

**The Social Implications of
Residential Car Reduction:
Exploring Mobility & Community
Development at the Neighbourhood Scale**

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**Thesis submitted for the award of a PhD in Planning Studies at
University College London**

Declaration

I, **Iqbal Hamiduddin** confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

Transportation exerts a critical influence on spatial structure. From settlement pattern and urban form to detailed urban design, this thesis argues that the dominant transport mode across a locality will exert a control on spatial quality, and subsequent patterns of mobility and social interaction at the neighbourhood scale. Yet, as the first part of the thesis shows, the potentially significant social functionality of the neighbourhood and the quality of life of residents are sensitive to the intrusive effects of vehicles in the residential environment and the expansive geographies that car-based lifestyles permit. As a consequence of research indicating the negative social effects of car dominance in the residential environment, a suite of residential design measures has evolved. These consist of: (i) measures to address the car's impact, (ii) measures to address car use, and (iii) measures to address car ownership. By deploying the measures in packages, different 'car reduced' residential schemes have emerged, ranging from the relatively 'light touch' to 'car-free' development.

This thesis tackles a single central question: *what are the social implications of residential car reduction?* It begins by considering the rationale for residential car reduction and the implications of generating car-reduced schemes in car dominant societies. Evidence from pilot studies of schemes in the UK indicate that issues such as mobility disadvantage and residential self-selectivity can emerge, and these are investigated further in empirical research undertaken in the German city of Freiburg. By way of comparative case study research across three neighbourhoods, three sub-questions investigate resident demographic profile, access and opportunity constraint and whether lessons can be identified for future residential schemes. Four car-reduced neighbourhood models are developed, but the thesis concludes by arguing that the model should achieve a fit with the wider 'operating system' indicated by the overall pattern of modal share.

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Chapter One

Introduction



Why Investigate Residential Car Reduction?

Seeing is of course very much a matter of verbalization. Unless I call my attention to what passes before my eyes, I simply won't see it.

Annie Dillard, *Pilgrim at Tinker Creek*, p33.

1.1 Introduction

As the setting for home life, socialising, growing up, retirement, and for an increasing minority - a working life, society spends more than half of a typical day in the home environment (Metz, 2008:9). Against this background it may be argued that neighbourhoods – the context for home life - are important social places deserving attention. Yet the relative importance of these spaces is not necessarily reflected in the level of attention that they have received, and the qualities of the space that have subsequently been produced. Indeed, Barton (2000:49) notes that the neighbourhood has had a ‘chequered’ history in planning, being regarded as ‘places’ in their own right such as in Clarence Perry’s ‘neighbourhood unit’ in the early twentieth century, before a shift in emphasis towards ease of access and movement by car in the following decades that has impacted on the social performance of the residential environment (Appleyard *et al*, 1981). This, together with a substantial body of recent policy and design guidance (DfT 2007, 2007; Jones *et al*, 2009; CIHT, 2010) suggests that balancing the desire for a strong social setting for home life and place of ‘dwelling’ (Heidegger, 1971) and the need to move (Metz, 2008) remains an area of importance and interest.

The neglect of the neighbourhood as a physical and social entity reflects the broader underdevelopment of social sustainability in research and policy (Dempsey *et al*, 2009) and only very recently have concerted efforts been made to bridge gap in research (e.g. Dempsey *et al*, 2012). Social equity and sustainability of community have emerged as two key poles of a conceptual framework (Bramley *et al*, 2006). The former concentrates on matters of accessibility and mobility to amenities, opportunities and people, whilst the latter focuses on community cohesion – and with it better known concepts such as social capital – and long term community viability. The neighbourhood, and specifically residential design – towards which transport provides a critical structuring element, provides a strong geographical focus for both elements of social sustainability. However, also important is how the physical and social entity of the neighbourhood integrates into the wider community. Where specific attention has been paid to the characteristics of residential design the relationship between the localised scale of the neighbourhood and the wider urban context can seem unclear. Such tension between micro scale design and macro trends presents a particular challenge to neighbourhood car reduction strategies in western societies that have heavily orientated towards the private car. In spite of this tension and the challenges underpinning it, residential

car reduction may be considered an important subject of investigation for three principle reasons. The first reason is the negative impact that the car can have locally on community development and, by definition, the notion that car reduction as a community-strengthening project. The second reason is that neighbourhoods can provide an important bridge between households and society to embrace notions of neighbourhood 'community'. Recent governments in the UK have successively recognised the importance of local communities and have sought to strengthen this level of societal organisation. Drawing on the idea of community strengthening and the importance of the neighbourhood as a 'bridge' to greater society, a third important reason for investigating car reduction is the affect that automobiles have on the sense of 'place'. This aspect may be thought of both in terms of the direct intrusion of the vehicle itself and also in the use of space for automobile related infrastructure and the overall impact of vehicle on urban design which may have a strong influence on social relations, health and other less 'tangible' aspects including urban quality and access to the natural environment that have a bearing on well-being.

This research initially takes the relationship between the car and qualities of neighbourhood design as the focal point of a wider discussion exploring the relationships between transport, urban quality and social outcomes, and specifically between the qualities of residential space and community development. A basic argument forged is that residential space should be viewed as part of a greater continuum of spatial quality (Barton, 2000:132-133) influenced by transportation and urban form, rather than being considered separately in a 'neighbourhood first' approach, and that this continuum as the starting point for residential design rather than neighbourhoods themselves. This point will be borne out in case study evidence presented later in the thesis.

1.1.1 Why Study Residential Car Reduction?

Car reduced developments typically prioritise public transportation over the personal automobile and use a community rather than an individual household-orientated approach to residential development. Such schemes, which are usually underpinned by social and/or environmental rationale, have been created in a number of European countries on sites that range from small inner city infill to large urban extensions. Environmental objectives typically include reducing congestion, noise, energy and emissions by curbing car use. The creation of health and community-strengthening pedestrian and child-friendly streets frequently form a significant part of the social agenda. In the UK car-reduced residential design generated interest among policy makers was illustrated by the inclusion of guidance for car-free development in Planning Policy Statement 3 on housing (DCLG, 2006) and although the guidance has now been replaced by the National Planning Policy Framework,

plans for car-free districts remain in the proposed 'eco towns' (TCPA, 2007). Further interest in car-free residential schemes has been generated by local authorities and campaign organisations (e.g. carfreeuk.org), and academic discussion in relation to potential contribution towards new residential development (e.g. Melia, 2010a).

Despite the sustained interest in, and practical implementation of car-reduced schemes over the last decade, empirical research into the social and socio-economic implications remains very limited. This research deficit can be explained partly by the still limited extent of schemes that strive to be specifically 'car reduced' or 'car free'. Moreover, much greater attention has been focussed on related movements and concepts including new urbanism, neo-traditionalism, smart growth and transit-oriented development. There is inevitably a broad overlap between these different schemes; car-free schemes are by definition transit-oriented, for example. However there are also important differences. Although movements that promote the idea of 'car-free' residential design exist across Europe, the concept of car-reduction explored in this research does not relate to a specific design movement. Rather, different types of residential scheme may be considered to be 'car-reduced' provided that they fulfil certain criteria as set out later in this chapter. Equally, residential car reduction could be regarded as being as relevant to retrofitting as it is for new build – something that could not be said of new urbanism or neo traditional planning (Soja, 2000; Harvey 2000). Critically but perhaps most obviously, car-reduction has a sharper focus: on the private automobile.

But a sharp focus does not mean a lack of contextual breadth. Transport has a dominant influence on urban form and quality, which in turn has an important influence on human behaviour. Similarly, transport has a dominant role on the way that lives are lived. Though situated at the immediate confluence of housing, transport planning and urban design, this research into the social implications of residential car-reduction initially draws upon a wider literature of related disciplines including spatial planning, urban design, transport planning, sociology, psychology, healthcare, landscape architecture, geography, economics, politics and literature. This breadth was found to be crucial for initially setting an appropriate context that draws attention to the long history of a supposedly modern phenomenon, the relationship between transport, residential design and urban form, and some of the social processes that arise from this relationship. It became apparent that to assume a 'blank canvas', in the present day, with a highly constrained focus would be to miss a number of important points. The first point is that the issue of wheeled vehicles and human well-being has vexed thinkers, politicians and planners since Ancient Rome, and some useful insight and perspective can be gained. Similarly, the second point is that urban form has historically followed the dominant transport mode; to attempt to do the reverse, as some advocates of car-free development wish is both to defy history and to lead to potentially adverse social outcomes both residents within

and those beyond such schemes. The final and related point is about attempting to define ‘desirable’ social consequences. This is perhaps subjective and therefore largely unanswerable, but as the later discussion in this chapter and in chapter three suggests, there are a number of factors that seem to positively affect well-being including social contact, community development and a pleasant environment with access to green spaces.

At the present time there is a question about whether the ‘problematic’ of car dominance will become self-righting through a reduction in car use and ownership across advanced economies. The phenomenon of ‘peak car’ – an apparent plateau in car use since the mid-1990s (Goodwin, 2012; Le Vine and Jones, 2012) – has sparked debate about whether the trend signals a long term shift in behaviour or whether it will be recognised as only a ‘blip’ in the fullness of time. Either eventualities support a reconsideration of the car in the residential environment; the former to pursue a ‘reclaiming’ of space that may result from a slackening of automobile demand (Newman, 2012), and the latter as a means to dealing with the original problem. Furthermore, there are likely to be lessons for countries where car ownership and use is set to increase significantly.

1.1.2 Thesis Aim

The aim of this thesis, therefore, is to scope and examine the salient social implications of car-reduced residential development. It is grounded both in a concern that residential car reduction policies could have negative social consequences both for residents and also for surrounding communities, particularly as a result of concentration that can lead to significant demographic imbalances. There is also a desire to identify the steps that might be taken to minimise such negative impacts. Imperatives for this research include, firstly, the recent interest in car reduction and car-free development that has led to the introduction of guidance into the UK’s planning policy, and secondly, the dearth of research that currently exists into the social consequences of such schemes. Although a number of studies exist on travel behaviour (e.g. Nobis, 2003), demographics (Reutter & Reutter, 1996) and potential demand (Melia 2010a), virtually none attempts to cut across and join different strands of social analysis together.

1.1.3 Research Questions

The essence of this research is about examining how car reduction can create the opportunity for desirable outcomes whilst balancing the need for accessibility and inclusion. Social research often entails dealing with significant levels of complexity from which trends, firm conclusions and policy recommendations are difficult to draw. In order to deal with the inevitable complexity surrounding lifestyle patterns and livelihoods of the individuals, the

research was directed specifically towards investigating how mobility and social interaction are influenced by car reduction. To this end, the research was conducted around the following three focused questions:

- 1. What implications does car reduction have for the demographic profile of residents, and with what implications for own and neighbouring districts?**
- 2. What are the key access and opportunity constraints associated with residential car reduction? Who is disadvantaged and why?**
- 3. What design, planning and implementation lessons can be learned for future car-reduced development?**

The decision to focus the research entailed a degree of selectivity in the lines of investigation. The questions were used as the basis for empirical research that compared three different neighbourhood models in the southern German city of Freiburg. The strength of this approach is that it allows a high level of background consistency to be maintained, however it also means that some findings are inevitably context specific. In order to make the research more generally applicable, comparisons were drawn with findings presented in the literature or from pilot studies and supplementary research conducted in the course of this work.

1.1.4 'Car Reduction' Defined

One of the difficulties of addressing the matter of residential car reduction is in the varying terminology employed to describe different types of development that can be at times confusing and even contradictory. A number of different terms have been adopted to describe different types of car-reduced housing including 'car-free', 'car parking space free', 'optically car free' and 'car-reduced' (Heller, 2008, Morris, 2005 and Melia, 2006). Chapter three attempts to bring together the different terms and concepts by presenting a framework in which three distinct approaches to neighbourhood car reduction identified in planning and transport policy consist of:

- 1) Measures to reduce the impact of the car in the neighbourhood
- 2) Measures that attempt to restrain car use among residents
- 3) Measures that attempt to limit car ownership among residents

In this way, residential car reduction broadly includes neighbourhoods in which planning measures have sought to limit the impact, use and/or ownership vehicles below prevailing norms with the planning authority boundary.

This work uses several different terms to define residential areas, including ‘neighbourhood’ which is meant in the social sense of a collection of residents living together, and ‘district’ that a dictionary defines as an administrative territory (Coulson *et al.*, 1976). In practice however, the two terms overlap substantially and are often used interchangeably or together as ‘neighbourhood district’. This thesis uses both terms to mean a residential entity, but in relation to the case study of Freiburg, neighbourhoods and districts are the same in terms of residential space and territorial definition.

1.1.5 Key Argument

A recurring theme in this thesis is over the *appropriate* point of approach for residential car reduction. A moderate body of literature exists on residential and neighbourhood design (e.g. Biddulph, 2007; Rudlin & Falk, 1999; County Council of Essex, 1973 & 2005; Friedman, 2002) and on car mitigation strategies in residential spaces (e.g. Buchanan, 1963; Appleyard *et al.*, 1983; CIHT, 2010; Biddulph 2012a, 2012b & 2011). In addition a small but growing literature exists on ‘car-free’ development (e.g. Melia 2011, 2010a, 2010b & 2007) and supplemented by material produced by campaign movements. The literature tends to select the neighbourhood itself as the starting point for consideration with connections between the neighbourhood and the wider city considered afterwards and in some instances almost as an afterthought. Manifestation of this ‘neighbourhood-first’ approach is perhaps best illustrated by the neo-traditional development of Poundbury, which introduced new design approaches to prioritising non car-movements internally, but as Marshall (2005) notes, it is not obvious how the development relates to the wider environs and specifically the town of Dorchester. Where car reduction strategies attempt to reduce private vehicle ownership, this neighbourhood-first approach can bring problems including mobility disadvantage for some groups and the displacement of residents’ vehicles to areas where parking regulations permit. The point is underlined in evidence presented in chapter three from a pilot study undertaken in the Slateford Green car-free development in Edinburgh.

Although several themes emerge in the course of the thesis, a consistent argument is that because urban form has historically tended to follow the dominant transport function, car reduction should be commensurate to the overall mobility ‘offer’ of the city or wider region. The term ‘operating system’ is introduced in chapter six to draw together aspects of the transport network, integration of travel modes and planning policies that influence this ‘system’ from both the demand and the supply side. In particular, the German city of Freiburg which serves as the main case study for empirical research, illustrates the need for car-reduced development to be supported by a wider arrangement of transport and land use policies. To illustrate this point it is useful to note that work to ‘re-orientate’ Freiburg away from

automobile dependence was stimulated by the rise of environmentalism in the late 1960s; the creation of the ‘car-free’ quarter at Vauban began in the late 1990s following a wider modal shift away from the car across the city which was the product of nearly 4 decades of policy. However, today at Vauban nearly half of all households in this ‘car-free’ development are car owners. It is argued that car reduction at the residential scale can entail considerable long term commitment from a wide spectrum of policies that influence how lives are lived. Attempting to produce quick solutions that give primacy to the internal characteristics of the neighbourhood is to defy the logic of development history and, by extension, to invite negative social outcomes, such as mobility disadvantage or demographic concentration.

1.1.6 Thesis Structure

This thesis attempts to follow an ‘hourglass’ structure, being broad at the outset in examining the wider research problem in the opening chapters. The first task of the next chapter is to provide a brief overview of urban development in relation to transport technology before focussing specifically on the effects of automobile dominance on urban quality, lifestyles and livelihoods. Chapter three then addresses car reduction in residential design strategies through a three-part analytical approach before focusing on car free development in the second part. The chapter summarises the findings from two pilot studies aimed at validating the theoretical framework and determining some of the key issues. Chapter four summarises the research approach and methodology applied in the main data collection exercise in Freiburg and from here the thesis focuses tightly on the research question and supporting questions. Chapters five and six are dedicated to data presentation and analysis in relation to issues of community and mobility, respectively. Chapter seven draws out the lessons for setting conditions at the macro level for micro-level car reduction, whilst chapter eight details four models of residential car reduction in the form of ‘new quarters’ inspired by the empirical research, and investigates the implementation considerations in relation to approaches used in both Germany and the UK.

1.2. Issues of Car Dominance

Private car ownership is recognised widely as a powerful embodiment of individual freedom; a vehicle that has brought liberty to many, a universally recognised symbol of prestige and attainment, and an aspiration for many more. Widespread car ownership has, in other words, brought widespread social benefits to different sectors of society and for different reasons – access to greater work and social opportunities, an ability to combine a number of tasks into a single journey, carry groceries and good around, and so forth. For young families, the advantage of car ownership is perhaps even more profoundly felt, as one commentator noted:

[I]n the overcrowded, time-pressured, work/life balance nightmare that is the average female's life, the motor car is a girl's best friend...For those of us with children, it's also a nappy-bag extension, a mobile crèche, a soft play centre and, in times of extreme need, a breast-feeding cubicle...

Sarah Vine, The Times, 31st May 2008

Set against the undoubted social benefits that the car has brought are a range of dis-benefits, some of which are now widely known – pollution, financial costs and association with oil dependency, for example. Other aspects have been the subject of recent attention and include impacts on land use planning and development patterns and density that are attributed to car dominance. Related to the impact of car dominance on the built environment, but perhaps less well understood has been the impact on civic ties (Putnam, 2000 & 2002) and the rise of ‘individualism’ (Kunstler, 1993); both of which remain moot points depending on how individual needs are perceived and where the balance between the needs of individuals is perceived in relation to the wider needs of society. Entwined with this basic point over individual and societal balance is the contested notion of ‘community’, and the extent to which both the automobile and communications technology have facilitated the development of different types of community spread over physical and ‘virtual’ space.

1.2.1 Quality of Life

Any discussion over car dominance will perhaps inevitably encounter a broader debate about the relationship between standard of living as measured almost exclusively in material well-being and quality of life that is concerned with social well-being (Oktay, 2012; Economist Intelligence Unit, 2005:1). There is an inevitable cross-over between the two indices, but there is now general agreement about the limitations of material indicators such as GDP as a means to measure economic performance and social progress (*ibid*; Stiglitz *et al*, 2010:7). For example Stiglitz *et al* (2010:8) note that ‘traffic jams may increase GDP as a result of the increased use of gasoline, but obviously not the quality of life’, and the authors note the frequent discrepancy between material well-being as by standard indicators and individual perception and experience. Although quality of life assessments can be subjective and heavily influenced by an individual’s circumstances, persona and perceptions – such as of their own circumstances, relative performance or locale (Goldberg *et al*, 2012), this apparent ‘gap’ between material and social well-being has increasingly exercised national government and has attracted high-level political interest particularly in France, Canada and the UK. British Prime Minister David Cameron once described the gap as one of the ‘central political issues of our time’ (Guardian, 14th November, 2010) and introduced a national ‘happiness’ survey,

arguing that economic measures were 'an incomplete way of measuring a country's progress' (BBC, 25th March, 2010).

This discussion on quality of life leads to the somewhat vexed question over the automobile's role in shaping societal well-being. It is a decidedly complex issue that can depend on individual circumstances – notably on level of car access, and how this affects the range of life choices and opportunities. Essentially important is the influence that transport exerts on the organisation of physical space, and how this organisation in turn places a strong control on levels of accessibility by different transport users. The car-oriented out-of-town shopping centre or business park serves as a potent example of unequal accessibility (Wachs, 2002). However, transport's role in shaping quality of life may be seen to go beyond functional measures of accessibility across the built environment to embrace ill-understood and less easily 'measurable' issues surrounding human response to physical qualities of the built environment. Winston Churchill understood that 'we create our architecture and then our architecture creates us' (Fullilove, 2001), reflecting Mumford's assertion that 'Mind takes form in the city; and in turn, urban forms condition mind' (Mumford, 1938: 6). By relating transport's influence on the built environment and the built environment's influence on human behaviour together, strong connections can be made between automobile dominance, built environment and societal well-being. However, it must also be noted that a theoretical 'vagueness' persists in the reciprocal relationship between built environment and social phenomena (Scaff, 1995).

In an attempt both to broaden our understanding of the social response to the physical environment and to examine a salient phenomenon in detail, chapter three reviews some of the recent research on physical and mental health that relates to car use and car-dominated neighbourhoods. While an established body of research associates a rise in obesity with increasing car use and attendant urban form which discourages physical activity, mental health tends to be less well-noted by planners. Aspects that may be of particular concern include a loss of day-to-day social contact due to physical dispersion and car-orientation embodied by low density development (Lefebvre, 1974), 'severance' and the social degradation of residential streets by traffic (Appleyard *et al*, 1981), and a loss of propinquity wrought by societies that have become 'hypermobile' (Adams, 2000). In addition, the socially degrading effect of 'sterile' urban landscapes (Sennett, 1990) and adverse consequences on well-being of the loss of natural spaces all appear to have taken a toll on mental health as urban landscaped have become increasingly shaped around 'peak traffic flow' (Marshall, 2005) rather than the needs of sentient beings.

1.2.2 Man and Machine

In his poem 'Autogeddon' Heathcote Williams describes how 'aliens from afar observing life on earth would conclude that the major life form was in fact the automobile' (Dennis & Urry, 2009:27-28). Williams' depiction of the automobile as a life form recalls the 'machine city' concept of modernism (Lynch, 1981:88) and the geometric patterns of urban development that have evolved around the technical requirements of the car and the safety of road users and pedestrians. That between 30-40% of urban space is now consumed by infrastructure for automobiles (Servant, 1996) raises questions over the allocation of land use and the efficiency of development patterns, social justice, and furthermore whether developments have been shaped towards the needs of humans or the machines that transport them. Because automobile dominance on urban form becomes self-reinforcing due to the way that lifestyles and social networks become organised, one is perhaps also forced to question the relationship between 'man and machine'; put bluntly, has the master become the slave?

Pertinent as the question may seem, the way in which societies have become 'configured', in a physical and a social sense towards automobile travel, presents a significant barrier to change, should it be deemed necessary or desirable. As chapter two will show, historic changes in urban form have been strongly linked to macro-scale developments in transport technology. This is perhaps most obviously seen in Europe with its compact, pedestrian-orientated ancient city cores, dense railway-orientated industrial cities, early twentieth-century suburbs around early metropolitan transport systems and later low-density car-orientated developments. In the UK, up to 93% of all personal travel is undertaken by automobile (RAC Foundation, 2010) even though only approximately 70% of households have access to cars (ONS, 2011). A debate has emerged over the extent that urban compaction and neo-traditional patterns of development can generate modal shift. However, although density is undoubtedly a prerequisite for viable public transport, it is also perhaps easy to understand why modal shift has been so difficult to achieve at the local level through changes in urban form alone. To be 'car-free' in a car-orientated society would logically mean accepting limits to choices and freedoms or at least an organisation of one's lifestyle that differs from wider society. Other measures are also problematic, as Sarah Vine once again notes:

Crippling fuel tax won't solve this problem; slowly and sensibly restructuring our lives so that we come to rely less on the car will.

The Times, 31st May 2008

An element of the later empirical research aims to shed light on this issue by examining the extent to which residents with different levels of residential car access experience lifestyle constraint and the extent to which lives are differently structured as a result. Another element attempts to draw on the experience of Freiburg to examine how cities and regions can be structured to facilitate reductions in car travel and to reduce automobile dependency overall.

1.3. Wider Context for Residential Car Reduction

As noted at the beginning of the chapter, most existing car-free development and many heavily car-reduced neighbourhood schemes strive towards social and environmental goals. Economic objectives tend to be less heavily promoted, but can provide further appeal. The sum of these different sets of rationale can be brought together under the single banner of ‘sustainable development’, and represented in the familiar trefoil of sustainability (Fig.1.1).

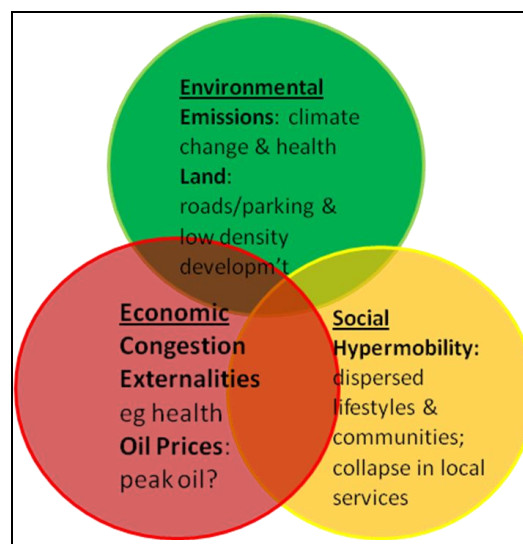


Fig.1.1 The sustainability effects of automobile dependence.

1.3.1 Environmental Sustainability

Although some doubts do currently persist over the existence of anthropogenic climate change, the contribution that residential car reduction can make to environmental sustainability go beyond reducing emissions by curbing car use to include wider issues of land use. Most directly this relates to a reduction in space consumed by car infrastructure, and consequently greater development densities leading to a lower overall land take. As the pioneering garden city architect Raymond Unwin (1994) noted, a reduction in land taken by roads and car parking can also mean more land put to other uses. As will be seen later, contests between ‘grey’ and ‘green’ space have frequently taken place, not only for the

preservation of the countryside, but also in the designs of residential neighbourhoods that have sought to lessen the impact of the car.

1.3.2 Social Sustainability

Urban green spaces can also be considered as social spaces, and urban land taken for roads and parking can sometimes be considered a challenge to social needs. This can also be true of residential streets that are designed to be primarily movement spaces and largely ignore the traditional social importance of streets as public spaces. There is perhaps also further concern over ‘hypermobility’ – the sheer quantity of travel undertaken that the car has facilitated, and the degradation to neighbourhood community bonds that has resulted (Adams, 2000 & 2006). This is possibly more of an issue for those who are less mobile, but the greater fear, crime and isolation that arises from a loss of ‘social capital’ will be explored later in greater depth.

1.3.3 Economic Sustainability

It is perhaps easy to put aside the significant social and economic benefits that the automobile has brought. Shaw & Docherty (2009:3) note that: ‘It has literally driven the generation of wealth and provided countless opportunities for people to improve their life opportunities’. Yet a parallel narrative of concern over Western society’s reliance on high levels of energy consumption has developed from the oil shock of 1973, the Chernobyl nuclear accident in 1986, and geopolitical insecurity in the Middle East and Central Asia that threatens oil supply and has raised questions over nuclear safety. The latter two points have recently been brought into sharp focus once again as political instability has once again flared-up across North Africa and the potential hazards of nuclear power exposed by tsunami damage to the Fukushima plant in Japan. The latter may have a long term effect on energy costs as the then British Secretary of State for Energy and Climate Change, Chris Huhne, noted that:

There are a lot of users outside the realm of nuclear safety that we will have to assess. One is what the economics of nuclear power post-Fukushima will be, if there is an increase in the cost in capital to nuclear operators.

Observer, 20th March 2011

In the longer term, much has been written on the economic ramifications of ‘peak oil’. Former President of the oil company Shell, John Hoffmeister, recently noted that ‘the further we look and the deeper we drill, the more we realise [oil] is finite’ (BBC Radio 4, 27th March 2011).

1.3.4 The Role of Car Reduction

An important point to note is the potential breadth of scope that car reduced development can bring towards tackling a range of different issues. With the shock to oil prices that has recently resulted from political instability in producing countries, itself echoing previous periodic shocks, an obvious solution is to look at alternative sources of energy and means to power vehicles – for example electric vehicles (Economist, 10th March, 2011 & 19th April, 2013). This could help to solve specific problems – namely a switch away from oil-based fuel for cars and a reduction in road emissions. Yet, such a switch will not resolve other issues. Electricity will need to be generated to power these vehicles, and given the relatively slow uptake in renewable energy in the UK switch to alternative fuels, this will predominantly need to be from nuclear, gas or coal energy. Furthermore, a switch will not in itself address other issues associated with automobile dominance – sprawl, congestion and the erosion of community bonds, for example. In this way, electric vehicles might be considered as one part of a package of measures that could attempt to address a diverse range of sustainability issues, and car reduced development might be considered as a focus at the neighbourhood scale (Fig.1.2).

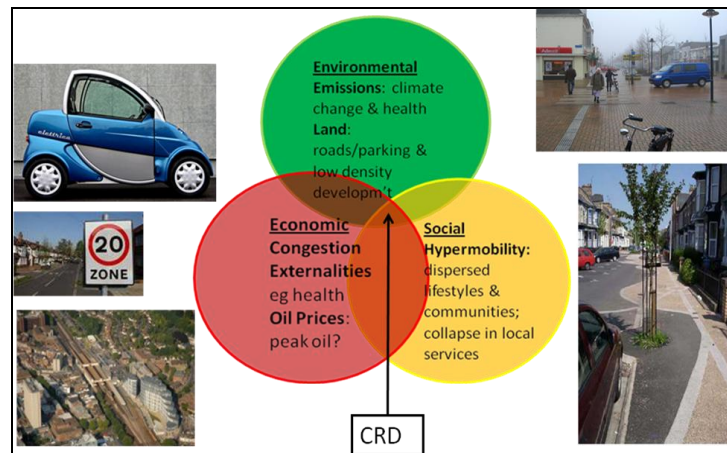


Fig.1.2 Sustainability Concerns, Remedial Policies and the 'place' of Car Reduction.

Although new urbanism and 'smart growth' will be addressed in the next chapter, it is perhaps worth mentioning how car-reduced development relates with these other models at this stage. The Charter for the New Urbanism sets out to incorporate a wide range of sustainability principles into neighbourhood design. For example the charter states that:

neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions.

CNU (1993)

However in its current existence, new urbanism and smart growth are directed towards new build developments – specifically urban extensions. Although car-free movements do exist to lobby for the development of heavily car-reduced neighbourhoods, the bulk of developments built have been to local criteria, by local organisations and without specific reference to universally binding building codes.

1.4 Social Implications of Car Reduction

Spiralling levels of car ownership in the developed world is argued by some to have contributed to a social ‘ungluing process’ where ‘use of automobile became not so much a choice but a necessity’ according to two well known researchers in the field of automobile dependency, Peter Newman & Jeffrey Kenworthy. The term ‘Auto City’ was coined by the authors (1999:32) to describe the modern, low-density cities of North America where automobile orientation offers comparative freedom to the car-owning many, and a hindrance to the swathes of society without car access. The authors’ statement that ‘the Auto City began to lose much of its traditional community support processes’ (*ibid*) is perhaps less a sentimental lament, but more an assertion of concern over the mobility of the car-less in an overwhelmingly car-dominated society. At a basic level, the services and amenities associated with the ‘traditional’ neighbourhood (Perry, 1929) – local shops, schools, church and so forth, have been the social ‘pillars’ that helped to bind a community together. Their loss serves both to perpetuate the need to travel, reduce neighbourly social contact and diminish ‘social capital’ (Putnam, 2000). This broad process has three discernable facets: dispersion, disconnection and disadvantage that might be summarised by an overall effect of ‘dissociation’.

1.4.1 Dispersion

Residential street design and car dominance are examined in relation to a range of factors in the following chapters, including in relation to density and the continuing ‘compact city’ debate on the influence of density on travel behaviour. Yet while density and transport modal share continue to dominate the agenda on sprawl, there exists a range of other factors that are similarly affected by low density development. These include the increased costs of travel and the creation and maintenance of infrastructure (Southworth and Ben-Joseph, 2003), and historic instances of social injustice in which the car-less have subsidised the greater infrastructure costs associated with wealthier, lower density, car-orientated neighbourhoods (Kunstler, 1993:90).

1.4.2 Disconnection

Low density sprawl has also been associated with social ‘disconnection’ because it does not provide the critical mass, proximity and resulting propinquity to support strong civic life (Lefebvre, 1974). In addition a less frequently cited narrative in the recent history of urban development is in access to nature, and specifically the ‘contests’ that have occurred between green natural spaces, and grey automobile infrastructure. Evidence in healthcare research suggests a strong correlation between disconnection with nature and mental ill-health (e.g. Maller *et al*, 2005). The importance of this connection between man, nature and well-being was ‘rediscovered’ during the Romantic period of the early nineteenth century and began to shape the design of urban spaces through the influence of landscape architects Joseph Paxton in Britain and Frederick Law Olmsted in the United States, later in the century. Olmsted had a particularly notable influence on residential design, as will be explored later, but an important aspect of the green spaces that he brought into the urban realm was the social contact that it engendered. Green spaces serve as spaces of connection between people as well as between mankind and the natural world.

1.4.3 Disadvantage

Automobile dominance that has led to dispersion and the relocation of employment, shops and services from central localities to the outskirts and around major road junctions, disadvantages those without car access. *In extremis*, Soja (2000) describes the social polarising and ostracising effects of the automobile-based ‘white flight’ from the North American inner city, the relocation of employment and services to the ‘exopolis’ and some of the social effects of the daily car commute. The process of dislocation between housing, employment, shops and services has been encouraged by governmental land use zoning policies which perpetuate the need to travel for the most basic life needs. In the UK, three-quarters of those who work outside of London do so by private vehicles’ (Giuliano & Gillespie, 2002:30), a self-reinforcing pattern if left unchecked ‘as employment continues to decentralise, the shift away from public transit will continue’ (*ibid*). Groups generally associated with low car access include the poor, the elderly, disabled and the young. This problem of diminished accessibility is further compounded by the degradation of public transport services because of falling ridership due to a modal switch to the car by some and a process of physical dispersion that undermines economic viability.

1.4.4 Dissociation

The sum of these tangible processes of physical dispersion, disconnection and disadvantage might be described as ‘dissociation’, embracing less tangible aspects and particularly how members of society relate to one another and to the wider world. For example, the existence of a perceived value-action gap has interested social scientists and policy makers attempting to understand why individuals frequently fail to translate the attitudes and opinions they hold towards a matter into action. One explanation for this failure is the existence of three ‘barriers to action’ (Blake, 1999:108), broadly consisting of (i) individual character traits or ‘individuality’, (ii) the extent of personal ‘responsibility’ felt, and (iii) the ‘practicalities’ of action. ‘Association’ might be important. One explanation of the of the value-action gap follows that in the absence of personal association or empathy, ‘constructed’ by direct experience or indirectly through social interaction, then the degree of responsibility felt by an individual is likely to be less (Bickerstaff & Walker, 2003). Although, the relationship between an individual’s attitudes and action towards is not straightforward (e.g. Anable, 2005) and a multitude of potential complicating factors exist between one’s experience and one’s inclination or ability to act, direct experience could provide at least one significant avenue towards accepting personal responsibility, and through interaction, a lever for engendering a wider response. This is potentially important in relation to less perceptible issues such as environmental change, where it is easy not to notice small changes, particularly within the urban environment, and therefore not to feel a sufficient level of personal responsibility to make a significant change.

1.4.5 Grey versus Green Space

Car reduction affords the opportunity to use space differently from ‘conventional’ developments that require extensive parking and vehicle access roads. Indeed, it will be seen that the car-reduced developments studied in this research feature extensive green areas, minimising the need to travel to parks and gardens, and providing natural relief to urbanity. The writer Henry Thoreau (1851) once mused that ‘when we walk we naturally go to the fields and woods: what would become of us, if we walked only in gardens and malls?’ at once implying a human inclination towards, and a need for, contact with nature. Frederick Law Olmsted (1865), the creator of New York’s Central Park more fervently argued that access to the natural environment was a basic human right, and railed against the privatisation of natural landscapes by the rich whilst ‘[t]he great mass of society, including those to whom it would be of greatest benefit, [are] excluded from it’ (Olmsted, 1865:22).

In the present day, Strife & Downey (2009) in the United States note how the urban poor are much more likely to be disproportionately burdened by environmental inequities – such as from busy roads or industry, and furthermore to experience disproportionately lower levels of access to nature. Greater car ownership for the masses has been regarded as ‘the’ solution to this accessibility disadvantage, and it was probably without intended irony that the Scottish-American naturalist John Muir (1912) wrote that: ‘All the western mountains are still rich in wildness, and by means of good roads are being brought nearer civilization every year’ (Muir, 1912:71). Muir probably did not anticipate the environmental degradation that roads would bring nor the disparity between the car ‘haves’ and ‘have nots’. In President Lyndon B. Johnson’s address to the US congress in 1965 the irony – intended or not, is even more pronounced:

More than any country ours is an automobile society....By making our roads highways to the enjoyment of nature and beauty we can greatly enrich the life of nearly all our people in city and countryside alike.

Context is important. By the time of Johnson’s speech America had in many respects become an ‘automobile society’ since the remodelling of cities around the private car that had begun half a century earlier. At the time of his address vehicle ownership was still rapidly rising and spreading to the less well off. Indeed, earlier in his address Johnson was at pains to stress importance of equal access and opportunity for all:

[C]oncern is not with nature alone, but with the total relation between man and the world around him. Its object is not just man’s welfare but the dignity of man’s spirit... protection and enhancement of man’s opportunity to be in contact with beauty must play a major role. This means that beauty must not be just a holiday treat, but a part of our daily life. It means not just easy physical access, but equal access for rich and poor, Negro and white, city dweller and farmer.

Lyndon B. Johnson, (1965:173-5)

Much can be read into this particular passage, which has a particularly ‘Darwinian’ flavour about mankind’s place in the wider world, and the importance of contact with nature as a basic human right. A competition between ‘grey’ road and ‘green’ natural space in residential design has ensued since Olmsted’s creation of a landscape design influenced suburb at Riverside, Illinois. This competition has been characterised chronologically by the Garden City movement’s narrowing of road carriageways to provide extra greenery, Stein’s prolific green areas as a means to ameliorate the car in Radburn, New Jersey, and contemporary car-reduced developments such as Vauban, Freiburg where potential car parking has been turned over to green spaces. In Freiburg a ‘city of short distances’ philosophy has been the basis for

reducing the need to travel (Daseking, 2010). One need not travel out of the city to experience the Black Forest as pieces of it are woven into the new neighbourhoods, just as Olmsted sought to bring the American wilderness into the centre of New York, and his mentor Joseph Paxton brought glimpses of the countryside into the heart of urban Glasgow, London and Merseyside.

1.4.6 Shaping Policy: Shaping Lives

Because of the connection between automobile dominance, urban quality and human behaviour, a question is formed whether places really are fit for the purpose of human habitation. This profound question is not a new one. Indeed, one commentator noted, in relation to the rise of the automobile in America in the 1920s, that:

During the height of automania, a zoologist observed that in animal herds excessive mobility was a sure sign of distress and asked whether this might not be true of his fellow human beings...[twentieth century man] seemed to be constantly going from where he didn't want to be to where he didn't want to stay.

Goodman (1960), quoted in Duany *et al*, 2005: 85

The implication in Goodman's reflection is that places were unsatisfactory, and that travel – by car in particular, derived from this matter. A cycle forms in which places degrade by the vehicles that transport people there in the first place forcing people to move on just as animals graze and move when the food is depleted.

The contention is that a cycle of self-reinforcing dependency manifests itself in physical dispersion, disconnection and disadvantage to those without car access. This hypothesis points towards a deeper 'problem' from which a range of symptoms arise; yet tackling each symptom individually seems an insufficient strategy to solve the root problem. If the whole is supposed to be greater than the sum of its parts, then highly specific and fragmented strategies fall well short, just as policies to tackle individual symptoms of car dominance and dependency will not 'solve' the root problem. This being the case, residential car reduction could be offered as a focal point for policy – by presenting a desirable end point that draws together a wide range of policies to work effectively (Fig.1.3). By comparing different models of development, it is the task of the empirical research presented later to scope the social effects of car reduction, to investigate how balances can be achieved so as not to create undesirable social consequences, and to try to identify the range of wider policies that are needed. In this way, car reduction and car-reduced forms of development are viewed as a desirable end point rather than a starting position.

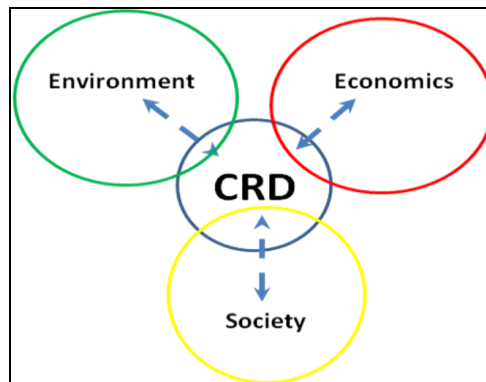


Fig.1.3 Car Reduced Development and Wider Policy

1.5. The Research Focus

This study is essentially an exploration of the relationship between mobility and community development at the neighbourhood scale, with specific reference to automobile reduction. The previous section detailed why residential car reduction can serve as the focus for a range of policy and design interventions, underpinned by environmental and social objectives. As the next chapter will demonstrate, previous studies have shown that residential design interventions can influence mobility patterns and social interaction. There is a notional tension between the two aspects: does enhanced social interaction mean curbing residents' mobility by the removal of private cars, or can a positive balance be struck?

1.5.1 Mobility & Car-Reduced Design

Key mobility issues centre on the operation of 'car-reduced lives'. This term is used here not because car reduced development preclude car ownership and private or shared car use outright, but because a number of studies have shown a consistent and significant reduction in car ownership and use in residents of such schemes. For example, in Vauban – Europe's largest scheme located on the edge of the Southern German city of Freiburg, Scheurer (2001) found that 81% of household previously owned a car but 57% relinquished ownership on moving into the development. Similarly, in the small Slateford Green development in Edinburgh, Scheurer (2001) found that '54% of all households lead a practically carfree lifestyle' with just 12% of households with car-dominated travel patterns. However, more detailed analysis of car-free lives are currently lacking in the literature, particularly relating to different needs groups such as the elderly or disabled and to particular requirements such as for shopping or the 'school run'.

