  form='("ZUS:",2x,'+string(d)+'a3)'
  printf,1,zus,format=form

 ;Knoten im dot-file definieren:
 h1=' [shape=Mrecord, label="{'
 h2='}", fontname="ZapfDingbats", color=black, fixedsize="false" ];'
 form='(i3,a,4(a1,"|"),a1,a)'
 printf,2,i,h1,zusd,h2,format=form
 form='(i3,":",2x,'+string(d)+'i3)'
 for j=0,num-1 do printf,1,inx(j),zst(inx(j),*),format=form
endif
endfor
close,1
```

```
for i=0,nr3-1 do begin
 printf,2,vdp(i,0),vdp(i,1),format='(i3," -> ",i3)'
endfor

for i=0,nr5-1 do begin
 printf,2,vvdpf(i,0),vvdpf(i,1),format='(i3," -> ",i3,"[dir=both,color=red];")'
endfor

printf,2,'}'
close,2

end
```

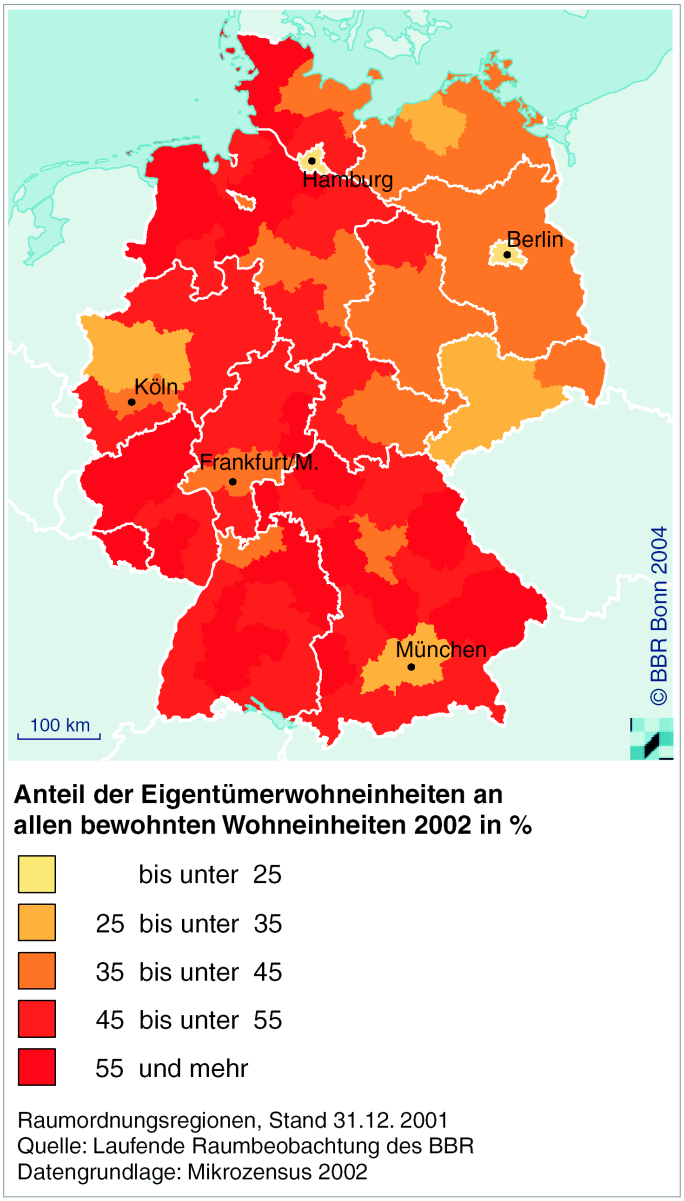
15 Annex: Mining and Industrial Areas in England

Figure F.4: Mining and Industrial Areas in England. Source: Rees et al. (1996), based on census 1991 - ONS UK 1991.



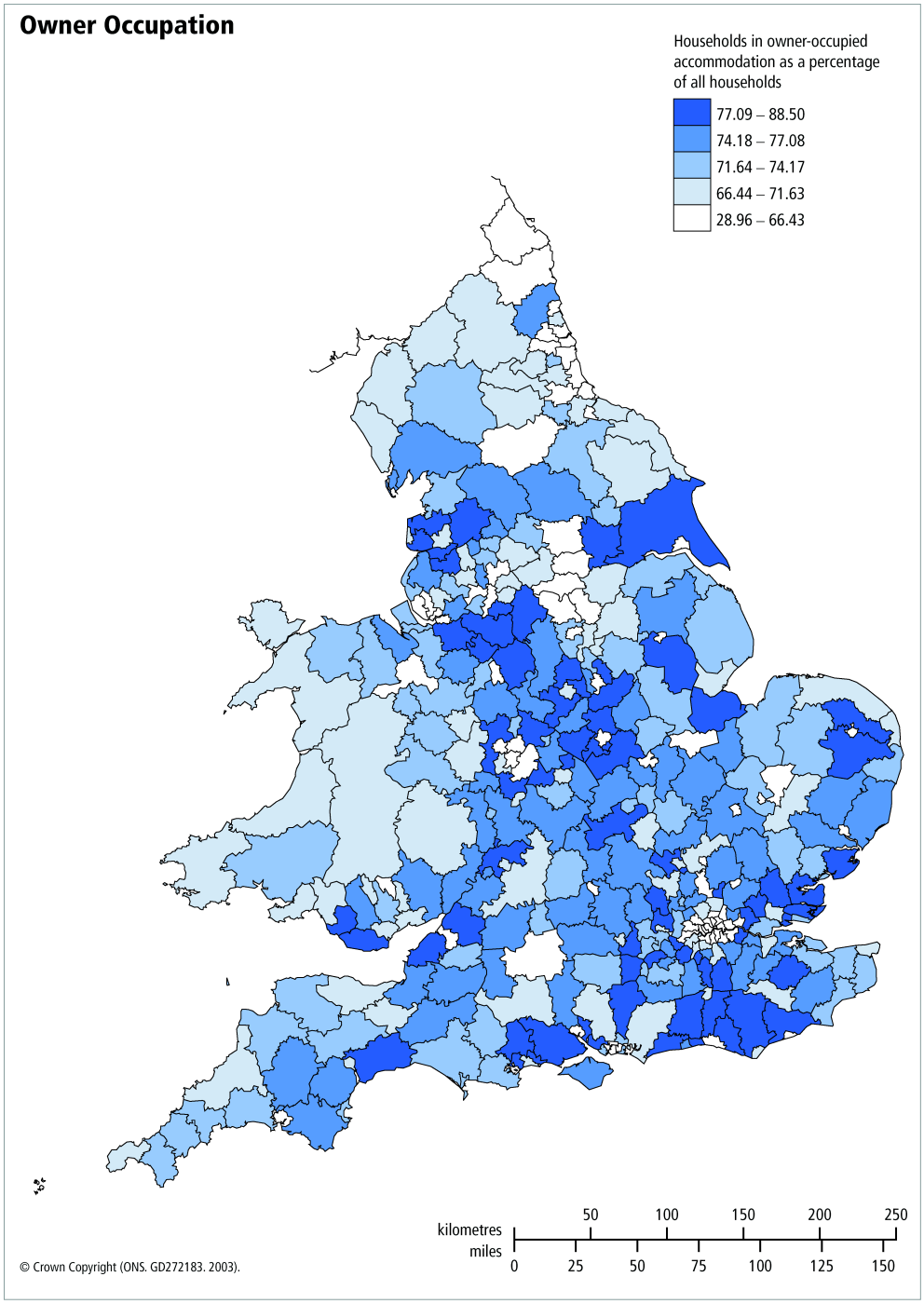
16 Annex: Tenure structure in Germany

Figure F.5: Tenure structure in Germany in 2002: Share of owner occupation in percentage of all households. Source: BBR (2005, p.140).