1.5.2 Social Interaction & Car-Reduced Design

As technology has enabled lives – indeed *communities* to become spread over widening geographical space, there is a concern that social ties within specific localities will be weakened. Adams (2006) argues that:

If we spend more time interacting with people at a distance, we must spend less time with those closer to home, and if we have contact with more people, we must devote less time and attention to each one

Adams (2006)

Beyond simple nostalgia, Adams' critique has a number of stark and measurable outcomes, including the self-reinforcing demise of neighbourhood services and facilities, the erosion of *social capital* leading to increasing levels of crime, mental health problems (Putnam, 2000 & 2002), and the consequences of the loss of children's independence (Hillman *et al*, 1995; and Putnam, 2000). Conversely, Adams uses the phrase 'hypo-mobility' to describe the negative consequences of insufficient mobility leading to inaccessibility and consequently the loss of opportunities. Such tension and 'trade-off' between mobility and community forms a core element of this work when comparing different housing schemes.

Greater social interaction may be beneficial for two main reasons. Firstly, there may be a notion of 'community' through a shared sense of purpose and common aspirations. This may relate to residential self-selectivity by which '[t]hose who choose to live in developments which are pedestrian or bicycle friendly or where cars are explicitly banned, may be the segment of the population who do not choose to own a car in the first place' (Banister & Marshall, 2003:50). The second explanation is that of 'environmental determinism' where interaction between residents is improved as a direct result of the removal of traffic and consequent design of the built environment, essentially because 'urban design can be seen as a means of manipulating the probabilities of certain actions or behaviours occurring' (Carmona *et al*, 2003:107). Traffic removal is clearly an outcome of urban design within such schemes, and one would logically expect a greater probability of interaction between residents. A tripartite relationship is therefore proposed to summarise the theoretical relationship between social interaction, mobility and design in figure 1.4, in which the 'design' represents the level of automobile provision in a particular development and the alternative uses of would-be automobile space.

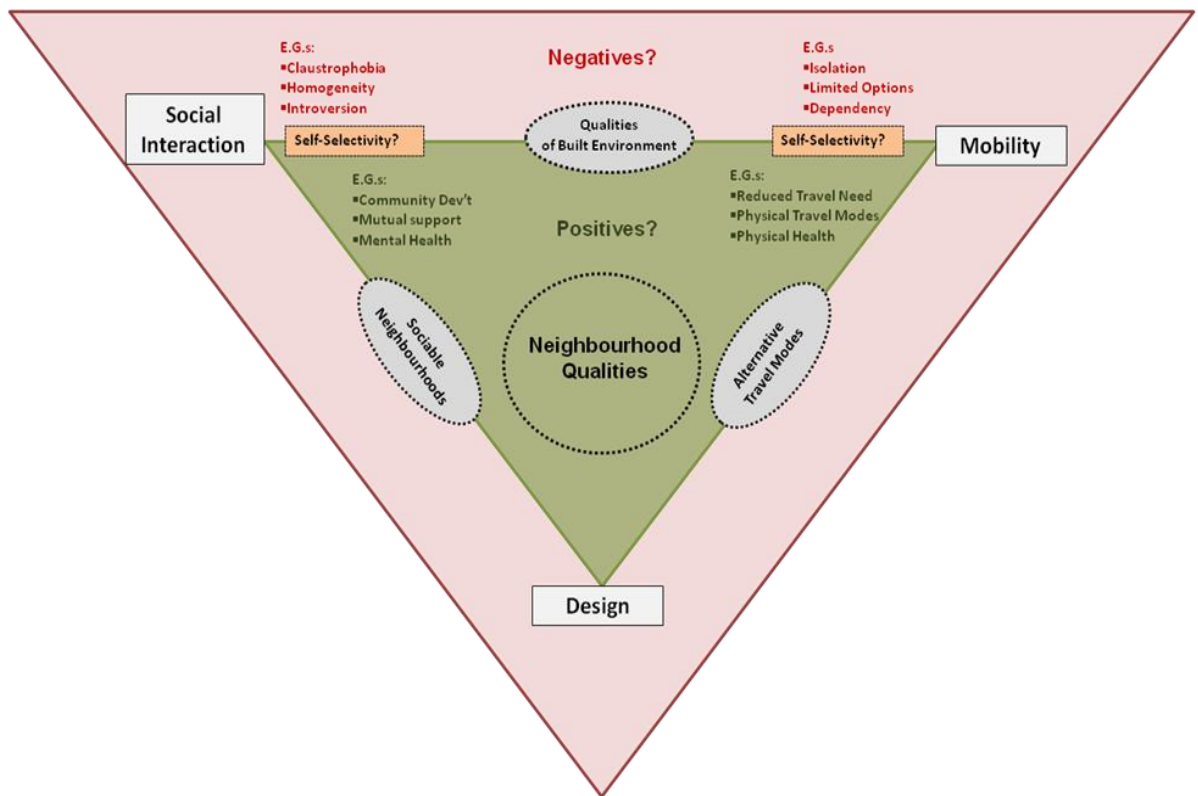


Fig.1.4 Theoretical Framework

This thesis explores the triangular relationship between design, social interaction and mobility as depicted in Fig. 1.4. ‘Design’ – which includes the scalar range from ‘micro’ residential design detail to ‘macro’ aspects of urban planning – is assumed to exert a controlling influence on residents’ mobility and social interaction by producing different qualities of built environment. Different neighbourhood qualities will be produced as a result of this triangular relationship, as depicted by the interacting residential design, socialising and mobility options at the core of Fig. 1.4, and two examples from the UK are given later in chapter three to show how these factors interact. The inner triangle of the theoretical framework shows some of the social aspects stemming from the balance of the triangular relationship which might be universally regarded as ‘positive’, such as mental health benefits from greater social interaction or improved physical health from integrated land use and mobility planning (Evans & Stoddart, 2003). On the other hand, the outer triangle shows some of the potential negative effects which could arise when privileging mobility or social aspects of the built environment – for example a sense of ‘claustrophobia’ if design is too socially oriented (Dempsey *et al*, 2012), or dependency on particular transport modes if development is skewed to heavily in a particular direction. Lastly, however, demographic concentration stemming from residential self-selectivity may be seen as both an outcome of design and a process which can shape patterns of social interaction and mobility and which, in theoretical terms, might be regarded as both a potentially positive and negative outcome – a matter of central

concern throughout the thesis. This thesis is an exploration of the factors presented in Fig. 1.4, and directions of causality form part of the research outcomes, from the literature in the chapters immediately following this, and from the empirical research presented in the latter chapters.

At the core of the theoretical framework (Fig.1.4) is a basic Venn diagram depicting the three key neighbourhood qualities of ‘socialising options’ and ‘mobility options’ in relation to ‘residential design’. The three neighbourhood qualities relate more broadly to the three elements of society, mobility and design shown below in Fig.1.5. These elements form the structuring basis of the next chapter and are ‘unpacked’ individually in the next chapter.

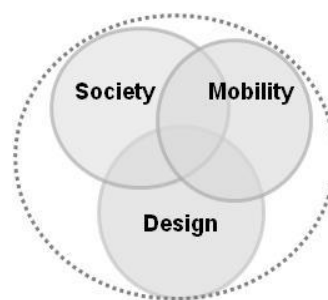


Fig.1.5 Theoretical Framework Core

Fig. 1.5 could also represent the wider decisions about land use allocation. In relation to residential street design, ‘urban design’ could be regarded as a ‘fulcrum’ which, by means of allocating space differently for traffic and pedestrians, can create different outcomes as depicted in 1.3. This is an important yet basic point, as:

a modest change in pavement width can have large consequences for energy consumption, comfort and convenience, sociability, the time and effort we must spend in local trips, as well as the costs of construction and maintenance.

Southworth & Ben-Joseph, 1997:3

A question to be investigated in this thesis is whether overall residential car reduction ‘tilts’ the balance similarly – and if not, why not?

1.6 Empirical Research Structure

This thesis has employed a case study approach. Although the rationale for selecting this approach, and some of the considerations surrounding it are discussed fully in chapter four, Renurpi *et al* (2002) argue that the following characteristics should prevail when considering selecting a case study:

- i. it is a story;

- ii. it draws on multiple sources of evidence;
- iii. the evidence draws on multiple sources of triangulation;
- iv. it seeks to provide meaning in context
- v. it shows both an in-depth understanding of the central issue(s) being explored and broader understanding of related issues and context;
- vi. it has a clear-cut focus on either an organisation, a situation or a context.
- vii. it must be reasonably bounded. It should not stretch over too wide a canvas either spatial or temporal.

In addressing these points, the ‘story’ of the main Freiburg case study is introduced in chapter four and developed in chapters five and six , where multiple sources of evidence are used to triangulate the demographic profile of residents, social interaction and mobility patterns in three different neighbourhoods where different design packages have been implemented. In this way, the case provides meaning in context – both spatially within the region of Baden-Württemberg - and thematically in terms of the research concerns explored, the subject of chapters two and three where the related issues and broader context are set out. Finally, the main focus is distinctively bounded spatially and temporally in a comparative study of three neighbourhoods in Freiburg.

In order to support the main case study research and to develop lessons for other cities from the principal findings, empirical research was conducted in three distinct phases:

- I. Pilot case study research undertaken at two small car-reduced schemes of Slateford Green in Edinburgh and BedZed in London – the focus of chapter three.
- II. The main case study research on the small southern German city of Freiburg, which included detailed comparative social analysis of three neighbourhoods where three different approaches to car reduction had been implemented – the focus of chapters four to seven;
- III. Additional site visits to the Greenwich Millennium Village in London, a small development at Dreikönigstraße in Freiburg and Südstadt scheme in Tübingen in order to further substantiate the neighbourhood design and implementation lessons identified in the main Freiburg case study, examined in chapters seven and eight.

The three phase research programme was designed to create a systematic structure within which the research framework and methodology could be tested before embarking on the main phase of data collection, with additional sites used to help draw out key findings. However, a danger is to consider the empirical research in terms of a rigid hierarchy which overlooks valuable information and insights gained from each case study, whether intended as a pilot, the main empirical focus or additional material. Therefore, key insights from the pilot case studies are presented in chapter three, the main research body in chapters five and six and additional insights in chapter eight. The case studies can also be considered in parity, as a ‘mosaic’; with each providing different perspectives and insight into social outcomes in relation to the specific context. As Yin (2009:39) and Flyvbjerg, 2006:227) note, the role of the case study is not to produce data from which statistical generalisations are produced, but rather to assist in learning about potentially complex processes. In this way, a mosaic of case studies can be particularly informative. Table 1.1 shows the organisation of the fieldwork, with the abbreviations O,U, I referring to the measures implemented in each neighbourhood to reduce car ownership, use and impact, respectively, as outlined earlier in section 1.1.4.

	Impact	Use & Impact	Ownership, Use & Impact
Chapter 3 (Pilots)		BedZed (London)	Slateford Green (Edinburgh)
Chapters 4-6 (Main empirical)	Haslach (Freiburg)	Rieselfeld (Freiburg)	Vauban (Freiburg)
Chapter 7 & 8 (Additional)	GMV (London)	Dreikönigstraße (Freiburg)	Südstadt (Tübingen)

Table 1.1 Development examples cited and location in the thesis

Although chapter four explores the fieldwork methodology in detail, two related points are worth noting at this stage about the decision to select Freiburg as a case study. The first point is that the city boasts a number of distinct development models; specifically the Vauban ‘car-free’ suburb and the Rieselfeld ‘sustainable’ (car-reduced) suburb, built at a scale that surpasses similar development in other European cities. The second point is that key background variables – public transportation access, cycle and pedestrian networks, access to shops and amenities, for example, are broadly similar. This potentially makes examining the reasons for difference more straightforward. Yet if significant differences between development models, which offer varying levels of car access, are not recorded then it could theoretically ease the process of identifying the reasons easier, in terms of identify policies and design features that have set a ‘level playing field’. In this way, the ‘null hypothesis’ – the

assumption of no difference can be as significant a line of investigation as hypothesis-led approach which assume that differences will be recorded in the social outcomes between each development.

In this instance the empirical research is organised around a single and broad research question and ‘operationalised’ by the three sub-questions that emerge in chapters two and three. Different approaches have been employed to collect a range of quantitative and qualitative data. The aim of this approach was to enable trends to be drawn from aggregated data at the neighbourhood scale, whilst also capturing stories and reflections from residents, stakeholders and decision-makers. A mixed approach permits collaboration and a certain amount of ‘triangulation’ between different data sources. It also means that the perspectives and circumstances of individuals can be captured. This reminds us of the importance in considering the full breadth of people’s needs rather than becoming fixated on separate aspects in isolation. It is in attempting to address and to reconcile human needs that research and the policies that follow become particularly complex.

1.7 Conclusions: Why Study Residential Car Reduction?

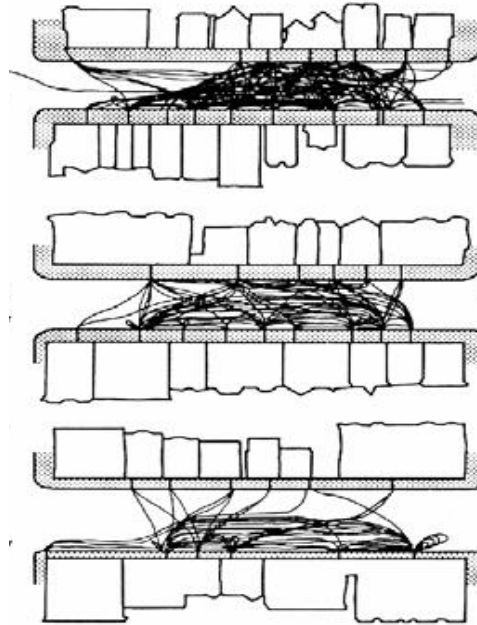
Using the oft-used sustainability venn diagram as a structure, there are three sets of rationale for researching residential car reduction. Socially, these are spaces in which the majority of the population in western societies spend a significant proportion of the population spend their lives. They are places in which children grow up and have their first experiences, where adults spend more than half of each typical day, and perhaps with the prospect of increasing energy costs and the implementation of travel reduction strategies, where a proportion of the population will spend increasing parts of a working life. Environmentally such neighbourhoods lend the prospect of orientating residents away from private car and towards alternative modes or car usage schemes, they may be instrumental in reducing the need to travel overall and may provide space that can be used for growing, recreation or natural areas. In this way, a corollary may be the strengthening of relationships with the wider world; to feel oneself truly as a ‘stakeholder’ in the fate of the world and the apparent challenges faced. Economically vibrant neighbourhoods may result from travel reduction as strong local hubs develop, whilst greater interaction and local networking could lead to local creativity.

The next chapter attempts to draw attention to some of the social needs that are frequently forgotten or considered to be outdated, and that are undermined by the car and the infrastructure it requires. These specifically include social capital, community development and natural spaces that serve as social areas, ‘restorative’ spaces and a connection between

people and the wider world around them. However, it is the extent to which urban form and land use are controlled by the dominant transportation mode that needs to be understood initially and the potential pitfalls in attempting to control transport use by modifying land use and urban form; this relationship will be examined.

CHAPTER TWO

Urban Development, Society & Automobiles



How do we approach car reduction?

Suburban houses and ‘new towns’ came close to the lowest possible ‘threshold of sociability’ – the point beyond which survival would be impossible because all social life would have disappeared.

Henri Lefebvre, Social Production of Space

2.1 Introduction

Chapter one established a rationale for investigating the impact of the automobile on society and an indicative set of underpinning problems associated with automobile dominance. As the automobile can be viewed simply as the most recent form of transport technology to exert a social dominance, it is therefore useful to understand the social effect of different dominant transport modes over the course of civilised history. Understanding the extent and nature of transport as a social shaping force is a logical first step in developing strategies in the later chapters of this thesis. The purpose of this chapter therefore is to attempt to understand the structuring and shaping force that transportation imposes on urban space, and in turn on livelihoods and patterns of life. To this end, Part A briefly reviews some of the defining ways in which the development of transport technology since the Industrial Revolution has shaped urban structure and the qualities of urban space – generically defined as ‘urban design’. Part B then explores the relevant aspects of the relationship between urban design, as shaped by transport, on social outcomes including residents’ profile, community development and well-being.

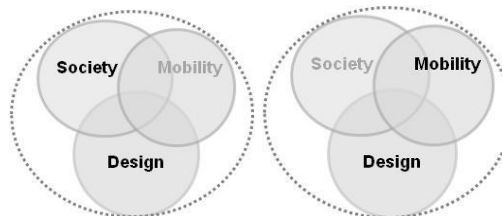


Fig.2.1 Chapter Focus (A) Part A (B) Part B

One motivation in the first part of this chapter is to explain the dominance of transport in shaping urban development. Such contextual analysis is undertaken not simply for the sake of historic interest but, moreover, to scrutinise the extent to which density and the replication of older styles of settlement form can act against car dominance. An argument developed is that the same shaping ‘force’ of transportation connectivity that operates at the metropolitan and regional levels exerts an important shaping influence at the local level in the form of a continuum from the macro down to the micro scale. This argument will be developed more specifically in relation to Freiburg when reporting on the findings of fieldwork in later chapters. Such discussion raises a basic question whether neighbourhood car reduction

policies *should* be implemented unless satisfactory movement by other forms of transportation can be met at wider scales. Of particular salience are the ways in which lives are organised both spatially and temporally including the combination of multiple purposes into journeys, and also the need to for residents to be accessible by outsiders. Against this background, the guidance given to car-free development by UK planning policy for localities with ‘sufficient access by non car modes’ (DCLG, 2011:42) appears extremely vague.

2.1.1 Key Themes

Two themes recur in this chapter. The first is in relation to the ontological and epistemological challenges posed by the privileging of ‘scientifically’ obtained data in the development of streets and roads in the ‘Progressive Era’ – a period in early twentieth century urbanism that emerged from the Enlightenment. Specific challenges posed by scientific rationalism might be summarised, firstly, in the prioritising of car traffic in urban streets over the other uses of these public spaces, secondly, the social ramifications that this shift towards ‘mechanized physical’ environment (Mumford, 1938: 8) had, and thirdly, how to evaluate such effects, and whether under ‘Positivist’ and ‘Post-Positivist’ paradigms (Guba & Lincoln, 1994:105-106) these acts of ‘measurement’ privilege tangible effects that are verifiable, over those that elude verification under the value system and methods applied.

A second recurring theme is the way in which ideas develop, prevail, disappear then re-surface at a later stage, often in modified form, and frequently as an apparently new idea. In the case of neo-traditional design, explored towards the end of Part A, the historic precedents are, as one might expect, deliberate. A problem arises when patterns of new development attempt to reach back to a past era that was shaped by a different dominant transport regime and thus different *modus operandi* by its residents. In this context it is therefore unsurprising to learn that tensions and undesirable consequences occur as a result with a number of determinedly ‘sustainable’ residential schemes producing patterns of behaviour that are substantially less sustainable than intended.

2.1.2 Key Questions

By examining the way in which urban form has tended to follow the dominant transport function, two critically important questions emerge. The first is where the starting point is for residential car reduction; is it possible to look at neighbourhoods in isolation from the wider transport system and the way in which lives are structured? To illustrate the point, it should be noted that a fundamental shift towards the car occurred in the UK in the late 1950s and 1960s,

and with it the way in which individual's lives were conceived. Buchanan's 1963 'Traffic in Towns' report (Buchanan, 1963) is often considered to be fundamental in producing a shift towards accommodating the car in the urban environment and a mixed package of measures to incorporate but also mitigate against the negative impacts in neighbourhoods. Yet the Buchanan report was one of three measures introduced by Transport Secretary Ernest Marples that engendered a profound wider change. An extensive programme of motorway building had already seen the opening of the M1 motorway in 1959 whilst the railway network, already under pressure from road competition, was substantially rationalised following the recommendations of Richard Beeching's 1963 *Reshaping of British Railways* report. It is argued that because structural change at the national level was underway, car dominance became an inevitability in the residential environment Buchanan could only recommend measures that would mitigate its worst effects on neighbourhood communities.

A second question therefore emerges: is car reduction viable without wider structural change to the transport system? The answer depends on how 'car reduction' is defined, and this question forms the basis for exploring different mitigation strategies in Part B. However, as discussed in later chapters, the orientation of development towards public transport provides only a part solution to the negative effects car dominance in the residential environment. Furthermore, whilst 'car-reduced' development models are proposed in chapter eight that capitalise on proximity to public transport nodes, attempting to substantially reduce car ownership without structural change to the wider transport network and supporting travel-influencing policies, termed in composite as the 'operating system', the scope for private car reduction will remain constrained.

PART A: THE RISE OF THE ‘AUTO CITY’

2.2 Transport & Urban Development

Discussion and debate in the literature over the effects of car dominance and dependency on the urban environment is, in greater part, devoted towards cities in their contemporary setting (e.g. Newman & Kenworthy, 1999). It is argued that such accounts and ‘solutions’ offered such as alternative fuel vehicles, shared ownership schemes (Cervero & Tsai, 2004) or car free development (Melia, 2010a) offer only partial analyses of the problem and can therefore offer only partial solutions. Specifically, by seeking innovative remedial solutions rather than developing a historically-grounded appreciation of the transport-land use narrative, such accounts often ignore the controlling influence on urban structure and on the structure of lives imposed by the dominance of a particular transport mode. It is suggested that this may lead to the implementation of strategies that are inappropriate to the wider context, for example in the creation of car free schemes that have pre or post-car ownership overtures but are in fact placed within wider settings that remain heavily car dominated.

Transport has been described as the ‘maker and breaker of cities’ (Clark, 1958) and transportation routes have long exerted a profound influence on the spatial disposition of urban settlements. Travel has for a long time been associated with economic activity with many early settlements developing as strategic staging posts, links or nodes in transportation networks. For example, the Sumerian port city of Ur was four square miles in extent by 3500 BC, boosted by its regional trading links around the Persian Gulf (Lynch, 1981:6), while New York owes its existence as a gateway between Atlantic shipping and the onward transportation of goods along the Erie Canal (Marshall, 2000:47). Even with the development of telecommunications and information technology, transportation continues to play a critical urbanising role by providing foci of economic activity. This is true within cities as well as across nations and global regions.

The form and characteristics of urban spaces have been defined and redefined by the shaping influence of transportation technology. This, in part, is due to the concentrating and de-concentrating effects of certain types of public transport against private transport, and the impact on street cross-section of different modes, exerting a controlling influence on building height and frontage as a result.

2.2.1 Early Cities

The earliest settlements of Mesopotamia were densely configured for movement on foot, in spite of the development of the wheel in around 5000 BC (O’Flaherty, 1997:3). However, the

first grid layouts are believed to have been developed by Hippodamus in Ancient Greece (Fig.2.2a) as a means to accommodate the passage of carts and chariots in cities (Grammenos *et al*, 2008). This model was later adapted into a radial pattern by Roman architect Vitruvius in the first century (ibid; Fig.2.2b) to control the ‘eight winds’ (Southworth and Ben-Joseph, 1997:10). Both patterns are readily apparent today – with the former found extensively in North American cities because of utilitarian ease for real-estate division, and the latter across Europe. These basic settlement patterns have recurred in modified forms throughout history and can be traced into the modern day.

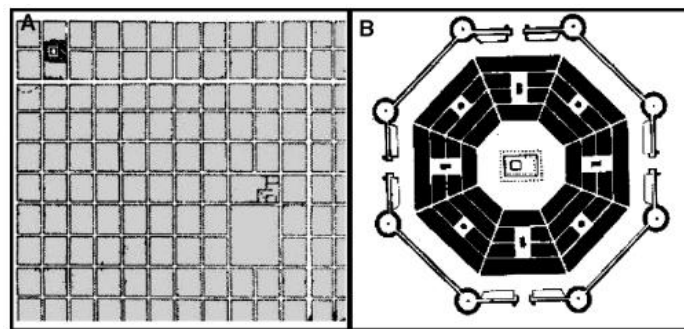


Fig. 2.2 City grid plans (a) Hippodamian Grid and (b) Vitruvian radial grid (Grammenos *et al*, 2008)

Within the larger Roman towns, streets became stone-paved with raised pavements. Because of a need to accommodate wheeled traffic and to establish an appropriate ratio between building height and street width, Emperor Augustus laid down ordinances for street widths in 15 BC, including 40 feet for the main east-west processional road or *decumanus* and 15 feet for side roads or *vicinae* (Southworth & Ben-Joseph, 1997:9-10). A number of cities are known to have suffered from chronic congestion due to the competing needs of chariots, animals, carts and pedestrians. In response, Julius Caesar created culs-de-sac around the roman forum to prevent traffic from entering (Hass-Klau, 1990: 9) – an early model of traffic restraint that re-emerged in the late 19th century.

After the collapse of the Roman Empire and the subsequent reversal that occurred in much of Europe, medieval towns were typically constrained by defensive walls that forced building upwards (Southworth & Ben-Joseph, 1997:14) while the internal circulation structure was shaped primarily around pedestrian circulation. This provided a compact overall form with dense networks of narrow streets lending the ‘permeability’ that is clearly seen in the street pattern of the City of London below (Fig.2.3) together with traces of the earlier Roman grid. There was, however, considerable variability in street width in the Medieval city with major traffic including horses and carts funnelled down wide commercial streets, whilst residential areas were protected from traffic by narrow alleyways (Goecke, 1893: quoted in Hass-Klau, 1990).

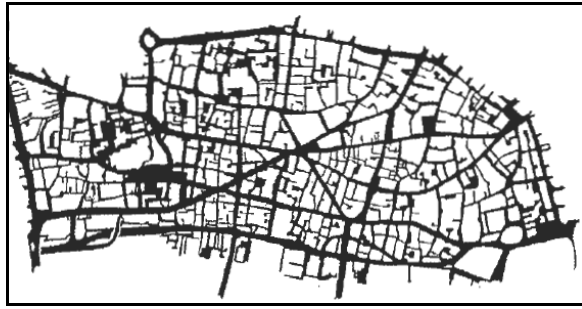


Fig.2.3 City of London with Bank circled (from Hillier, 1996)

2.2.2 Industrialisation

Although the devastating fire of London in 1666 led to early attempts to regulate street width by decree (Barnett, 1986:8), it was the Industrial Revolution that changed the urban landscape most radically through rapid urbanisation caused by influxes of workers from the countryside and by the creation of new transport technologies. The opening of George Stephenson's railway between Liverpool and Manchester in 1831 was a particularly important event, heralding the arrival of rapid and reliable inter-urban transportation for passengers and freight and in so-doing, the opening of new markets. The railways made the production and speedy transportation of goods around the country possible. As a consequence industries boomed in the railway towns. However, reliance on foot travel within cities heavily constrained the extent of urban growth leading to heavily overcrowded and squalid inner city housing, compounded by rapid urban population growth.

The development of the horse tram and the later electric tramway began to make longer urban journeys possible and thus spread development outwards. By the turn of the twentieth century public transportation in the form of street trams and suburban rail services were beginning to alter the shape of cities with the emergence of transit suburbs around London and major 'streetcar suburbs' in North American cities. London's tramway and later 'metroland' suburbs attempted to draw workers away from cramped inner-city conditions with fares guaranteed by an Act of Parliament (Hall, 2000:52) so as by the 1930s the author Peter Ackroyd notes in his 'biography' of London that:

two and a half million people were on the move in London...It was the age of 'Metroland' ...The importance of transport in effecting this mass dispersal is emphasised by the fact that the very notion of Metroland was created by the Metropolitan Railway Company...Their booklets and advertisements emphasised the resolutely non-urban aspects of what were effectively great housing estates.

Ackroyd (2000)

Outer metroland suburbs were largely the preserve of wealthier citizens searching for a rural ideal with good city access. Improved conditions for the urban poor came in the form of the 'Bye-law Street Ordinance' of the 1875 Public Health Act (Southworth & Ben-Joseph, 1997:39) which created long and 36 feet wide streets to remove stagnant air in a bid to raise standards of public health. The 1875 Act was grounded in a growing concern over the well-being of the urban poor document graphically in Edwin Chadwick's earlier *Report on Conditions of the Labouring Classes in the Town of Leeds* (*ibid*:20). It was a combination of concern over public well-being and the opportunities afforded by developments in transport technology that led to the emergence of new settlement forms including the 'garden suburb' that will be examined in the next section.

2.2.3 *The Progressive Era*

If the development of railways in the mid-nineteenth century revolutionised transportation and propelled urban growth, the invention of the automobile in Mannheim by Karl Benz in 1885 caused a similar revolution defined by freedom and dispersion that can be readily seen in the urban fabric of the modern city. The mass-production of the Model-T Ford in the early twentieth century set the revolution in motion, which happened initially in the United States as mass car ownership in Europe did not begin until after the economic boom which followed the close of the Second World War. A five-fold increase in car ownership in the US between 1910 and 1915 meant that by the 1920s American roads were already suffering from chronic traffic congestion (Brown, 2006:11) and solutions were urgently sought. A new approach based on a 'scientific' methodology came from a group including Harland Bartholomew, Charles Cheney and Miller McClintock that led a 'progressive era' in urban planning (Brown, 2006). The flow of traffic along roads became subject to data collection and mathematical modelling under the laws of fluid dynamics – where a steady flow was the desired outcome, and new expertise developed on the basis of this 'rational' approach. The impact of the 'Progressive Era' experts has been profound, both in terms of the physical networks and patterns of development that has emerged, but also because of the social and political ramifications of an approach which has:

[T]ransform[ed] transportation planning from a broad, multidisciplinary exercise conducted by a diverse group of architects, engineers, and planners concerned with the social, economic, aesthetic, and transportation needs of city residents into a narrow technical exercise conducted by specially trained engineers and planners who were concerned largely with facilitating safe, high speed motor vehicle travel. In so doing, they more directly served the practical political and economic interests of their local government and downtown business group clients.

Brown (2006:4)

In other words motorists – the rich and elite of the time, were prioritised above other streets users. Furthermore, Brown (2006:28) notes that by focusing on motor vehicle travel has ‘exerted a profound influence on the course of urban development’. The rationalist scientific approach gave birth to the freeway, and new highways were constructed with the minimum of road intersections, building frontages and access so as to minimise disruption to the overall flow. MacKaye noted that “Motor traffic and pedestrian ‘living’ do not go together” (MacKaye, 1930 quoted in Hass-Klau, 1990: 100) and advanced the notion of segregation that would create ‘highway-less towns’ and ‘town-less highways’ as a means to resolve this basic incompatibility. It is this divorce between buildings and roads that began a process that has been likened to the ‘filleting’ of the skeleton from the urban ‘flesh’ (Marshall, 2005:6) and with it the emergence of highway engineering. The impact on urbanism has been profound, with the relationship between buildings, their immediate environment and a wider circulation system fundamentally redefined. Marshall (2005:7) describes the resulting ‘schism’ in terms of a ‘deconstruction and separation of the elements of the street’.

2.2.4 Modernism

It is perhaps in the profile of Modernist development that this changing relationship is most dramatically seen. In Le Corbusier’s *Ville Radieuse* sky-scrapers occupy a small footprint to leave generous swathes of open parkland space in the order of 95-85% of the land area because personal automobile transport allowed a new relationship between buildings, streets and the wider urban ‘system’ to be established with new forms of urban development following a ‘fluid geometry’ (Marshall, 2005:6) designed to take the motorist quickly to their destination. Describing his residential blocks not as homes but as a ‘machine for living in’ (Hall, 2000:220), Le Corbusier conceptualised urban living in mechanistic terms that rarely seemed to have taken social needs into account. Indeed, Hass-Klau (1990:19-20) observes that ‘Le Corbusier had little time for the needs of pedestrians. His cities were places for the motorists who could drive at high speeds and not be held up by traffic congestion’. It was a machine-orientated urbanism that Le Corbusier sought to create.

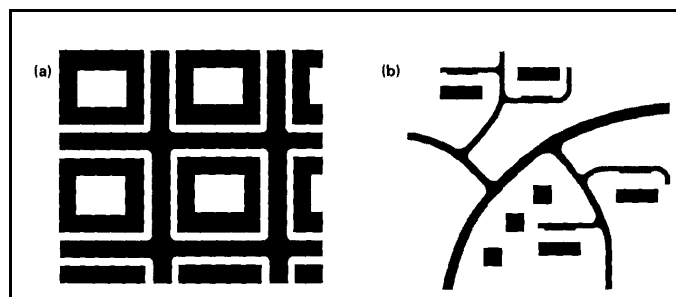


Fig.2.4 Traditional Grid (a) and Modernist Radiant city (b) layouts (Marshall, 2005:6)

Modernism helped to perpetuate a wider paradigm shift towards a highway engineering approach as a means to tackle congestion and safety. This scientific approach placed an onus on the efficient of traffic movement through the road network and the application of a law of ‘inverse correlation of access and movement’, in which the aim was to reduce all impediments to movement and by segregating arterial ‘spaces of movement’ from cell-like ‘spaces of standstill’ (Hebbert, 2005).

2.2.5 Traffic in Towns

After the end of World War 2 Britain experienced a dramatic upsurge in road traffic with a doubling of car ownership between 1954 and 1962 from 3 to 6 million vehicles. Colin Buchanan was appointed to tackle the last and arguably most elusive of these issues and in 1963 delivered his *Traffic in Towns* report. First and perhaps foremost was a proposed road hierarchy that set out to clearly differentiate between urban roads for local access and those dedicated to movement. Second, Buchanan saw a need to treat residential areas sensitively, arguing that they should be treated like ‘rooms’ of a building unlike the main road ‘corridors’. His proposal was for residential ‘environmental areas’ that strongly resonated with an earlier concept of ‘precincts’ proposed by Herbert Alker Tripp. Thirdly, *Traffic in Towns* sought to improve the urban environment for pedestrians by means of segregation. The hierarchy scheme which Buchanan proposed was based towards the movement utility of urban streets. These streets became ‘roads’ under a four part classification scheme (Fig. 2.5).



Fig.2.5 Buchanan's classification scheme (without access roads shown)

In Fig.2.5 the grey lines denote the boundaries of Buchanan's 'environmental areas' that are set out in a striking grid pattern. Access roads into the 'superblocks' were distributed inside the local distributor roads. The basic principles for road hierarchy has had a lasting impact on the residential environment with the adoption of around 900 'environmental areas' in the 1970s (Hass-Klau, 1990). The outcome desired by Buchanan was to create 'rooms and corridors': roads where free movement was unimpeded and static spaces for residential and other 'destination' areas. In other words, streets could be either one or the other – a link or a place, but not both at the same time with the traditional multipurpose 'street'. The term 'street' began to disappear from official British government parlance in 1963 with the publication of *Traffic in Towns*.

Initially after its publication, *Traffic in Towns* was widely perceived as being largely pro-car, but later interpretation cast the report in a different in a different light, regarding it as being rather more a reflection on the steps that would need to be taken if Britain went for full motorisation. Buchanan was ambivalent, if not highly questioning of such an outcome as he commented in an earlier work:

It is when one considers carefully the full implications of Alker Tripp's theory – the searing of the town with a railway-like grid of roads and the literal turning of the place inside out that the first qualms arise and one asks whether, if this is the price to be paid of the motor car, it is really worth having.

Buchanan, 1958 (quoted in Marshall, 2005:4)

2.2.6 New Towns

By the late 1960s, English new towns such as Milton Keynes began to incorporate a fusion of the traditional grid layout at the macro scale (Fig. 2.6a) through a hierarchical lattice of

Buchanan-esque primary and district distributor roads containing Radburn style ‘superblocks’ complete with segregated pedestrian routes (Fig. 2.6b).

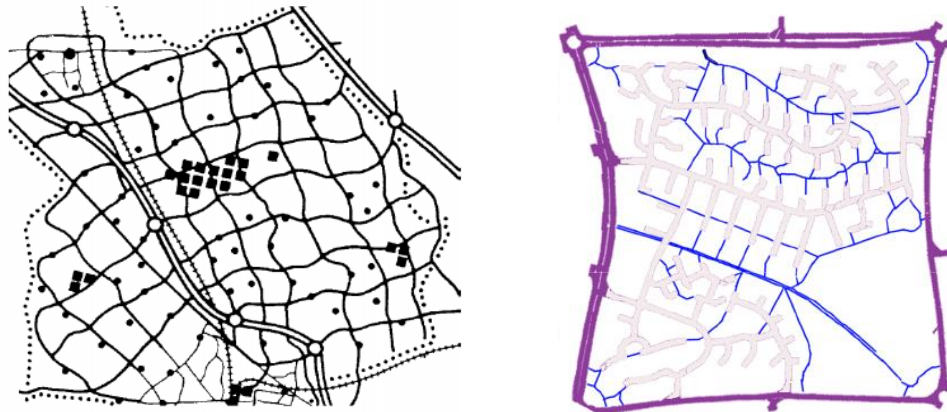


Fig.2.6 Milton Keynes at the macro scale (a) and at the neighbourhood level (b)

The concept was for each grid neighbourhood to contain its own local services, but an attempt to promote all transport modes has not proven to be successful due to the large distances generated by the low density, making local public transport difficult to sustain while pedestrians and cyclists are discouraged by a lack of natural surveillance along routes (Hamiduddin, 2012). New Towns such as Milton Keynes are the products of the 1960s view of the world in which the car had primacy; the automobile dominates as a result.

2.2.7 Post-modernism

The ‘filleting’ of the road network (Marshall, 2005:6) from the urban core and the creation of ‘exoskeleton’ assemblages of ring roads and highways has had a well-documented effect of projecting growth outwards, and the concentration of development into ‘edge city’ developments (Garreau, 2011). With the pre-eminence of automobile transport in the late 20th century this strategic shift to best possible road access on the outskirts has followed the same logic as the concentrated development around the railways in the previous century. Just as the mode of transport has changed, so have the scale and the character of these forms that draw upon wide catchment areas of car owners to support large scale development. Similarly, just as Modernists demonstrated how new urban patterns were possible with the automobile, road networks have allowed housing to de-concentrate outwards onto cheaper land, resulting in swathes of low density, automobile-dependent suburban development that shroud a significant proportion of Western cities today.

Such development naturally favours the automobile owner, and can leave those without car access at a significant disadvantage. One observer has noted that:

The urban poor, primarily members of racial and ethnic minority groups who have relatively low levels of technical skill and own automobiles at lower rates than richer and whiter components of the population...have decreasing access to employment opportunities, which increasingly occur at low densities on the urban fringe.

Wachs, 2002:23

Taken to the extreme, Soja (2000) describes how social polarisation has stemmed from an automobile-based ‘white flight’ from the North American inner city to the suburb, where employment and services have also relocated, resulting in an ‘exopolis’ in which the city has literally been turned inside-out, as the traditional functions of the metropolis have located to the edge; and out of the reach of the poorest.

In summary, the shape of development has progressed from the confines of the medieval walled city, through suburban expansion along transit corridors during the Industrial Revolution, to a shape-less style of suburban residential growth and edge-of-city commercial development in the late twentieth century.

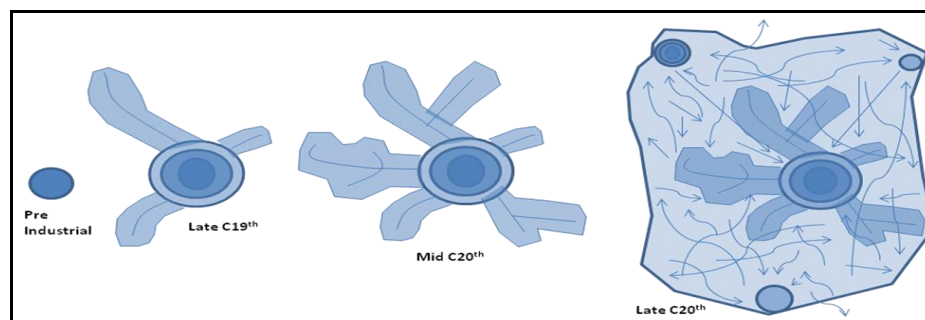


Fig.2.7 General Model of Urban Growth Around Transport

Although the reshaping of the traditional city can be regarded as a corollary of changing transport technology, and specifically the rise of the automobile, governments have abetted the process to a considerable extent with land zoning policies designed to separate different land uses. Zoning policies stem from a governmental desire to improve public health by separating potentially detrimental activities – notably heavy industry, away from housing, schools, and other areas of public use (Duany *et al*, 2000). Laudable as zoning’s original intention undoubtedly was, the concept has been overtaken by the disappearance of much of the target industry as economies have restructured around non-polluting industries. In the United States zoning has been criticised for being a somewhat ‘mechanistic’ relic – a throwback to the simplistic ideals of Modernism (Lynch, 1981:88) and a blunt instrument that, because different services are separated, needlessly generates a travel demand that reinforces car dependency and sprawl (Duany *et al*, 2000).

On the other hand, land use planning has also been deployed as a means to controlling growth and preventing sprawl; urban containment or ‘greenbelt’ laws exist to focus development into the existing urban boundary, prevent the merger of settlements and to preserve the countryside for agriculture and recreational space. In Britain, greenbelts have operated since 1955 with widespread public support (Cullingworth & Nadin, 2005:233-5) underpinned by a prevailing concern for countryside preservation. Yet the policy has not been without negative consequences and its detractors, for example by encouraging ‘leapfrogging’ of development beyond the belt, densification of existing settlements beyond the limits of infrastructure capacity and high land costs on the fringes of existing settlement boundaries (Rudlin & Falk, 2006:119).

2.3 Into the Twenty-First Century

New Urbanism and its close relative neo-traditionalism have achieved prominence by attempting to produce socially, economically and environmentally sustainable development patterns. New Urbanism has been cited as the antithesis of land-hungry, energy-consuming and socially detrimental suburban sprawl particularly of North America (Duany *et al*, 2000). Inspiration is especially drawn from development patterns of the early twentieth century (Hebbert, 2005) to inform ‘codes’ that serve as the basis for the ground plans of new development and, in the case of neo-traditional planning, to influence the building façade also. The 1993 charter for New Urbanism – an echo of the Athens charter produced by the Congress of Modern Architecture (CIAM) in 1933 is wide-ranging, recognising a scalar continuum of processes from the city-region down that have a bearing on urbanism at the local scale. The charter deploys broad brush strokes in some of its aspirations, for example in relation to residential design it states that:

Neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions.

CNU (1993)

On the other hand, the charter attempts to tread the delicate balance between being a guiding philosophy containing sufficient detail to be put into operational effect and being overly prescriptive and rigid. But the movement has drawn considerable fire for a variety of reasons, particularly for being vague and superficial and for contradicting its own ‘sustainability’ ideals by generating new tracts of development on green field land (e.g. Soja, 2000; Harvey, 2000). Many of New Urbanism’s detractors are Marxian-influenced and most prominently led

by David Harvey and Edward Soja. Harvey argues that ‘the founding ideology of the new urbanism is both utopian and deeply fraught’ and furthermore that:

Most of the projects that have materialized, are “greenfield” developments for the affluent. They help make the suburb “a better place to live”...and do nothing to help revitalize decaying urban cores.

Harvey, 2000:70

Paradoxically, such criticism may have been to the movement’s benefit, enabling it to put a distance between its own aims and the ‘busy-body latte drinkers, elitist Volvo drivers, brie cheese eating blowhards’ (Hebbert, 2003:202). In other words, there is a hard political reality in the ‘car equals freedom, freedom equals car’ (Hebbert, 2003:203) philosophy behind sprawl in the United States. Any attempt to alter the course of development will not only have to contend with this prevailing attitude but also to find a patriotic language and a commercially viable means to sell it to the wider public.

2.3.1 Criticism

It is on this basis that the writer Alex Marshall attacks New Urbanism’s approach in producing ‘off the drawing board’ patterns that are historically influenced, but are taken out of the original context and therefore do not relate to the basic influence of transportation that shaped the source pattern in the first place. Citing the ‘traditional’ layout of the New Urbanist town of Celebration in Florida as fundamentally ‘dishonest’ Marshall (2000) details the practical difficulties and undesirable outcomes that emerge from the creation of a town that is transit orientated in pattern but car dominated in reality. Some of the difficulties featured by Marshall include inadequate residential parking hidden in back streets so as not to disrupt building frontages – which tended not to be used as residents tended to access their vehicles from the rear. A weak retail base orientated the town’s shops towards incoming tourists as locals would shop in the large Wal-Mart off the freeway. Long commuting distances by car were generated by the lack of employment within the town itself and compounded an absence of public transport. Management of the public realm made for an interesting excursion by Marshall. Celebration was developed by the Disney Corporation and ‘public spaces’ including streets are managed corporately rather than by a public body, in a manner that recalls a commercial shopping mall with its attendant regulations.

This is, of course, just to cite one example of a New Urbanist development – and one that could be described as a ‘company town’. But it is the relationship between transportation and urban form that is of particular interest and concern, and the extent to which the metaphoric

‘cart’ has been put before the ‘horse’ (Marshall, 2000). To pull a ‘timeless’ pattern out of a book (Fig.2.8), Marshall suggests, is to approach urban pattern from the wrong starting point, unless there is a transportation system in place to support the commensurate pattern of life.

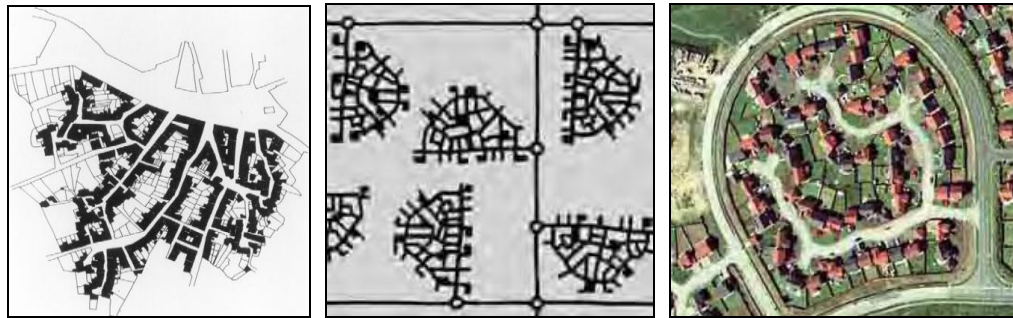


Fig.2.8 (a) Christopher Alexander's 'Timeless' Pattern (b) A 'Plethora of Poundburys (c) Importance of Context (all: DfT, 2007)

A relevant point is the extent to which such developments relate to their surroundings. A new neighbourhood can function well internally but seem detached from its immediate context. Greenfield or free-standing schemes pose a particular challenge. Stephen Marshall (2005) highlights this issue in relation to the neo-traditional urban extension of Poundbury where an internal pattern of development produces ‘desirable’ outcomes including a reduction in road engineering dominance leading to an improvement in urban quality and an uplift in walking and cycling. But how Poundbury relates to its surroundings and notably the parent town of Dorchester is much less clear. The point is illustrated with the depiction of a ‘plethora’ of disconnected Poundburys (Fig. 2.8b); schemes that are intrinsically ‘virtuous’ from a quality of life and internal travel point of view, but are disconnected and therefore questionable in terms of overall ‘sustainability’ at the wider level when people need cars to meet their basic needs.

2.3.2 Compact Cities

Urban density has been described as a ‘hub’ to which a number of other factors are related, including the provision of facilities, viability of public transport and the ‘walkability’ of urban districts (Urban Task Force, 1999:63). In the UK, the ‘compact city’ debate has emerged around the assumed relationship between urban density and modal share. One side argues that increasing density will lead to greater public transport use, whilst the other asserts that modal switch is not an inevitable outcome, and densification often simply contributes to greater road traffic congestion (Dempsey, 2010; CABE, 2010). For example, recent research in three UK city-regions found that although substantial compaction can increase walking and cycling, the distance travelled by car decreased by just 5% (Echenique *et al*, 2010). Furthermore, in a recent review of the compact city debate, Melia *et al* (2011) describe a ‘paradox of intensification’ also noticed earlier by Breheny (1997) whereby a doubling of density yielded just a 7% decline in car use. Melia *et al* add that a continuing overall decline in household

occupancy means that in order maintain urban population density, an increase in overall residential density will be needed. A solution could be provided by European style car-free development that would increase density without adding to local traffic congestion. This would not be an altogether new approach as a considerable quantity of ‘parking-free’ already exists in inner London and other larger cities in the UK, much of built by housing associations and directed towards tenants who are less likely to be car owners.

Early work by Crane & Crepeau (1998) provides useful insight into this apparent paradox. The authors question the emphasis placed on journey-to-work data in the bulk of studies, given that the bulk of local travel is for non-work journeys; non-work travel can reveal different patterns of behaviour. Furthermore, the authors draw attention to the process of residential self-selectivity to explain differences in behaviour which may be related to a wide range of socio-economic factors later confirmed by studies undertaken in the UK by Stead (2001), and also to personal preferences rather than just urban form and layout. This is an issue that will be examined in greater depth later in this chapter.

However, these studies also hint at the controlling influence, even at the neighbourhood level, of the dominant mode of transport at the wider level. As the historic narrative at the beginning of this chapter showed, older cities were compact by dint of transport availability, as Marshall (2000) notes:

Urbanism comes from a particular type of transportation system or systems. Grids of streets with a close network of stores and homes are produced by a transportation system where people rely on their feet to get around short distances, and on some type of mass transportation to go longer distances.

Marshall, 2000:6

Larger cities well-served with dense, reliable and comfortable public transport networks can substantially reduce car ownership levels (Holtzclaw, 1997). Additionally, FitzRoy & Smith (1997) note how the use of an integrated range policy package including cheap travel passes, pedestrianization, traffic calming and parking restrictions as well as extensions to the tram and bus network caused a doubling of public transport use in Freiburg between 1984 and 1994. (Fig.2.9). Tellingly, the authors conclude that ‘[n]ot all aspects of the Freiburg model are readily transferable to cities in Britain under current legislation’ FitzRoy & Smith (1997:173).

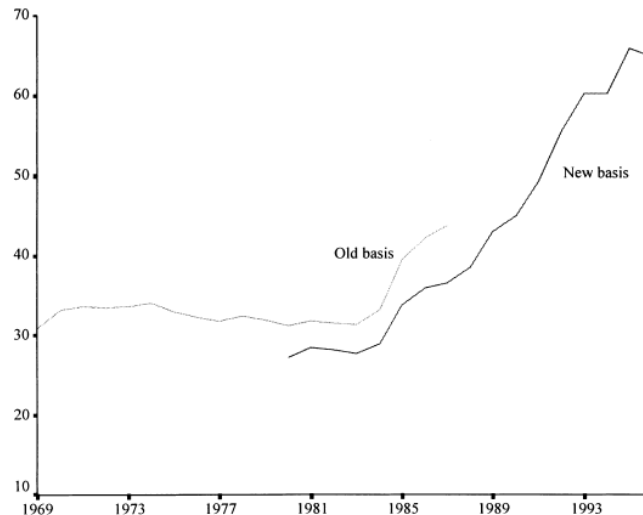


Fig 2.9 Passenger Trips (millions) by Public transport in Freiburg (FitzRoy & Smith,1998)

FitzRoy and Smith draw attention to the need for long-term, cross-cutting and broad scale transport strategies in order to effect behaviour change in travel, and is an additional factor in explaining why density and urban layout alone cannot produce radically different travel outcomes. As Cervero (1998:4) asserts: ‘Islands of TOD [transit-oriented development] in a sea of freeway-oriented suburbs will do little to change fundamental travel behaviour or the sum quality of regional living’. Crucially, even if a high density of housing presents favourable conditions for a good public transport route, ridership is more than simply about a single route, but about the quality of the network around which passengers need to be transported, interchange between different services and modes and about fare structures and ticketing. Logically therefore, reducing automobile dependence seems to be about creating a ‘seamless web’ of reliable public transport with a convenience to challenge the private car on a regional scale as operates in many metropolitan areas such as London, Manchester, Karlsruhe or Portland. Compaction is, indisputably, critical in generating a critical mass of customers to make public transport services viable, but it is not likely to produce high levels of ridership by itself unless there is a comprehensive and affordable public transport network. In this light therefore, car-free development and other highly car-reduced forms could be regarded as logical an outcome of high quality transport as the dense ‘streetcar suburbs’ of North American cities or ‘metrolands’ in Britain; an outcome rather than a starting point.

It is perhaps telling that the few car-free or ‘parking-free’ developments in Britain have been largely local authority led, concentrated within the UK’s largest cities and with a high proportion of social or assisted ownership homes, in which residents are much less likely to be car owners. By contrast and in spite of the explicit ‘garage law’ governing new-build property, the greater bulk of Germany’s substantially more extensive car-free development is

in private ownership. It is perhaps a paradox therefore that Germany which is second only to the United States in its overall level of car ownership (Pucher, 1998) has a significantly higher level of privately led car-reduced development than Britain, a country with a significantly lower level of car ownership. Glasson & Marshall (2007:192) assert that 'the UK is consistently one of the worst planners and managers of transport systems in Western Europe'. One possible reason for the difference between Germany and Britain is in the quality, reliability and confidence that Germans have in their public transport at a regional level, and the broad package of measures illustrated by FitzRoy & Smith (1997) that metropolitan authorities introduced to reduce car reliance. In this respect urban form, as embodied in residential car reduction, follows transport functionality in German cities such as Freiburg, as will be shown in the findings from the empirical studies in chapters five and six.

PART B: COMMUNITY, MOBILITY AND THE BUILT ENVIRONMENT

2.4 Preamble

The purpose of Part B is to try to understand how aspects of community, mobility and the built environment intersect; aspects which form the basis of the theoretical framework at the core of the empirical research reported in the later chapters. At the heart is the notion of ‘social capital’, a concept rooted in sociological investigations early in the twentieth century, but popularised successively by Jane Jacobs (1961) who referred to it in describing neighbourly relations, Pierre Bourdieu who described it in ‘resource’ terms (1983:249) and perhaps most prominently in recent times by Robert Putnam (2000) in *Bowling Alone*. Although the economic overtones of the term ‘capital’ might raise qualms, the term nonetheless may be recognised in serving its purpose well. Although social capital is a complex and, to an extent, a contested subject matter, this thesis accepts that social interaction forms the necessary foundation on which it is built in the neighbourhood environment, and it is this interaction which forms the focus of later investigation in chapter 5.

A primary concern is the structuring effect that transport has on urban space, and by definition, on both social relations between individuals and on the social condition of individuals. Some of these effects are scientifically measurable, and the following sections will explore the implications of car traffic on community, car-orientated development on health and well-being, and mobility on social relations more generally with respect to ‘hypermobility’. Yet this is perhaps to fall into the same epistemological and ontological ‘trap’ that Brown (2006) depicted in his critique of the application of scientific rationalism to the street network in the early twentieth century in Part A; if phenomena are not ‘scientifically’ measurable, does it mean that they do not exist? By extension there are profound methodological questions over the measurement of social phenomena that are discussed in chapter four.

Of interest, firstly, is the occurrence of both tangible effects from car domination and reduction and also those effects that are perhaps less ‘tangible’ and might be connected with a second point of interest, the quality of space that car reduction potentially produces. As a concept, one of the arguments in support of car reduction is the opportunity it affords for alternative uses of space, for example the substitution of ‘green for grey’ space as it was termed in chapter one. This may be regarded as a significant end in its own right in urban planning, and tangible effects on physical and mental health and general ‘well-being’ may be measurable by clinically tested public health derived methodologies. Yet it is less clear

whether such approaches are sufficient for capturing the full ‘phenomena’ of environmental quality on health and well-being. Urban commentator Lewis Mumford once lamented that:

Millions of people grow up in this metropolitan milieu who know no other environment than the city streets: people to whom the magic of life is represented, not by the miracles of growth, but by placing a coin in a slot and drawing out a piece of candy or a prize. This divorce from nature has serious physiological dangers that the utmost scruples of medical care scarcely rectify.

Mumford, 1938: 253

Mumford echoes the ‘existentialist’ beliefs of the Romantic movement and transcendentalists of the enduring qualities of a natural world, which, to echo Emperor Marcus Aurelius might serve to provide a ‘firm foothold’ in the ‘running river’ of existence (Harvey, 1996:10). Contact with the natural world, in other words, might serve as a subconscious ‘contract’ between individuals and a wider sense of being as eloquently summarised recently by author-academic Robert MacFarlane:

We experience, as no historical period has before, disembodiment and dematerialisation. The almost infinite connectivity of the technological world, for all the benefits it has brought, has exacted a toll in the coin of contact [...] And so new maladies of the soul have emerged, unhappinesses which are complicated products of the distance we have set between ourselves and the world.

MacFarlane, 2007: 203

A ‘felt’ connection with the wider world is the critical point and ‘nature’ here is studiously avoided as a term that implies separation, echoing Harvey’s (1996) assertion that New York City is a product of nature. Although this thesis will not investigate such non-tangible aspects in detail, non-tangible qualities may be recognised as part of a residential design ‘package’ permitted by the alternative use of space from car reduction.

2.5 Mobility, Community & Traffic

Social capital – the development of bonding relationships in social networks - has a bearing on local civic engagement, and physical and mental health (Helliwell & Putnam, 2004; Putnam, 2000). Putnam describes social capital as:

[...]connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them. In that sense social capital is closely related to what some have called “civic virtue.” The difference is that “social capital” calls attention to the fact that civic virtue is most powerful when embedded in a sense network of reciprocal social relations. A society of many virtuous but isolated individuals is not necessarily rich in social capital.

Putnam (2000: 19)

Social capital is grounded in social interaction in other words, and can be recognised as a quality that has a strong influence on an individual's well-being. Positive 'externalities' may be produced, for example by deterring crime in a neighbourhood. Trust - a quality that is intimately bound up with social capital, can affect behaviour for example by influencing our perceptions of safety to use particular places at certain times, or the extent to which children's freedom is restricted. Cauchon (2005) reports that on an average day children are six times more likely to play a video game than ride a bike. However, the extent to which this situation is caused by developments in gaming and virtual technologies as opposed to parental concerns remain unclear (Strife & Downey, 2009). In any event, parental control is likely to be a factor (Valentine & McKendrick, 1997) and one that is strongly influenced by perceptions of risk, itself related to the development of trust and social capital.

2.5.1 Social Capital & Hypermobility

Adams (2006) explores the link between trust and mobility - and specifically a degradation of social capital, due to the increasing geographical dispersal of livelihoods and lifestyles entailing ever greater amounts of travel and diminished time spent in one's home neighbourhood. Adams' concern is directed towards the implications of a collapse in civic trust as increasingly 'hypermobile' residents have less neighbourly contact, leading to an erosion of social capital and eventually bringing a collapse in civic institutions and community organisations that Robert Putnam (2000) describes. A collapse in social capital perpetuates a loss of trust, leading to gated communities and a proliferation CCTV cameras to undertake - by remote - the functions that a 'society of strangers' (Adams, 2000) is unable to perform. Put simply, social capital serves as a social 'adhesive' for which social contact is a key ingredient; diminished social contact means a weakening of the adhesive. Adams contends that if members of society spend increasing time travelling (Fig.2.10), then there will be less neighbourly contact and thus diminished neighbourhood social capital.

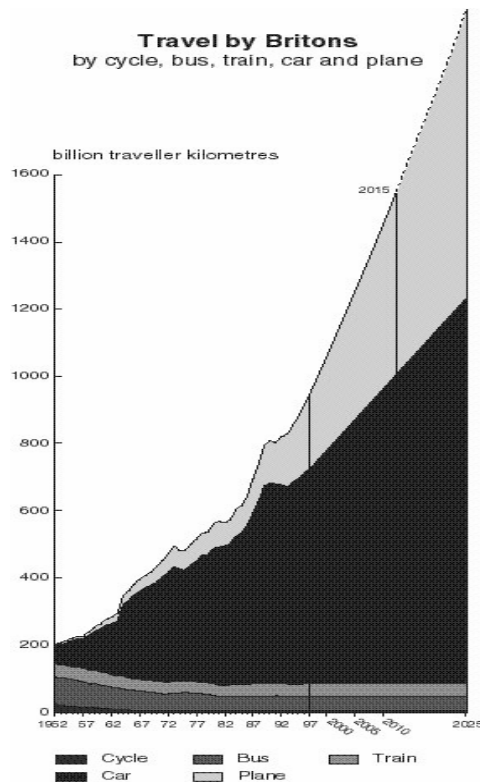


Fig.2.10 Increase in Annual Travel by Britons (Adams, 2006)

Different perspectives have been expressed on this matter and particularly in relation to the meanings of ‘community’. As long ago as 1964 Webber expressed doubt about the extent to which communities had been geographically defined from as far back as the eighteenth century. Communities of interest were more closely related to mobility than being tied to a specific place:

As accessibility becomes further freed from propinquity, cohabitation of a territorial place – whether it be a neighbourhood, a suburb, a metropolis, a region, or a nation – is becoming less important to the maintenance of social communities.

Webber (1964:109)

And as a consequence therefore, ‘the place-community represents only a limited and special case of the larger genus of communities, deriving its basis from the common interests that attach to propinquity alone’ (Webber, 1964:111). Webber’s ‘genus’ of territorially unbounded communities has undoubtedly multiplied with the advent of the internet and communications technology, and with it the number of ‘communities’ – physical or virtual – that individuals belong to. More recently, Cresswell (2004:39) has suggested that place has become ‘an event rather than a secure ontological place [...] an event is marked by openness and change rather than boundedness and permanence’.

Webber's logic found a physical manifestation in urban sprawl – the ultimate expression of the boundless community. Yet even rapid recent developments in communications technology seem to have had a very limited effect in reducing physical journeys (Hall & Pain, 2007), just as the extent of urban sprawl has spatial-temporal boundaries tied to particularly localities – major road junctions or the 40 minute average commute into the inner city (Newman & Kenworthy, 1999). In fact, even by the late 1970s Lynch (1981:198) had already noted the extent to which improving communications technology served to 'stimulate demands for new trips' rather substitute them. Adams (2006) underlines this point with the following story:

During a chance encounter in Vancouver airport while waiting for a flight to London, I got chatting to the fellow sitting next to me who was waiting for a flight to Toronto. He was flying for a game of bridge with someone from Toronto, someone from Edinburgh and someone from San Francisco. They had met and played bridge on the internet, and now they needed a "real" game.

Adams (2006)

Therefore, just as the car has generated additional travel that was not previously made by public transport, the same could be said in respect to the displacement of travel by other forms of communication.

However, just as it was noted that individuals were likely to members of a number of different communities, the aspect of specific concern here is not the substitution of place-community by interest or other non-territorial community. Moreover, it is about the strength of street and neighbourhood communities that creates safe and pleasant home environments. This does not in itself imply a zero-sum situation in which membership of one community is bought at the expense of another.

The logical outcome of hypermobility and the dispersed pattern of urban development that results from car dominance is an individualism which becomes reinforcing. Indeed Henri Lefebvre noted that 'Suburban houses and 'new towns' came close to the lowest possible 'threshold of sociability' – the point beyond which survival would be impossible because all social life would have disappeared'(Lefebvre, 1974:316).

The 'lowest possible "threshold of sociability"' reverberates with a recent report on social well-being in Britain which noted that:

Loneliness and a lack of social networks have become a stark feature of a more individualistic society. Millions like living on their own but we found that many are suffering because of the

absence of people they can turn to for help and support. Half a million pensioners spend Christmas Day alone, and seven million people suffer a 'severe' lack of social support.

Young Foundation (2009)

The question may be posed therefore – will residential car reduction make for greater interaction between residents and stronger relations within the residential community? The question will be addressed in chapter five.

2.5.2 Political Implications of Social Capital

A link between social capital and political engagement has been noted at the local level (Helliwell & Putnam, 2004). Communities with high levels of social capital are generally found to engender a sense of public spiritedness, in which as Alexis de Tocqueville wrote in the early nineteenth century: 'feelings and ideas are renewed, the heart is enlarged, and the understanding developed only by the reciprocal action of men one upon another' (quoted in Putnam, 2000:338). Communities in which social capital is stronger tend to have greater levels of political engagement both directly and through participation in clubs and organisations, which may not be political but can serve to equip individuals with basic 'tools' for democratic participation such as debating, public speaking and so forth. Additionally, and as with the street setting itself, organisations can also be an important setting for casual discussion and formulation of ideas:

We learn about politics through casual conversation. You tell me what you think, and what your friend have heard and what they think, and I accommodate that new information into my mental database as I ponder and revise my position on an issue. In a world of civic networks, both formal and informal, our views are informed through interchange with friends and neighbors. Social capital allows political information to spread.

Putnam (2000:343)

In an echo of Lefebvre's fear for human survival because of a lack of sociability, Adams (2000) raises concern about macro-level governance with the loss of social capital and trust at the local level. *How can a society of strangers be governed?* Adams asks. Notwithstanding the physical 'socio-spatial' aspect implied by this shift (Marshall, 2009: 91 & 107) – a further retreat 'behind walls' perhaps, *by remote* is the conclusion that Adams arrives at. He depicts an 'Orwellian' vision of a society surveyed by CCTV cameras because natural surveillance and the traditional checks and balances of the street have faded, and a loss of democratic accountability as decision-making is deferred upwards as local civic and political institutions have failed. It is a bleak prospect, which Adams substantiates with evidence of the emerging patterns of mobility and civic engagement. Yet, because the building blocks of social contact,

social capital and social engagement are built upwards from the lowest levels - the street and the neighbourhood, it is logically important to understand the patterns at that level.

2.5.3 Traffic & Community Development

Work undertaken in San Francisco in the late 1960s by a team led by Donald Appleyard began to uncover a strong correlation between the levels of traffic on residential streets and the strength of neighbourly relations. Appleyard's team found that residents living in streets with traffic levels exceeding 16,000 vehicles per day were acquainted with far fewer of their neighbours than those living on a street with 'light' traffic with less than 2000 vehicles passing per day (Fig. 2.11).

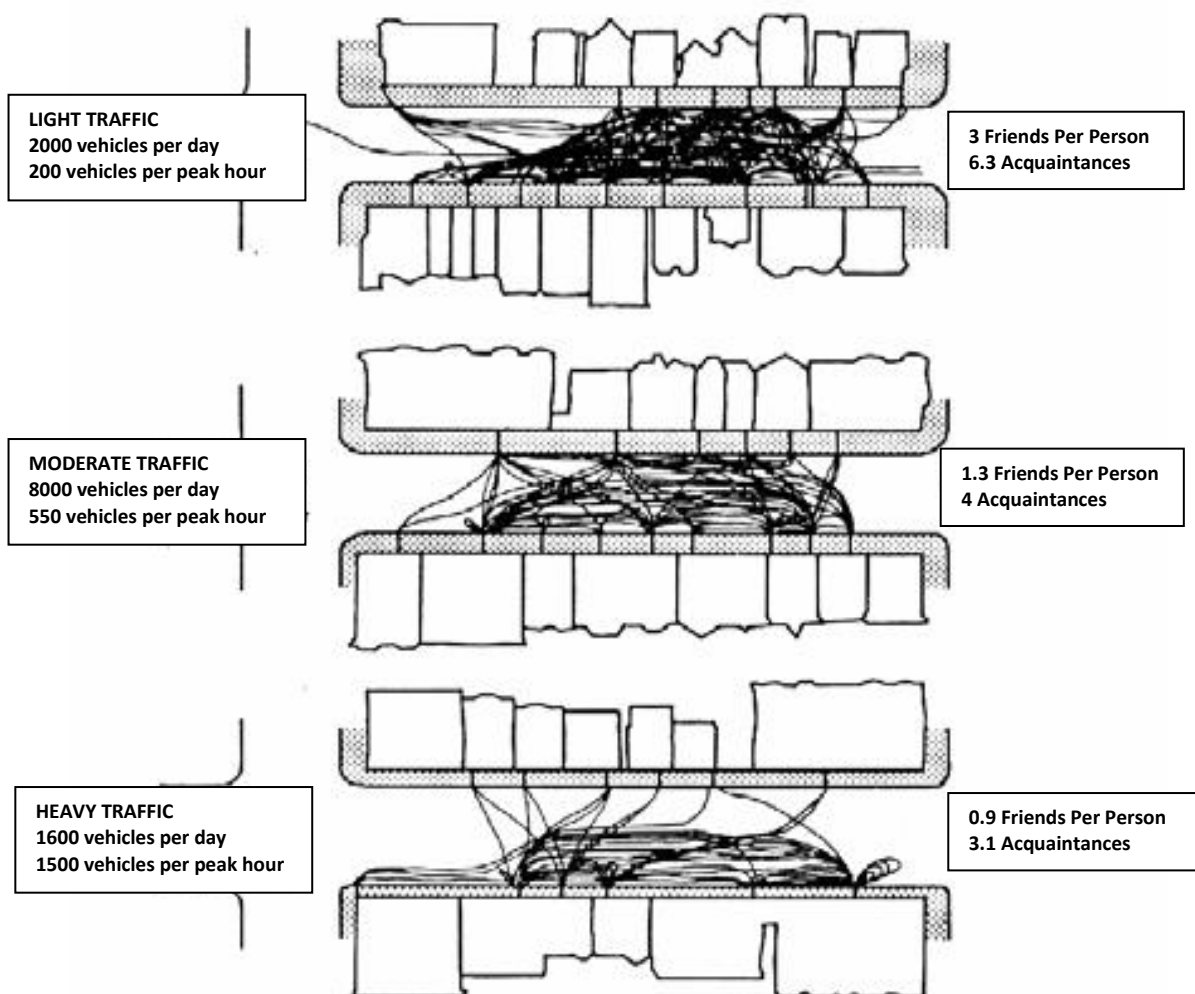


Fig.2.11 Traffic and Street Community

To determine why such a striking correlations should exist, Appleyard *et al* (1981) examined the way in which households lived in streets with different levels of traffic in considerable detail. Their findings pointed in a number of different directions. Most obviously, lightly trafficked streets presented a more socially conducive environment where children could play, residents would linger, interact with their neighbours and establish much stronger feelings of territorial ‘ownership’ for their street that in turn created a virtuous circle. Households were also found to arrange themselves differently within their homes according to levels of traffic, with residents of heavily trafficked streets more likely to orientate themselves to the rear of their buildings, keep curtains drawn and ‘cocoon’ themselves inside and take less interest in the street outside. Furthermore, residents living in streets with high levels of traffic were much more likely to be tenants rather than homeowners with a considerably higher household turnover rate as a result with correspondingly weaker social ties.

Appleyard’s findings, which have recently been confirmed by a study undertaken in Bristol (Hart and Parkhurst, 2011) relate to a greater ‘social cost’ of heavy traffic which leads to a modification in behaviour both in and outside of the home. In a separate piece of research on children’s independent mobility, Hillman *et al* (1985:5) found that ‘knowledge of neighbours across the street decreased sharply as traffic increased, suggesting that a good accident record is often purchased at the cost of community severance’. The point made here is that traffic is often acknowledged to be a problem in terms of accident statistics; low accidents rates frequently conceal the disruption to lifestyles and modifications to behaviour required to live safely with traffic. The absence of children playing epitomises such modification. On ‘Heavy’ street Appleyard *et al* report that all families with children had left the street – an indicator of wider processes:

The lack of children partly explained the impoverished social life on HEAVY street; in fact, many treated the street more as a transient hotel than a residence. On MEDIUM street these processes were also at work. As the traffic slowly increased, families were in the course of leaving. Those who remained expressed deep regrets at the demise of their street community.

Appleyard *et al* (1981:27)

Migration from the street or neighbourhood in question is the final stage in a model of behavioural response to environmental change by rising traffic (Fig.2.12) - or diminishing tolerance to existing conditions - that served as a working hypothesis for Appleyard’s team.

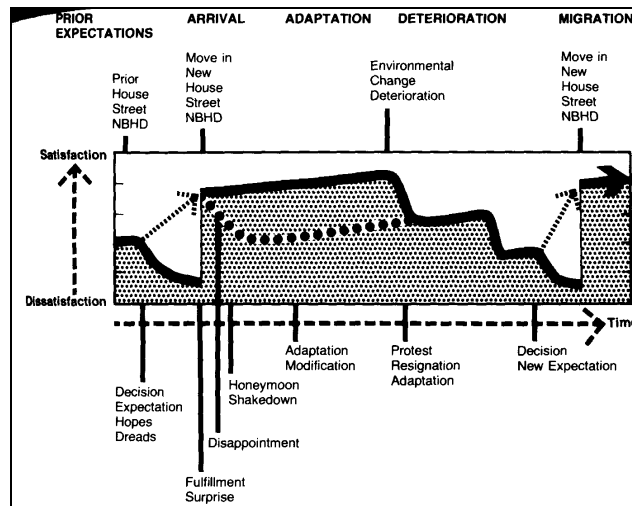


Fig.2.12 Adaptation of Behaviour to Traffic (Appleyard *et al*, 1981:39)

The model raises important questions about the process of social selectivity that results. HEAVY street became dominated by childless couples and single people who benefited from the better levels of accessibility compared with quieter streets. The model is useful only as a guide, however. Appleyard notes the weakness of linking ‘satisfaction’ with behaviour. Residents make trade-offs and compromises, a degree of inertia is usually involved – people often act as a matter of last resort but a proportion of residents become entrapped for a variety of reasons including age, situation and money.

Finally, in relation to street life, neighbouring and a home life undisturbed by traffic the team lament that ‘[s]o many of these activities have been suppressed that we sometimes forget they exist’ (*ibid*: 35). Of the residents of Dewey Street, a heavily trafficked but wealthy road in San Francisco, one comment has is particularly striking in relation to the earlier discussion on the link between mobility, individualism and social capital:

The possibility of withdrawal to the backs of these large houses is probably one thing that makes conditions tolerable for residents with children.

Appleyard *et al*, 1981:112

In the empirical research into social relations of different development models presented in chapter five, traffic levels can be discounted as a factor for explaining patterns in social relations as all streets experience very low levels of traffic. But the outstanding and prevalent problem to have dogged all that have tried to grapple with the issue of traffic on residential streets – from Perry to Buchanan, is simply that the traffic has to go *somewhere*, whether pushed out onto the margins of a residential scheme or allowed a free run within it.

2.6 Built Environment, Self-Selectivity and Travel

In a reversal of the historic pattern of urban form following the dominant transport function, policy makers in different countries have sought to influence the way that citizens travel, and to reduce car use in particular, by altering the qualities of the built environment. Specific examples include orientating residential development towards public transport in so-called transit-oriented development (TOD) and by densifying new development and mixing different land uses to shorten travel distances and promote car-alternative travel modes such as walking and cycling. However, the relationship between built environment and individual travel patterns is not necessarily as straightforward: different qualities of built environment do not always lead to commensurate differences in behaviour. Where differences in behaviour are recorded, other factors may intervene. Bohte (2010:4) identifies the three principal intervening factors as (i) the preference of residents for different activities and the control that these preferences have on travel patterns, (ii) the influence of built form on car ownership and, in turn, the mediating role of car ownership on travel behaviour, and (iii) the preferences of residents for different qualities of built form, and the process of self-selectivity that may occur. Mokhtarian and Cao (2008) suggest that residential self-selection is strongly associated to residents' attitudes and socio-demographic traits. There is growing literature on self-selectivity in relation to travel and particularly in respect to new urbanist influenced neighbourhoods. Such interest is due, in part, to the stated ambition of some developments to influence lifestyles and journey-making, for example by reducing driving distances and by implementing layouts and other design measures that encourage walking (Crane & Crepeau, 1998). Yet because the bulk of research draws upon aggregate data, it is often not possible to establish the extent to which self selectivity operates to influence the overall travel behaviour. A number of researchers contend that disposition towards a particular travel mode will influence residents' decisions to live in different neighbourhoods. On this basis, Mokhtarian & Cao (2008) developed a simple theoretical model (Fig.2.13) to represent the influence that residents' attitudes and socio-demographic traits can bring to bear both directly on travel behaviour and through a process of self-selectivity through residential location preference.

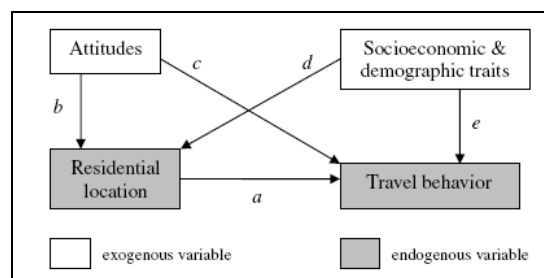


Fig.2.13 Theoretical Model of Travel Behaviour (Mokhtarian & Cao, 2008)

A number of authors emphasise the importance of attitudes in determining travel behaviour (e.g. Kitamura *et al*, 1997; Schwanen & Mokhtarian, 2005; Bohte *et al*, 2010). For example, in a comparative study of ‘conventional’ neighbourhoods and a neo-traditional development with mixed land uses in North Carolina, Khattak & Rodriguez (2005) found that households in the neo-traditional development travelled slightly less, made more walking trips and fewer car journeys than residents of the conventional neighbourhood. In an attitude survey, residents of neo-traditional housing were found to be more likely to enjoy living near a sidewalk so as to enjoy interacting with passers-by and be comfortable with higher density living. Conversely, neo-traditional neighbourhood residents were less likely to place importance on a large backyard for children to play in. The trends were interpreted by the authors as indicating self-selection based on values and preferences. Socio-economic and demographic indicators were found to be broadly similar, although neo-traditional development households were smaller overall – at 2.89 than households in the conventional district (3.34). The influence that the characteristics and attitudes of residents are assumed to exert on travel behaviour are summarised in conceptual model (Fig. 2.14) developed by Bohte *et al* (2010:83) to inform empirical research undertaken in the Netherlands. Chapters five aims to build on the models of self-selectivity presented by Bohte *et al* and Mokhtarian and Cao by exploring the impact on social relations, and examining whether the neutral treatment of such processes warrants more careful scrutiny.

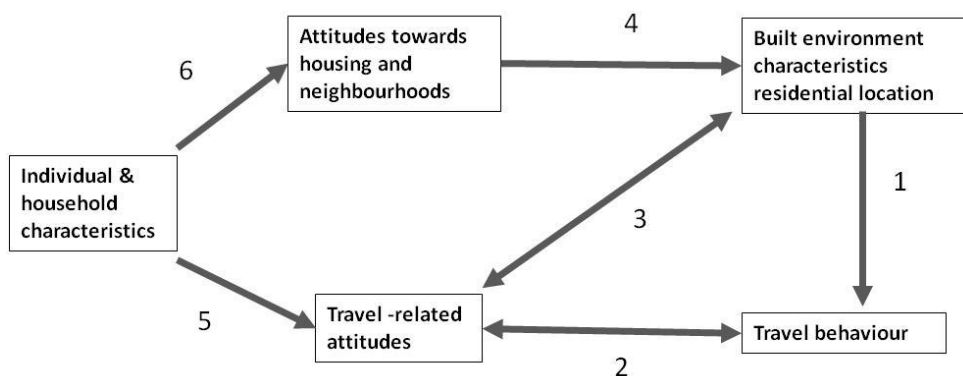


Fig. 2.14 Conceptual model linking attitudes and travel (Bohte *et al*, 2010).

Although the conceptual model is broadly supported by empirical evidence, Bohte *et al* (2010:133) also report significant levels of mismatch between residential location, different travel-generating activities, and travel preferences. The mismatch indicates that residents do not always travel in the manner that they would wish, and ultimately travel preferences are one of a number of factors that need to be balanced in determining residential location. Similar conclusions were drawn by Schwanen & Mokhtarian (2005) from research undertaken in California. Their research identified two groups of residents: i. the ‘consonant’

group who were located in residential areas consistent with their travel preference, and dissonant (coerced) urban and suburban dwellers who were not (Fig.2.15). The clear implication of these findings is that spatial dissonance will have an influence on modal share patterns, with car-owning would-be ‘suburbanites’ living in the inner city, and vice versa.

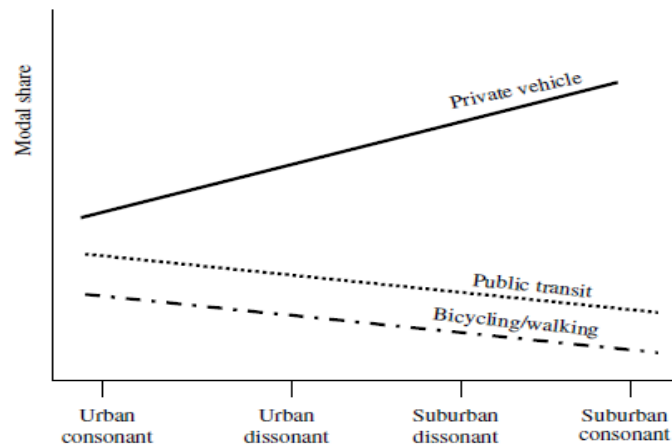


Fig. 2.15 Modal Share of Consonant & Dissonant Travellers (Schwanen & Mokhtarian, 2005b)

Linking self-selectivity to car reduction, Schwanen & Mokhtarian (2005) argue that one of the implications for policymakers arising from the importance of attitudes on travel behaviour, is that substantial car reduction can only be achieved by attracting those without strong affinity to auto travel in the first place. By definition, the authors note that in order to engender a more widespread modal shift to walking ‘[p]olicies that only seek to provide land use conditions favourable to non-auto modes may...not be sufficient’ (*ibid*:128).

A significant challenge in this research field has been in designing and executing a methodology that is sufficiently robust to establish causality. Causality requires four different criteria to be satisfied, namely, statistical association, that the effect follows the cause in time (time order), that there is no intervening variable to cause spuriousness (non-spuriousness), and that a causal mechanism is established (Mokhtarian & Cao, 2008; Handy *et al*, 2006). Although this issue of causality will be explored in greater detail chapter four, Mokhtarian & Cao (2008) note particular issues of time order and non-spuriousness as well as general limitations of sample size in asking residents directly about their preferences and behaviour. The majority of recent studies have tended to deploy large mail-out questionnaire surveys in order to generate a substantial quantitative data set.

Because this research field is still in its relative infancy, studies on the effects of the built environment on travel behaviour and the role of residential self-selectivity have tended not only to have been unable to provide definitive answers, but they have raised significant

questions. The role of self-selectivity on determining overall travel behaviour remains unclear in relation to the shaping influence of neighbourhood characteristics. An ‘optimal package’ of neighbourhood qualities remains elusive (Handy *et al*, 2006:71). To illustrate this research shortfall, Handy *et al*’s (2006) study on the role of self-selection in the relationship between the built environment and walking found that although selectivity had an influence, accessibility to shops and services was probably more important, and that other physical and social qualities of the eight neighbourhoods examined also had an important influence. Yet because different features and qualities occur together it was difficult to identify specific causes and effects. A further research gap that Handy *et al* (2006) identify is in the response of residents to changes to the built environment through enhancement or retrofitting. To summarise therefore, although there is evidence to suggest that residential selectivity might have a general influence on behavioural outcomes, there are a range of mitigating circumstances and important physical factors that can influence behavioural outcomes.