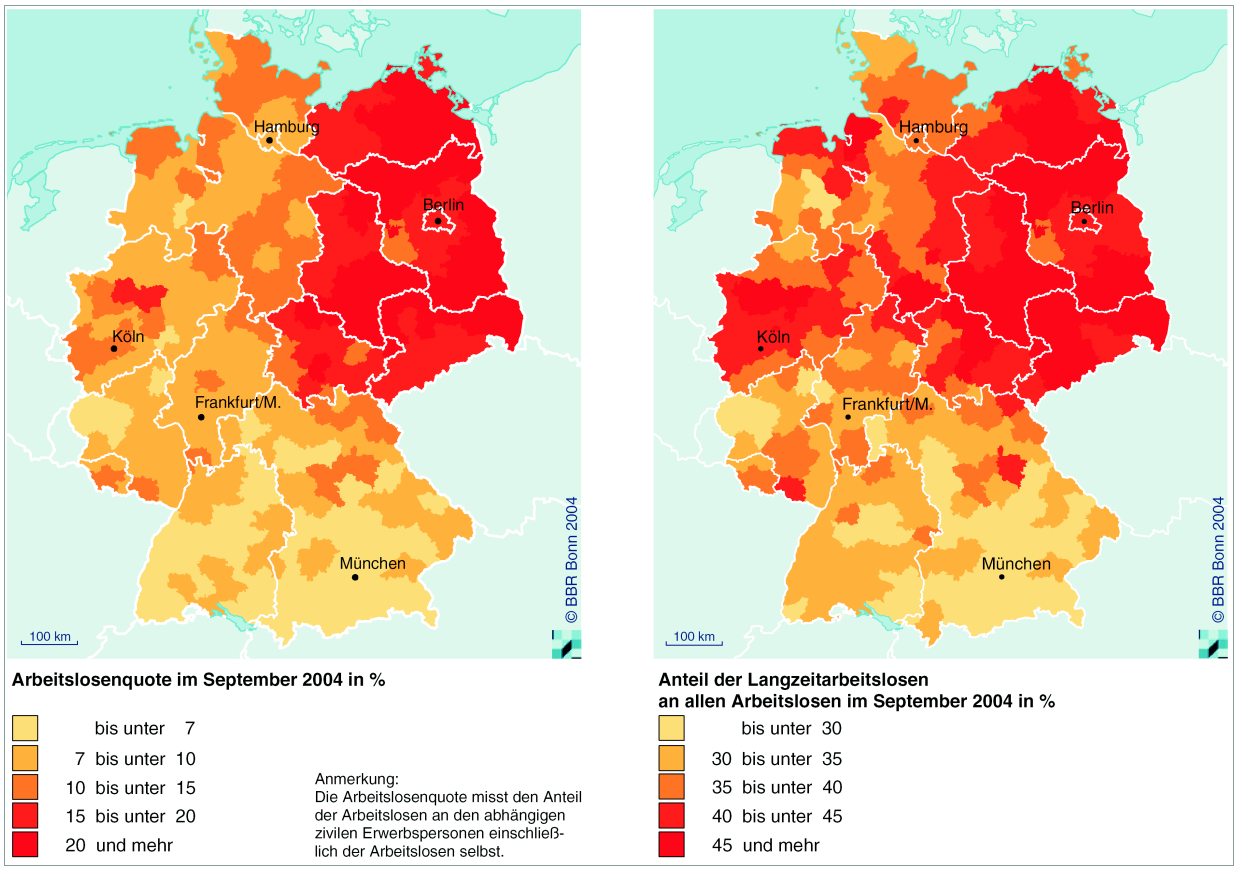
17 Annex: Tenure structure in England and Wales

Figure F.6: Tenure structure in England and Wales in 2001: Share of owner occupation in percentage of all households. Source: ONS UK (2003).



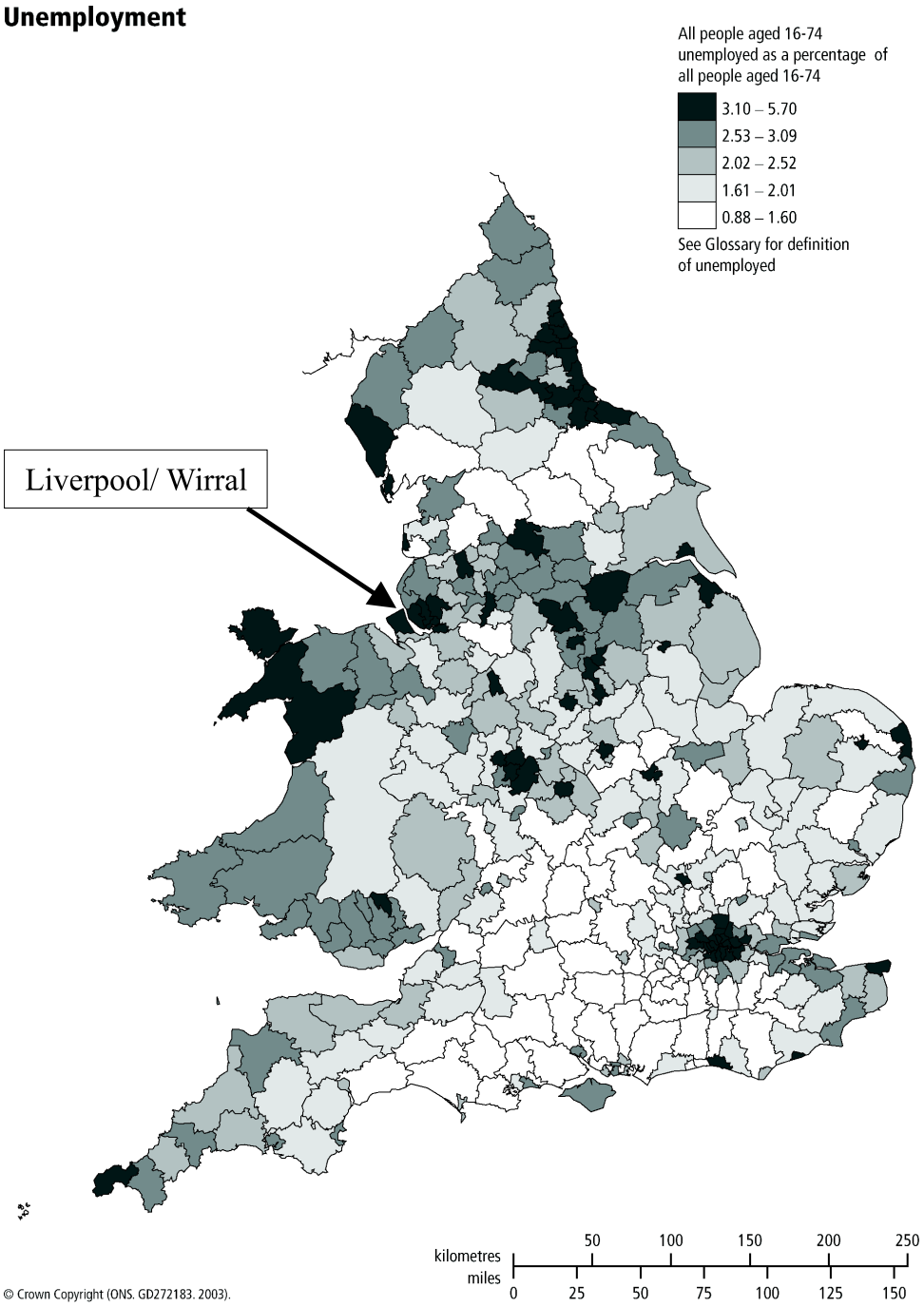
18 Annex: Unemployment rate in Germany

Figure F.7: Unemployment rate and share of long-term unemployed as a percentage of all unemployed in Germany, September 2004 [%]. Source: BBR (2005, p.154).