Table 2.1 below is a survey from the literature of studies that have employed indicators to capture social aspects from each of the schemes including demographic information about the resident community, and lifestyle patterns - including modal share and travel patterns. Two demographic and two mobility indicators that have been used across the include household size, the proportion of highly educated residents employed in white collar jobs, household car ownership, and car use for the journey to work or major daily journey. The relative strength of the indicators are depicted by way of arrows (e.g. ↑ = slightly higher / ↓↓↓ = strongly lower).

Development (& City)	Study	Intervention O = Car ownership U = Car Use I = Car Impact	Demographic Indicators		Mobility Indicators	
			Household Size (Children)	White Collar Workers	Car Ownership	Car Use
Vauban (Freiburg)	Nobis & Welsch (2003)	O U I	↑↑↑	↑↑↑	↓↓	↓↓
Florisdorf (Vienna)	Hertwich & Ornetzeder (2005)	O U I	↑	↑↑↑	↓↓↓	↓↓↓
GWL Terrein (Amsterdam)	Scheurer (2001)	O U I	↑↑	↑↑	↓↓	↓↓
Slateford Green (Edinburgh)	Eastwood (2008)	O U I	↑	↓↓	↓↓↓	↓↓↓
Rieselfeld (Freiburg)	Nobis & Welsch (2003)	U I	↑↑		↓	
BedZed (London)	Chance (2009)	U I	↑		↓	↓↓↓
GMV (London)	Susilo (2012)	I			↑	

Table 2.1: Car Reduced Resident Communities Characterised

Table 2.1 strongly indicates the appeal of car reduced development to families with young children, and to highly educated professional workers a significant proportion of whom are likely to be sympathetic to the social and environmental objectives of this development approach (Nobis & Welsch, 2003; Scheurer, 2001). In mobility terms, the evidence suggests that car-reduced schemes have been successful in reducing both car ownership and car use compared with local prevailing norms. However, a degree of caution needs to be applied to Slateford Green, where approximately two thirds of homes are for shared ownership or rent with a housing association (Scheurer, 2001), and at BedZed where a half of homes are under shared ownership or social rent (Chance, 2009). Similarly, about thirty percent of Rieselfeld's homes are for social housing (Ryan and Throgmorton, 2003). Slateford Green, BedZed and Rieselfeld have high proportions of residents who are less likely to be car owners; a point confirmed by a study at Slateford Green by Eastwood (2008) which found that just under a half of residents held a driving licence. At face value, these schemes seem to strongly attract a blend of wealthier educated professionals and the car-free less well-off. Building on this limited evidence base, chapter five aims to identify evidence of potential self-selectivity with increasing levels of car reduction in Freiburg.

2.7 Well Being, 'Tangible' & 'Non-Tangible' Effects

In chapter one, a tension was identified between 'grey' space given to road and related infrastructure and 'green' space given to parks and amenity areas. Environmental response – the way in which individuals, communities and societies are shaped by their surroundings is an important issue generally and a core interest in this thesis.

2.7.1 Social Environment

As discussed earlier, the development of strong social ties in a community – a quality that has become known as 'social capital' (Putnam, 2000), has demonstrably positive effects on health and general well-being. Indeed, Helliwell & Putnam (2004) note that:

Dense social networks in a neighbourhood—barbecues or neighbourhood associations, etc.—can deter crime, for example, even benefiting neighbours who do not go to the barbecues or belong to the associations.

Helliwell & Putnam (2004)

Regular social contact has been found to reduce the subjective feeling of isolation and loneliness and thereby improve mental health. The effect can be self reinforcing, through the creation of a pleasant neighbourhood environment in which residents are more likely to spend time outdoors, thereby having positive effects on both physical health by activity and mental health through social bonds. Social capital affects perceptions of risk that can influence levels

of outdoor activity by young children, which in turn influences development (Valentine & McKendrick, 1997; Taylor *et al*, 2006). The impact on the social environment of mobility and traffic is the subject of the next section and will be explored in greater detail later.

2.7.2 *Physical Environment*

Under the heading of ‘physical environment’ a considerable body of research has developed into human response to different qualities of physical space. Sennett (1994:15) notes the ‘dullness, the monotony and the tactile sterility’ of modern car-dominated urban landscapes that ‘serves to numb bodily awareness’. This is important because, as noted in chapter one, significant proportions of urban space are given to automobile infrastructure in the form of roads, car parking and so forth.

Handy *et al* (2006) noted the importance of the physical qualities of the built environment – sidewalks, trees, and other visual enhancements - in promoting walking. The authors assert that ‘Americans are fatter than ever’ and draw attention to research on the correlation between suburban sprawl and obesity (McCann & Ewing, 2003) to argue for a broader connection between health and the physical environment. To create attractive and user-friendly physical environments is to encourage physical health, an argument substantiated by a number of recent studies have established a connection between physical health and outdoor activity. For example, Strife & Downey (2009) note a ‘significant association’ between diminished outdoor activity and childhood obesity, a condition which is linked to a series of further health risks including heart disease, Type 2 diabetes and cancer.

Similarly, other research links mental health with outdoor activity. Strife & Downey (2009) cite a growing body of work which tie unprecedentedly high rates of mental and cognitive disorders including depression and attention deficit hyperactivity disorder (ADHD) in children to ‘physical inactivity and lack of exposure to the natural world’, after accounting for background factors including socio-economic status. More specifically, Wells & Evans (2003) suggest that natural areas provide psychological ‘buffers’ for childhood stress and help to foster better relations between children (Geller *et al*, 2001). The stress-relieving effects of nature and natural scenes have been noted in a number of studies that include prison inmates with different cell views (Moore, 1981) to outlook from the workplace (Kaplan & Kaplan, 1989). Similarly, hospital patients have consistently shown improved recovery rates with access to nature (Maller *et al*, 2005), whilst Kaplan (1995) found that natural environments were particularly beneficial in the restoration process for directed attention fatigue. Such factors have recently informed the development of ‘biophilic’ design (Kellert *et al*, 2011). Kaplan (1995, after Kaplan & Talbot, 1983) identifies three qualities in natural settings that have ‘restorative’ qualities for mental health: 1. Fascination – such as naturally occurs in

sunsets, clouds or leaves in a breeze; 2. Extent – miniaturization such as found in Japanese gardens can provide this effect; and, 3. Compatibility – such as provides a ‘resonance’ between the setting and ‘human inclinations’ – for example gardening, bird-watching, fishing or other forms of engagement.

Lastly, Strife & Downey (2009) draw attention to the importance of attractive natural spaces for social interaction and the development of social capital. In a study of neighbourhoods in Chicago, those living in ‘barren’ neighbourhoods reported experiencing greater aggression and violence than those in greener neighbourhoods (Kuo & Sullivan, 2001). In other words ‘green public settings encourage[...] social interaction among both youth and adults, which may increase trust, decrease crime, and increase perception of community safety’ (Strife & Downey, 2009).

2.7.3 Well-being, Nature & Neighbourhood Design

An interesting historical point is the way in which these different aspects of the social and physical environment have been brought together in neighbourhood design, and particularly by reducing car dominance. As noted in chapter one, at Hampstead Unwin and Parker sought to reduce car dominance by reducing carriageway width and landscape the space created Radburn was similarly based on the notion of reducing car dominance through residential culs-de-sac, linked together by gardens. This spatial organisation reduced the overall street area by 25% giving cost savings that paid for the green spaces (Southworth & Ben-Joseph, 1997:63). Clarence Stein’s Radburn concept was shaped by Frederick Law Olmsted’s neighbourhood designs, perhaps most famously epitomised by the garden suburb at Riverside Illinois. Olmsted was a prominent Romantic Movement designer who believed in the value of nature in everyday life. Members of the related transcendentalist movement in the United States encouraged a particularly proactive approach to contact with nature, and Olmsted was linked to a number of leading transcendentalists that may have helped influence his design philosophy. Olmsted also journeyed to Britain in 1845, and was impressed by the ‘novel’ layout of Birkenhead Park with its segregated routes for different transport modes – features that were incorporated into Olmsted and Calvert Vaux’s design of Central Park and later residential schemes. He met Joseph Paxton its designer and protagonist of another Romantic group – the Arts and Crafts Movement. Paxton’s work influenced the neighbourhood designs of the Garden City Movement, and subsequently Modernism and the New Towns.

The Garden City Movement’s champion, Ebenezer Howard, was himself a resident of Chicago when Olmsted’s Riverside suburb was built and is very likely to have been influenced by it (Hall, 2002:90). One of the Howard’s key architects, Raymond Unwin, is also known to have had considerable contact with Clarence Stein through the Regional

Planning Association of America (RPAA), who brought his designs of Radburn to Europe in 1925 (Hass-Klau, 1990:107).

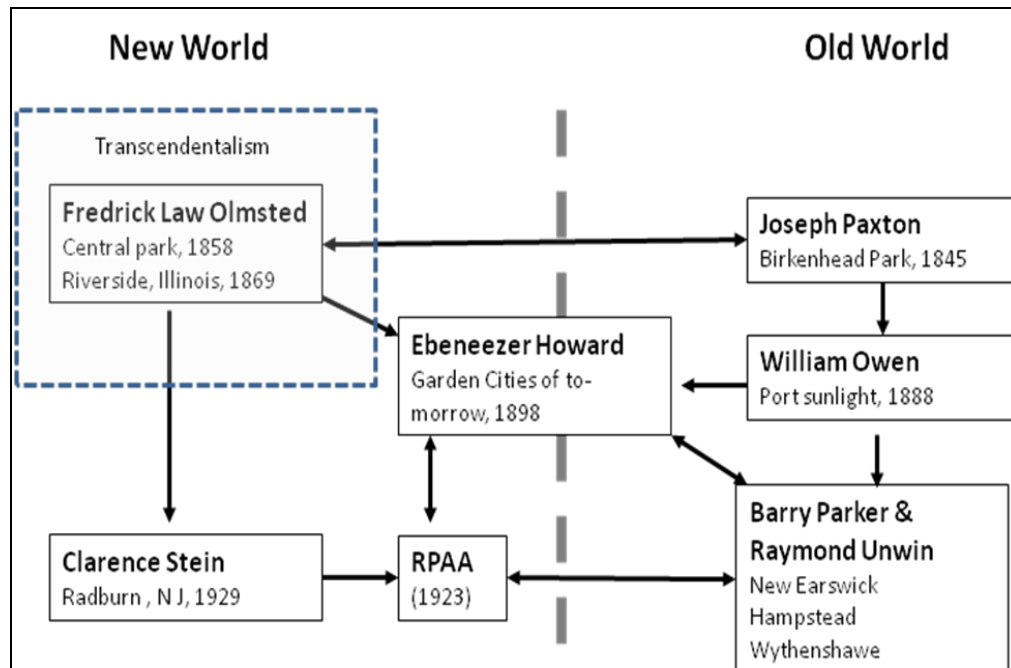


Fig.2.16 Diffusion of Influence: ‘Old World & New World’

The point of this historic ‘diversion’ is to draw attention to some of the aspects of the original ‘car reduced’ residential designs – notably Radburn and the garden suburbs, the thinking of their creators – particularly in relation to green spaces and landscaping, and lastly to illustrate how ideas travelled between the ‘old’ and the ‘new’ worlds (Fig.2.16). The deeper value of urban green spaces for reinvigoration, now being rediscovered and scientifically proven, was likely to have been well understood by its creators. Furthermore, Stein and Unwin seem to have implicitly understood the importance of car restraint for the well-being of individuals and strength of the neighbourhood community.

PART C: CONCLUSIONS

2.8 Transport development and urban change

Transport can be considered ‘the’ critical shaper of physical space and an important influence on social relations in turn. This chapter has attempted, in the first instance, to summarise the historic change in patterns of urban development that has accompanied developments in transport technology, particularly with the creation of suburbia that accompanied the railways and low density sprawl associated with the car. Attempts to reduce automobile congestion and minimise conflicts of interest heralded the origins of traffic engineering during the ‘progressive era’ in the US during the early twentieth century that has placed an emphasis on movement over other traditional functions for urban streets and roads. As a counter-movement, New Urbanism has attempted to restore a balance between mobility and community-development for residential streets and a pattern of development that attempts to shorten journeys for basic needs and minimise the need for car travel.

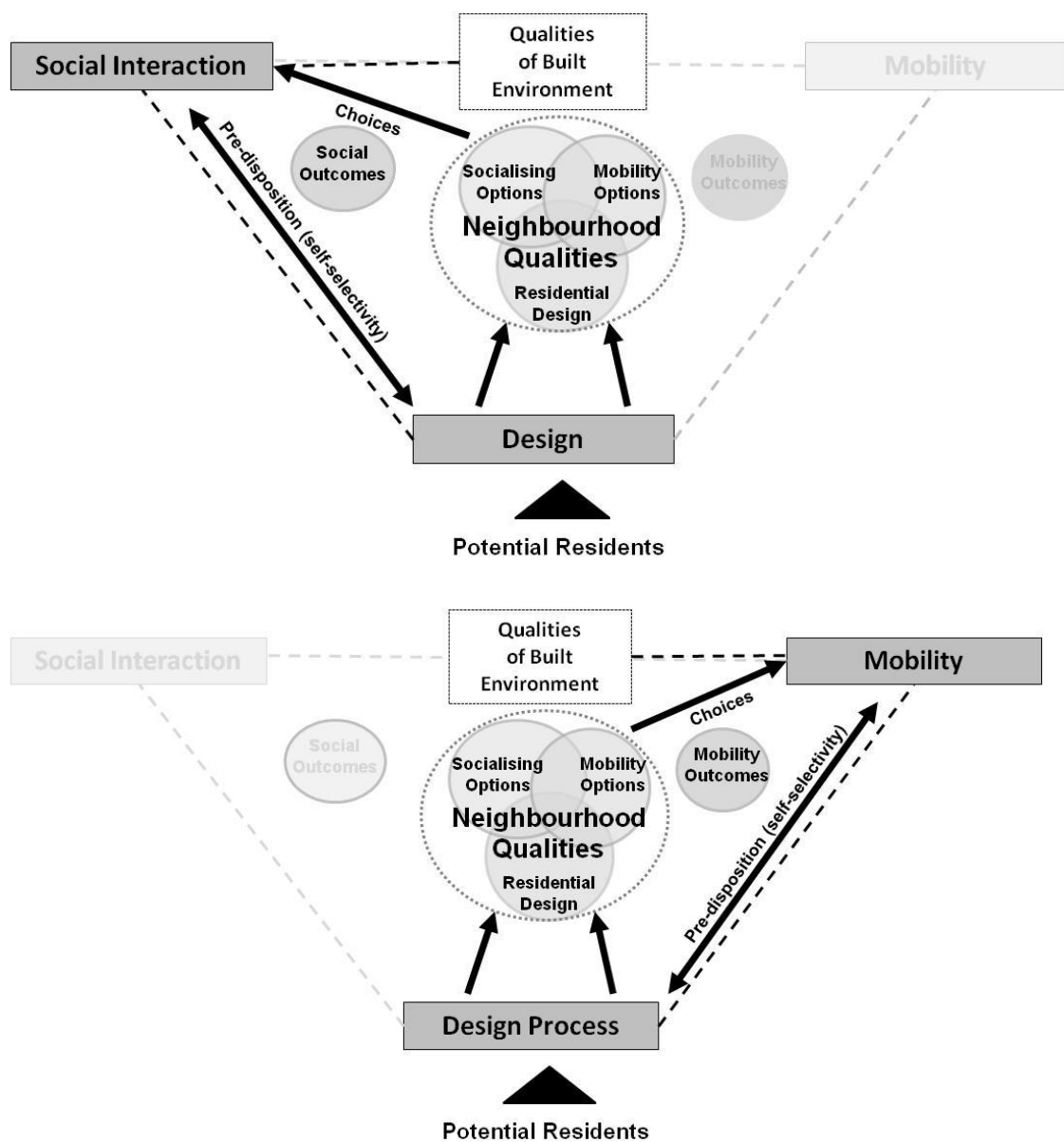
The second part of the chapter explored a range of social issues that are strongly influenced by car dominance. On the other hand, automobile dominance can undermine well-being through a ‘tactile sterility’ (Sennett, 1990:15) in the urban landscapes that are produced and through a through the degradation of community-binding social capital. On the other hand, it has been seen how new urbanist neighbourhoods that attempt to orientate residents away from vehicle and towards public transport or walking can promote self-selectivity. Yet an elemental danger remains that such developments continue to be highly self-selective. As Harvey notes:

[i]n its practical materialization, the new urbanism builds an image of community and a rhetoric of place based civic pride and consciousness for those who do not need it, while abandoning those that do to their “underclass” fate.

Harvey, 2000: 70

The above excerpt underlines a potential tension between community development and mobility in residential design. Drawing on the evidence presented in this chapter and particularly the conceptual models shown in section 2.6, fig.2.18 below sets out expected directions of causality, firstly in relation to social interaction (A) and, secondly, mobility (B). With regard to social interaction, fig. 2.17 shows ‘design’ acting as a magnet or filter for prospective residents in the first instance, and as a shaping influence on neighbourhood qualities, directly in residential design terms – for example by creating settings or ambiance for enhanced interaction such as by limiting traffic or by controlling land use, and therefore creating socialising options within the neighbourhood itself. Residents may decide to utilise

these socialising options, leading to social interaction. The cycle repeats with ‘design’ performing a conduit function – with different spaces serving to sustain interaction. However, there an initial ‘short cut’ between design and social interaction may also exist, due to the initial process of self-selectivity, that can serve to draw residents with common attributes or values together. An example here would be a neighbourhood which attracts a high proportion of families with young children – where children are the catalyst for wider community interaction rather than design. Similarly, fig.2.17b shows a similar process between design, neighbourhood qualities and mobility, with a direct link between design, self-selectivity on mobility grounds and mobility outcomes, and an indirect route in which neighbourhood qualities coerce mobility behaviour.



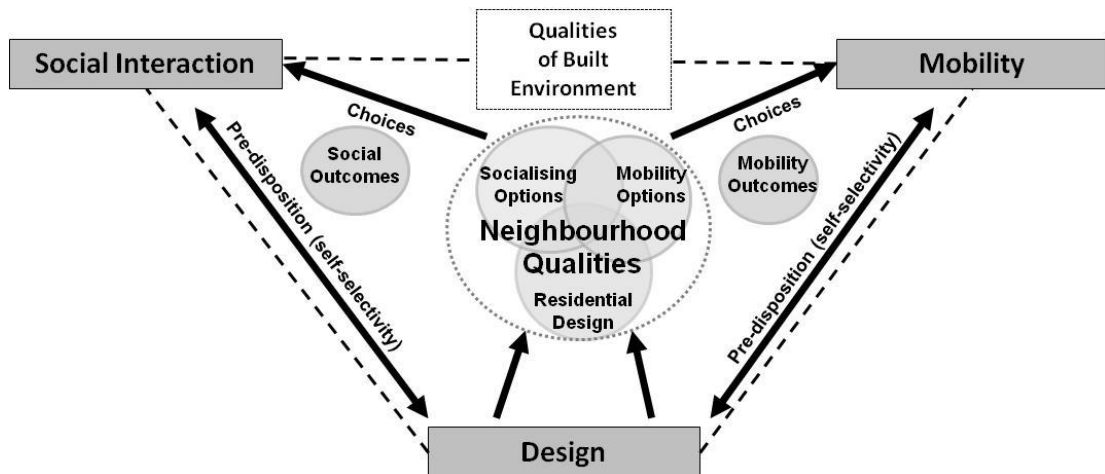


Fig.2.17 (A) Social Interaction Aspects (B) Mobility Aspects (c) Overall Directions of Causality

The directions of causality presented in Fig.2.18 represent conclusions from the literature and will be tested by empirical data in the second half of the thesis.

Drawing on the earlier discussion on well-being and the social-physical environments in part b, specific links between the social outcomes depicted in fig 2.18a could include the following five key aspects:

1. Regular social contact and mental health, particularly for those vulnerable to the negative consequences of isolation;
2. Social capital and child development, with the ability for the greater proportion of young children to roam freely;
3. Social capital and adult physical health, with the provision of safe and pleasant outdoor space;
4. Green space and mental and physical well-being created from would-be car infrastructure;
5. Mobility patterns and physical health, with high levels of walking and cycling;

The self-reinforcing feedback process between physical environment and resident self-selectivity depicted in fig. 2.18, and indicated also by Bohte *et al* (2010) and Schwanen & Mokhtarian (2008) may also form an important element of well-being. This chapter has

demonstrated the paucity of existing evidence on the relationship between neighbourhood qualities and residential self-selectivity; the aim of chapter five is to add to this evidence base.

Car Reduction & Car-Free Development



**How can residential design contribute
towards car reduction?**

3.1 Introduction

3.1.1 Summary

The previous chapter highlighted a number of principal social problems associated with automobile dominance which stem from the physical and social shaping force that transportation technology exerts. This chapter charts the development of design strategies that have aimed to rebalance neighbourhoods away from vehicle dominance in a process of ‘car reduction’ and in the first instance identifies three distinct approaches: (i) reduction in car ownership, (ii) reduction in car use, and (iii) reduction in impact within the residential environment. Although overlaps exist in the measures that are used to address these three aspects, and different elements are used to create different residential ‘packages’, the empirical evidence suggests that different tools can impact differently on car ownership and travel behaviour. For example, in Germany, the Netherlands and Denmark, evidence suggests that the implementation of high quality cycle facilities has had limited impact on car ownership levels which, as Pucher & Buehler (2008) show, are some of the world’s highest, but have had profound effects on modal share.

Part A reveals that street patterns have played a particularly key role in the historic narrative of residential vehicle reduction from ancient Rome to Unwin and Parker’s Hampstead and Stein’s Radburn that attempted to mitigate the effects of dramatic motorisation. In Britain this occurred almost a half century after the United States, from the late 1950s and led Alker Tripp and Colin Buchanan to try to mollify the most negative effects of the automobile on the residential streets. Since the 1970s two closely related developments in street design – shared spaces and home zones have attempted to prioritise the social value of residential streets over the movement function. These measures are discussed in the last section of the chapter, and an interesting point is the way that they have been used in the retrofitting of existing streets. Furthermore, it will be seen in some of the later chapters how modern car-reduced developments often bring together the range of different measures – modified street patterns, home zones that frequently use shared spaces, and green spaces. In theory, the literature suggests that such modifications to the street environment can stimulate higher levels of social interaction, but this is tested in a ‘mini case study’ of social interaction in Hackbridge South London.

Part B traces the creation of ‘car-free’ residential developments in Europe with specific reference to Germany and the UK. Consideration is given to retrofitted car free schemes as well as new build developments, and an important point of note is the wider motivation to create a high quality residential environment in such schemes, and not merely the removal of traffic or car parking. A second pilot study undertaken at the Slateford Green car-free scheme

in Edinburgh is reported, and here several important mobility issues emerge in relation to car parking and the accessibility of public transport following one bus operator's decision to ban child buggies. Uncertainty that this situation generated suggests that successful car reduction is supported by robust transport policies at the city or regional level, and not just site-specific conditions such as proximity to a transport stop. Details of the two mini case studies are as follows.

3.1.1 BedZed Mini Case Study

This pilot study, which is reported in section 3.5, aimed both to test a household questionnaire survey as a methodological approach, and also the principal components of the theoretical framework - in particular the role that design plays in balancing the mobility of residents with social interaction and overall community development. The case study focussed on the 82 home Beddington Zero Energy Development (BedZed) at Hackbridge in South London, and compared social interaction and mobility habits of samples of residents of streets built with different design qualities. All residents questioned lived within 200m of one another.

3.1.2 Slateford Green Mini Case Study

This pilot study tested the semi-structured interview approach at the 120 home Slateford Green 'car free' development in the west of Edinburgh. The scheme which was completed in 2000 restricts car access onto the site by means of a barrier, and has just six on-site car parking spaces. The mini case study is reported in section 3.8.

PART A: CAR REDUCTION

3.2 Approaching Car Reduction

Residential car reduction may be defined by three different approaches: (i) reducing ownership, (ii) reducing use, and (iii) reducing the impact in the residential environment, and each approach may incorporate both physical, and administrative aspects of organisation or legislation. Such measures may be thought of in terms of incentivising or providing a ‘carrot’ to car reduction or providing a means to preventative or ‘stick’ measures to engender change. Table 3.1 summarises the measures used from a selection of studies of car-reduced schemes across Europe.

Element	Incentives (‘Carrot’)		Preventative Measures (‘Stick’)	
	Physical	Administrative	Physical	Administrative
Ownership	Public Transport proximity	PT User Quality, Coverage & Cost	Parking Provision (Ratio)	Car Parking Cost
	Mixed land Uses			Parking Controls
	Car Share			Home Tenure Terms
Use	Relative Convenience of Car Alternatives	Public Transport Offer	Parking Convenience (Distance)	
	Quality of Pedestrian Environment			
	Cycle Facilities			
Impact	Shared Street Surfaces		Car Parking Location	Speed Limits
	Landscaping		Car Access Restriction e.g. pedestrianisation	Car Access Terms
			Urban Pattern: e.g. superblocks	Home Zones & Play Streets
			Traffic Calming: e.g. speed bumps	

Table 3.1 Summary of Car Reduction Measures (sources: Scheurer, 2001; Eastwood, 2008; Melia, 2010a)

3.2.1. Car Ownership

Car ownership may, in the first instance, be addressed by the existence of high quality transport alternatives. For example, a number of European and North American cities examined by Hass-Klau *et al* (2007) demonstrate the suppressive effect that close proximity to high quality public transport can have on levels of household car ownership. In Freiburg the authors report that in 2004 there was a near 20% difference in car ownership between residential areas located in a 300m tram corridor and those without tram access (table 3.2). Between 1995 and 2004 car ownership grew in areas without tram access by 7.5% overall, against a slight decline of 0.9% in areas inside the corridor.

Area	1995 Cars per 1000 Inhabitants	2004 Cars per 1000 Inhabitants	Change in %
Freiburg	353	363	2.8
Tram	327	324	-0.9
Areas without tram access	401	431	7.5

Table 3.2 Car Ownership Differences in Freiburg (Source: Hass-Klau *et al*, 2007:91)

The difference can be seen spatially (Fig.3.1), where the arrows indicate the Freiburg neighbourhood study sites investigated in chapters five and six: Rieselfeld (yellow), Haslach Gartenstadt (red) and Vauban (green). It should be noted that Hass-Klau's research was undertaken prior to the extension of Freiburg's tram network through Haslach and Vauban as described later in chapters four and six. Similar patterns are reported across other small to medium sized European cities including Montpellier, Karlsruhe and Nantes.

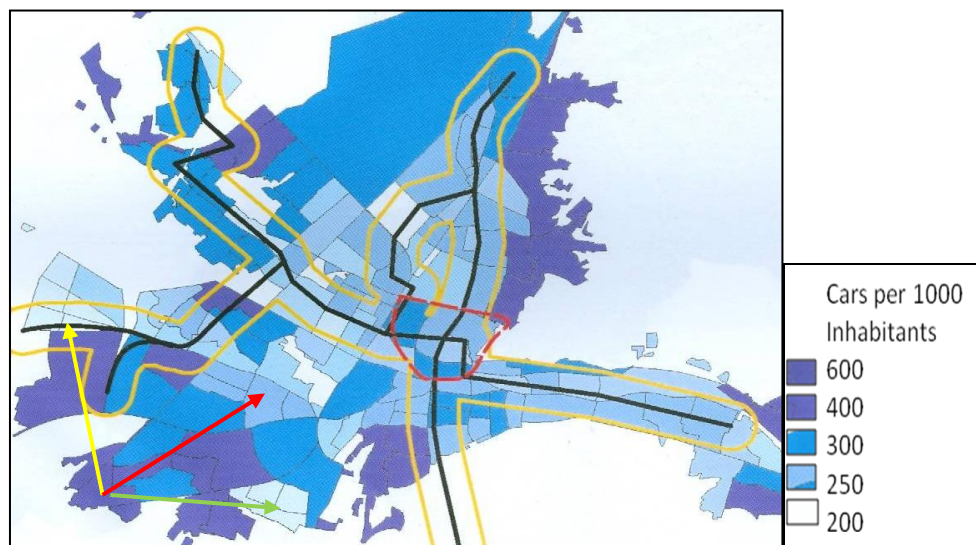


Fig. 3.1 Car Ownership in Relation to Freiburg's Tram Network (Source: Hass-Klau *et al*, 2004:173)

Proximity to quality public transport may be an important factor in its own right, yet FitzRoy & Smith (1998) demonstrated earlier how seamless organisational integration between services and particularly in ticketing can have a profound impact on ridership. However the authors issue the following warning for the UK that:

In a regime of deregulated local bus services where the local authority has only limited control over routes, fares or service levels, competing private bus operators may have little interest in long-term planning, much less the introduction of a low-cost transferable travel card valid across all operators and modes.

FitzRoy & Smith (1998:173).

This is an important matter for the development of policy to address car dominance, and an issue returned to in chapters seven and eight. Other approaches to reducing car ownership include the suppressing of car travel through the tight integration of mixed land uses in a compact urban form (Bernick & Cervero, 1997; Barton 2000), and the availability of car sharing schemes to provide on-demand private car travel in urban areas. In San Francisco, 30% of members of the City CarShare scheme got rid of one or more cars in the first two years of operation (Cervero & Tsai, 2004), but in Europe most schemes are small in scale (Enoch & Taylor, 2006) with perhaps only a limited capacity to impact on ownership directly.

Lastly, although physical and legislative controls on car parking can contribute to the curbing of ownership levels in larger cities such as London (Wheelan, 2005), the role of the ‘stick’ of residential parking restrictions and congestion remains unclear against the relative ‘carrot’ of high quality public transport (Marsden, 2006). It will be seen in the next section how car ownership agreements have been used in relation to car-free developments, and particularly in German cities, whereas the UK experience at Slateford Green explored in Part B shows how residential development constructed without parking, but also without supporting legislative measures in surrounding streets may lead to a displacement of vehicles rather than curbing ownership.

3.2.2 Car Use

Inevitably, a considerable overlap exists between the physical and administrative measures that contribute to reducing car ownership and those that reduce use, although there are a number of distinctive exceptions. Walking and cycling may be encouraged by favourable infrastructure and urban design, although Pucher & Buehler (2008) note somewhat ironically that the Netherlands, Denmark and Germany have some of the world’s highest car ownership levels, they also have some of the greatest cycling levels. The relative accessibility of different modes from the home may also have an effect on modal share as indicated by a

stated preference study by Borgers *et al* (2008) which concluded that access to high quality non-motorized transport modes and public transport could compensate for car parking near the home.

3.2.3 Mitigation

Reducing the impact of vehicles in the residential environment through physical and administrative measures has historic precedents in ancient Rome. More recently, however, Colin Buchanan (1963) introduced physical curbs to traffic in ‘environmental areas’ through dead ends and the displacement of through-traffic to distributor roads. Modification to street layouts, cross-sectional design and carriageway as a means to reducing vehicle impacts will be discussed in detail in the following sections, but in general terms the physical detachment of buildings and street which became a hallmark of late twentieth century planning (Fig. 3.2) is now being addressed in new development schemes that attempt to reproduce the dense urban character of older settlements in a way that makes the car subservient to urban quality rather than the master of it.



Fig.3.2 Masterplan for Sherford (a) disconnection between builds and streets (b) elements connected

Similarly, a number of old approaches to keeping the car at bay have been ‘recycled’, including the ‘superblock’ concept used by Owen in Port Sunlight near Birkenhead in the late nineteenth century and by Clarence Stein at Radburn in the 1920s. This pattern permits both building frontage and car-free areas to be created in a way that permits both street life outwardly and a degree of privacy within the confines of the blocks

3.3 Street Layouts & Car Reduction

Automobiles have profoundly influenced the physical and social qualities of the urban environment, which in turn has had a shaping influence on social relations and individual well-being. A number of authors (cf. Newman & Kenworthy, 1999; Putnam, 2000) argue that the car has contributed towards a process of social ‘ungluing’ by physical dispersal and low density sprawl, and also by undermining the traditional social role of the street, in many

instances by orientating almost singularly towards movement. A variety of measures have been implemented in order to ameliorate some of these negative impacts, including the modification of street layouts which redirect traffic and create separate networks for different travel modes, traffic calming, and modifications to road carriageways to accommodate different users and uses simultaneously. These measures are considered in turn.

3.3.1 Modified Street Patterns

Most Western cities have required the re-engineering of street circulation systems in order to cope with the demands of heavy traffic. In Britain Buchanan's *Traffic in Towns* report led to the remodelling of urban circulation in many cities around a four point hierarchy of distributor and access roads, and redirected away from residential 'environmental' areas. In the United States, high levels of traffic in the urban grid-iron system meant that '[p]edestrians risked a dangerous motor street crossing 20 times a mile' (Stein, 1950). The T-junction and the cul-de-sac were two devices that were revived around the turn of the twentieth century to help to produce different urban layouts. It was the medieval street pattern that inspired Viennese architect Camillo Sitte's *City Planning according to Artistic Principles* (Hass-klau, 1990:31) and the advancement of the T-junction for visual effect (Grammenos *et al*, 2008) although the T-junction can also be seen in Olmsted's designs of Berkley campus and Riverside Illinois dating from the late 1860's (Fig. 3.3a). The dead end or cul-de-sac featured in early British industrial cities until banned by some city authorities (Hass-Klau, 1990:33-34). But it was in Stein's design of Radburn that the cul-de-sac was most prominently revived (Fig.3.3b).



Fig. 3.3 (a) Riverside, Illinois Plan (Fredericklasolmsted.com) and (b) Radburn, NJ (Southworth & Ben-Joseph, 1997:63)

Both devices have meant the closure of portions of the street network to motor vehicles. In the case of Radburn, a segregated movement network for pedestrians and cyclists accompanied

the implementation of residential culs-de-sac – a model that served as the basis for the street patterns of the British new towns such as Milton Keynes. The idea was to route traffic around the outside of each neighbourhood block, and for each block to become a social entity, serviced by shops and amenities within a few minutes walking distance – a concept enshrined in Clarence Perry’s Neighbourhood Unit of 1929, shown below Fig. 3.4 (Grammenos *et al*, 2008).

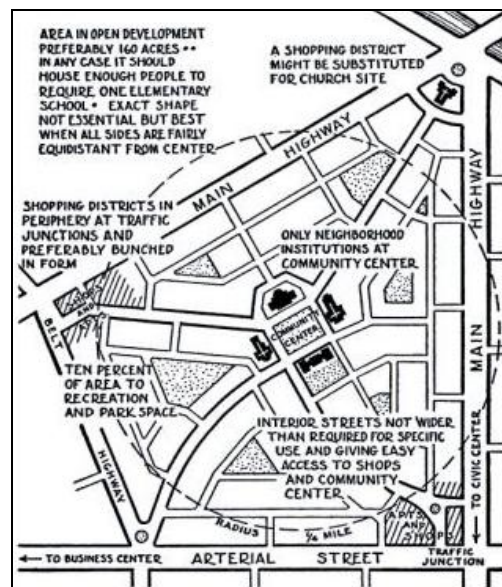


Fig.3.4 Perry – Neighbourhood Unit (TCRPC: 2004)

Perry’s concept was ‘A scheme of Arrangement for A Family-Life Community’ (Southworth & Ben-Joseph, 1997:68) that enshrined many of garden suburb principles that Raymond Unwin presented to Perry in New York in 1922 (*Ibid*:70). Unwin firmly believed that residential neighbourhoods should be protected from traffic congestion. Thus a crucial element of Unwin & Parker’s design of Hampstead Garden suburb was the narrowing of the 35ft carriageway standardised under the bye-law ordinance of 1875, to just 16 ft by means of the 1906 *Hampstead Garden Suburban Act* (*Ibid* 39-43), an Act which also permitted the creation of culs-de-sac. On the layout of Hampstead, Howe (1912) noted that:

The roadways in Hampstead ignore right angles. They avoid regularity in every way...Nor are they of equal width. The residential streets are narrow. They are designed to discourage traffic and keep it on the main thoroughfares.

Howe, 1912 (in Southworth & Ben-Joseph: 1997: 45)

The street cross-section from Hampstead (Fig. 3.5) shows how the carriageway width has been more than halved to 16ft from the 36ft of the bye-law street, together with a substitution of ‘grey’ carriageway space with ‘green’ gardens and landscaping.

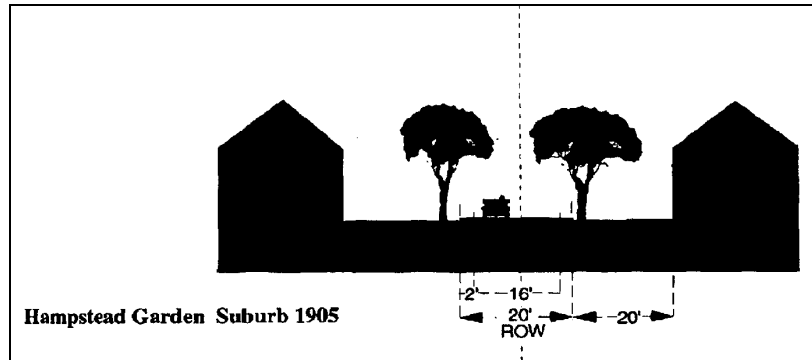


Fig.3.5 Street Cross-Section at Hampstead (Southworth & Ben-Joseph, 1997)

3.3.2 Modal Segregation

Although Clarence Stein's Radburn saw the use of segregation to create networks for different traffic modes, inspiration was drawn from Olmsted and Vaux's design of Central Park in New York (Hass-Klau, 1990). A unique feature of Central Park was the use of variegated networks for different transport users, and was itself based on a model developed by Joseph Paxton and implemented initially in Birkenhead Park in 1845. Echoing the landscape architecture designs of Olmsted & Vaux parks and later garden city developments, such as at Riverside and Berkeley, Radburn's culs-de-sac were not simple dead-ends but had street gardens that led into a green corridor containing an independent footpath network to link with other culs-de-sac beyond. By creating a separate movement network for the non-motorist, Stein sought to reduce conflict between different modes, whilst the cul-de-sac prevented infiltration by through-traffic. Like Unwin at Hampstead, Stein substituted road space with public green space at Radburn. In order to cut down on the number of access roads to service homes and to permit the clustering of houses in each cul-de-sac, Stein and Henry Wright introduced the 'superblock' concept (Appleyard *et al*, 1981: 148) initially to a small development at Sunnyside and then to Radburn. The superblock was not a new idea - William Owen had used it in the design of the Lever Corporation's model village at Port Sunlight, near Birkenhead (Hass-Klau, 1990:48).

Having viewed the plans for Radburn at the 1925 RPAA conference in New York, Raymond Unwin providentially commented that:

This is a big step in the matter of planning for the motor age and Radburn may well prove to be the basis of future planning both in America and in Europe.

Unwin 1994: 651

In the event a so-called 'Radburn' model has become a standard model for low density development since the 1960s. However, it is questionable whether Stein would recognise his

influence on the modern housing estate, which is orientated specifically towards the car and with far less of the orderliness, green space and footpath network of Radburn, New Jersey. The British ‘Radburn’ development style (Fig. 3.6) could be regarded as a conflation of the Buchanan road hierarchy and car restricted ‘environmental areas’, with the culs-de-sac, segregated footpaths and green areas of the Radburn model, the gentle road curvatures of traffic engineering, together with bottom line economics on the part of the developer. Radburn did not become a model for development in its own right. This failure was partly because of the Great Depression that hit as it was being built, but also because of difficulties in delivering large integrated plans (Southworth & Ben-Joseph, 1997:66). Large tracts of public space push up development costs, while the decrease in individual garden space compared with ‘conventional’ development can make developers wary.

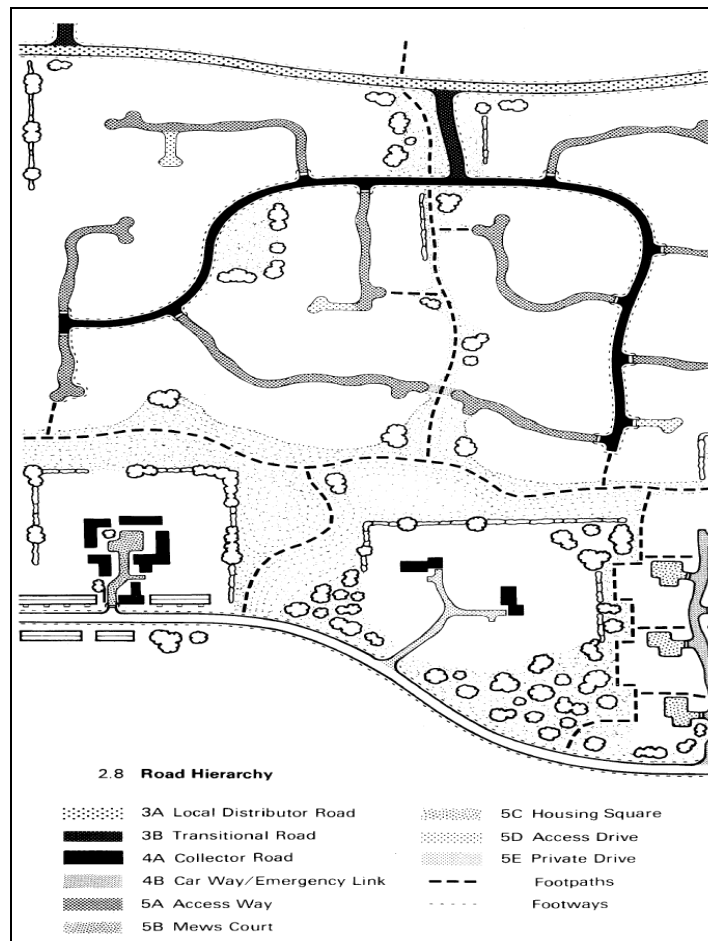


Fig.3.6 The modern ‘Radburn’ layout (Lancashire County Council)

3.4 Grey Space' Revisited

On the basis of research into the social effects of traffic partly summarised in chapter two, Appleyard *et al* (1981) set out a number of strategies that would help to create 'liveable streets' in the face of vehicle traffic (Fig. 3.7) that consisted of (a) slowing traffic, (b) keeping traffic out, (c) grouping parked cars, (d) creating play space, (e) planting trees, (f) installing social amenities, and (g) creating 'woonerven'. The latter strategy literally meaning 'backyard' was to use design on order to redefine the relationship between cars and people by giving priority to the non-car aspects of physical space and to engender feelings of 'intrusion' on the part of the driver.