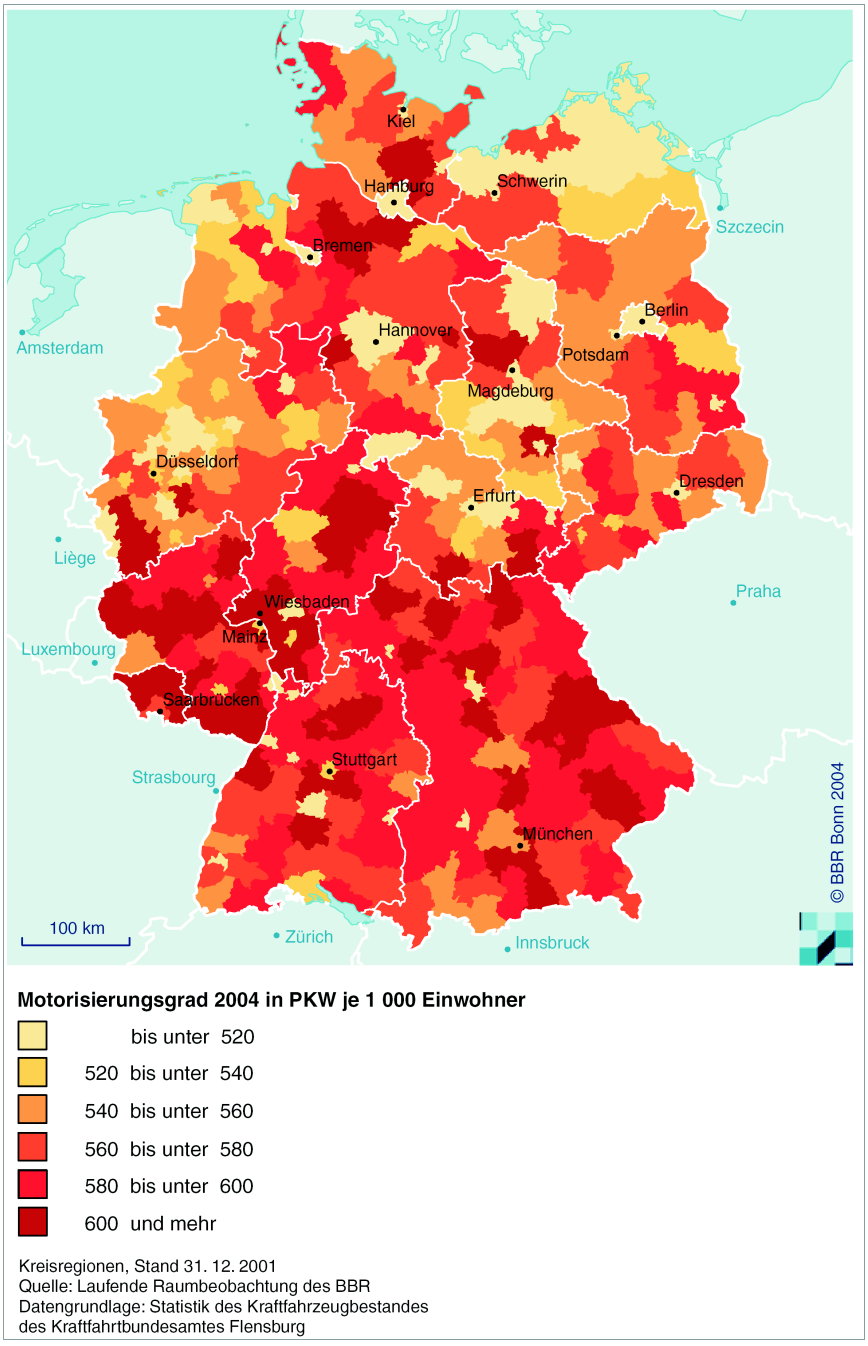
19 Annex: Distribution of Unemployment in England and Wales

Figure F.8: Distribution of Unemployment in England and Wales in 2001 as a percentage of unemployed people aged 16 - 74 in relation to all people aged 16-74. Source: ONS UK (2003).



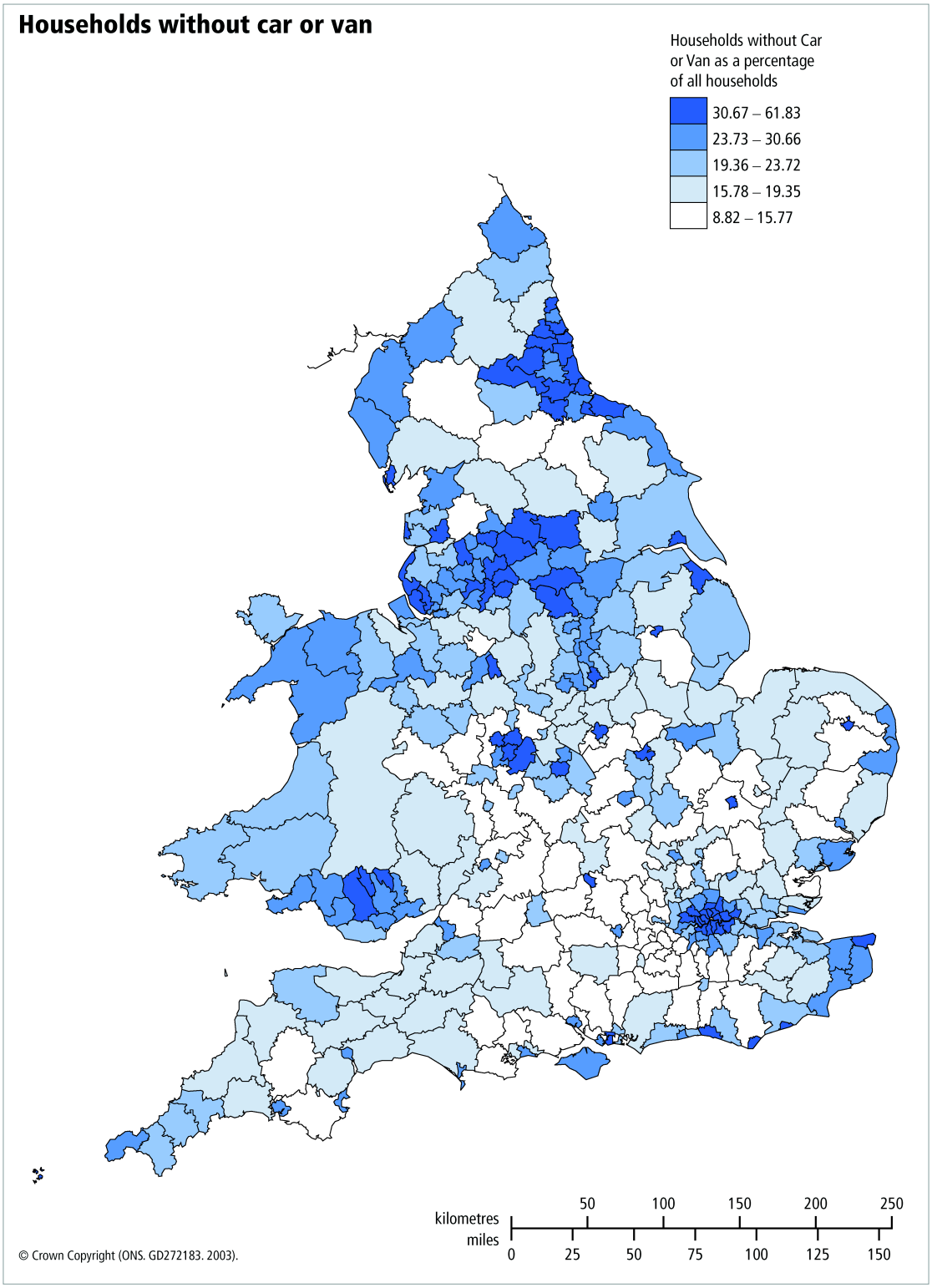
20 Annex: Rate of motorisation in Germany

Figure F.9: Rate of motorisation in Germany 2004. Source: BBR (2005, p.73).



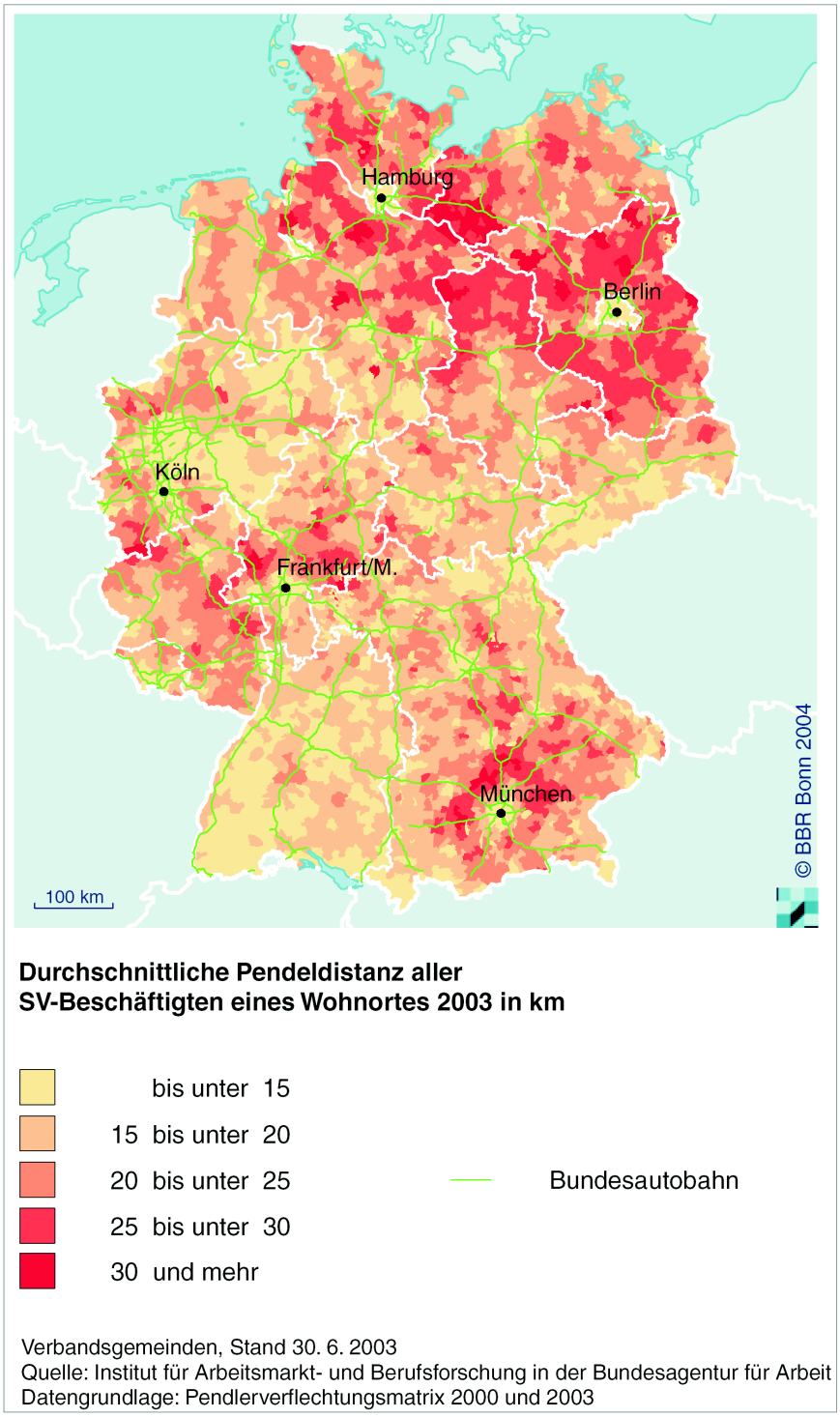
21 Annex: Provision of vehicles in England and Wales

Figure F.10: Provision of vehicles in households in England and Wales in 2001, as a percentage of all households. Source: ONS UK (2003).



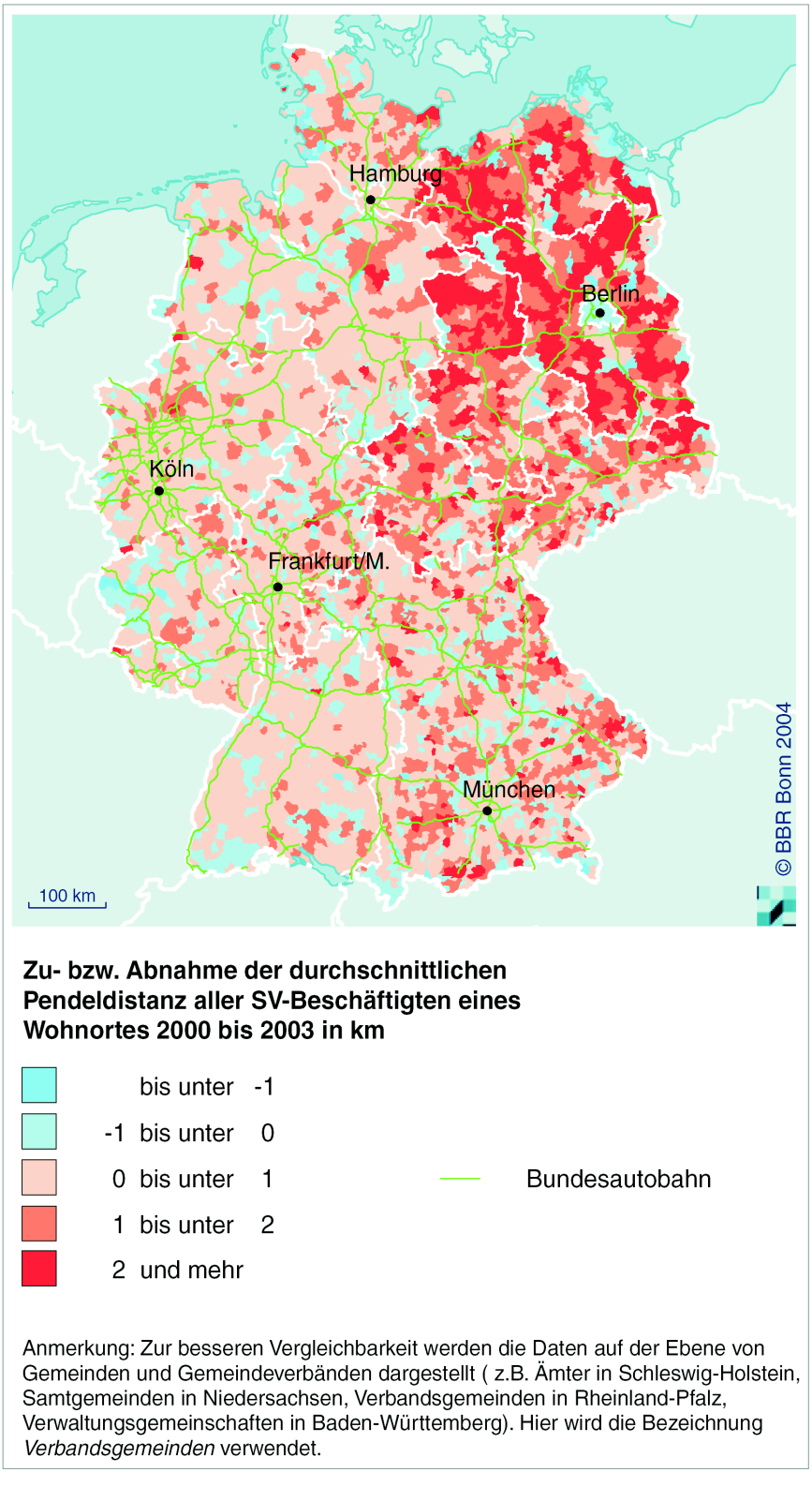
22 Annex: Commuting distances in Germany

Figure F.11: Commuting distances in Germany in 2003 [km]. Source: BBR (2005, p.83).