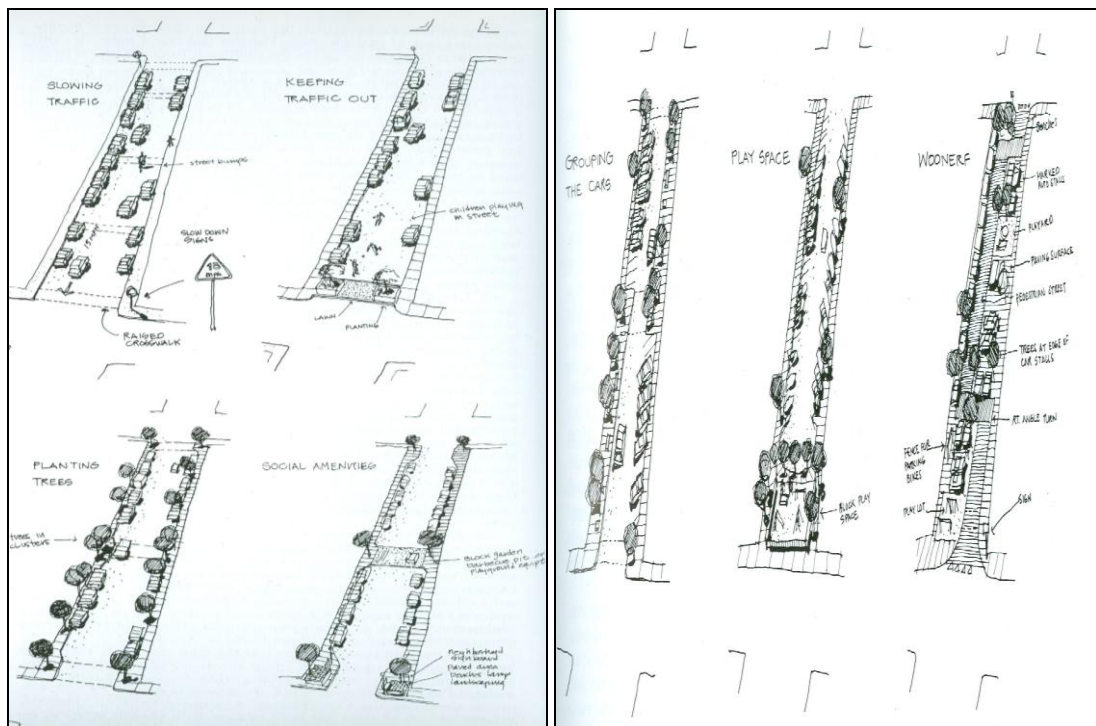


Fig. 3.7 Proposals for 'Liveable Streets' (Source: Appleyard *et al*, 1981: 280-281)

As well as using street pattern to restrain and control vehicle flow through neighbourhoods and to alter the balance between overall grey and green space, there has been much recent focus on varying the properties of the road carriageway itself in the form of 'shared spaces' and its close relative – the 'home zone'. A bold stance is taken in the design guidance provided by *Manual for Streets 2* (CIHT, 2010:7) which gives priority to the community aspect of streets 'as spaces for social interaction. Streets should integrate and not segregate communities'.

3.4.1 Shared Space & Home Zones

Although ‘shared spaces’ which allow pedestrians and traffic to mingle together in a level surface (Fig 3.8) was developed as a design concept by traffic engineer Hans Monderman in the Netherlands in the 1960’s, it has attracted considerable attention in Britain over the past decade. Shared spaces have been applied to mixed-use streets such as high streets and other ‘destination’ areas in order to enhance put the place dimension of such streets on an equal footing to the movement function. However, they are similarly used in residential streets to emphasise the ‘inferiority’ of the car driver (Southworth & Ben-Joseph, 1997:109).



Fig. 3.8 Shared Space: New Road, Brighton (DeFacto)

Deep reservations expressed by groups representing the visually impaired, concerned about the lack of a distinguished carriageway as a potential safety risk, seem to have been overcome by the integration of tactile surfaces to indicate the different parts of the street surface. However, Hans Monderman accepted that shared space streets inevitably entailed a reduction in traffic flow, and therefore suggested that they should be used as part of a wider system with alternative routes allowing higher vehicle flows. Thus, the ‘slow network’ also needs a complementary ‘fast network’ (www.shared-space.org).

The related concept of the Home zone is also Dutch in origin, deriving from the *Woonerf* or ‘backyard’ scheme that was developed in Delft in the 1970s. The aim of *woonerven* was therefore to project the street as an extension of the home in order to prioritise pedestrian street users over the automobile. Motorists were instilled with the impression that they were encroaching on a public space in which they did not have priority. Similarly, the aim was to instil a feeling of ownership of their street onto residents. Reflecting these social aspects, the Department for Transport defines British home zones as:

...residential streets in which the road space is shared between the drivers of motor vehicles and other road users, with the wider needs of residents (including people who walk and cycle, and children) in mind. The

aim is to change the ways that streets are used and to improve the quality of life in residential streets by making them places for people, not just for traffic.

DfT, 2005

The adoption of home zones into the UK in the 1990s followed considerable campaigning over the need to tighten legislation over traffic in residential streets in order to allow children to play safely outdoors and in the vicinity of the home. The arguments in favour of the home zone projected an overtly 'social' angle by encouraging the use of residential street as social spaces rather than simply serving as 'car parks'. According to Biddulph (2003) the primary objectives of the home zone are to:

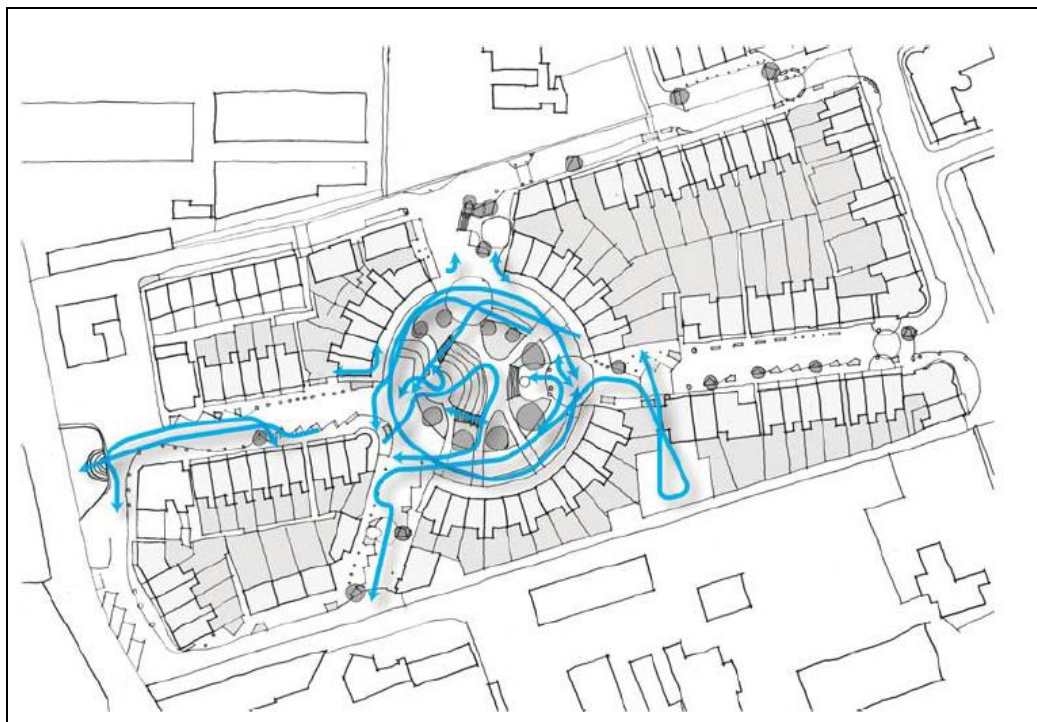
1. Improve feelings of safety;
2. Promote greater use of public spaces, especially by children;
3. Make streets more visually attractive;
4. Encourage people to walk and cycle within local area; and
5. Encourage people to take greater care of street.

In practice, home zones can vary from being demarcated merely by signage and road markings to alert drivers to the fact that they have crossed a threshold and, importantly, that a 20 mph speed limit is in force. On the other end of the spectrum some home zones have been turned over to shared space, with landscaping and the removal of car parking spaces. An example of such a 'robust' and comprehensive project is the Millford Street scheme in southwest Bristol (Fig.3.9) which was retrofitted through the involvement of its residents. Chatterjee (2009) found that general satisfaction with the final result was very high, with a notable uplift in the use of the street as a social space for children and social interaction. Aside from increased pressure on car parking owing to the reduction in spaces, other evidence indicated that the scheme has had a few adverse effects. For example contact between neighbours has increased and as a result good relations have strengthened, however the scheme has also served to heighten tensions where existing relations were poor. Furthermore, the increase in street use by young children has not been universally popular, and one resident has reportedly moved out of the street, affirming Handy *et al's* (2006) uncertainty over the acceptability of street retrofit schemes for existing residents.



Fig. 3.9 Millford Street, Bristol: before (a) and after (b) home zone re-modelling (Chatterjee, 2009)

Chatterjee's findings are supported by evidence elsewhere (Biddulph, 2012a; 2012b) which suggests that the main residential beneficiaries of home zone schemes are young children, who are much more likely to make use of the space for play, whereas older residents seem to take less advantage of the street space – perhaps because they are too 'time poor' (Biddulph, 2012a:202).



3.10 Disposition of children playing in shared surface area: GunWharf, Plymouth (Biddulph, 2012a)

As chapter four will show, home zones feature in residential areas across Freiburg and characterise the residential environment in each of three neighbourhoods investigated.

3.5 Pilot Study at BedZed, London: Car-Reduced & Regular Streets Compared

3.5.1 Introduction

The purpose of this pilot study was to investigate whether an inverse correlation between social interaction and traffic, indicated in Appleyard’s seminal work, applied to different residential streets in South London - which included the BedZed scheme where streets were traffic free – and whether enhanced social interaction is bought at the ‘cost’ of foregoing a degree of mobility . Furthermore this pilot study, which was undertaken in 2008, set out to deductively validate the theoretical framework (Fig.2.16) at the core of the research, and to inductively draw out social and mobility issues related to car reduction. To do so the pilot study compared a number of basic elements of the theoretical framework by surveying a sample of residents on travel behaviour and social interaction in relation to two broadly different street types in Hackbridge, South London. Questionnaires were obtained from a sample drawn from a car-reduced street in the ‘BedZed’ low carbon development and from residents living in ‘regular’ streets immediately adjacent. The specific objectives were to:

- Compare general travel behaviour between streets;
- Characterise levels of social interaction and community development on each street;
- Gauge attitudes towards urban form of residents of each street;

3.5.2 The Study Site

The properties included in the survey sample were all located within 200m of each other, giving a more or less equally high level of public transport accessibility and common provision of local shops, schools and services. The four chosen streets contrast markedly in terms of traffic volume and density (Table 3.3).

	Heavy	Light / Old	Light /New	Car-Reduced
Density	20 DpH	30 DpH	48 DpH	105 DpH
Age	C.1900 – 1950s	C.1900-1970s	1990s	2002
Car Provision	Busy ‘A’ Road with limited street parking	Residential distributor road with street parking	Residential cul-de-sac with street parking	Limited car access & no street parking. Peripheral parking at 1.5 spaces/home.

Table 3.3 Characteristics of the four study streets in Hackbridge

3.5.3 Demographic & Background Data

Basic demographic data consisted of household age composition, housing tenure and lead occupation. Although a small data sample means that a degree of caution is required, a

number of basic demographic differences are evident between car-reduced and regular streets (Fig.3.11).

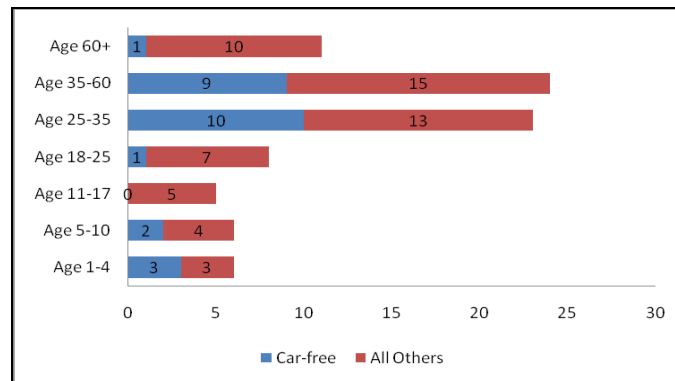


Fig. 3.11 Distribution of Age Groups – Car-Free & Regular

Firstly, just 2 out of 14 BedZed households had children, compared with 4 out of 22 respondents in the regular streets. Secondly, the survey recorded a higher proportion of older people living in the regular streets. Generally, there was a greater spread of age groups in the regular housing compared to the car-reduced. Most respondents were owner-occupiers in both data sets, with just one rental property in the car-free street and four among the regular housing, although ‘ownership’ included participants in the Peabody Trust’s ‘shared ownership’ scheme for key workers and those on lower incomes. In accordance with its recent completion, time spent at the current address was least in the car-free street (Fig.3.12). Surprisingly perhaps, in light of the correspondence between traffic levels and occupancy turnover recorded elsewhere (Appleyard *et al*, 1981), respondents in both the older housing along ‘heavy’ street and those along the ‘light’ street had all been resident for an average of 15 years.

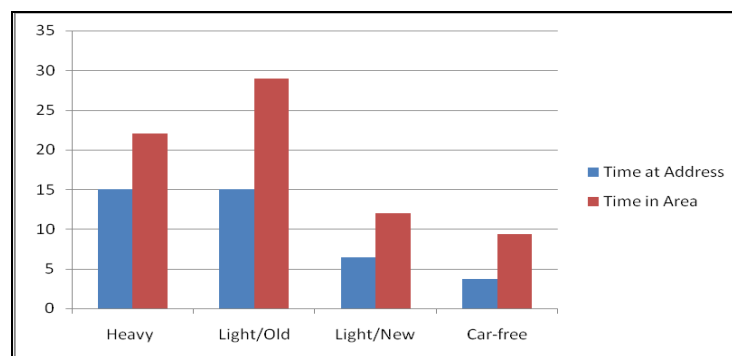


Fig.3.12 Time Spent at Address & in Area (in years)

3.5.4 Travel Behaviour

Overall car ownership levels at Bedzed have previously been estimated at between 50% and 59% against 71% overall in Hackbridge generally in previous studies (Francis & Bell, 2008). Within the small sample of 14 households of the car-reduced street, 84% had cars against 100% among the 22 households in the adjacent streets. Clearly, these differences in car ownership rates do not explain the contrasting journey-to work patterns shown in Figure 3.13 below which show a predominance of train and cycling at BedZed against the automobile based commuting of residents of the regular streets.

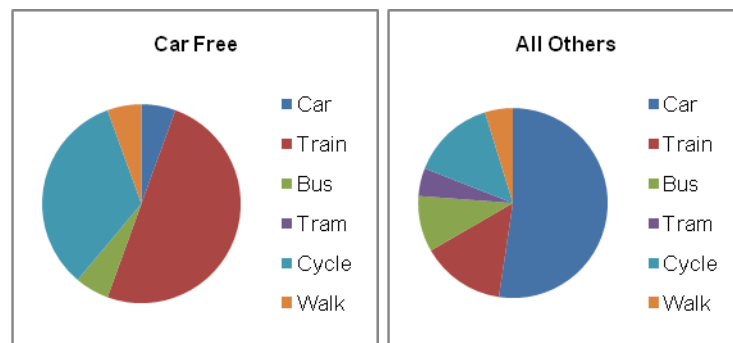


Fig.3.13 Journey to work modal share.

Explaining such variance is not straightforward, but a number of factors were considered including the viability of public transport to reach the workplace, combining work and the school run and the effect of the one car per household ratio at BedZed on a household with young children. Using Transport for London's 'journey planner' tool¹, all commutes were found to be theoretically possible from Hackbridge railway station to the destination district's transport hub to within 5 minutes of the car journey time given by the respondent. Combined work commutes and school runs also do not account for this disparity as only two BedZed households had children, of which one made combined journeys - against 4 of the Hackbridge households, suggesting that other factors affect behaviour.

Environmental issues are evidently of concern to a significant proportion of BedZed residents with nine out of fourteen households selecting environmental concerns as a factor in their decision to locate to the development. Attitudinal differences could be a significant factor, whilst a difference in the age distribution of residents of also needs to be considered. Furthermore, the peripheral nature of car-parking versus the close proximity of cycle lock-ups may explain the popularity of cycling as a travel mode over driving.

¹ Available at: www.journeyplanner.org

Car use by visitors was at the 80% level across all streets in the study. With limited parking availability at Bedzed, anecdotal evidence from nearby residents suggests that vehicles are parked in adjacent streets which are not governed by parking controls, leading one resident to claim of having had the kerb dropped outside his home as a result.

3.5.5 Community Development

The impact of traffic on neighbourly contact and the community strength of each street was assessed by asking residents to diagrammatically show which other residents of the same street they were acquainted with and to evaluate the community strength of their street on a scale of 1-5 from weak to strong (Fig.3.14).

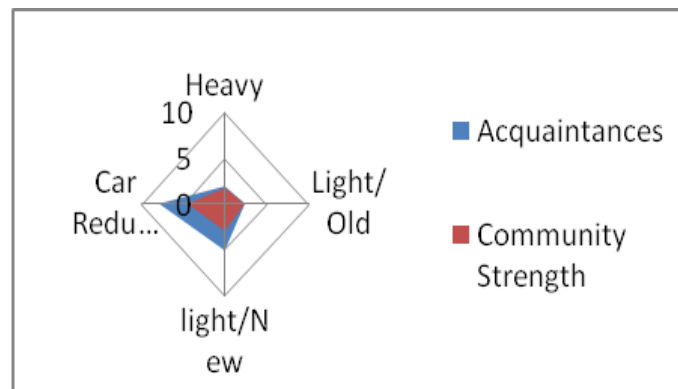


Fig.3.14 Community Development & Traffic

The patterns depicted in Fig. 3.14 correspond with Appleyard & Lintell's (1971) seminal work in San Francisco, although they do mask a degree of variability. A direct link between length of time at address and development of neighbourly relations might be expected, but almost the reverse is true in the study sample. The residents of the car-free street had been in residence for an average of approximately 4 years but had 8 or so acquaintances, whilst those on 'heavy' street had been there for 15 and knew 5 of their neighbours by name. Length of residency may be factor in the contrast between old and new build streets, but between the new build and car-free. Similarly, tenure seemed to play little role in the development of community relations, although rental rates were highest along 'heavy' street, in keeping with Appleyard & Lintell's findings.

3.5.6 Community Versus Mobility?

Rather than to draw firm conclusions from a limited data set, the point of this pilot study was to try to identify patterns and lines for further investigation in a subsequent major fieldwork programme. In addressing number of data features are worthy of note: (i) the narrower overall age profile of the car-free street, (ii) the contrast in journey-to-work modal share between car-free and regular streets, and (iii) the patterns of community development and involvement between streets, commensurate with traffic levels. The survey results also suggested that residential design has oriented streets differently: the car-free street towards high levels of sociability, through the prioritisation of non car uses, and the regular streets towards mobility, through the design of streets towards movement. All other factors being equal therefore, design might be considered as a ‘fulcrum’ tilting the overall ‘qualities of the built environment’ (Fig. 3.15) between ease of mobility – in this instance by the private car, and one engendering a more ‘sociable’ environment, perhaps with the loss of some convenience of travel with displacement of access and restrictions on parking found at BedZed.

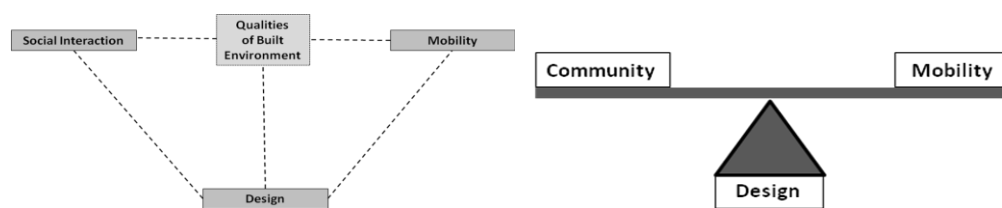


Fig. 3.15 Design as a ‘fulcrum’.

3.6 Concluding Discussion

Part A has discussed a three-part approach to residential car reduction, consisting of measures to restrain ownership, measures to restrain use, and lastly those concerned with mitigating the impact. The seminal work of Appleyard’s team has been verified by both the Hackbridge pilot study and by Chatterjee’s (2009) analysis of retrofitted home zones which found levels of enhanced social interaction through a reduction in traffic and improvement to the street environment. Nevertheless, the effects of such measures on mobility patterns remain somewhat obscured in relation to the Pilot Study due to the impact of residents’ values and lifestyle preferences rather than the controlling effects of residential design (Williams & Dair, 2010). The point is illustrated by Susilo *et al* (2009). The study found that residents of developments billed to be ‘sustainable’ and incorporating elements of car reduction including segregated parking and shared surfaces generally owned more cars and frequently travelled by less sustainable means than the UK population at large. Using the same data set, Susilo *et*

al (2012) noted that these developments had the lowest proportion of car-free households (Fig.3.16).

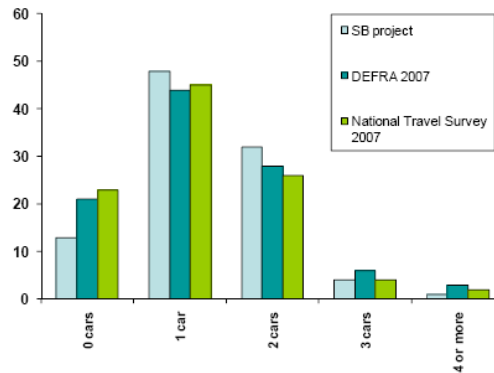


Fig.3.16 Car ownership levels compared: sustainable projects and UK average (Susilo *et al*, 2010)

The authors noted the importance of context in producing different outcomes, but there was a suspicion that socio-economic status was a strong influence in controlling travel patterns. A measure of residents' attitudes and beliefs, revealed that improved public transport would be the best incentive to encourage change, and significantly the authors report that 'individual attitudes are often more strongly associated with travel behaviour than land use policies which promote higher densities'. This indicates that residents will not necessarily live 'sustainably' because of residential design measures such as segregated parking or good cycle facilities. The study found that wider measures including the improvement of public transport to be elemental in engendering deeper change away from the car. Although this is a logical outcome it suggests that residential design alone provides only a limited enabling force and, somewhat ironically, could by creating a high quality and attractive neighbourhood environment, draw a more affluent, car-using resident.

PART B: CAR-FREE DEVELOPMENT

3.7 A Short History

The preceding sections have discussed design approaches that have aimed to lessen the impact of road traffic, or to reverse the tendency to orientate residential schemes solely towards the private car. Such neo-traditional influenced schemes could be classified loosely under the heading of ‘car reduced’ development. However, a bolder course has been attempted with the creation of ‘car-free’ housing developments in a number of European countries. This title is, in the first instance, something of an aspiration as few of the developments are completely free of car owners or car-parking, but such schemes commonly attempt to draw-down provision for automobiles to the bare minimum. This section traces the history and development of car-free development and finishes by presenting a case study of car-free experiences in the UK at the Slateford Green development in Edinburgh.

The car-free movement had an inauspicious start with the failure of one of the first car-free residential schemes, the Hollerland project, in the northern German city of Bremen in 1995. The city attempted to build a scheme of 220 homes that had 30 parking spaces under a general ambition to ‘create a new quality of urban lifestyle’ (Glotz-Richter, 1996). The project enjoyed strong local political support, but in order to be granted permission the Hollerland scheme had to be well-connected to public transport, in close proximity to a range of services and near to green spaces. The scheme was stopped after the first phase of twenty-two homes failed to attract sufficient interest amid unfavourable economic conditions of the mid-1990s.

In spite of Bremen’s failure, over a dozen car-free housing developments had been built in Europe by 2000 (Scheurer, 2001). Car-free developments go beyond being simply ‘housing without car-parking’ – as most of these developments have parking to an extent, but the development is usually designed to minimise automobile access, by physically separating car parking away from homes and usually by levying substantial charges (www.carfreeuk.org). Residential streets, in keeping with the ‘home zone’ code are usually designed to prioritise other street activities over automobile access, which is normally minimised to drop-offs and collections. As with the case of the Hollerland project, Scheurer (2001) identifies five ‘ideal’ characteristics for a car-free scheme as being:

1. Integration with frequent public transit service
2. Within easy walking distance of basic shops and services
3. Connection to a good cycle network

4. Be sheltered from traffic
5. Safe and pleasant areas for residents to commune and children to play outside.

3.7.1 Germany – ‘Auto-frei Wohnen’

Residential schemes throughout Germany are subject to strict regulations for the provision of car parking through the 1939 *Reichsgaragenverordnung* or ‘National Garage Order’ which is usually interpreted to mean one space per household. 180 to 220 parking places were initially required for the 220 home Hollerland scheme in Bremen, but a legal review permitted this figure to be adjusted to 30 based on expected parking demand from residents who had to sign a life-long commitment against car purchase (Glottz-Richter, 1995 & 1996). The Garage Order is a significant source of revenue for municipal authorities, who reinvest it in public parking and other transport infrastructure. Developers can apply for an exemption but are normally obliged to pay a fee in lieu equivalent to the construction costs of the space (Scheurer, 2001).

In Freiburg, residents of the Vauban car-free district may purchase a space in a peripheral car park for €17,500 (as at 2010) or alternatively become a member of the “Verein für autofreies Wohnen” or car-free association. The association grants households an exemption to have a parking space for their home, with land reserved for the provision of car parking at a later stage should it be needed, but which is turned to green space in the interim (Nobis & Welsch, 2003). The advantage of the arrangement at Vauban is that residents can alter their car ownership status annually according to their changing circumstances (*ibid*).

3.7.2 UK Car-free Housing

In the UK, a number of determinedly ‘car-reduced’ developments were built from the late 1960s as a reaction against traffic on residential streets. One of the earliest and most extensive examples is architect Neave Brown’s Alexandra Road Estate in Camden, North London, and heavily influenced by the form of the traditional Victorian bye-law street but closed to traffic in order to create a safe environment in which children could roam and play freely (Utopia London, 2010). Today, a degree of support exists for car-free development in policy guidance and in the legal framework than in Germany, where each development must be justified on a case-by-case basis (Morris *et al*, 2009). 1999’s Urban Task Force report provided impetus in the move down to draw-down residential parking by recommending a policy of one parking space per home in new build development. A subsequent revision to *Planning Policy Guidance* (PPG) 13 on transport followed the Task Force’s findings by

setting a maximum threshold guideline of 1.5 spaces per household, together with support for the principle of car-free schemes:

New residential areas should be designed to encourage low traffic speeds and may be car free, where there is sufficient access by non car modes.

CLG, 2011:22

Similarly, *Planning Policy Statement (PPS) 3* on housing which superseded the preceding PPG in 2006 refers to the sustainability benefits from promoting modes other than the private car by situating housing close to good public transport links (CLG, 2006:14). Furthermore the guidance encourages communities to ‘develop their own residential parking policies for their areas, taking account of expected levels of car ownership’ (CLG, 2006:17) rather than adhering to a rigid parking ratio.

In Scotland which has a separate legal system, and where the UK’s largest current ‘car-free’ development exists in the west of Edinburgh, Section 75 of the Town and Country Planning (Scotland) Act 1997, permits Local Planning Authorities to stipulate specific terms and conditions for development, including for travel management (Eastwood, 2008:18). Furthermore, Section 151 of the Roads (Scotland) Act, 1984 defines ‘vehicle free’ development (*ibid*). It was under a Section 75 agreement that the Slateford Green project in Edinburgh was built as a ‘vehicle-free’ scheme, with seven car parking spaces for 120 homes and barrier-controlled access onto the site. Unlike in German developments, residents were made aware of the vehicle free nature of the scheme but were not contractually obliged against car ownership.

3.7.3 Retrofitted Car-free Schemes

Retrofitted car-reduced residential streets have been created in the UK and in Germany. Perhaps the most ambitious example is the Johannesplatz scheme in Halle / Salle in former Eastern Germany (Fig.3.17), which between 1999 and 2001 and with the cooperation of residents implemented a variety of measures in different streets, ranging from complete pedestrianisation and car parking removal on one street to parking and speed limit reductions in others (Reutter, 2002). Residents’ mobility was managed by means of reduced public transport fares, a car-pool scheme and improved cycle scheme.

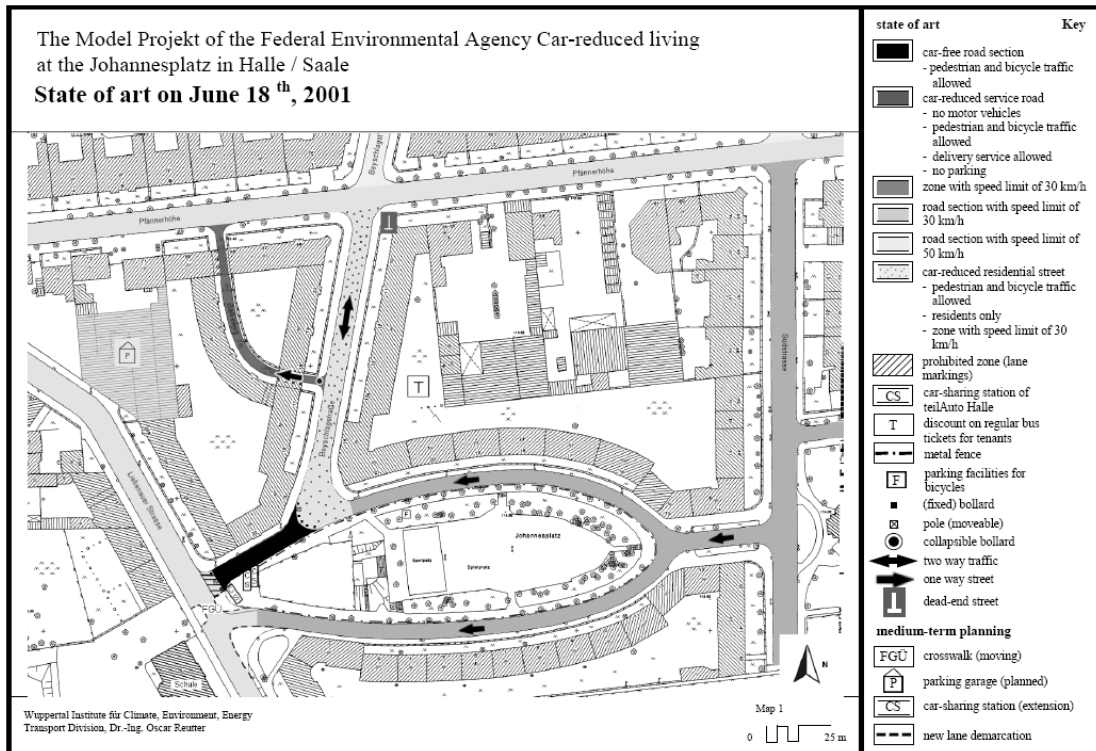


Fig.3.17 Plan of a Retrofitted Car-Reduction Scheme, Halle/Salle (Source: Reutter, 2002)

Although not a strict retrofit scheme, the Eppendorf Falkenried-Terrassen quarter in Hamburg (Fig.3.18) demonstrates how older housing can be improved with the absence of cars (Heller, 2008). The Falkenried-Terrassen never had car access and it was decided not to implement automobile access during a major restoration in the 1990s.



Fig.3.18 Kalenried-Terrassen, Hamburg (Photo: Markus Heller)

Car-free retrofit schemes share clear synergies with other policies which aim to reduce the negative consequences of traffic such as shared spaces.

By surveying the pattern of urban development generated by emerging transport technology and the rise of automobile, chapter 2 argued that urban form has logically followed the dominant transport function. Part A of this paper examined approaches to car reduction and specific physical and administrative devices that could be used before examining the development of the 'car-free' movement. Although the bulk of car-free developments are to be found in continental Europe, and particularly in Germany and the Netherlands, the UK has a relatively small example at Slateford Green in Edinburgh. It is in relation to this scheme that a number of issues emerge that seem to stem from the absence of wider background conditions in the operation of the transport system. Although modal share is comparatively diffuse in Edinburgh compared to national modal share in Scotland, the car remains the dominant mode of transport; research presented in the next section has identified mobility problems for residents that arguably relates to Slateford Green's attempts to counter overall modal trend.

3.8 UK Car-Free: Slateford Green Case Study

3.8.1 Introduction

As the second pilot study undertaken in a UK car-reduced development which aimed to test the theoretical framework of this thesis, and to test and refine the methodology used in the main data collection exercise, research was undertaken on the mobility of residents at the 120-home Slateford Green development in a western suburb of Edinburgh. A relatively small quantity of primary data was produced although this has supplemented and corroborated with secondary findings from other empirical studies and have been reported elsewhere (Hamiduddin, 2010). Completed in 2000 by the Dunedin-Canmore Housing Trust, the site is location between two major bus corridors, has high cycle storage provision and with two of six car parking spaces reserved for car club vehicles, with a further four for disabled residents. Although vehicle access into the development is controlled by a barrier, the surrounding streets are not part of a controlled parking zone, and there are a number of substantial car parks in the vicinity, including medical centre car park immediately adjacent.

In addition to secondary data collected during a consultancy conducted by Eastwood (2008), primary research for this pilot study consisted of interviews with Susan Napier (A), Business Development Director at Dunedin-Canmore Housing Trust and site concierge Alan Wood (B) in November 2008. This initial session was followed by a further round of interviews with eight residents and a community health nurse from the adjacent medical centre at a weekly 'Mums and Tots' group held at the Slateford Green community centre in February 2009.



Fig. 3.19 Slateford Green (a) Approach with Medical Centre – right (b) Interior with play area visible

3.8.2 Mobility Patterns

A questionnaire survey of residents was conducted by Eastwood (2008), which elicited a 22.5% response rate or 26 completed forms. Because of the small sample size the data produced therefore needs to be treated with considerable caution, but the findings indicated that a significant minority of residents – approximately 10% - used automobiles as their ‘usual mode of transport’. Although the wording of the questionnaire used did not specify ‘usual mode’ as the work commute, this has been inferred by the author and is significantly less than the 48% car commuting rate in Edinburgh overall. 42% of residents used the bus and 37% walked as their main mode of transport, which relates to the high frequency bus services available nearby and the proximity of local shops and services, respectively.

Mode	Walk	Cycle	Bus	Train	Car/Van Passenger	Car/Van Driver	Car/Van Total	Other	Total (%)
Scotland	13	2	12	4	7	60	67	2	100
Edinburgh	18	3	27	2	5	43	48	2	100
Slateford Green	37	5	42	0	5	5	10	0	100

Table 3.4: Journey to Work Data (Source: Eastwood, 2008)

3.8.3 The Experiences of Young Mums

The rationale behind interviewing this group was to try to identify some of the issues associated with this traditionally transport vulnerable group (DfT, 2006) and particularly in relation to residential car reduction. In the event, just one out of the nine attendees of the group transpired to be a resident of the development and whose travel difficulties were significantly reduced by the fact that she owned a car, although she had previously been car-free until beginning a family. The interviewee was a part-time community worker (C) whose

job was located to the South of Edinburgh and her husband commuted to a job also outside of the city in Fife. She described how they parked their two cars in streets outside of the development:

So we park in the surrounding streets...it's fine really, the only thing is having a young baby – it's a bit of a hassle getting her out of the car and then walk to your flat and carry her up the stairs, but we don't find it a major inconvenience (C).

In fact this interviewee thought the arrangements compared favourably with those generally associated with living in Edinburgh's tenement flats, in which obtaining convenient car parking was difficult anyway, and she appreciated not having the noise or pollution of traffic close to her home.

However, the key common issue that quickly emerged from interviews with different mums was a decision by a local bus operator – Lothian Transport, to introduce a ban on child buggies on board their buses. A community health nurse (D) responsible for supporting mothers with children under five years of age at Slateford Green summarised the confused and vulnerable position that parents were left in:

I think the main thing lately has been lately over the last 6 to 8 months, has been the problem on the buses with them not allowing prams on...

Some of the drivers allowed on certain kinds of prams and others said no to all prams – so parents are in this horrible position of waiting at the bus stop, not knowing if they're going to be able to get on the bus or not (D).

The ban was introduced in the summer of 2008 due to a conflict of space with wheelchair users in attempt by the operator to comply with disability legislation. The policy related specifically to unfolded pushchairs and prams. Folded buggies continued to be unrestricted, but one interviewee noted that this concession was not always particularly helpful as:

It's really hard to hold you baby, get your bags on and fold your buggy and get your buggy on – I just can't do it unless somebody helps me; you just have to wait for another bus (D).

A local newspaper summarised the effects for Edinburgh's residents generally:

The impact of the ban – and the latest move to effectively start lifting it – should not be lightly written off. For many, the city's buses are the only way to readily access vital services, and to stay in touch with family and friends at a vulnerable time.

Edinburgh Evening News, 24 March 2009

For the residents of Slateford Green where the majority do not have car access, Mary the community health nurse noted how the impact of the ban had been particularly dramatic:

We've seen that have massive repercussions on parents not being able to get out and about and with people's [lack of] access to cars they can't go anywhere and in the winter when it's raining; it's not very nice at all (C).

The ban was lifted after a period of approximately nine months - shortly after the interviews above were conducted in February 2009. The story had attracted extensive media coverage and considerable local opposition. It serves to underline the potential difficulties posed to residents who wish to reduce their car use and particularly for residential car-reduction schemes. In this instance, the actions of a local bus operator here have undermined the accessibility of transport services to a significant and potentially vulnerable sector of the population. As the Edinburgh Evening News suggests this issue may linger in public consciousness for a while yet, and certainly until a new bus fleet is fully introduced.

3.8.4 Car Reduction and Context

With car ownership levels at Slateford Green estimated by the site concierge at 20 – 25% (B) and potentially as high as 40%, Eastwood (2008) notes that '[t]he availability of car parking in the vicinity is...a significant factor in undermining the effectiveness of Slateford Green as a car-free development'. Eastwood's report proposes a number of policies including liaising with local landowners and businesses for the introduction of parking restrictions that would 'minimise the risk of undermining the aims of the development by providing unrestricted parking in close proximity' (*ibid*). The bus company's buggy ban and higher than desirable car ownership levels pose a dilemma over whether to uphold the scheme's overall philosophy by imposing restrictions that could adversely affect the social and economic needs of a considerable proportion of residents. The public confidence-eroding ability of a local bus operator to rapidly alter terms of travel poses a wider challenge to the concept of car-free or heavily car reduced developments in the UK. In this instance it is perhaps acutely ironic that the operator - Lothian Buses - is one of the few remaining publically owned transport operators left in the privatized UK market. Although the evidence presented is limited, it indicates the need to consider the 'fit' between neighbourhood design model and the wider transport functionality of a city. This relationship is the subject of intense scrutiny in chapters five and six, where particular attention will be paid to indicative evidence of mobility constraint and to residential self-selectivity as a mitigating outcome. Chapters seven and eight investigate the factors needed to achieve the seamless integration of car reduced development into the wider urban fabric.

3.9 Concluding Discussion

The Slateford Green case study confirms the conclusions reached in Part A that the successful suppression of car ownership, and to a certain extent car usage, relies on wider contextual support, and particularly from public transport policies. Additionally, it cannot be assumed that residents will necessarily travel in ways that are considered environmentally sustainable as measured in CO₂ footprint terms, and a degree of caution must be exercised in making assumptions about the environmental performance of the residents of car-free schemes. To illustrate this point a comparative study between residents of the Florisdorf scheme and a reference development of a similar size in Vienna by Hertwich & Ornetzeder (2005) found only a slight reduction in overall CO₂ emissions by residents of the former compared with the reference, though this reduction constituted a third less than the Austrian average. Patterns of energy consumption were found to be substantially different: ground transportation and household energy consumption were about half at Florisdorf compared with the reference but air transport accounted for 64% of CO₂ emissions of car-free residents (Fig.3.20) – about the same as the national average.