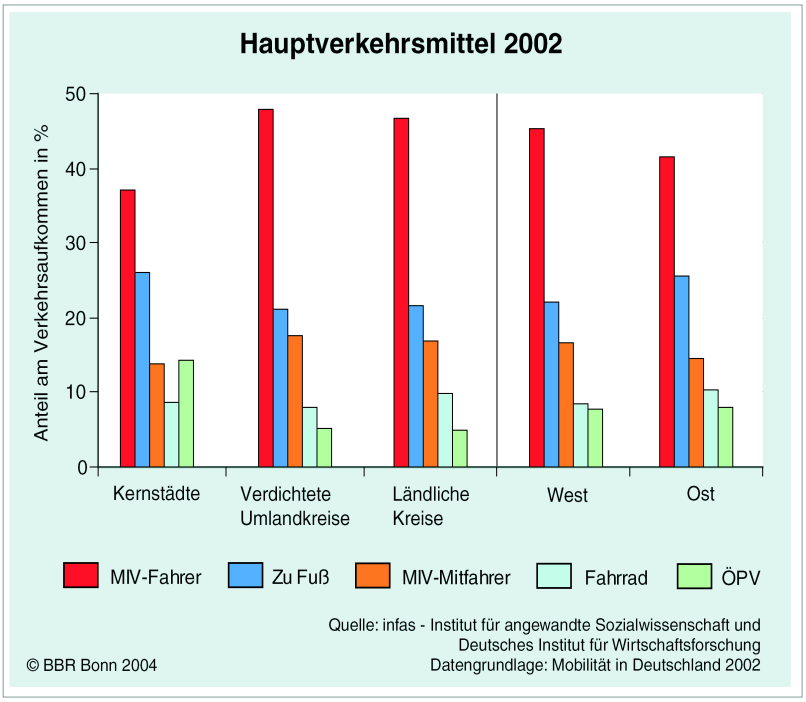
23 Annex: Change of commuting distances in Germany

Figure F.12: Change of commuting distances in Germany between 2000-2003. Source: BBR (2005, p.83).



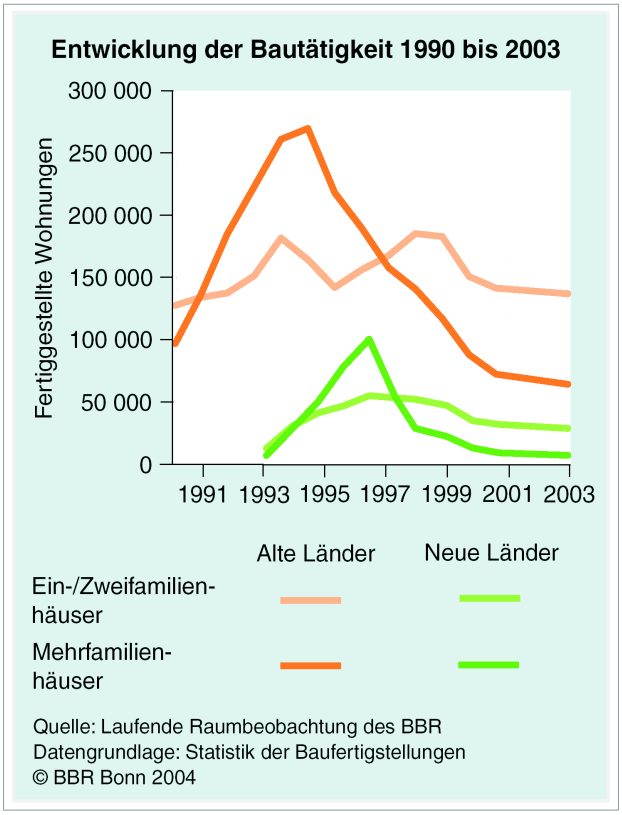
24 Annex: Main means of transport in Germany

Figure F.13: Main means of transport in Germany. Source: BBR (2005, p.72). Note by the author: First cluster of bars - Inner cities, Second cluster of bars - Suburban areas, urban fringes, Third cluster of bars - Rural areas, Fourth cluster of bars - Western Germany, Fifth cluster of bars - Eastern Germany, Red - With car as driver, Blue - By foot, Orange - With car as passenger, Light blue - By bike, Light green - Public transport.



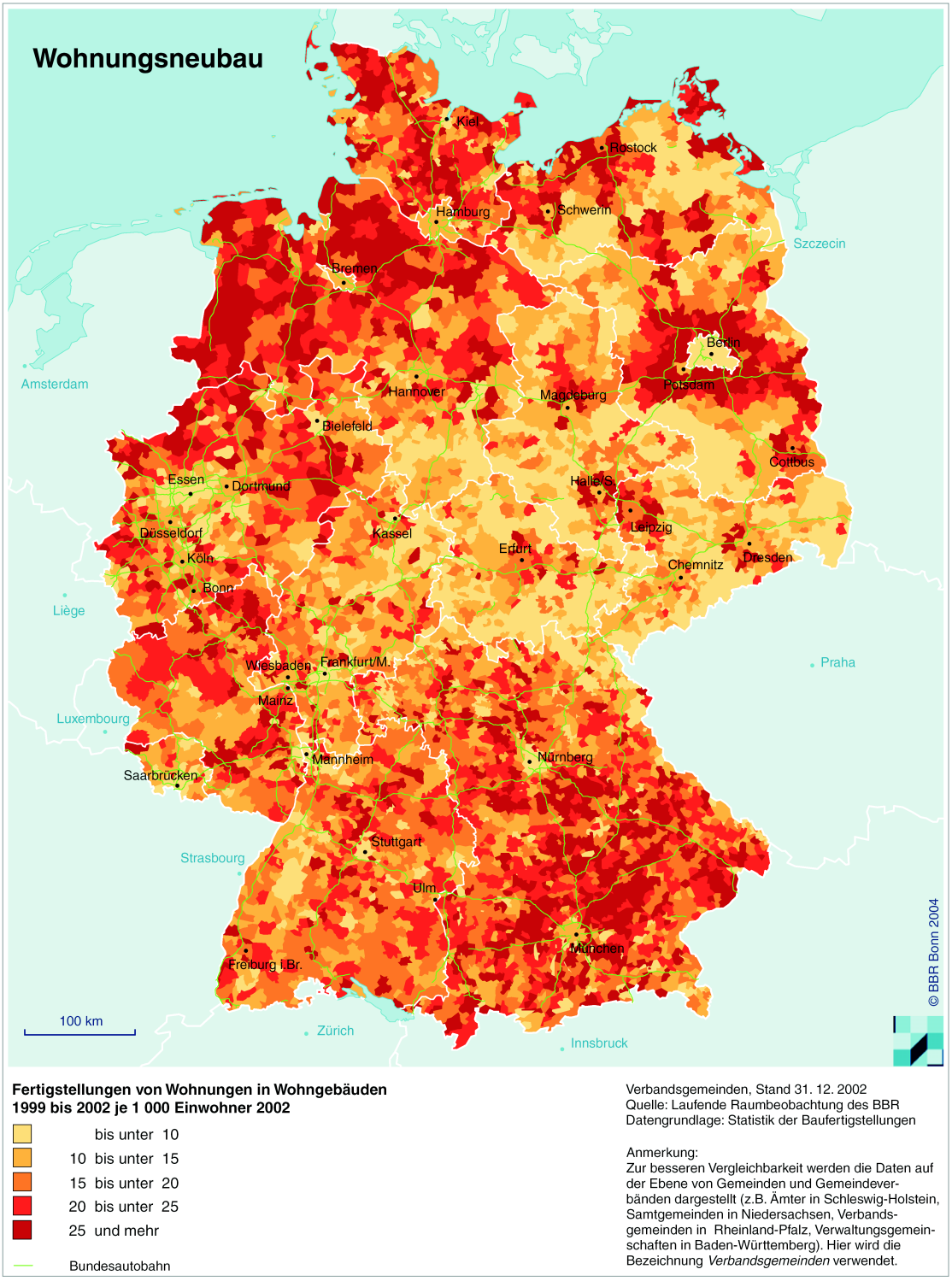
25 Annex: Residential housing construction in Germany

Figure F.14: Development of the residential housing construction in Germany between 1990-2003. Source: BBR (2005, p.63). Note by the author: Green - Eastern Germany, New Länder Light green - detached and semi-detached houses Dark green - apartment buildings Orange - Western Germany, Old Länder Light orange - detached and semi-detached houses Dark orange - apartment buildings.



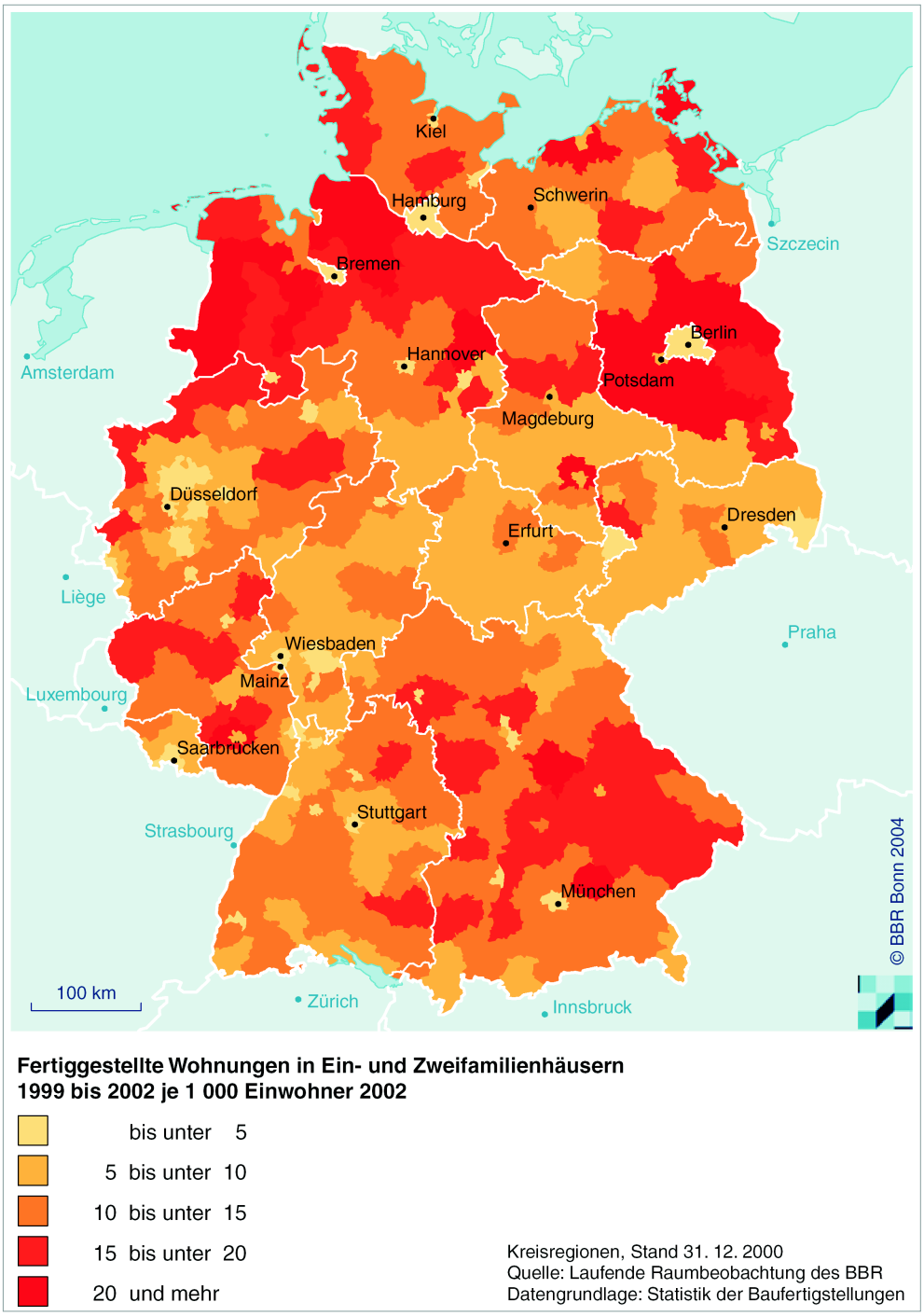
26 Annex: Construction of new residential dwellings in Germany

Figure F.15: Construction of new residential dwellings in Germany between 1999-2002, per 1000 inhabitants in 2002. Source: BBR (2005, p.64).