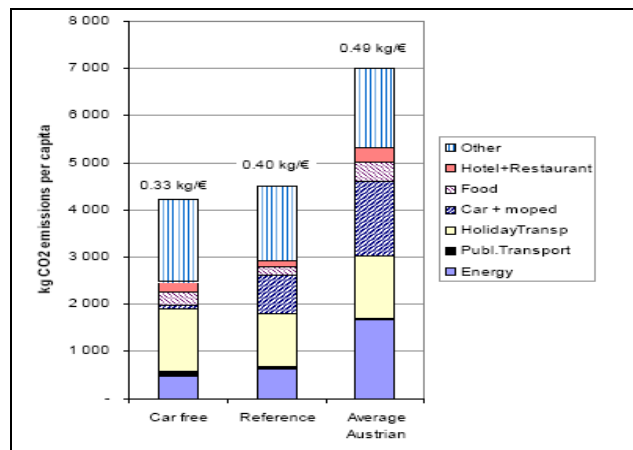


Fig. 3.20 Comparative CO₂ emissions in Vienna (Source: Hertwich & Ornetzeder, 2005)

Both of the Viennese developments are similarly well-served by public transport, whilst much of Austria is relatively rural perhaps reflecting the differences between the average Austrian and the Viennese resident in car use and energy consumed. The differences in CO₂ profile between the ‘car free’ and ‘reference’ residents could be indicative of social and attitudinal differences found in other environmentally-orientated developments such as BedZed, where Francis & Bell (2008) found that a significant proportion of residents routinely travelled for leisure on long haul flights. In summary, and put crudely, evidence from Florisdorf and BedZed suggest that CO₂ ‘saved’ in some lifestyle aspects are ‘expended’ in others according to the preferences of residents.

PART C: CONCLUDING DISCUSSION

3.10 Conclusions

Chapter three has once again taken an historic perspective by tracing the development of residential car reduction techniques. A three-part definition of car reduction was introduced in Part A, and by viewing strategies through the lens of history the layouts of Hampstead Garden Suburb and Radburn, New Jersey may be regarded as being ahead of their time. Significantly, these early attempts stemmed from a landscape architecture approach surveyed in chapter two, and set out not merely to reduce traffic but introduce green space in lieu of road space. More recently, Alker Tripp and Colin Buchanan re-visited the use of street patterns to regulate traffic in residential areas, and both seem to have had an instinctive feel for the negative impact that high levels of traffic could have on community relations and neighbourhood life. Buchanan publicly expressed his qualms about the social costs of motorisation on residential streets that Donald Appleyard found evidence of a decade later. Appleyard investigated a number of design solutions that sought to ameliorate the worst effects of traffic, including shared spaces and home zones that were being developed in the 1970s. Such solutions are now commonly brought together in new urbanist or ‘neo traditional’ residential schemes and also in car-free development. In the UK, ‘neo-traditional’ developments such as Poundbury have sparked interest, criticism and debate, which in turn have had a profound influence on residential design guidance including *Manual for Streets*. Evidence presented in Part A of this chapter in the form of the mini case studies of Milford Street in Bristol and Hackbridge in London demonstrated how reducing the impact of the car in the neighbourhood environment can encourage greater social interaction.

Car reduction measures have begun to be applied in different combinations to form nuanced ‘packages’ of neighbourhood design. Although some are limited new-build ‘showcase’ projects that have not witnessed broader replication, retrofitting has also occurred in major UK cities with the adoption of home zones and in some instances, with shared space. Although mitigation strategies have had demonstrably positive effects on social interaction, a question hangs over the extent to which such limited approaches can themselves engender modal shift, and if this is the case, to what extent such a shift is influenced by the profile of residents, itself relating to processes of residential selectivity. Ultimately a conundrum might be reached if social sustainability is undermined through demographic concentration in a bid to achieve perceived environmental sustainability; it is this tension between ‘community’ and ‘mobility’ which forms the core rationale for the empirical research presented in chapters five and six.

Research Approach & Methodology



How to Research the Social Implications of Residential Car Reduction?

4.1 Introduction

The two preceding chapters have explored the way in which transportation shapes the urban environment by producing different patterns of development and density, and how individuals and communities are in turn shaped by the physical environment, in terms of processes of self-selectivity towards different residential forms and response to different qualities. In relation to urban physical form, car reduced development might be viewed as pre-automobile age development in a modern guise, whilst the opportunity generated to utilise space differently - particularly through the substitution of 'grey' car infrastructure by green space also featured in earlier attempts at car reduction such as at Hampstead and at Radburn.

Although there appear to be solid theoretical reasons for supporting car reduced development, this thesis is concerned firstly that the social effects of creating developments that present a significant departure from 'mainstream' society, and with the car as a single point of focus, have not been fully investigated. Furthermore, in strategic planning and neighbourhood design terms, the discussion of the literature in chapters two and three suggests that urban form has tended to follow the greater transport function – or 'operating system' as it will be termed in later chapters.

A basic set of three questions may be identified firstly about whether residential car reduction can be considered socially 'progressive' when wider implications surrounding self-selectivity are considered; secondly, whether there are issues surrounding mobility and accessibility that result; and thirdly, whether neighbourhood design in itself provides the best point of approach for schemes that potentially affect every aspect of residents' lives. Further refining of these points has produced the following three research questions, around which the following chapters will focus:

- 1 What implications does car reduction have for the demographic profile of residents, and with what implications for own and neighbouring districts?**
- 2. What are the key access and opportunity constraints are associated with residential car reduction? Who is disadvantaged and why?**
- 3. What design, planning and implementation lessons can be learned for future car-reduced development?**

The purpose of this chapter is to describe the steps taken and rationale supporting the approaches that were utilised, methods employed in the field and in subsequent analysis. The steps taken to address each of the focused questions are covered in the following sections, before a detailed examination and critique of the methodology employed.

PART A: Research Approach

4.2 Scheme of Approach

The following sections in this Part describe the steps taken to translate the theoretical framework and corresponding research questions introduced in chapter one, and addressed in chapters two and three, into a programme of data collection. The city of Freiburg and its three neighbourhood models are introduced, before describing how a ‘layered’ methodological approach was employed in an attempt to draw both a depth and breadth of data to the three research questions. With a mixed-methodology package employed to address the research questions, and with three phases of data collection, apparent complexity in the field research programme is underpinned by a robust and relatively straightforward strategy.

The theoretical framework introduced in chapter one (Fig.1.4) established a three-way relationship between social interaction within a neighbourhood community, the mobility of residents and neighbourhood design. In chapter three it was suggested that design could act as a ‘fulcrum’ that can exert a controlling influence in the balance between interaction and mobility. Perceived positive effects fall within the triangle while potential negative impacts fall outside.

Chapters two and three identified patterns of causality initiated, in the first instance by the influence of neighbourhood design on resident self-selectivity, which has a bearing on social interaction and mobility in turn, as shown in Fig. 2.18 (Fig. 4.1 below).

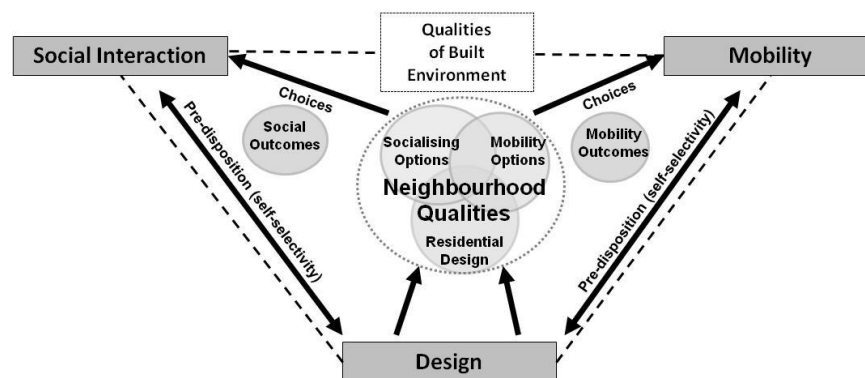


Fig.4.1 Theoretical Framework with directions of causality

Significant ontological and epistemological challenges were described in chapter two that related to social outcomes from urban quality that could be described loosely as ‘tangible’ and ‘intangible’. The ontological aspect relates to a view on the part of the researcher over the *nature* of reality (Guba & Lincoln, 1994:108) and, simply put, whether aspects that are difficult to determine ‘positively’ are considered ‘real’ or not. The epistemological challenge

lies in the approaches used to determine the nature of reality (*ibid*), and the extent to which the way individuals perceive or ‘construct’ the world has a bearing on how the research problem is approached. The impact of the Progressive Era on the form of urban streets and layout and Modernism’s conceptualisation of society, with the machine-dominating impacts that were wrought as a consequence, underlines the importance of establishing a considered philosophical baseline. This research takes a ‘post-positivist’ stance that rejects the notion that all aspects of reality can be reduced and verified ‘factually’ on the one hand, but embraces triangulation as a means to contributing to the development of knowledge (*ibid*: 110) on the other. A mixed-methodological and ‘layered’ approach serves as the basis for triangulation in this research.

The two pilot studies presented in chapter three have assisted in developing the conceptual framework, and specifically by providing initial examination of how car-reduction strategies in residential developments have affected the composition, mobility and community development of each resident population. Yet identifying the outcomes of residential car restraint is to explain only the ending, and to miss the complexity of the story - the *processes* leading to the outcomes, and pertinently, residents’ attitudes towards them. The empirical research sets out to identify different social outcomes relating to residential car reduction as well as investigating *how* and *why* different outcomes are produced. A mix of different methodologies was therefore deemed to be appropriate from the outset, and the mix of different methods will be explained in detail in Part B. However, the general conceptual framework was to analyse three models of development: (i) ‘car-free’, (ii) ‘low car’, and (iii) ‘regular’ development. This novel approach set out to provide greater resolution to the analysis than a two-way comparison between car-free and conventional, reflecting the fact that car-reduction can entail complex combinations of different design and strategy measures.

4.2.1 Neighbourhood Typology

For the purpose of this research the term ‘car-free’ uses Melia’s (2010a) definition of a site where car access is typically restricted to loading and unloading and car-parking provision is physically and financially segregated from housing and at ratio of 0.5 spaces per household or below. Such schemes typically aim to suppress car ownership, use and impact (Table 4.1), and are illustrated by the Slateford Green. ‘Low Car’ means a site where car access into residential parts is restricted and resident car parking is largely segregated but with a generous provision, typically at 1.5 spaces per household or occasionally above. These developments aim for only modest reductions in car ownership and use, and instead focus on reducing the impact as typified by the BedZed scheme. The ‘regular’ model simply means a neighbourhood in which no specific car reduction strategies and measures have been

implemented beyond the prevailing ‘norm’ for the city which, in the case of cities such as Freiburg, means the widespread implementation of impact-reducing measures such as home zones and shared street surfaces.

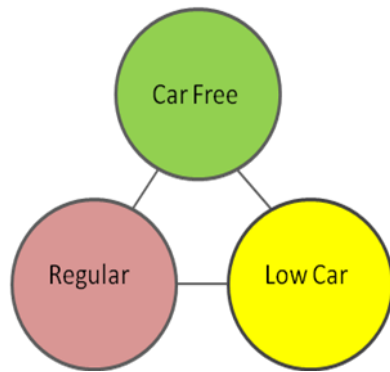


Fig. 4.2 Study Site Typology

	Car Ownership	Car Use	Car Impact
Car-free	↓↓↓	↓↓↓	↓↓↓
Low Car	↓	↓	↓↓↓
Regular	---	---	---

Table 4.1 Characteristics of neighbourhood types where the relative strength of the indicators are depicted by way of arrows (e.g. ↓ = slightly lower / ↓↓↓ = strongly lower).

4.3 The Case Study Approach

In order to create more general theory a case study approach has been adopted using Freiburg, and specifically, three neighbourhood models that are compared. There has been considerable discussion and debate in the literature about the role of case study research, and particularly whether generalisations can be drawn from one or a small selection of examples. Indeed, Flyvbjerg (2006:220) rejects the ‘conventional wisdom about case-study research’ as depicted by the *Dictionary of Sociology* ‘[...] a case study cannot provide reliable information about the broader class, but it may be useful in the preliminary stages of an investigation since it provides hypotheses [...]’ (Abercrombie *et al*, 1984, p.34). Indeed, the use of the case study has been the subject of contention and criticism as an approach that ‘cannot be expected to transcend story-telling’ (Miles, 1979:600 quoted in Yin, 1981). However, as argued by Yin (1981) such criticism confuses the case study as a research approach with the evidence and data collection method used to construct it. Indeed in Fig. 4.3 Hunter and Kelly (2008) show a range of potential approaches to research from the quantitative ‘Positivist’ to qualitative ‘Social Constructivist’ on the horizontal axis and the researcher’s own engagement with the subject on the vertical. Fig. 4.3 shows that the case study would be expected to include a strong element of qualitative data and direct involvement on the part of the researcher – typically through interviews to construct the ‘story’. Yin (1981) notes that some case studies have been constructed solely from quantitative data, although these remain somewhat exceptional.

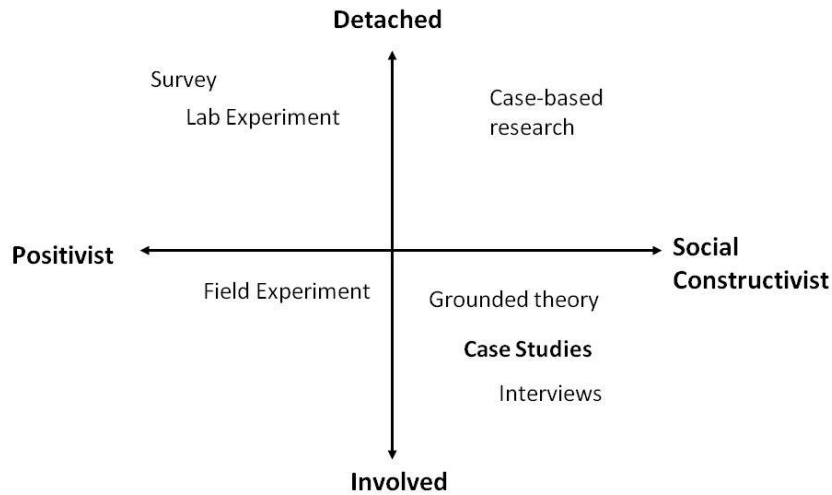


Fig. 4.3 Spectrum of Research Approaches (Hunter & Kelly, 2008)

The case study implies an approach rather than a single, qualitative based method as some critics have implied. Indeed, Proverbs and Gameson (2008) argue that one of the strengths of the case study approach is in the triangulation from three different sources of evidence that is often undertaken. Further criticism that case studies are useful only for hypothesis development rather than the development of theory is rejected by Flyvbjerg (2006). Specifically, Flyvbjerg dismisses the following assumptions:

- i. theoretical knowledge is more valuable than practical knowledge
- ii. One cannot generalize from a single case, therefore, the single-case study cannot contribute to scientific development
- iii. The case study is most useful for generating hypotheses, whereas other methods are more suitable for hypotheses testing and theory building
- iv. The case study contains a bias toward verification
- v. It is often difficult to summarize specific case studies.

Flyvbjerg (2006:219)

Rather than being merely a means of pilot testing, Flyvbjerg contends that the strength of the case study approach is that it embraces the complexity in relation to context, and this relationship to context is helpful to knowledge development in ways that theoretical generalisations are sometimes not. Moreover, the author argues that there are not – as indeed there never can be - universally generalisable theories about human behaviour. Indeed, he argues that:

Predictive theories and universals cannot be found in the study of human affairs. Concrete, context-dependent knowledge is, therefore, more valuable than the vain search for predictive theories and universals.

The argument, therefore, is that to be ‘expert’ is to have intimate knowledge with a very large number of case studies that summarise context-specific experience, serving a similar function as a trial or a scientific experiment, through which ‘More discoveries have arisen from intense observation than from statistics applied to large groups’ (*ibid*:226).

4.3.1 Case Study Selection

Flyvbjerg (2006) sets out a framework for case study selection (table 4.2), which encompasses those that help in building theory (Random selection), and those directed towards providing more nuanced accounts of particular behaviour (Information-oriented selection).

Strategies for the Selection of Samples and Cases

Type of Selection	Purpose
A. Random selection	To avoid systematic biases in the sample. The sample’s size is decisive for generalization.
1. Random sample	To achieve a representative sample that allows for generalization for the entire population.
2. Stratified sample	To generalize for specially selected subgroups within the population.
B. Information-oriented selection	To maximize the utility of information from small samples and single cases. Cases are selected on the basis of expectations about their information content.
1. Extreme/deviant cases	To obtain information on unusual cases, which can be especially problematic or especially good in a more closely defined sense.
2. Maximum variation cases	To obtain information about the significance of various circumstances for case process and outcome (e.g., three to four cases that are very different on one dimension: size, form of organization, location, budget).
3. Critical cases	To achieve information that permits logical deductions of the type, “If this is (not) valid for this case, then it applies to all (no) cases.”
4. Paradigmatic cases	To develop a metaphor or establish a school for the domain that the case concerns.

Table 4.2 Strategies for the selection of samples and cases

This thesis can be identified as a ‘paradigmatic case’ (B4), although maximum-minimum variation has been a means to operationalise the empirical work, through the selection of neighbourhoods which strongly contrast in design – and treatment of the car specifically – to the prevailing norm. This thesis does not seek to prove or disprove any specific theory or hypothesis but rather to try to understand how different social factors interact. The selection of Freiburg as the primary case was information driven and motivated by the desire to draw out lessons that could help to establish generalisable theory on neighbourhood car reduction,

with other smaller secondary cases used to substantiate or negate the findings. Although Flyvbjerg (2006: 233) notes that paradigmatic cases are often selected ‘intuitively’; the selection of Freiburg followed a more straightforward logic: it is the only city in Europe in which such substantially different neighbourhood models exist. Between Freiburg and the nearby city of Tübingen – also in the state of Baden-Württemberg, four potential models of car reduction were identified from schemes that have recently been completed across the two cities, consisting of (i) ‘Inner Urban’ represented by Tübingen’s Südstadt scheme, (ii) ‘Fresh Cell’ of small infill development represented by Dreikönigstraße in Freiburg, (iii) Suburban Quarter – Vauban, and finally, (iv) Urban Extension – Rieselfeld. Some of the main design characteristics of each development model are set out below in table 4.3. Although these four models will be introduced here and referred-to in the following chapters, much closer attention will be paid to these in chapter eight.

	Inner Urban Quarter (Südstadt)	Fresh Cell (Dreikönigstrasse)	Suburban Quarter (Vauban)	Urban Extension (Rieselfeld)
Scale	500 + homes	under 500 homes	500 + homes	500 + homes
Density	Upto 200 dph	40-130 dph	40-70 dph	40-70 dph
Public Transport	Services to city centre. Scheme located within 1.5 km of major interchange.	Regular services to city centre within 500m.	Direct and reliable service to centre and to key destinations throughout city within 500m,	Direct and reliable services to centre and popular nearby destinations within 500m
Cycling	Quality cycle routes to centre	Access to city-wide network	Access to city-wide network	Access to city-wide network
Car Parking	30-50% of city average, underground parking, car club priority	Up to neighbourhood average, underground parking, car club priority	50-75% of city average in peripheral parking, car club priority	75% of city average in mixed underground and street, car club priority
Layout	Superblock and car-free blocks containing communal spaces	Block scale – homes face onto communal gardens	Superblocks and car-free blocks created by street loops	Superblock and car-free blocks created by grid form

Green Spaces	Pocket gardens & wild spaces using innovative techniques e.g. vertical gardens and 'outdoor rooms'	Shared neighbourhood green spaces	Car-free superblocks; wild spaces; continuity of green space into nearby countryside	Car-free superblocks; wild spaces; continuity of greenspace into nearby countryside
Amenities	Mixed use buildings	Supplementing & supporting existing neighbourhood amenities	High level of self containment; sharing with neighbouring districts	High level of self containment; sharing with neighbouring districts

Table 4.3 Four models of residential car reduction

Of the four models in table 4.3, Vauban and Rieselfeld permitted close comparative study – being located within the immediate context of Freiburg and, being large enough in scale to permit significant samples of primary data to be extracted. On the other hand, Dreikönigstraße’s small size meant that sample size could be problematic – as it was found to be in Slateford Green and, being located in a different city, the Südstadt development would have meant that comparisons would not have been easily drawn with Vauban and Rieselfeld. For these reasons, of the four potential models identified, the empirical research concentrated on Vauban and Rieselfeld, while research at Dreikönigstraße and Südstadt was limited to observational analysis to draw wider conclusions from the detailed case study research.

4.3.2 Case Study Design

Building on the innate strengths of the case study approach as a means to exploring the relationship between a case and its context, Yin (2009) established a framework of four approaches to case study design (Fig. 4.4), two ‘holistic’ – being based on a single unit of analysis in a single or with multiple cases, and two using ‘embedded’ units of analysis within a single case or multiple set of cases.

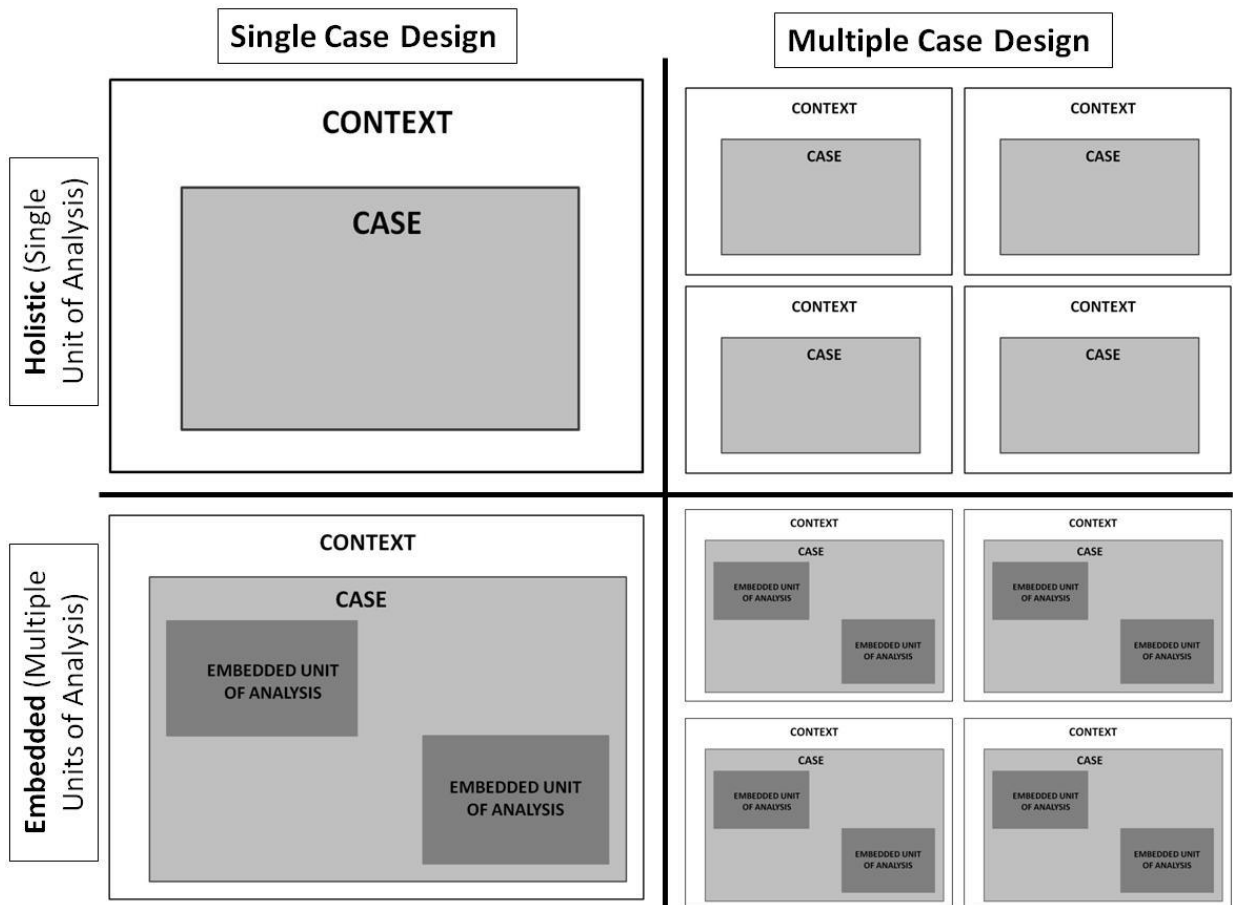


Fig. 4.4 Four potential case study approaches (from Yin, 2009)

This research adheres to Yin’s ‘holistic’ approach, with Freiburg providing the context and three separate neighbourhoods - Haslach Gartenstadt, Rieselfeld and Vauban - as separate cases. This was not an automatic decision – there is a scalar dilemma as it would have been equally possible to have used an ‘embedded’ approach with Freiburg as the case study and the three neighbourhoods as embedded units. However, as the objective of this research is primarily to compare outcomes of the neighbourhoods themselves, and secondarily to relate these outcomes to context, the decision was taken to place the emphasis on the neighbourhoods as the case studies. This decision means that useful data collected during two pilot studies at BedZed south London and Slateford Green in Edinburgh, and two further site visits to Tübingen Südstadt and the Greenwich Millennium Village in London, could be compared to the main Freiburg case studies, in level terms. These four additional studies yielded valuable data and are therefore referred to as ‘pilot’ and ‘additional’ studies, respectively, to denote their relative importance and also to depict their temporal relationship to the main Freiburg case study.

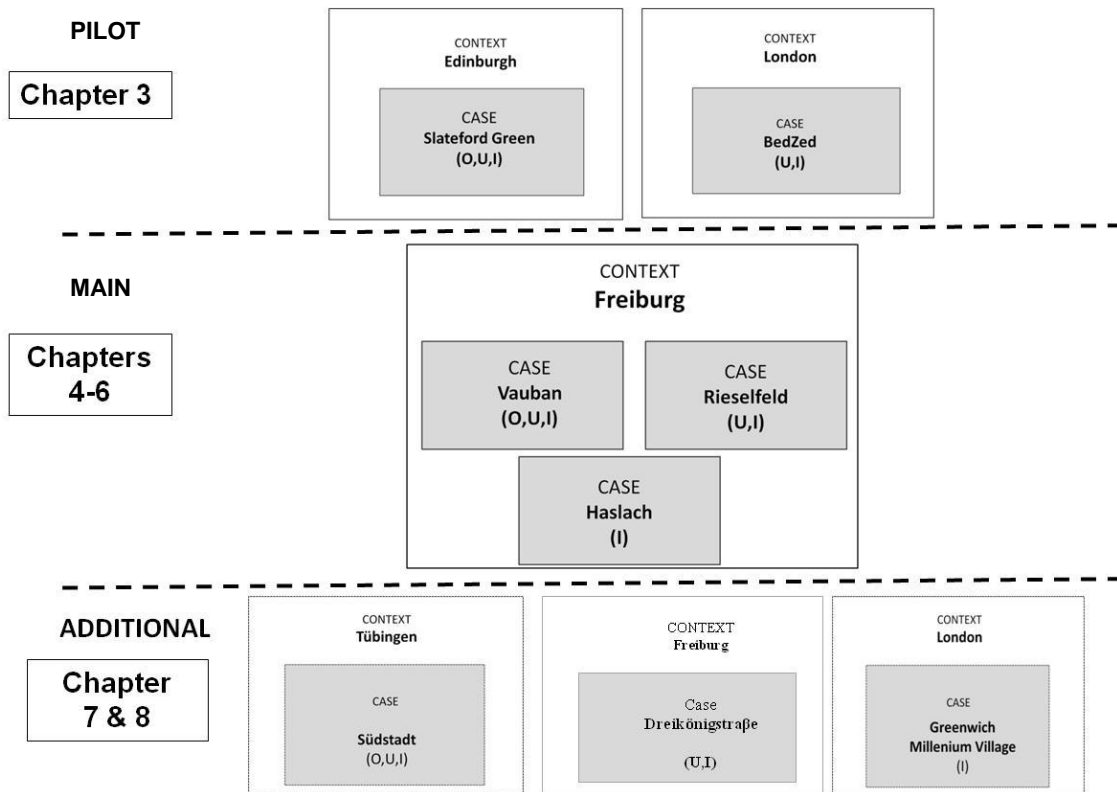


Fig. 4.5 The approach used in this thesis

4.4 Case Study Context: Freiburg

Germany has recently been described as a ‘green leader’ in ‘recognition for its successful alignment of prosperous and sustainable growth [whose] greenhouse gas emissions have fallen in absolute terms, effectively decoupling growth from Germany’s environmental footprint’ (Buehler *et al*, 2011). Taking the course that the nation has followed in respect to energy pricing, renewable energy, green infrastructure and sustainable transportation, Buehler *et al* (2011) identify four broad themes relevant to the nation’s strong and sustained environmental performance:

- Policies begin small and are implemented in stages, with up-scaling of pilot projects;
- Policies coordinated and integrated across sectors and levels of government to achieve maximum effectiveness;
- Citizen participation fostered and policies communicated effectively – increasing public acceptance and reducing potential legal challenges;
- Innovative solutions found, which embrace bipartisanship – nationally, regionally and locally.

4.4.1 *The Freiburg Model of Sustainable Transport*

Even against the backdrop of a nation with strong recent record of environmental performance, Freiburg has emerged as an outstanding performer, having succeeded in countering growing car ownership and doubling its public transport patronage during a period of rising car ownership across the nation and in spite of being located in one of Germany's wealthiest states (Ryan & Throgmorton, 2003). Explaining Freiburg's success is not easy, although a number of recent attempts have been made (e.g. Buehler *et al*, 2011; Buehler & Pucher, 2011; Ryan & Throgmorton, 2003). All identify to a greater or lesser extent the influence of demographics – particularly the city's burgeoning younger demographic (in contrast to many cities across Germany), service and high tech economic base, geography – particularly its appealing climate and proximity to the Black Forest, and the long term coherence and integration of transport and land use policies. The latter reaches back to the reconstruction of the city after extensive damage suffered during world war two, and the decision to reconstruct the city to its former historic and highly permeable pattern – unlike other bomb-damaged cities across Germany. Buehler *et al* (2011, after Buehler & Pucher, 2011) identify five aspects of Freiburg's post-war planning policy that have been critical in producing the city's model of transport sustainability:

- i. Integrating land use and transportation planning – Vauban and Rieselfeld serve as examples of this 'joined-up thinking', and furthermore by 2006 two thirds of jobs were located within 400m of a light rail stop.
- ii. Coordinating and integrating public transportation regionally – both the city and the region have expanded their transport systems – including the growth of the tram from 18km in 1983 to 34 km in 2008, and in 1984 all regional services were brought under a single 'environmental' ticket.
- iii. Promoting bicycling – through the provision of both segregated cycle infrastructure and cycle-friendly streets within the city, the slowing of traffic speeds generally across the city, and the extension of routes out into the surrounding region.
- iv. Restricting automobile use – the city was one of the first to pedestrianise its city centre in the early 1970s, and the city has embarked on a long term goal of reducing the need for car travel generally, but accommodating it wherever it is necessary.
- v. Citizen involvement – this has been a key component of transport and land use planning since the 1970s, and is perhaps best illustrated as Vauban – the product of participative planning.

Key phases and important milestones in Freiburg's post-war land use and transport planning, compiled by Buehler & Pucher (2011), are as follows:

1944 – 1969 Rebuilding the city to serve the needs of the car

- 1948: Reconstruction Plan – specifies that the old town must be rebuilt to its compact pre WWII form.
- 1969: First Transport Plan (Generalverkehrsplan) – focuses on accommodating car use, but also recommends to preserve and potentially expand the streetcar system.

1970 – 1979 Crucial decisions: laying the ground work for sustainable transport

- 1970: First bike network plan
- 1973: City Council decides to expand the light rail network.
- 1973: City Centre converted into pedestrian-only zone.
- 1979: Second Transport Plan – emphasises changed political and environmental circumstances, the connection of transport and land use, and favours ‘green modes’ over the car.

1980 – 1989 Improving public transport, walking and cycling

- 1981: New land-use plan – centres new development around public transport stops.
- 1984: Introduction of Germany’s first transferable flat-rate monthly transport ticket.
- 1985: Transport providers in Freiburg and surrounding counties begin collaboration for transport planning.
- 1987: City council decides to traffic-calm all neighbourhood streets to 30 km/h by 1991
- 1989: Transport plan Reauthorisation (Gesamtverkehrskonzeption)– explicit goal to reduce and restrict car use.

1990-2009 Restricting car use and further promoting green modes

- 1993-2006: Vauban neighbourhood developed with car-free streets
- 1994-2010: Rieselfeld neighbourhood developed around public transport
- 1996: first regional public transport plan completed
- 1997-2008: Three new light rail lines and four regional rail lines (S-Bahn) begin operation
- 2008: Land Use Plan – focuses on high density around transport routes

Fig.4.6 below shows the cumulative effects of a number of policies on Freiburg’s streets – notably the city’s large pedestrian core, 30 km/h residential streets, and ‘streets for children’ or play streets which are distributed across residential neighbourhoods, but which are particularly concentrated in Vauban and Rieselfeld.

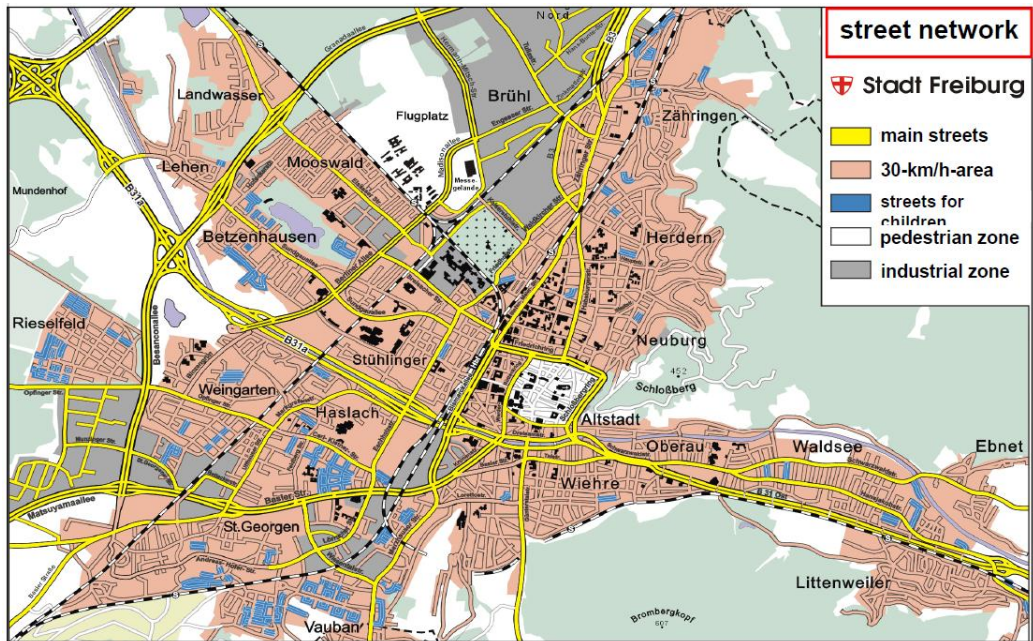


Fig.4.6 Characteristics of Freiburg's Streets (Source: Schick, 2009).

4.5 Case Study Sites: Haslach, Rieselfeld and Vauban

Three Freiburg neighbourhoods were selected as case studies to represent the different models of car reduction, depicted earlier in Fig. 4.3, as follows: (1) Vauban as a model of 'car-free' development, (2) Rieselfeld as 'low car' development, and (3) Haslach as the control or 'regular' neighbourhood model. The relative car-reduction characteristics of each of the neighbourhoods is set out below in Table 4.4, as assumed from the design features of each. The table shows that Haslach with its high concentration of 'streets for children' has a level of car impact mitigation which is higher than the Freiburg average, where the relative strength of the indicators are depicted by way of arrows (e.g. ↓ = slightly lower / ↓↓↓ = strongly lower).

	Car Ownership	Car Use	Car Impact
Car-free (Vauban)	↓↓↓	↓↓↓	↓↓↓
Low Car (Rieselfeld)	↓	↓	↓↓↓
Regular (Haslach)	---	---	--↓

Table 4.4 Characteristics of the Freiburg case study sites

Against the context of Freiburg’s model of long-term, integrated land use and transport planning, the car-reduced neighbourhoods of Vauban and Rieselfeld appear ‘products’ of Freiburg’s broader philosophy of development towards becoming a ‘green city’. With 5,000 residents, Vauban is the largest neighbourhood in Europe to have been built with the implementation of aggressive car reduction measures, whilst Rieselfeld with a population of 10,000 represents a more ‘utilitarian’ model by accepting average levels of car ownership but encouraging the use of alternatives through design. In addition to the neighbourhoods of Vauban and Rieselfeld, a third district of Haslach Gartenstadt became a target for empirical research. Haslach was selected because its population represented the city’s ‘average’ in terms of age structure and car ownership levels. Although Haslach represents a regular district in terms of its demographic profile, as its ‘Gartenstadt’ name implies it was built in the early twentieth century as a garden suburb of terraced houses with large private gardens, connected to the city centre by tram. Such garden suburb style districts are not untypical of the late nineteenth century city. Between them, the three districts represented a ‘car-free’ neighbourhood in Vauban, a ‘car-reduced’ district in Rieselfeld and a ‘regular’ neighbourhood in Haslach (Fig. 4.7).



Fig.4.7 Location of the three study sites in Freiburg

4.5.1 'Regular' Neighbourhood: Haslach Gartenstadt

Located 2 km to the southwest of inner city Freiburg, the inner urban district of Haslach Gartenstadt is a residential district and one of the oldest parts of the city and originally a village which grew up in the middle ages (Wulf Daseking, pers. comm.). In later life the Gartenstadt was developed as a garden suburb at the terminus of a tram line from the city centre, as part of the German garden city movement that thrived alongside its UK counterpart during the early twentieth century (Hass-Klau, 1990).

The district contains a mixed housing stock and has three distinct parts, with the first consisting of the early twentieth century garden suburb with its large family terraced houses and generous private garden spaces (Fig. 4.8a). The second part contains terraces of smaller houses with small gardens of a similar size to the typical Victorian terraced home in Britain (Fig. 4.8b), whilst the third part contains low rise and modern apartment blocks. Much of the neighbourhood's very substantial proportion of green space is privately owned (Fig.4.9c).



Fig.4.8 Haslach Gartenstadt (a) Garden Suburb Homes (b) Small Terraced Homes (c) Modern Flats

Haslach was selected as a 'regular' neighbourhood model, because the demographic profile of its population is close to the Freiburg city average in almost every respect, reflecting the wide cross-section of housing found across the district. Haslach's relative position in the city, though substantially more central than Rieselfeld, is not dissimilar to Vauban's. Like Rieselfeld, most residential streets are designated 'home zones' and whilst a number have shared carriageways.

4.5.2 'Low Car' Neighbourhood: Rieselfeld

Rieselfeld is a new urban extension which began being developed in the mid-1990s and continues to the present day. It is located on Western edge of the city beyond Haslach. Due to

its scale – with a resident population of 10000, and its peripheral location, Rieselfeld was planned with a degree of autonomy and contains a full range of services and amenities, including the full range of schools, shops, community services and employment sites. The district is set out on a grid network, with a tram line forming a central axis through the development. Importantly, the tram line became operational before the bulk of residents moved in. The grid layout of Rieselfeld means that substantial car-free blocks exist, and although the car parking ratio is relatively high at 1.5 spaces per home, a substantial proportion of residential parking has been allocated in subterranean car parks. It is for these reasons that Rieselfeld has been designated as a ‘low car’ neighbourhood for the purposes of this research.



Fig. 4.9 Rieselfeld (a) Underground Car Parking (b) Paula Moderssohn Platz / Rieselfeldallee

4.5.3 ‘Car-free’ Neighbourhood: Vauban

Now well-established as a model of a sustainable suburban quarter, construction on Vauban began in the late 1990’s and continues in the present-day, although the bulk of homes were completed by 2010. Vauban is located towards the southern edge of the city approximately 3.5 km from the city centre. Like Rieselfeld, residential streets radiate off of a main axis with a tram line that was completed in 2006 after many of the first wave of residents had settled in. The overall neighbourhood layout differs somewhat from Rieselfeld in having a residential ‘loop’ residential street pattern, and an inner ‘core’ of ‘car-free’ homes.



Fig. 4.10 Vauban: (a) Vauban Allee central axis (b) Typical Residential Street

4.5.4 Summary

Table 4.5 below provides a summary of key built environment qualities of each of the three Freiburg neighbourhoods.

	Suburban Quarter (Vauban)	Urban Extension (Rieselfeld)	Regular (Haslach Gartenstadt)
Scale	2000 homes	4000 homes	4000 homes
Density	40-70 dph	40-70 dph	30-150 dph
Public Transport	Tram provides direct and reliable service to centre and to key destinations throughout city. Nearby heavy rail serves regional destinations. Bus services serve suburbs and outlying villages	Tram provides direct and reliable services to centre and popular nearby destinations Bus services serve suburbs and outlying villages	Tram provides direct and reliable services to centre and popular nearby destinations Bus services to suburbs
Cycling	High levels of communal storage. Access to city-wide network	High levels of communal and private storage. Access to city-wide network	Storage is extremely variable. Access to city-wide network
Car Parking	c.50% of city average in peripheral parking, car club priority	75% of city average in mixed underground and street, car club priority	Mixture of street parking for flats and private driveways for houses. Neighbourhood design pre-dates high car ownership levels.
Layout	Superblocks / grid	Superblocks / grid	Vitruvian grid
Green Spaces	Car-free superblocks; wild spaces; countryside continuity	Car-free superblocks; wild spaces; countryside continuity	Mostly private gardens, but a few small green recreational spaces
Amenities	High level of self containment; sharing with neighbouring districts	High level of self containment; sharing with neighbouring districts	Commercial area shared with neighbouring districts

Table 4.5 Characteristics of 3 case study neighbourhoods

PART B: Methodology & Techniques

4.6 Preamble

The research techniques employed for primary data collection followed the ‘layered’ principle set out in Part A, and followed a systematic logic of selecting techniques appropriate to the objectives of the data collection. Achieving a balance of ‘macro’ and ‘micro’ scale data collection is not necessarily straightforward, although the process was assisted in the first instance by the availability of secondary demographic data from the Freiburg City Authority which provided a rich demographic indicator set. Although it provided rich demographic data of scale, the secondary data did not permit detailed examination of travel trends, social interaction and attitudes. On this basis, it was decided that a questionnaire survey would provide the most appropriate technique for collecting bulk quantitative data to be combined with greater detail. This also had a more practical advantage that the questionnaire survey forms could be translated into German prior to the field work phase.