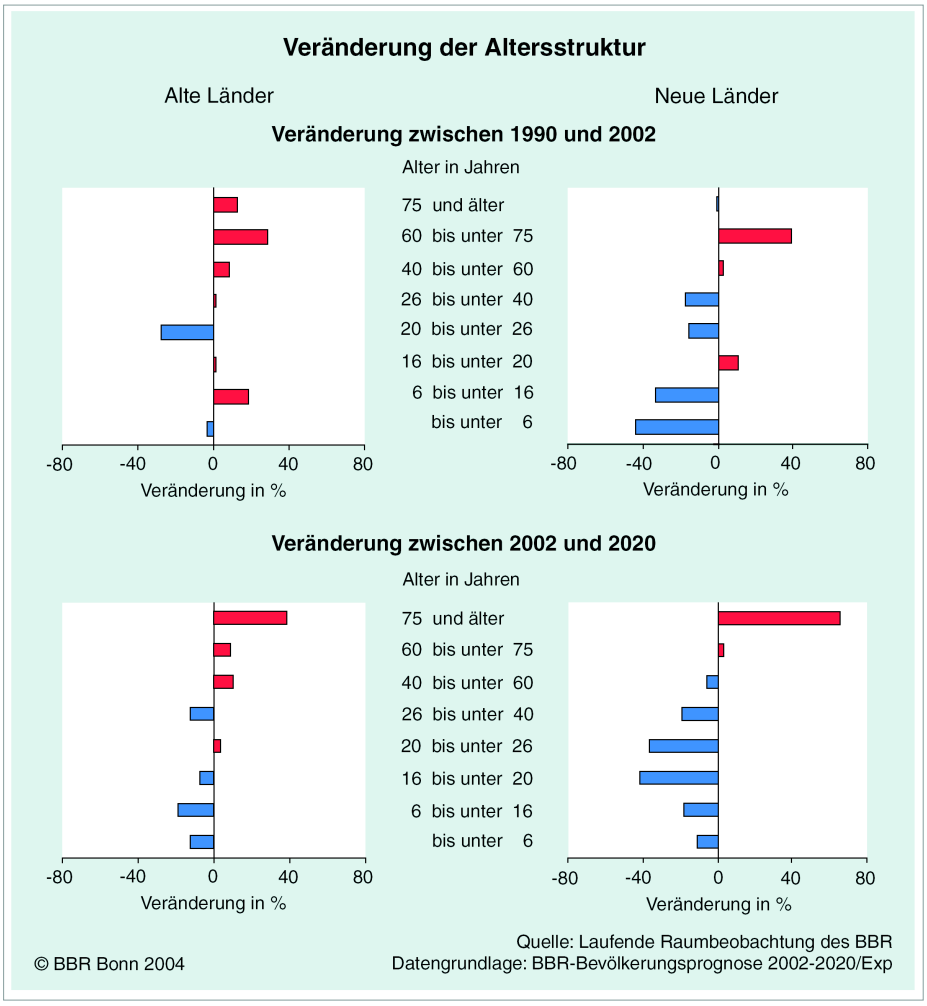
27 Annex: New construction of detached and semi-detached houses

Figure F.16: New construction of detached and semi-detached houses. Source: BBR (2005), p.65.



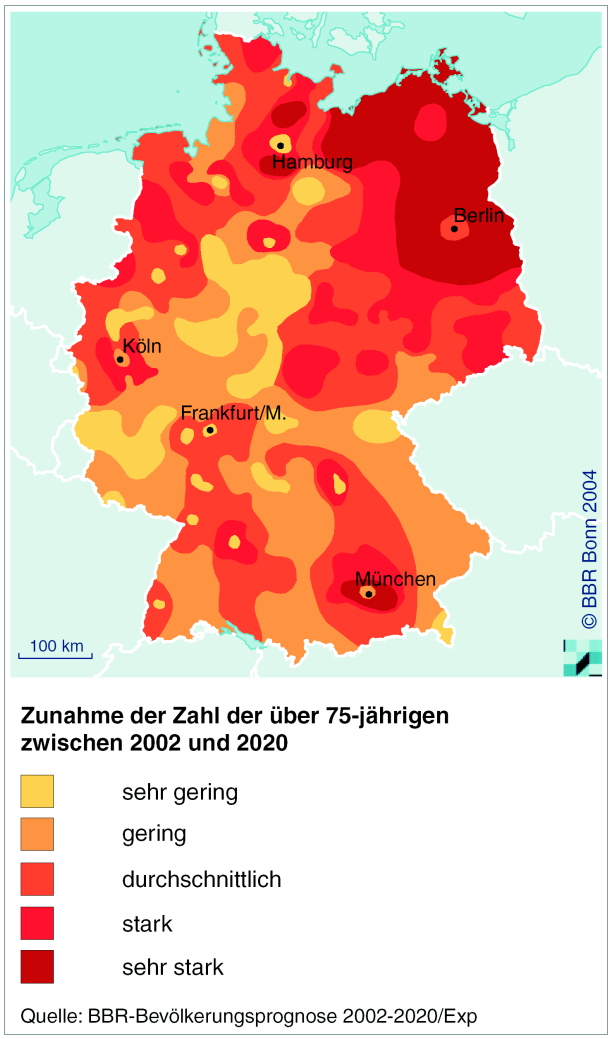
28 Annex: Change in the age structure in Germany

Figure F.17: Change in the age structure in Germany.
Note: Left - Old Länder, West Germany, Right - New Länder, East Germany, Upper part - Change between 1990 and 2002, Lower part - Projected change between 2002 and 2020. Source: BBR (2005, p.37).



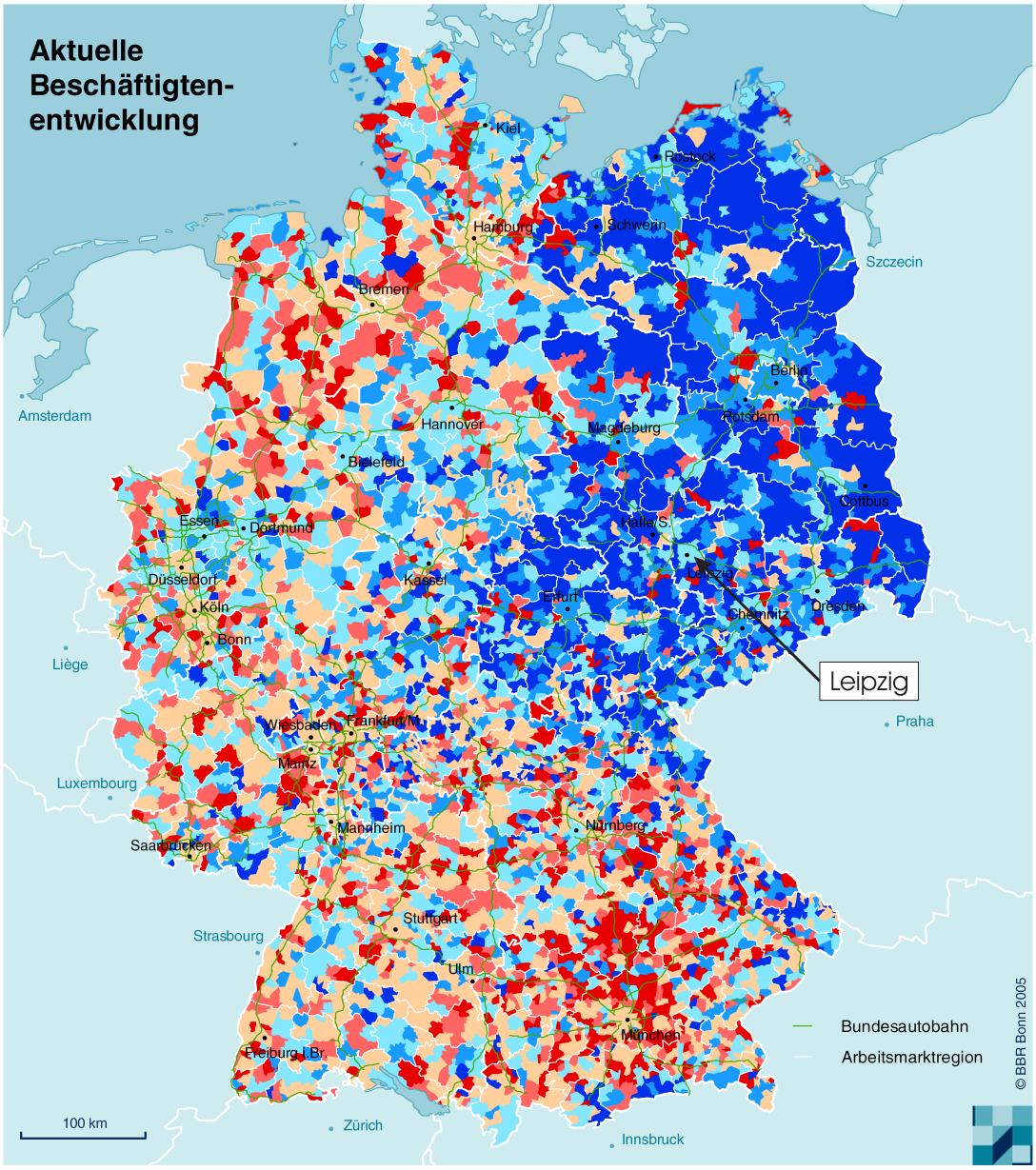
29 Annex: Change of people aged over 74 in Germany

Figure F.18: Change of people aged over 74 as projected between 2002 and 2020 in Germany. Source: BBR (2005, p.38).