In order to address the second objective of exploring causation, and in order to gain deeper insight into the social relations of each neighbourhood community and individual lifestyles and choices in relation to car-reduction, interviews were undertaken with residents and community representatives in Vauban and Rieselfeld. Interviews consisted of formally arranged semi-structured interviews with representatives from neighbourhood organisations and residents that were tape recorded, transcribed and content analysed. In addition to formal semi-structured interviews, informal and spontaneous conversations took place in Rieselfeld where a questionnaire survey point was manned. These conversations yielded valuable insights, and though not tape recorded, field notes were kept.

Lastly, observations on resident interaction with space were made and a photographic record kept, with particular reference to design features and qualities of space. These observations, together with findings from the analysis of the secondary data, primary questionnaire analysis and resident interviews and conversations were used as the basis for later semi-structured interviews with city-level policy managers in Freiburg after the main fieldwork phase was completed. Observational visits were undertaken across Freiburg in order to gain a comprehensive understanding of urban structure, the transport network and aspects that constitute elements of the city’s wider ‘operating system’ as it is termed in chapter six. The following sections consider in detail aspects and issues surrounding the specific techniques selected.

4.7 A 'Layered' Approach to Research

To complement the 'horizontal' framework provided by three neighbourhood models for the comparison of different social outcomes, a 'vertical' structuring of research techniques was employed (Fig. 4.11) in order to obtain and analyse data that would provide insight at different levels and provide a basis for 'triangulation' from different data sets and techniques which Yin (2009: 114) argues as being at the core of good case study research. The three layers incorporated both qualitative and quantitative evidence. In order to characterise the general demographic structure of each neighbourhood, secondary data in the form of aggregated official demographic statistics was obtained from the Freiburg City Authority and supplemented by the findings of relevant social studies undertaken by Freiburg's Office for Statistics, and openly available at the City Authority website. Interviews were undertaken with policy managers at the City level and district organisations in Vauban and Rieselfeld in order to explore social processes at the higher level.

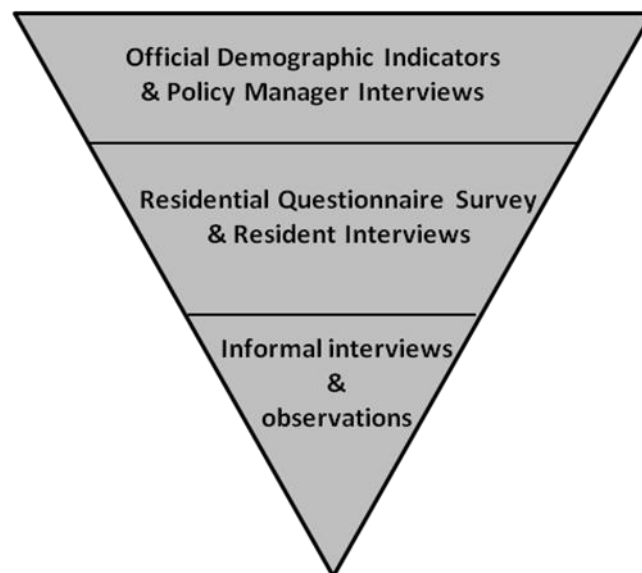


Fig. 4.11 Layered Approach to research

The middle strata of data collection was based on sample household questionnaire surveys from each of the three neighbourhoods, supplemented by a number of semi-structured interviews with residents of Rieselfeld and Vauban that examined specific issues of design of these neighbourhoods that did not apply to Haslach. In essence therefore, the data set of this layer was considerably smaller than the higher level set, but explored social outcomes and processes in greater depth. Finally, the bottom layer consists of informal and spontaneous interviews, structured and unstructured observations on particular aspects of neighbourhood life, and the 'flâneur' – absorbing the qualities of each place from time spent literally

‘strolling and photographing’ during six study visits to Freiburg that ranged from two days to four weeks in duration.

4.7.1 Approach to the Research Questions

The three research questions formed a set of three operational objectives, relating to the research questions, for data collection that demanded the employ of an appropriate range of techniques. The initial objectives were as follows:

- 1. To characterise each of the neighbourhoods through indicators of demographic structure, resident travel behaviour, social relations, and perceptions of mobility and community;**
- 2. Explain the social trends identified and assess the influence of car-reduction strategies on population structure, mobility and social interaction;**
- 3. Draw out policy and design lessons that may be particularly applicable to the UK context.**

The research objectives demanded a strategy that permitted a sufficient breadth for characterisation of neighbourhood populations to be undertaken in combination with consideration of the individual and how lives are lived. The data used and the general scheme of approach to consider each of the three questions is considered in turn.

4.7.2 Demographic Profile & Community Aspects

Although the first of the focused questions is directed specifically to detecting potential residential self-selectivity, this leads seamlessly to a more extensive analysis of community composition and social dynamics and is reported in chapter five. This part of the research addressed both aspects by means of four different data sets:

- a. Secondary demographic data from household returns compiled by the Freiburg City Authority
- b. Primary household questionnaire survey on travel, social contact and attitudes
- c. Semi-structured interviews of key personnel by the author
- d. Informal discussions with residents

Freiburg benefits from having a city department charged with compiling and analysing a broad range of data upon which short thematic reports are published. These reports, together

with raw data sets that were forwarded privately from the town hall, provided the basis for demographic analysis of the city and the three case study districts of Haslach, Rieselfeld and Vauban specifically. A household questionnaire survey was distributed in each of the three districts, although a shortened version was deployed in Haslach owing to a poor initial response rate to the full survey. This survey formed the main means for investigating social contact and community development, but was supplemented by both semi-structured interviews conducted with community leaders and policy makers, as well as less formal discussions with the residents themselves.

Three sub-questions emerged during the empirical analysis of this focused question, namely:

- To what extent are internal neighbourhood relations influenced by the demographic profile of residents?
- How does demographic concentration influence the external relations between residents and the wider city?
- What impacts do car reduced neighbourhoods have on surrounding districts?

These questions were shaped by the need to investigate whether the residential communities at Vauban and Rieselfeld have experienced self-selectivity, as evidenced by demographic concentration, which has altered relationship dynamics both within the developments and to the wider city. Indeed, the term ‘green ghetto’ was coined by one interviewee (Daniel Haas) as a situation that Vauban was attempting to avoid, and the sort of place that Harvey (2000) depicted when describing strong communities that erect metaphoric ‘keep-out signs’. Similarly, a potential shortcoming in the process of developing ‘social capital’ – a seemingly desirable quality, is that it can be based around homogeneity that can become self-reinforcing with the further effect that groups and communities become insular. It is these potential effects that the three sub-questions are therefore directed towards.

4.7.3 Accessibility and Mobility Aspects

Four data collection elements were used to address the second of the focussed questions, which forms the subject of chapter six. The data consisted of:

- a. Primary household questionnaire survey on travel, social contact and attitudes
- b. Semi-structured interviews of key personnel
- c. Informal discussions with residents
- d. Observational studies of street activity

In addition to the main data collection element undertaken in Freiburg, two further supporting studies were undertaken. These consisted of (i) a pilot household questionnaire survey at the BedZed scheme in November 2008 and (ii) pilot semi-structured interviews at Slateford Green in February 2009.

The rationale for employing a combination of different techniques was chiefly to build two different data sets – a quantitative set from questionnaire survey returns and structured observations, and a qualitative set from interviews and discussions. This approach permits trends to be obtained from an aggregated quantitative data set and explored in relation to perspectives of the individual resident. The rationale for this mixed-methods approach is to try to determine the extent to which the resident communities of car reduced neighbourhoods differ from the norm in demographic terms, lives are lived differently and choices and opportunities are constrained. This basic rationale is founded on patterns of life that have altered with urban development as transport technology – primarily rail and the car have pushed out the urban boundary (Fig.4.12) and instigated a spatial disaggregation of lifestyle needs.

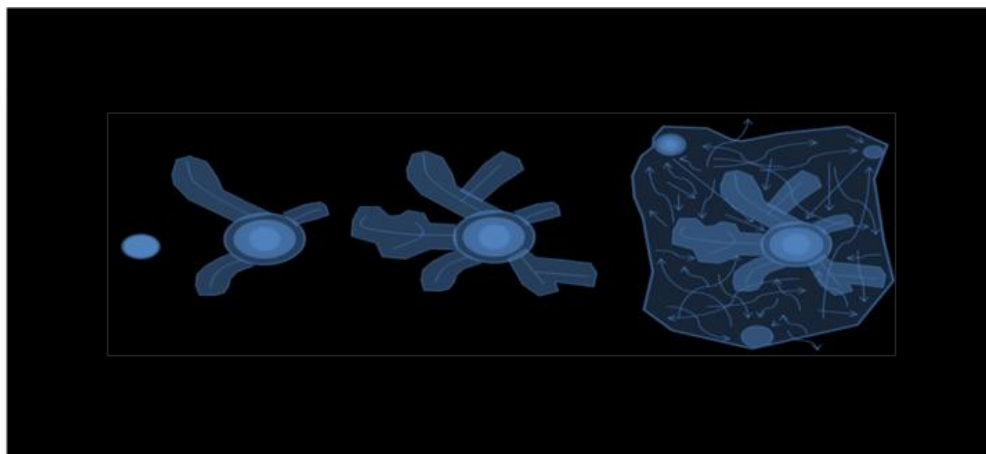


Fig.4.12 Urban growth with advancements in transport technology

As a consequence of this process that many of the more developed cities have experienced between industrialisation in the nineteenth century and an upsurge in car ownership in the late twentieth century, patterns of life for many have changed from those based around spatial proximity to those of spatial dispersion. Indeed the process has been abetted by the adoption of zoning laws that have served to physically separate different land uses, thereby creating even greater distance, dispersion and travel need. In relation to car reduction therefore, it seems pertinent to consider whether this could be regarded as an attempt to turn the clock

back to a previous pattern of life or, of perhaps more concern, a process that will create ‘outliers’ from the prevailing pattern.

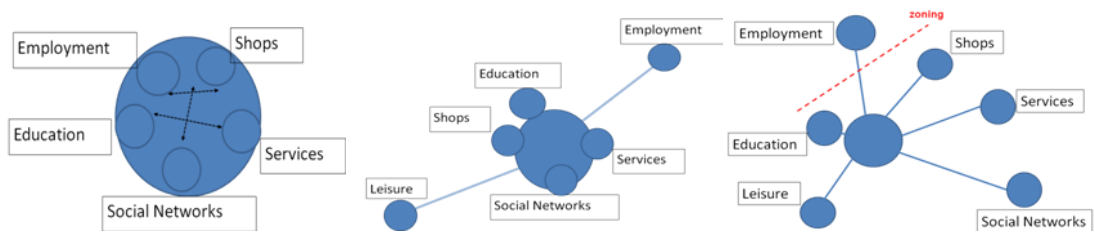


Fig.4.13 Changing patterns of life

The consequence of a lack of car access on opportunities was identified over 40 years ago by Hägerstrand (1971) who depicted the daily ‘prism’ of travel distance covered by a walker compared with a car driver (Fig. 4.14). Although at the time of composition the prisms depicted ‘opportunity’ in relatively straightforward terms – the driver being able to cover a much greater geographical range – the restructuring of lives and expectations around the automobile in the intervening period may, in many cases, make it necessary to replace ‘opportunity’ with ‘necessity’.

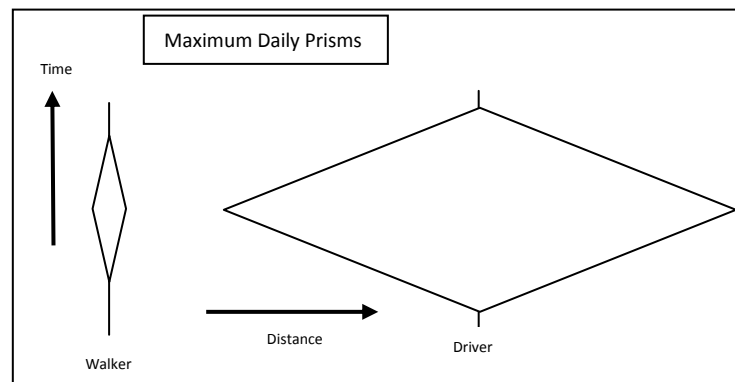


Fig.4.14 Daily Travel Prisms (after Hägerstrand, 1971)

Although general patterns of life may be determined for a population through ‘snapshot’ surveys such as by census or travel survey, persistent problems have firstly been in the level of detail recorded and secondly in the way that such surveys are constructed – often supposing that there is a single purpose for each journey. In reality households and individuals organise travel differently, often with multiple purposes for each journey or with travel modes that can regularly change according to variables including the weather, disruption to route or service, and the need to combine additional purposes to travel. This is a persistent problem in travel research that is not easily addressed. Indeed a pilot study using individual travel diaries was trialled in Vauban and Rieselfeld for this thesis but was hindered by problems in obtaining a large enough volume of diaries required to make the fine detail elicited from each diary meaningful. A decision was therefore taken to focus on a

questionnaire-based survey addressing general patterns of travel and some of the influences on individual travel decisions - particularly in respect to use of public transport.

Individuals were also questioned about the impact of travel options available to them in terms of access to and constraints on employment, social life, shopping and in terms of being accessible from others. This part of the questionnaire was motivated primarily by a desire to examine the extent to which travel options matched individual requirements. Four models are proposed (Fig. 4.15) based around Hägerstrand's prisms. The first shows the prism encompassing all needs – seemingly desirable but perhaps entailing a considerable of travel – such as by car. The second depicts exclusion as an individual's travel prism is not sufficiently large to encompass all needs – for example, the car-less in an automobile dominated society. The third model shows the shrinking of travel need through urban compaction – a process perhaps most evident in a larger city. The last model attempts to correlate travel to demographics and supposes that an element of residential selectivity at work in displacing any potential shortfall in accessibility, and relates specifically to areas that entail a considerable level of physical demand on its residents through design – such as orientation towards physical modes of travel, or by natural factors such as topography. In other words, it is primarily the characteristics of the individual resident that bridges a potential shortfall in accessibility needs.

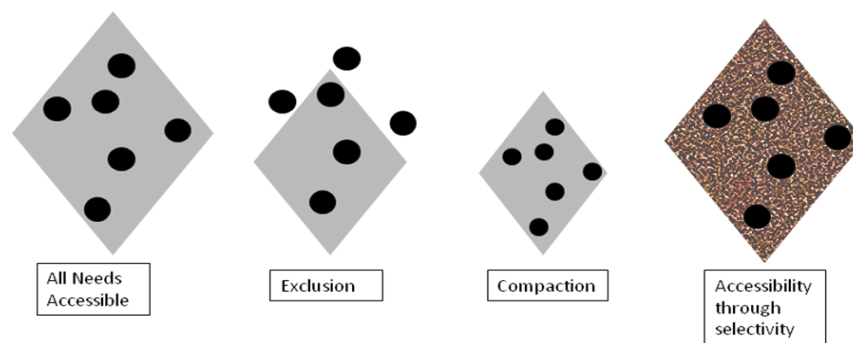


Fig. 4.15 Four models of residential accessibility

Two general points need to be made in relation to the models in Fig. 4.15. The first point is that they are not static. The first model – depicting all needs accessible through high levels of travel – is vulnerable to becoming the second model – depicting exclusion, in the event that limits are placed on travel, such as through a major escalation in travel costs, physical impairment, legal impairment to driving and so forth. The fourth model – accessibility through selectivity is similarly vulnerable from an individual's point of view through old age or infirmity. It is only the third model that appears robust, yet in relation to the theoretical framework in Fig. 4.1 carries potential social dis-benefits such as perceived 'claustrophobia'.

A second general point is over the importance of perception. A process of residential self-selectivity occurs because certain sectors of the population – the elderly being an immediately obvious example – may perceive that they will be vulnerable to a shortfall in accessibility that need not necessarily match the reality.

4.7.4 Design, Planning & Implementation Lessons

A set of ‘lessons’ have been produced by way of reflecting on the outcomes of the research into social and mobility aspects and are set out in chapter seven. However, it was determined that the compilation of a set of ‘lessons learned’ from comparative studies of the three Freiburg neighbourhood models missed some of the complexities associated with the wider strategic framework or ‘operating system’ in which development is set, and the importance of implementation. Chapter seven therefore attempts to provide a more comprehensive approach, firstly, by considering the strategic framework for car-reduction, and secondly, by focussing lessons learned into different models that might provide ‘blueprints’ for future development in relation to the strategic framework. Chapter eight builds on the previous chapter by considering implementation of the framework and development models in the UK context.

In addition to the potential models for residential car reduction based loosely on Vauban as a new suburb and Rieselfeld as an urban extension, two further models were added to reflect different scales and settings within the overall urban framework. To this end, visits were conducted to two additional sites in order to observe design qualities and note the qualities of the space produced. The first site at Dreikönigstraße in the east of Freiburg represents a small inner urban infill scheme that has taken a range of car-reduced design and implementation lessons from Vauban and Rieselfeld. This site is particularly important because it represents current thinking on residential development in the city. According to Freiburg’s Director of Planning, no further Vauban scale developments are envisaged in the city in spite of the scheme’s apparent success and the continuing high levels of potential demand from a burgeoning younger population. Instead, attention is being turned to smaller infill development schemes within the city in an attempt to stabilise the effects of population decline from ageing households.

The second additional site is the Südstadt development in a central district of the southern German city of Tübingen. This scheme was developed in parallel to Vauban and is recognised as an important model of development because its inner-urban location may be of relevance to cities with vacant sites and to cities without well-developed and robust public transport

networks, where proximity to a central transport hub is necessary to provide a full range of travel options to residents.

A fundamentally important point about the new German residential schemes of Vauban, Rieselfeld, Südstadt and Dreikönigstraße is that they have all incorporated a proactive resident ‘building group’ approach to realisation. This mode of development was identified as providing an important contribution towards community development. In order to provide a contrasting model a final site visit in the UK context was undertaken to the Greenwich Millennium Village in London which explored the relative importance of *how* new schemes are implemented in relation to the design features that they incorporate.

4.8 Summary of Data Collection

An overall summary of the data collected from in the Freiburg main data collection phase and the secondary pilot study phase are shown below in Tables 4.6 and 4.7, respectively.

	Freiburg City	Vauban	Rieselfeld	Haslach	Total
Questionnaire		92	95	76	273
Semi-structured Interview	2	3	3		17
Unstructured Interview		3	12		15
Structured Observations		Y	Y	Y	
Unstructured Observation	Y	Y	Y	Y	

Table 4.6 Main Freiburg Research Phase Data Body (All numeric values = N)

	Slateford Green	Hackbridge / Bedzed	Total
Questionnaire		35	35
Semi-structured Interview	9		9
Unstructured Observation	Y	Y	

Table 4.7 Supplementary Pilot Research Phase Body of Data (All numeric values = N)

To reinforce the data shown in table 4.2 unstructured observations and photographing of specific features was continually undertaken in all of the primary and secondary research sites.

4.8.1 Additional Site Visits

Beyond the pilot phase and main research phase data collection, further visits were undertaken to three further car-reduced schemes for the purpose of observing design features and informally observing and photographing activity. The three schemes consisted of the car-free Südstadt development in the southern German city of Tübingen, low-car Dreikönigstraße scheme in Freiburg, and the low-car Greenwich Millennium Village. Although these visits can be considered to be of ‘tertiary’ significance behind the main and supplementary data collection programmes, reference is made to the characteristics of these sites in chapters seven and eight, in attempting to apply the lessons learned from analysis of the main Freiburg data and supplementary pilot data.

Data was collected over a period of approximately two and a half years, which included initial pilot studies. Site visits were generally of the order of two or three days at a time. The bulk of data collection was undertaken in Freiburg in a four week period in the May and June of 2010, although five further short visits to the city were made between September 2009 and September 2011 (table 4.8).

	2008 Autumn	2009 Winter	2009 Spring	2009 Summer	2009 Autumn	2010 Winter	2010 Spring	2010 Summer	2010 Autumn	2011 Winter	2011 Spring	2011 Summer
BedZed	P											
Slateford	P	P	P									
Freiburg					M		M	M/A		M	M	M
Tübingen											A	
GMV											A	

Table 4.8 Data Collection Timetable (P = pilot; M = main; A = additional)

4.9 Household Questionnaires

Although the household questionnaire might appear to be a straightforward approach for generating relatively high volumes of data, many studies are done badly due to poor initial design and a failure to conduct a prior trial to gain feedback before the main survey. Common design pitfalls include having too many questions, poor structure, poorly phrasing of questions that make selecting an appropriate answer difficult, and a lack of clarity in how the survey forms should be completed. In addition, there is also a perennial question of sample size, where Rugg & Petre 2007:68 note a common tendency to collect as many as possible survey returns as possible rather than aiming to collect as ‘many as necessary’.

4.9.1 *Sample size*

As previously noted the questionnaire for this study was trialled and refined in the UK during pilot runs to become a single double-sided, folded A3 sheet containing a covering note and space for personal remarks at the end (Appendix A). A weakness in this study was the need to translate the questionnaire into German which was carried out by a fluent linguist, who was experienced in conducting questionnaire surveys in Germany, but which required significant re-phrasing of questions and some restructuring of the questionnaire itself. The questionnaire was distributed in Freiburg without a pilot trial of the German version, owing to severe time and financial constraints with the result that several questions were less than perfectly clear. Generally, de-briefs conducted with a number of respondents found that most could follow the survey and complete the questions satisfactorily.

4.9.2 *Survey Structure*

German and English versions of the form are provided at annex A and the survey followed a logic shown below in Fig. 4.14. The form was broken into four sections covering a. travel and mobility, b. community and social interaction c. attitudes to the built environment, and d. personal details. The travel section of the form was based loosely on a survey conducted into travel behaviour in urban central Scotland by Hine & Mitchell (2003) because the format had been proven and also because it would have provided like-for-like comparisons with an Edinburgh-based study as originally envisaged. Part A surveyed residents on car access, travel behaviour across a range of standard journeys, car parking, public transport and use of local amenities. In Part B, residents were given multi-choice questions about the amount of social contact they had within their neighbourhood, perceptions of community strength and how comfortable they were at allowing their children to play unsupervised. This last question

was designed to act as a surrogate measure of social capital - the trust that residents had in members of their community to ensure the safety of their children.

Part C surveyed residents' attitudes to elements of residential design by posing a series of statements to which respondents could express their opinions by means of a 5-point 'likert' scale that ranged from strong agreement, through neutrality to strong disagreement. Although contention surrounds the use of such scales, the number of scale points that should be used, and particularly whether they respondents should be given the option of neutrality or not, 5 points were deemed sufficient to cover the range of likely views whilst neutrality was treated as a proactive response rather than a failure to provide a considered answer. Lastly, Section D asked residents to complete a range of basic background information, including basic demographic details, tenure of home, duration at address and household composition.

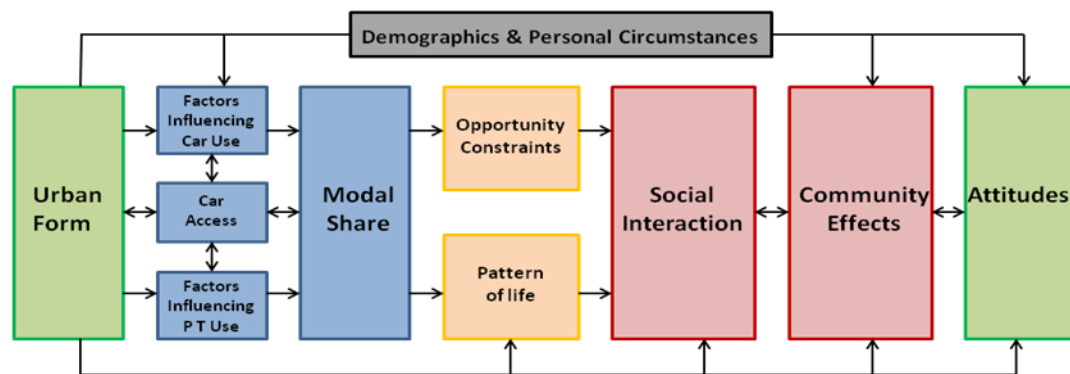


Fig. 4.16 Questionnaire Logic Diagram

4.9.3 Distribution & Collection

At the outset, questionnaires were hand-delivered to samples of homes across each of the three neighbourhoods, with care taken to ensure a distribution across different types of housing and geographical extent. Collection methods varied in each of the developments. In Vauban, the *Quartiersladen* or resident's cooperative shop acted as a collection point where returnees would receive a token €1 reduction on their shopping (paid for by the author). In Rieselfeld, where no such community shop exists, a collection bin was placed in the foyer of the 'Kiosk' community centre with the permission of the management. In addition, the author manned a collection outside of the Kiosk as a means of advertising and encouraging resident's to complete the form in the absence of a financial incentive (Fig.4.19a). In Haslach where there was no possibility of a central collection point, an attempt was made to recover the forms by hand by appealing to residents to leave completed forms outside their homes on nominated days. This technique had been piloted with considerable success during the previous BedZed study – eliciting a response rate of over 25%.

Despite visiting the city to check arrangements for the survey one month before the scheduled start, two emerging factors hampered this part of the data collection. The first factor was a programme of community surveys that had been conducted in Vauban in 2009 by Schings (2009), and another that was on-going at the time in Rieselfeld, leaving a proportion of residents confused over why they were apparently being surveyed twice. In addition a Baden-Württemberg state holiday during part of the survey period which meant that many households left the city. In Haslach, an initial survey drop yielded a poor response of just 17 completed forms. In order to improve the response rate, a change of approach was instigated. In Rieselfeld a stall was set up in the twice-weekly market to offer shoppers freshly-brewed coffee made on a portable stove in return for a completed survey form (Fig. 4.17 b&c). This strategy proved successful from a survey completion point of view, but also more broadly in that it opened the opportunity to talk informally with residents and simply to ‘hang out’, observe life and to get to know members of the community. At Haslach, the survey form was shortened to consist of questions over travel and community aspects – as the section covering attitudes to the built environment was deemed to be most relevant to Vauban and Rieselfeld. This shortened survey form was posted with a pre-paid envelope to the Kiosk in Rieselfeld which agreed to act as a local collection point. The strategy had the desired effect with a response rate of nearly 25%.



Fig. 4.17 Questionnaire distribution in Rieselfeld (a) outside Kiosk, and (b & c) at the market

In summary therefore, the 263 completed survey forms was a somewhat disappointing return of 12%. Although this figure is not an untypical response rate, it was hampered both by a local holiday and another survey being conducted in Rieselfeld and Vauban, despite a prior visit being undertaken to try to ensure that there would be undue impediments to the research programme. At Haslach, a doorstep collection approach yielded a particularly poor return in contrast with experience in the UK during a previous pilot, whereas a mail-back approach with a shorter form proved extremely successful in spite of a lack of a small incentive as at Vauban or a coffee at Rieselfeld. This experience suggests that a 2-sided A4 form with a mail

back envelope would be most productive in future research, although postage is expensive in Germany and would also entail the drastic reduction in questions posed that was undertaken. In the event however, the return was deemed to be satisfactory to characterise the population of each neighbourhood for relative comparisons to be made, whilst official demographic data enabled absolute assertions to be made where needed.

	QAs Distributed (N)	Completed Forms (N)	Response Rate
Vauban	749	92	12%
Rieselfeld	710	95	13%
Haslach	700	76	11%

Table 4.9 Overall Questionnaire Responses

4.9.4 Questionnaire Response Profile

Reflecting the greater proportion of younger adult respondents, the Haslach sample contained even proportions of residents who live alone and those living as couples, with 30% of households having children – either as lone parents or as couples, whereas the Vauban and Rieselfeld samples have couples with children as the greater majority of respondents.

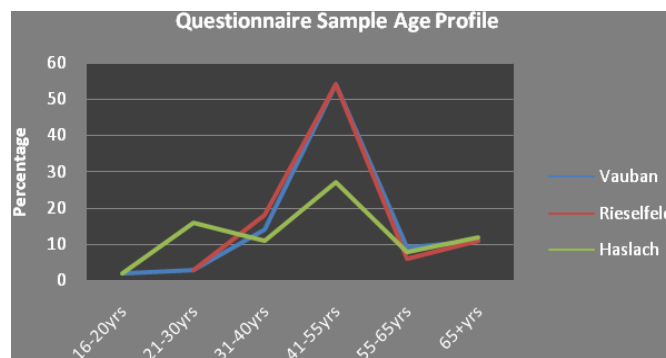


Fig.4.18 Age Profile of Respondents

As Fig.4.18 shows, the bulk of questionnaire respondents over the three sampled developments were in the 41-55 year age bracket. Returns from Vauban and Rieselfeld are closely matched, whereas the Haslach data contains a significant proportion of respondents in the 21-30 bracket. Rieselfeld has significantly lower than average proportions of its population in the 18-25 and 25-35 age group, whilst Vauban's 18-25 bracket is boosted by the presence of the student halls of residence; these were not targeted for data collection.

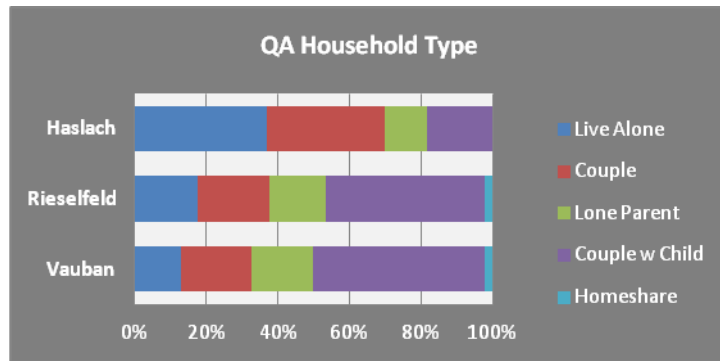


Fig.4.19 Household Type from the QA Data

An interesting point of note is that the bulk of survey respondents from all developments were male (Table 4.10), an outcome that must be born in mind when interpreting some of the later findings, particularly with regard to safety and mobility.

	Vauban	Rieselfeld	Haslach
Female (N)	35	34	28
Male (N)	57	60	48

Table 4.10 Gender of QA Respondents

4.10 Interviews

Dubbed the ‘the art of science’ (Fontana & Frey, 1994:361), three basic forms of interview are commonly described in the literature (Rugg & Petre: 138; Punch, 2005: 169) – the ‘structured’, ‘semi-structured’ and ‘unstructured’, forming a continuum (Fig.4.20) based on the degree of direction or structure envisaged. At one end of the spectrum, structured interviews tend to involve a script with a set of coded anticipated answers, while at the other end the unstructured will may involve a detailed account by the interviewee with only ‘light touch’ prompting on behalf of the interviewer. There are also ‘interpretive’ differences between the different approaches; the structured interview aiming for phenomenological objectivity of experience, and the unstructured allowing for, or even aiming at, capturing the interviewee’s subjective experiences (Holstein & Gubrium, 1994:262-3).



Fig.4.20 Continuum Model of Interviews (from Minichiello *et al.*, 1990:89)

As Fontana & Frey (1994: 373) note, ‘different types of interviewing are suited to different situations’. This research aimed at investigating how patterns of mobility and social interaction varied at the neighbourhood scale and specifically as a consequence of living in neighbourhoods in which car reduced design had enabled space to be used differently. It did not aim to produce detailed ethnographic portraits of residents’ lives, although some insights were obtained from unstructured interviews and excerpts have been used to add depth to the overall narrative, where appropriate.

Two types of interview were undertaken in Rieselfeld and Vauban, consisting of formal semi-structured interviews of ‘significant’ or representative members of the community, and informal interviews that in the form of conversations and dialogues that occurred spontaneously as a result of time spent in each neighbourhood. The latter were neither premeditated nor anticipated, and predominantly took place in Rieselfeld as a result of time spent manning a survey collection point in Rieselfeld’s main plaza or at the twice-weekly market where the stall became the focus of some interest. In Vauban a number of conversations took place as a result of the author’s attendance at a social function to mark the anniversary of the neighbourhood’s cooperative shop. It soon became apparent that such conversations were yielding interesting insights into community life, individuals’ lifestyles and general information not captured in official data and literature or in the questionnaire form. These conversations were not electronically recorded and although field notes were sometimes taken during the conversation, note-taking was often left to the end so as not to disrupt the ‘flow’ of dialogue. Although participants may not have been aware that information volunteered would be used, the author’s position as a researcher was made clear and this reflected the matters discussed. In the event, 15 short unstructured and ‘conversational’ interviews took place, of which 12 were in Rieselfeld.

A total of ten semi-structured interviews were conducted in Freiburg (table 4.8) which varied between twenty minutes and nearly two hours in length. Although the aim of each interview differed slightly according to the role of the interviewee rather following a standard set of questions, each contributed to building the overall narrative of Freiburg’s recent history, impressions of how residents in each of the new neighbourhoods lived their lives, and the types of communities that developed as a result. Wulf Daseking, Freiburg’s Director of City Planning was interviewed at length in two formal sessions to set the overall scene and provide insight into policy decisions that were taken. Similarly, Ian Harrison a UK-born resident of Vauban whom the author met initially during the reconnaissance visit in 2009 was interviewed on three occasions. Other interviews were conducted with representatives from community organisations, shop keepers and residents. A full list of interviewees is provided in table 4.11 below.

Designation	Name	Position	Interview Conducted
A	Wulf Daseking	Director of Planning, Freiburg City	April 10 & May 11
B	Peter Schick	Transport Planner, Freiburg City	Sep 11
C	Ian Harrison	Vauban Resident	April 10 & July 10
D	Daniel Haas	Vauban Community Forum, Communications Manager	July 10
E	Jörg Lange	Vauban Car-free Organisation, Manager	July 10
F	Christina Konietzy	Manager, Vauban Quartiersladen Store	April 10
G	Gesine Harrison	Vauban Resident	July 10
H	Birgitte Hipp	Rieselfeld Community Organisation	April 10
I	Shane Bettinson	Rieselfeld Shopkeeper	July 10
J	Christina Müller	Rieselfeld Resident	July 10

Table 4.11 List of Interviewees

4.11 Observational Data

Described as one of sociology's 'core research methods' (Adler & Adler, 1994: 377), observational approaches are often divided into the 'structured' and the 'unstructured' observing of real world phenomena. However, as Punch (2005:179) and Adler & Adler (1994:379) acknowledge, the distinction between the two approaches within the overall field of 'naturalistic observation' (Adler & Adler, 1994: 377) is not always clear cut. Here, observations were all conducted visually and 'structured' is given to mean that there was a systematic plan in place for the observation - and this instance was used as a means for obtaining quantitative data, whilst 'unstructured' refers to observations that were undertaken as a matter of course. The latter includes the 'flaneur' process of casually strolling and photographing the activities of people that were deemed to be of interest, but without any specific framework of classifications or categories.

Both structured and unstructured approaches were employed to different ends. Structured observations were used as a means to comparing typical off-peak pedestrian footfall around neighbourhood foci, whilst unstructured observations were undertaken as a matter of routine

around each neighbourhood in order to determine broader levels and patterns of activity. Again, the aim here was not to undertake detailed ethnographic research into individuals' use of space, but to characterise the way in which space was used by residents in the first instance.

4.11.1 Unstructured Observations

A tour of each development scheme was conducted in order to gain an impression of how outdoor space was used and, in broad terms, the nature of people who were using it. In the case of Vauban and Rieselfeld, a considerable amount of time was spent observing in each, under a wide range of circumstances. Representative impressions were captured by photography where appropriate and are used mostly in a supporting role to other data forms in the following chapters.

4.11.2 Structured Observations

A set of observational studies of pedestrian footfall was undertaken in a position that was deemed to constitute the focal point of each neighbourhood in order to characterise both quantity and composition, by approximate age and gender, of the pedestrian traffic during the morning of a working week and a non-working week. The surveys were conducted in an attempt to better understand the social and economic prospects of each neighbourhood, by establishing in basic terms how the main streets in these neighbourhoods fare outside of peak activity times.

Two main methodological obstacles had to be overcome for this element of data collection. The first obstacle was to select a location in which representative street traffic would be captured, and not merely one in which pedestrians were just transiting directly to and from homes to a transport stop. The second was to record the approximate age categories of each pedestrian, required a high level of subjective assessment, and undoubtedly a degree of inaccuracy. However, the structured surveys were successful in capturing a 'first impression', broad picture of footfall.

Part C: Tackling the Case Study

4.12 Summary

At the heart of a relatively complex data collection programme, developed over a layered and mixed methodological set of research techniques, it is believed that a conceptually straightforward approach of neighbourhood characterisation and comparison has been built on a robust theoretical framework. Chapters two and three identified and explored some of the complexities surrounding neighbourhood community development, mobility and social response to the qualities of space. Therefore, rather than ‘over-reducing’ the research problem, the decision was taken to develop a case study research approach that would allow a greater degree of the complexity to be explored. Chapters five and six form the core part of the investigation and evidence gathering into social and mobility aspects, respectively, from the main case study sites.

4.12.1 Demographic and Community Aspects

The multi-layered and mixed-methods approach to evidence collection detailed in the previous section is summarised in the table below, which outlines the data collected to address the demographic and community aspects – the central focus of chapter five. The table also includes a critique of the body of evidence generated.

Chapter Five	Body of Evidence	Critique
Part A: Background	Policy Documents	Translation required: German - English
	Policy-Maker Interviews	Few in number; interviews conducted in English which caused some language difficulties
Part B: Demographic Indicators and Social Outcomes	Official Household Data	Specific data collection techniques not known
	Authors’ Household Questionnaire	Relatively small sample size; shortened questionnaire format used for Haslach meant that not all sections could be compared (section 5.8).
	Observations	Unstructured observations can lead to superficial assumptions; structured observations on footfall limited in number

Table 4.12 Summary of evidence used in chapter five

4.11.2 Mobility Aspects

Table 4.13 below shows the evidence underpinning chapter six. Although the structure and approaches taken are similar to those used in chapter five, there is less emphasis on official household data which were used to generate indicators in chapter five, and more emphasis on utilising the authors' own household questionnaire survey data to analyse mobility patterns.

Chapter Six	Body of Evidence	Critique
Part A: Background	Policy Documents	Translation required: German - English
	Policy-Maker Interviews	Few in number; interviews conducted in English which caused some language difficulties
Part B: Car Reduction & Mobility Outcomes	Authors' Household Questionnaire	Relatively small overall sample size; shortened questionnaire format used for Haslach meant that not all sections could be compared (section 6.7).
	Observations	Unstructured observations can lead to superficial assumptions.

Table 4.13 Summary of evidence used in chapter six

4.11.3 Design Lessons

The lessons for design and urban planning stemming from chapters five and six are in chapters seven and eight, refer to two different scales. The first – the focus of chapter seven - is the 'macro' scale contextual considerations which, it is argued, should be considered in the first instance rather than the neighbourhoods themselves. The second – which is the focus of chapter eight – examines the 'micro' scale design factors of the neighbourhoods and the design process itself, including the different actors engaged in creating the design scheme. Key learning points are structured around the four development models presented in section 4.3 and depicted below (table 4.14). These are developed in the concluding sections of chapters 5 and 6.

Spatial Position	Development Model			
	Südstadt	Dreikönigstraße	Vauban	Rieselfeld
Inner urban				
Aspatial				
Suburban				
Ex-urban				

Table 4.14 Development model and spatial position

In order to draw out lessons about the mode of housing delivery, comparisons are made with other sites outside of the Freiburg case study, including the Greenwich Millennium Village in London, to compare the spatial and social outcomes of resident-led with developer-led schemes from observations. Lastly, learning outcomes and design lessons are focused in a typology of four different models of residential car reduction set out in section 4.3 to assist with making the lessons more widely applicable.

Chapter Five

Car Reduction Residents' Profile & Community Development



What implications does car reduction have for the demographic profile of residents, and with what implications for own and neighbouring districts?