30 Annex: Trend of employment in Germany

Figure F.19: Trend of employment figures as of between 1997-2003 in Germany [%]. Source: BBR (2005, p.45).



Entwicklung der sozialversicherungspflichtig Beschäftigten 1997 bis 2003 in %

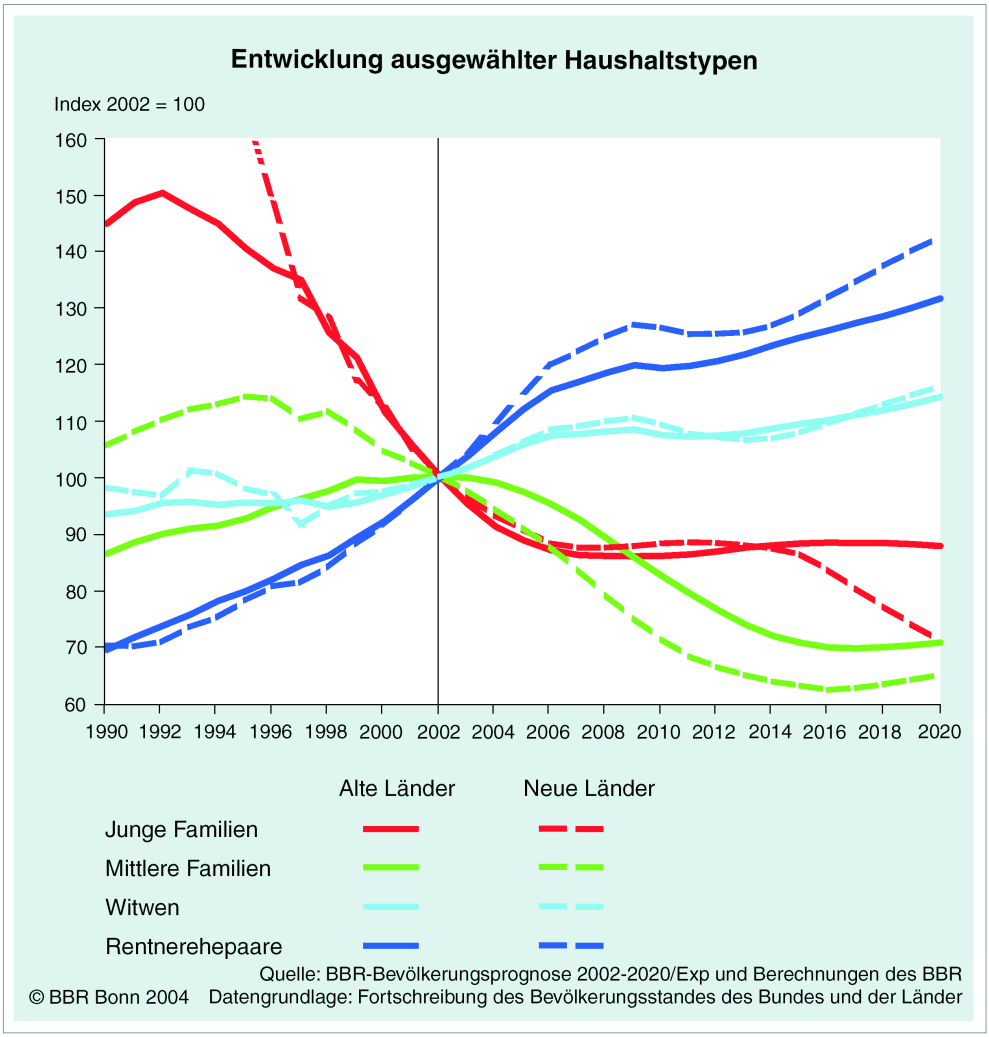
		bis unter	-15,0
-15,0	bis unter	-7,5	
-7,5	bis unter	0,0	
0,0	bis unter	7,5	
7,5	bis unter	15,0	
15,0	und mehr		

Verbandsgemeinden, Stand 31. 12. 2003
Quelle: Laufende Raumbeobachtung des BBR
Datengrundlage: Beschäftigtenstatistik der Bundesagentur für Arbeit

Anmerkung:
Zur besseren Vergleichbarkeit werden die Daten auf der Ebene von Gemeinden und Gemeindeverbänden dargestellt (z.B. Ämter in Schleswig-Holstein, Samtgemeinden in Niedersachsen, Verbandsgemeinden in Rheinland-Pfalz, Verwaltungsgemeinschaften in Baden-Württemberg). Hier wird die Bezeichnung *Verbandsgemeinden* verwendet.

31 Annex: Selected household types in Germany

Figure F.20: Development of selected household types in Germany from 1990 to 2003 and projected to 2020. Source: BBR (2005, p.39). Note of the author: Alte Länder - Old Länder, Western Germany, Neue Länder - New Länder, Eastern Germany, Junge Familien - Young families, Mittlere Familien - Middle-aged families, Witwen - Widower/Widow, Rentnerehepaare - Retired Couples.



32 Annex: Housing prices in England and Wales

Table T.17: Housing prices in England and Wales [Average dwelling prices £s, 2002]. 1 - Due to a policy requirement, the 2001 dataset was originally referenced to 1998 geographic boundaries. In accordance with the agreed policy for Neighbourhood Statistics, this dataset has now been referenced to the 2003 Census Area Statistics wards, local/unitary authorities, GORs and countries. 2 - Not National Statistics. 3 - All of the rent values quoted are weekly rents and are in UK Pounds. Source: ONS UK, Neighbourhood Statistics.

	Wirral	Liverpool	North West	England and Wales
Changes of Ownership by Dwelling Price, Price Indicators by Dwelling Type: Detached - Mean[1,2]	180595	152872	168376	208435
Changes of Ownership by Dwelling Price, Price Indicators by Dwelling Type: Semi-detached - Mean[1,2]	87551	79091	85877	119748
Changes of Ownership by Dwelling Price, Price Indicators by Dwelling Type: Terraced - Mean[1,2]	47270	42040	51663	103351
Changes of Ownership by Dwelling Price, Price Indicators by Dwelling Type: Flat - Mean[1,2]	68617	97383	90176	138762
Changes of Ownership by Dwelling Price, Price Indicators for All Dwellings: Mean[1,2]	88262	68510	88382	138370
Social Housing Rents, All Dwellings: LA Net Rent[3,2]	49	45	44	..

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