5.1 Introduction

The purpose of this chapter is to characterise the demographic composition of the three Freiburg neighbourhoods, in which the car is accommodated differently, and to compare social relations within the three schemes through different sets of indicators. Although the hypothesis set out in chapter three is that car reduction can cause residential self-selectivity, this chapter aims to add weight to the claim through descriptive statistical evidence from a modest data set rather than undertaking sophisticated modelling to unpack and prove a causal chain. The ambition of the chapter is to provide breadth by attempting to relate residential profile and social outcomes with residential design qualities and implementation processes as set out in the earlier conceptual framework. This element of the empirical research is directed towards the ‘sustainability of community’ element of the overall social sustainability frame (Bramley *et al*, 2006) introduced in chapter one. Sustainability of community is defined as ‘the ability of society itself, or its manifestation as local community, to sustain and reproduce itself at an acceptable level of functioning’ (Dempsey *et al*, 2009: 293). The sustainability of a community is strongly associated with notions of ‘social capital’ and ‘social cohesion’, which are the product of trust and social relations developed through interaction between residents, participation in community institutions, relative stability of community, and positive identification with a place (Dempsey *et al*, 2009; Bramley and Power, 2008; Forrest and Kearns, 2001)

Against this backdrop, the chapter examines the demographic profile and social interaction of each of the three key neighbourhoods, and also considers the potential tensions arriving from demographic concentration by considering the following sub-questions:

- *To what extent do internal neighbourhood relations relate to demographic traits?*
- *How does demographic concentration influence the external relations between residents and the wider city?*
- *What impacts do the demographic traits have on surrounding neighbourhoods?*

5.1.1 Relation to the Four Car-Reduced Models

Chapter three discussed some of the principal measures to reduce, progressively, the impact of the car in the neighbourhood, car use and car ownership among a resident community in order to improve both the social performance and environmental performance of the neighbourhood. Table 5.1 below shows how these measures have been deployed in each of the four car-reduced models set out in chapter 4 plus the control neighbourhood of Haslach Gartenstadt. There are broad similarities of approach to car reduction adopted at the Südstadt

and Vauban, and also between Dreikönigstraße and Rieselfeld. Car parking provision at Südstadt and Vauban are at below 0.5 per home (Daseking 2010) and, correspondingly, household car ownership in Vauban stood at 48% in 2010 (City of Freiburg, 2010). At Rieselfeld and Dreikönigstraße, car parking more closely reflects the overall city average, with a provision of over 1 space per home. At Rieselfeld overall car ownership stood at 72% in 2010 (*ibid*) compared with an average of 74% across Freiburg. In design approach, Vauban also represents Südstadt, whilst Rieselfeld also represents a similar approach to Dreikönigstraße; the results from Vauban and Rieselfeld are therefore used loosely as proxies for the other two models. Haslach, as the reference scheme, is a broadly typical Freiburg neighbourhood, where there has been a degree of urban design treatment to reduce the car's impact through shared surfaces in some streets and 'home zones' in a greater proportion of streets.

Model	Car Impact				Car Use		Car Ownership	
	Urban Grain	Street Cross Section	Street Surface	Home Zone	Car Access	Parking Segregation	Parking Ratio	Parking Cost
(1) Südstadt	XX		XXX	XXX	XX	XX	X	X
(2) Dreikönigstraße	X		XXX	XXX	X	X		
(3) Vauban	XXX		XXX	XXX	XX	XXX	X	XXX
(4) Rieselfeld	XXX	XX	X	XXX	X	X		
Haslach			X	XX				

Table 5.1: Car Reduction approach adopted in the 4 models plus Haslach. The relative prominence of each measure is indicated – e.g. X = slight / XXX = significant.

5.1.2 Structure

This chapter is structured in three parts. Part A presents key background factors which have directly influenced the design and mode of implementation of Freiburg's new neighbourhoods, and some of the principal design qualities of the three neighbourhoods being investigated, that may influence the composition of the resident population and social interaction between residents. Building on this background, Part B uses a range of indicators to characterise the demographic profile of each neighbourhood community, social interaction between residents and perceptions on the connectivity between residents and the wider Freiburg community. Part C concludes by weighing up some of the positive and negative effects of the indicated social outcomes.

Part A: Background

5.2 'A City of Neighbourhoods'

5.2.1 Background

Freiburg continues to experience an overall shortage of housing, owing to a sustained population growth since the 1970s. In 1998 Freiburg had a 10,200 dwelling deficit which had been reduced to 8,800 by 2010 (Freiburg City Authority, 2010b). As a result, property prices are high compared with other German cities, resulting in a significant amount of commuting from surrounding towns and villages (Fig. 5.1). The new suburbs of Vauban and Rieselfeld, together with smaller infill schemes typified by Dreikönigstraße form part of a strategy to tackle an immediate housing shortage and to reduce the amount of in-commuting from the surrounding towns of the Hochschwarzwald that placed a strain on the city's infrastructure by workers who paid their taxes elsewhere (A).

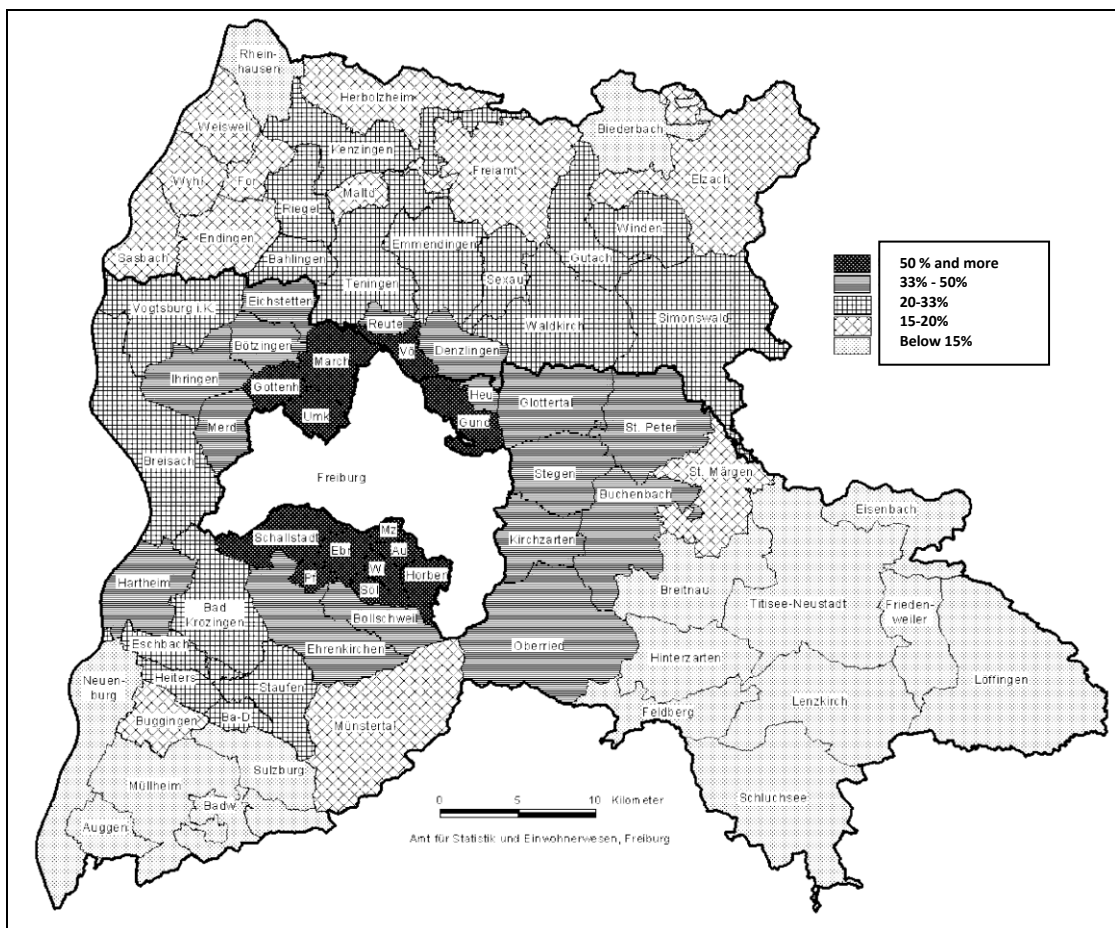


Fig. 5.1 Freiburg Work Commuting (Freiburg City Authority, 2000a)

Since the early 1980s, Freiburg has pursued a 'holistic' social approach to the design of its new neighbourhoods – similar in concept to Perry's 'neighbourhood unit', where the every day social needs of households are contained in close proximity to the home. Key elements of this approach have been set out in a recently published 'Freiburg charter' for sustainable urbanism (Academy of Urbanism, 2011). Principles two and three of the Freiburg charter are 'a city of neighbourhoods' and a 'city of short distances', respectively. Together the two principles have helped to produce a city in which the need to travel has been minimised to the greatest possible extent, with essential needs easily reached within the neighbourhood. The strategy has created a clear hierarchy of urban centres at the local, the district and city levels and an incremental approach to travel with urban design to promote walking at the neighbourhood scale, bus services that connect neighbourhoods to the district and districts to each other, and the tram system to connect districts to one another and with the city centre. In this way local centres are strengthened by transport and good design and, in theory at least, with the spectrum of basic life needs close to home, a higher level of self-containment will be created and greater opportunities for social interaction.

Comparative analysis of resident travel patterns is the task of the next chapter, but the task of this chapter is to characterise the demographic composition and patterns of social interaction within each neighbourhood. From the literature three elements of neighbourhood infrastructure - the products of planning policy and detailed masterplanning - were considered to be particularly important in creating settings for incidental social contact:

- Facilities and amenities including retail and cafes;
- Focal points such as public spaces and transport stops;
- Street space – the 'setting for incidental contact';

5.2.2 Facilities and amenities

The self-containment of shops and services within each district has been an integral element of post-war planning in Freiburg, and has been supported by four further planning policies:

1. Transit-oriented development, with the concentration of development in tram corridors;
2. Strict urban containment, including a ban on edge-of-city retail stores, except for bulky goods;
3. An upper limit of 800sqm for retail stores to encourage fragmentation into neighbourhoods;

4. A nodal pattern of transportation created by the tram and a feeder bus network.

The last point gives districts and neighbourhoods within a strategic significance that strengthens local business – literally by generating footfall front interchanging passengers, as will be seen in chapter 6. In summary, Wulf Daseking notes that achieving a city of short distances entails a holistic approach, with:

everything inside [a neighbourhood] for daily needs: you must have a bank, you must have a school, you must have a kindergarten... (A)

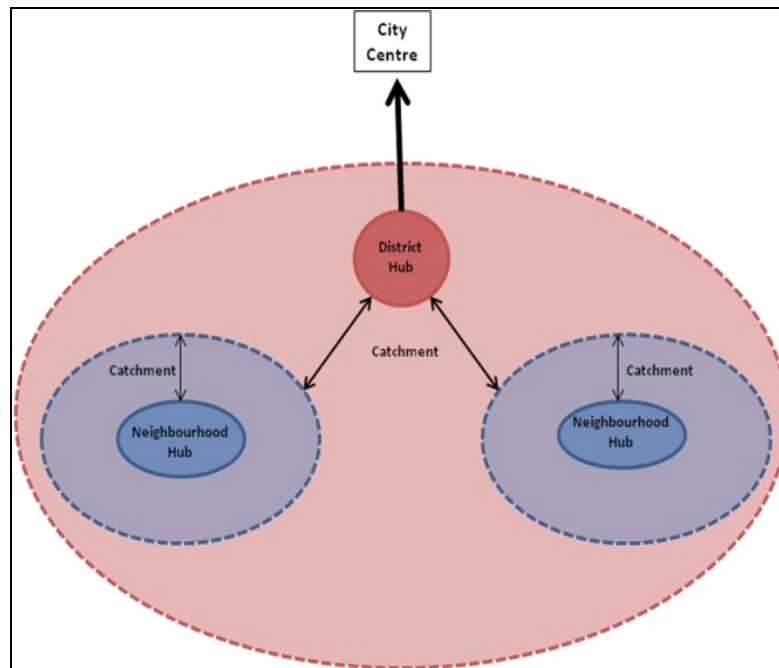


Fig. 5.2 Neighbourhood and District Conceptual Model

The three Freiburg neighbourhoods are structured differently, according to their scale (Fig.5.2). As the largest and furthest from the city, Rieselfeld has a strong business area and range of schools located centrally within it. The smaller neighbourhoods of Haslach Gartenstadt and Vauban share business areas, and in Vauban’s case – a secondary school, with neighbours. Crucially, the business area of each is clustered around the main transportation hub - each a multi-modal interchange.

5.2.3 Focal Points and Community Infrastructure

Rieselfeld and Vauban have clear civic focal points that are distinctive from their commercial centres, whilst Haslach Gartenstadt does not. Rieselfeld’s Maria von Rudloff Platz – located on the Rieselfeldallee main axis is also where principal community infrastructure components are clustered – including a combined Catholic and Lutheran church, library and community centre and a market place which hosts a twice-weekly market (Fig. 5.3a). The secondary

school, which has sports facilities available for public use, is located behind the market place. Similarly, Vauban has a central square focal point at Alfred Döblin Platz (Fig. 5.3b) with a cluster of key community infrastructure elements, including a community centre, a cafe, a twice-weekly market on the market place. The neighbourhood does not have its own church or secondary school – these are located in nearby St Georgen.

By contrast, Haslach Gartenstadt has no distinctive internal focal point of its own, despite being mid-way in size between Vauban and Rieselfeld. Instead Haslach Gartenstadt shares a nominal centre – the commercial area of Scherrer Platz on the arterial Carl-Kistner Straße with its neighbour Haslach Egerten on the other side, bringing a combined population of 13,000. Community infrastructure is dispersed.



Fig. 5.3 Neighbourhood Focal Points (a) Rieselfeld; (b) Vauban; (c) Haslach

The civic focal and economic hubs of each of the three districts are not always co-terminal. Indeed the main shopping of Vauban is on its edge at Paula Modersohn Platz and along Merhauser strasse , permitting ready access from the adjacent districts. The Vaubanallee contains a number of small retail outlets and enterprises, a proportion of which are clustered close to the central tram stop. By contrast, Carl-Kistner Strasse and Rieselfeldallee which form the major axes of Haslach and Rieselfeld respectively, appear to hold a greater place importance, as supported by their respective pedestrian footfall. Rieselfeldallee, like Vaubanallee forms a dead-end, and is therefore important only for local movement.



Fig.5.4 Extract from Freiburg Public Transport Map – tram lines in colour (VAG Freiburg, 2010)

Being on the very edge of the city and with almost double Vauban's population Rieselfeld was planned with a greater degree of autonomy in mind. Yet rather than merely being a suburb at the end of the tram line, Rieselfeld is also firmly tied to other districts by serving as a local transport hub for outlying villages and other suburban districts of the city including Haid and Mooswald. This gives Rieselfeld additional nodal value, a through-flow of public transport riders interchanging between bus and tram, and a degree of additional vitality. A conceptual overview of district connectivity is given below in Fig.5.5, which shows how the three neighbourhoods physically relate to their near neighbours.

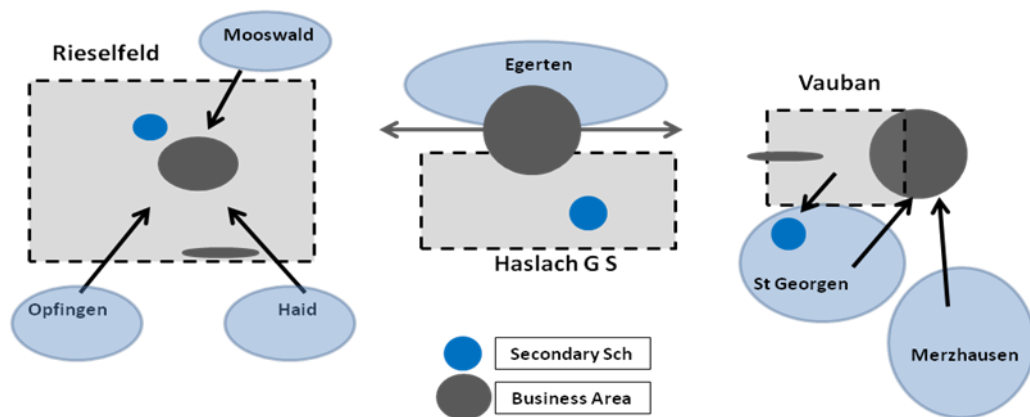


Fig. 5.5 Neighbourhood Physical Relations

5.2.4 Street Design

Chapter two demonstrated how the balance between the competing ends of street space for traffic movement and as social space could affect social relations between residents and perhaps most strikingly the relationship between traffic density and social relations, but urban design treatment within lightly trafficked residential areas has also shown by Chatterjee (2010) to have an important effect on local scale social relations and by Biddulph (2012 a & b) to encourage activities by children. Table 5.1 set out a number of street design elements aimed at reducing the impact of the car within the neighbourhood. Three elements are perhaps particularly important in encouraging the social use of street space:

1. Cross-sectional form – meaning proportions of space allocated for pedestrian and carriageway, and landscaping to soften the impact of traffic;
2. Carriageway treatment – including paving styles and shared spaces aimed at supporting pedestrian use;
3. Legal designation – from robust speed limits to home zones which alter driver behaviour and encourage non automobile uses of street space.

Can these aspects of residential design affect resident interaction? A number of notable structural similarities exist between the three neighbourhoods. In layout, each has a grid-based structure: Haslach being the ‘wedge’ of a Vitruvian grid, Rieselfeld following a broadly classical ‘Hippodamian’ layout and Vauban having grid blocks off a main spine containing a range of family homes and apartment blocks. Each of the three neighbourhoods has some streets with shared road surfaces and in keeping with Freiburg’s city-wide policy the minor residential streets of each neighbourhood are home zones or “Verkehrsberuhigung”, where non-motorised uses are legally prioritised (A).

Yet there are also differences too. In the literature it is argued that high levels of on-street parking can affect the wider utility of the street as a communal or play space (TfL, 2007; CIHT, 2010); on-street parking is widespread at Haslach compared with Vauban and Rieselfeld. Two types of residential street can be identified in Haslach and Rieselfeld – main thoroughfares designed to carry the bulk of through-traffic and which have pavements to separate pedestrians and traffic, and side streets which usually have just a single surface. However a notable difference is that in Rieselfeld street-parking is normally found just on the thoroughfares where there are designated parking bays. Although this makes for a wider street and consequently larger building blocks, the loss of wider street utility in Rieselfeld’s thoroughfares is compensated by the communal spaces that have been designed into these large building blocks. In Haslach, where the garden suburb predates modern car ownership levels, street parking is found throughout and no such compensation exists. In Vauban, all streets are single-surface, signalling unambiguously the social priority of these spaces over the car. Street parking at Vauban is limited to visitor parking bays along the Vaubanallee main axis whilst residential parking is restricted large to edge-of-development garages and underground parking in some of the ‘peripheral’ blocks.

5.3 Green Infrastructure

5.3.1 Background

Chapter two showed how green spaces are important to personal well-being and child development, but can also form important social spaces – for example with the designation of recreation or communal areas. Two issues are important. The firstly is a trade-off between overall automobile space in a neighbourhood to permit the creation of green space; an issue which has historic origins back to the development of the automobile in the early twentieth century. The second issue is the privatisation of green space – which may create overall aesthetic advantages for a neighbourhood, but will not provide a social setting. The two issues

become evident when comparing the three Freiburg neighbourhoods. Much of Vauban's green space has literally been bought by the car-free association – with large communal garden areas representing space that would otherwise have been given over to car parking. Similarly, at Rieselfeld the employment of a grid-based block structure has allowed the creation of large communal green areas – some with car parking underneath. By contrast, Haslach has a high overall proportion of green space as its 'Gartenstadt' name implies, but the bulk of it is privatised in the form of domestic gardens, reducing the overall housing density considerably by setting homes away from their street, and in the case of the large terraces, shielded by fences and hedges. There are just two relatively small public children's play areas within Haslach.

5.3.2 Green Space as Social Infrastructure

Rudlin & Falk (1999:44) note that great swathes of green space can, in reality, have negative consequences. The authors argue that the reality of the lavish green spaces of modernism was that 'much of this space was unused, dangerous and a burden on public authorities responsible for maintenance'; not necessarily the places in which young children could explore freely in other words. Vauban and Rieselfeld employ broadly similar approaches to one another in order to ensure vitality and security for their natural spaces. Firstly, through a good background level of natural surveillance noted above which also means that these spaces are also highly accessible. Secondly, by designating themes and uses to the different spaces that are supported by imaginative design or alternatively left completely alone as wild areas.



Fig.5.6 Natural areas in Vauban for repose and play

In both developments much of the natural space continues from more extensive open space beyond, providing buffer areas for wildlife and coherent links to the countryside beyond.

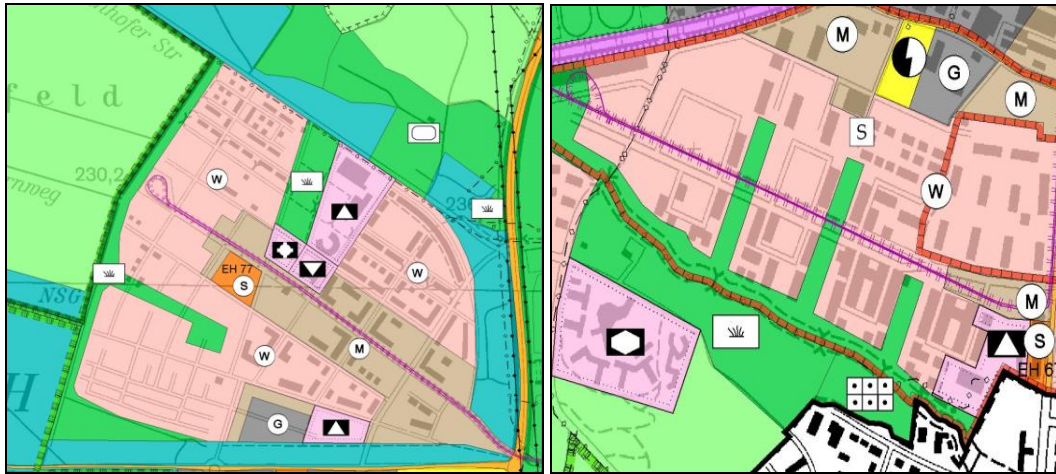


Fig.5.7 Rieselfeld & Vauban showing natural spaces protruding from green spaces outside (Freiburg City, 2006c)

5.4 Neighbourhood Realisation

5.4.1 Background

Two different approaches have been used to develop Vauban and Rieselfeld. The first may be termed the ‘passive’ or developer-led approach that has become the standard method for delivering housing across much of Europe. The other is the group build or Baugruppen approach used in both developments, but as a greater proportion of overall housing in Vauban. Vauban has developed a reputation both locally and internationally for being ‘alternative’, while Rieselfeld is generally viewed as being more ‘utilitarian’; reputations that have been garnered from deeper roots but which exert a profound influence on the composition of today’s residential community and property market dynamics. The following sub-sections briefly explain the background of Vauban and Rieselfeld and the resulting influence on today’s neighbourhoods.

5.4.1 Environmental Activism and the ‘1968 Generation’

One Polish-born resident of Rieselfeld described the development as being ‘for the workers’ and Vauban ‘for the idealists’, a statement that appears to have a degree of merit. It would be a mistake to consider Vauban residents as being an entirely homogenous community, as the development is comprised, to an extent, of people from a variety of different backgrounds – for example in the student residences and the SUSI and GENOVA community residences for the lower paid. Yet as the development does have an overt environmental overtone to it, as evidenced by the environmental activists that have been resident in a camp at the main road entrance off Merzhauser Straße (Fig.5.8) until site clearance for development in 2011, it is

perhaps unsurprising that its residents are also environmentally aware. This is very much evident from the political record of voting.



Fig.5.8 Environmental Protest Camp, Vauban (A) in July 2010 (B) Site Clearance in September 2011

If the political inclination of the Vauban community towards environmental concerns hints at the notion of ‘idealism’ articulated by a Rieselfeld resident, Daniel Haas the Communication Manager of Vauban’s Community Organisation asserts more boldly that the development is a ‘positive ghetto’ dominated by the liberal ‘1968 generation’, who were heavily involved in environmental causes (D). The Vauban community is heavily drawn from this sector of society whilst the Baugruppen concept, which accounts for approximately a quarter of housing here (A), automatically favours households at the point of raising children. The completion of the bulk of building work between 2000 and 2005 created a comparatively narrow window, which in the words of Vauban resident, Ian Harrison means that a ‘a generation has moved-in together and is growing-up together’ (C).

The combination of environmental design, community building groups and the ‘1968 generation’ of would-be residents helps to explain the demographic profile of Vauban that is dominated by younger to middle-age adults with children. But an important and as yet unanswerable question remains over whether the current generation of parents will stay or move on from Vauban once the children have grown up. More specifically, the universal accessibility policy employed in the construction of Rieselfeld permits the mobility impaired to live in their own homes and as fully integrated members of society. In Vauban, only 73 homes belonging to GENOVA out of the overall total of 1700 homes are ‘barrier-free’ (Stadtteilverein Vauban, 2009).

5.4.2 Rieselfeld’s ‘Utilitarianism’

Although Rieselfeld shares many of the design concepts of Vauban – public transport orientation, energy efficient building design, orientation for solar gain, and so forth, it appears less strident in its environmental ambitions, and with a strong focus on universal accessibility

(H), the development projects itself as being more overtly ‘utilitarian’. Although a number of demographic measures display similar patterns for Rieselfeld and Vauban, a substantially greater proportion of the population are retired or elderly. Vauban resident, Ian Harrison, noted ‘a binding sense of purpose about Vauban that is lacking in Rieselfeld, however Rieselfeld provides perhaps the more universally acceptable model’ (C). Here, a smaller fraction of homes – approximately 10% - were realised by Baugruppen (A).

Rieselfeld was intended as an autonomous district providing a balance of jobs, shops and services to complement the housing (A). The success of this approach in terms of reducing travel need is a matter to be explored in the next chapter, but the different guiding philosophy applied to Rieselfeld means that there are fewer restrictions on car ownership and use. Car parking is provided at an average ratio of 1.5 spaces per household – on street or on a private driveway, and at no additional cost.

5.4.3 Baugruppen

Baugruppen account for the individual design characteristics found across the apartment blocks of Vauban and Rieselfeld, as well as the collaborative financing of the buildings themselves by resident groups. Under this system the basic design code is established by the city planning department in the overall masterplan but the residents, who combine their mortgages together to raise finance for building construction, are able to fine-tune the building to their own specification (A). Typically, the balance is for 80% of the overall design framework to be set by municipal planners – including building heights, set-backs and overall housing mix – and the groups can dictate the final 20% - including precise layout, materials and colour. The result is a wide range of building styles in both neighbourhoods, and buildings tailored to the exact needs of individual families.

Baugruppen bear some similarities to co-housing schemes found elsewhere in Europe, where residents engage with the development process at an early stage. Unlike co-housing, however, Baugruppen are not expected to exist beyond the design and realisation phase, and do not necessarily imply the sharing of facilities found in co-housing, although this may occur on a case-by-case basis.

5.4.4 Group Build and Self-Selectivity

Access to finance and stage of life are both important forces in residential selectivity (ref), and both factors have a potentially important role to play in Vauban and Rieselfeld, where the group build approach has been extensively used. Ian Harrison (C) a resident of Vauban explained why the two factors were potentially important in influencing the demographic

profile of a neighbourhood where group build has been used. Culturally, a typical German family will obtain a mortgage to purchase a family home, rather than ‘climb’ a ‘property ladder’ from at an earlier age, meaning that life stage can be important: those raising a mortgage to join a group build scheme are much more likely to be at the stage of starting a family. Related to this point is that group build is an approach that is predicated on private finance and, by definition, is not necessarily open to those who are not able to raise a private mortgage.

Furthermore, the bespoke tailoring of the buildings towards individual preferences means both a lower than normal level of turnover, and also that the individualised nature of properties entering the market – particularly in Vauban may be less attainable to certain sectors of society, due to higher property values and also because of accessibility problems for the mobility impaired. The latter point was illustrated by a couple – a man of Polish descent and his wife who is wheelchair bound, who had recently moved to Rieselfeld but had also considered Vauban. Building design was a problem for them in Vauban, and their decision to move to Rieselfeld was ultimately influenced by the fact that the building code of Rieselfeld dictated that all buildings and spaces between them had to provide step-free access and a lift to all floors.

5.5 Summary

The picture emerging from the analysis of policy measures as well as the realised qualities of the built environment is that three distinct if interweaving strands may be brought bear on social relations at the neighbourhood scale. Policies operate at both the ‘macro’ scale across the city as well as at the neighbourhood scale, where the three neighbourhood models represented in the case study have adopted different ‘micro’ policies. The three policy strands consist of the following, which relate to car reduction in different ways:

- I. Strong neighbourhoods - including urban design measures to encourage non-automobile uses of street space and a reduction in travel and car use by encouraging dense and mixed land uses, reinforced by public transport.
- II. Housing delivery models – alternative models such as the group build approach seem are integral to the community-engaged design approach, particularly at Vauban, which pushed for car reduction and car-free housing.
- III. Green infrastructure – has been created by car-reduced block design and in some parts of Vauban and Rieselfeld represents a direct substitution of grey space by green space.

The remainder of this chapter will attempt to identify the impact of these policy strands on social outcomes across the three neighbourhood models.

Part B: Demographic Indicators and Social Outcomes

5.6 Social Indicators

The data provided has been used to provide a range of different ‘indicators’. Some of these were already mapped by the Freiburg City Authority and others were mapped by the author. As the aim of this section is to characterise each neighbourhood in relation to car reduced design, levels of car ownership are initially examined in relation to explanatory socio-economic variables. A detailed analysis of age structure, household composition, religious outlook and political orientation of each neighbourhood is then presented to build as comprehensive a profile on each of the three neighbourhoods in relation to the city overall.

5.6.1 Car Ownership

A combination of ‘carrot and stick’ measures that have simultaneously bolstered public transport and discouraged car use since the 1980s has resulted in a stagnation in car use so that by 2006 the proportion of cars and light trucks per 1000 inhabitants stood at 419, compared with an average of 546 for Germany. This translates to a ratio of 0.39 vehicles per Freiburg inhabitant. At Rieselfeld the ratio is 0.29 whilst the Vauban ratio is 0.17, however such ratios are somewhat misleading as they do not account for the demographic differences between districts. Vauban has the highest household occupancy rate - at 2.95 because it contains a greater proportion of children than any district except Rieselfeld. The 0.17 ratio therefore translates to a household car ownership rate of 48% (Table 5.2); approximately one third less than the Freiburg average of 74%. Rieselfeld has a relatively high household ownership rate of 72% whilst Haslach’s inner city location may account for its below average ownership rate of 64%.

Development	Cars (N)	Homes (N)	Household Car Ownership
Rieselfeld	2539	3507	72%
Vauban	820	1716	48%
Haslach	2445	3811	64%
Freiburg City	78857	106111	74%

Table 5.2: Car Ownership Per Household (Data: Freiburg City 2010c)

A striking point from table one is the relatively high household car ownership rate at both Vauban in spite of its physical and financial disincentives and at Rieselfeld despite its car

reduced internal layout and public transport orientation. However, the urban edge location and more ‘relaxed’ parking policies make Rieselfeld more amenable to car ownership, whereas Vauban’s substantial levels of car ownership reflects the strong hold of the car on German society at large (Buehler & Pucher, 2011), the relative affluence of its residents (see next section) and a perceived continuing need for car ownership for some purposes.

5.6.2 Employment

Haslach’s lower car ownership rate may also be explained by the district’s high worklessness rate (Fig.5.9a), however this does not necessarily correspond with unemployment rate *per se* as it includes those not seeking employment – including students, those caring for children and the retired. Rieselfeld has a lower rate of worklessness than Vauban which has a university hall of residence within the development. Thus, a different pattern emerges from the distribution of those receiving social support, with the lowest rates being recorded in Haslach and the highest within Rieselfeld. Unsurprisingly, the wards showing the highest levels of social support within the Vauban and Rieselfeld districts correspond with the highest proportions of social housing.

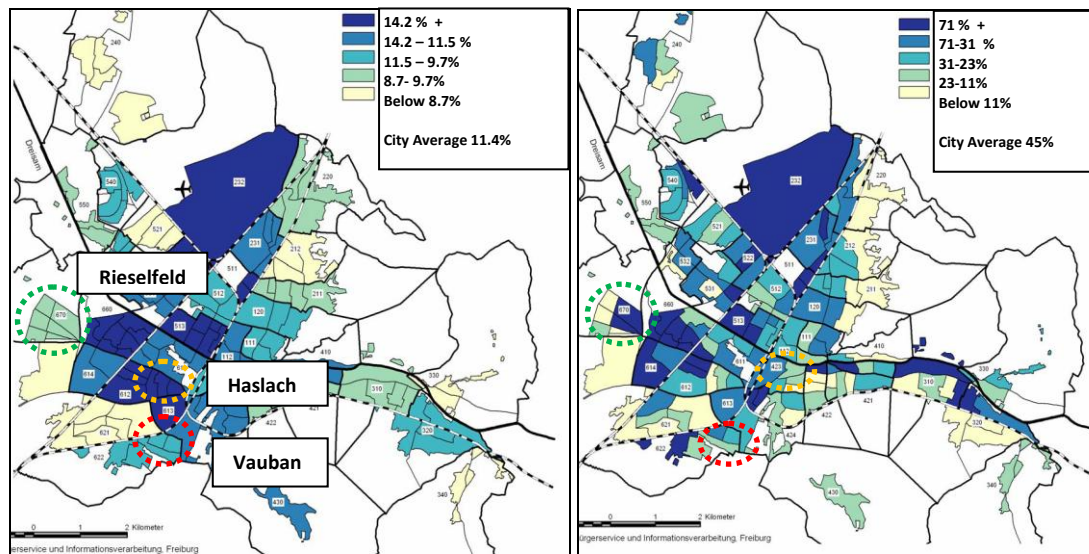


Fig 5.9 (a) Worklessness and (b) Residents Receiving Social Support (Data: Freiburg City, 2005a & 2006a)

5.6.3 Age

Fig.5.10 below shows age profiles in terms of percentage of the total population of the three study sites, together with the average for Freiburg overall. Two features immediately stand out; firstly, the peak in the 35-60 year bracket depicted in all four of the profiles, and secondly, the very close affinity of Haslach to the Freiburg average. The first point is due to the breadth of this particular age bracket, which stems from the fact that the data is used for the planning of municipal services and the resolution is therefore greatest in the younger or

older age brackets. The second point can be related to the diversity of housing located in Haslach, which ranges from the terraces of the large Haslach Garten Stadt homes to dense modern blocks of flats and retirement apartments.

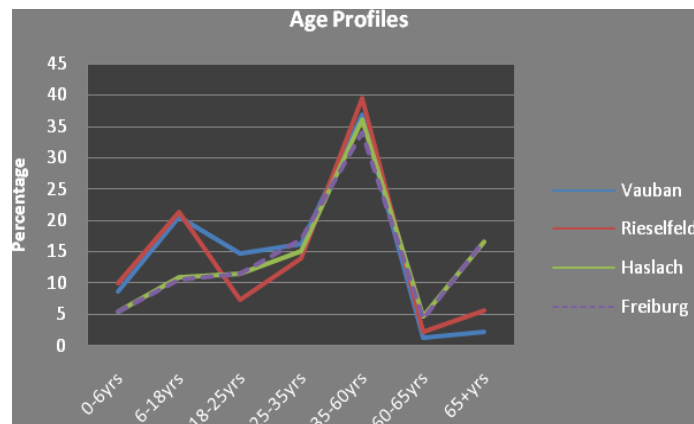


Fig. 5.10 Age Profiles of the study sites and Freiburg City Overall (Data: Freiburg City Authority, 2010c)

Fig.5.10 shows how the greatest differences in age structure between each development occur at the younger and older margins. Both Vauban and Rieselfeld have approximately double the average proportions of their populations below the age of 18, whilst Vauban has only 2.1% of its population in the over 65 bracket, less than half of the 5.7% recorded at Rieselfeld – itself almost two thirds less than the city average at 16.9% - and Haslach at 16.5%. Vauban and Rieselfeld record slightly higher than average proportions of their populations in the middle 35-60 year age bracket, whilst a noteworthy point at Vauban is the greater than average proportion of young adults in the 18-25 bracket which can be attributed to Freiburg University halls of residence within the development. In other words, the communities of Vauban and Rieselfeld are typified by households of middle-aged adults with children, whilst Vauban in particular is markedly under-represented by older residents.

5.6.4 Household Structure

Marital status among residents has a degree of correspondence with age structure. Fig.5.11 below shows a higher proportion of single adults in Vauban, which reflects in part the student population resident within the development. Most tellingly, however, are the proportions of widowed which reflect the levels of older residents: 0.8% at Vauban, 2.1% at Rieselfeld and 5.6% at Haslach compared with the city average of 5.4%.

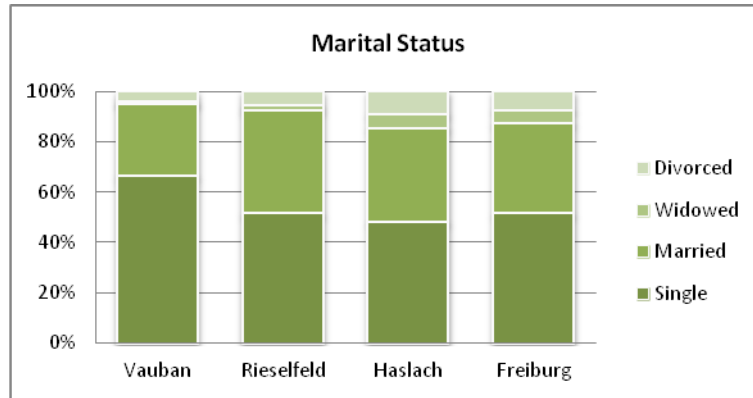


Fig. 5.11 Marital Status of Adults (Data: Freiburg City Authority, 2010c)

Vauban and Rieselfeld’s household occupancy rates of 2.95 and 2.56 respectively, are significantly greater than the Freiburg average of 1.89 (Table 5.3). The larger than usual proportions of children described earlier are likely to account for this pattern, although the greater proportion of elderly residents in Rieselfeld may account for a slight suppression of average household size in this development.

	Vauban	Rieselfeld	Haslach	Freiburg
Household Occupancy (N)	2.95	2.56	1.89	1.92

Table 5.3 Household Occupancy Rates (Data: Freiburg City Authority, 2010c)

5.6.5 Political Views

Three main political parties contended in the 2005 and 2011 state elections. Chancellor Angela Merkel’s centre-right Christian Democratic Party (CDU) originates in Baden-Württemberg and thus has traditionally attracted a high level of local support. The centre-left Social Democratic Party (SPD) is rooted in the merger of two workers parties in the nineteenth century (Conradt, 2008) and maintains its association with the blue-collar electorate. Lastly, the Green Party originates from environmental activism of the 1970s and after joining forces with the Alliance 90 civil rights movement in 1990, projects itself as the party for environmental and social justice.

Comparing the spatial distributions of the 2006 and 2011 election results is instructive (Fig. 5.12). In 2006 Vauban was ardently Green, Haslach was held by the SPD and Rieselfeld was split between the Greens with the SPD controlling one ward which contains a concentration of social housing and higher levels of social support. In the recent 2011 election which saw Baden-Württemberg reject Merkel’s CDU and vote in a Green-SPD coalition (Der Spiegel,

29th March 2011), the three districts voted unanimously Green in spite of intrinsic socio-economic differences.

Interviewees indicate that strong links exist between contemporary political support for the Green Party at Vauban and earlier environmental activism in the 1970s (Interviewees B, C & D from Table 4.5). Indeed the national movement is locally rooted in the nearby city of Karlsruhe, and it is from this local base of support that a camp was established at Vauban in the 1990s to campaign for the establishing of an ‘environmental quarter’, and from which Vauban forum was established in order to get the scheme underway, as will be discussed further in the next section.

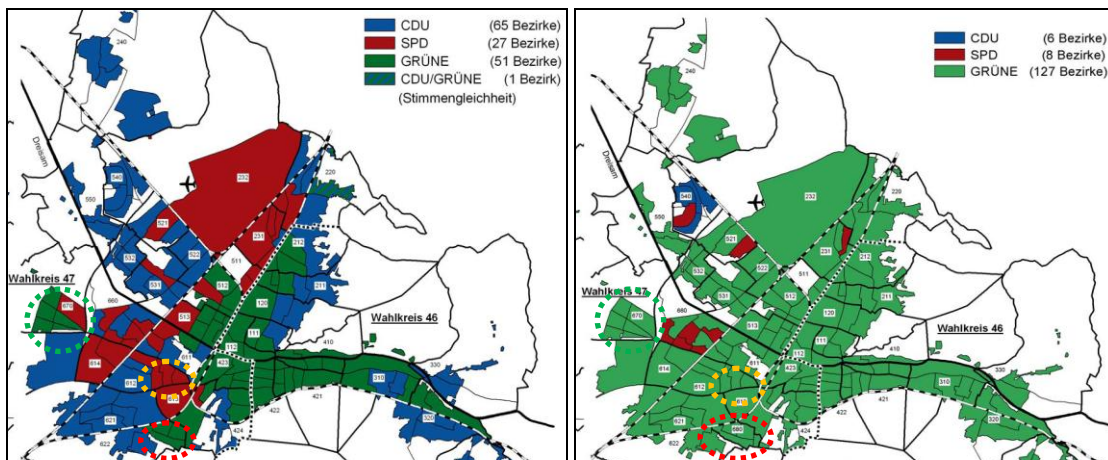


Fig. 5.12 State Election Results (a) March 2006 (b) March 2011 (Data: Freiburg City (2006b & 2011))

5.6.6 Summary – Accounting for the Differences

Table 5.4 attempts to summarise the characteristics of each of the three neighbourhoods from the data explored in this section. Compared with the Freiburg average, Haslach’s residents are slightly less likely to be car owners, less likely to be working and also less likely to be receiving social support. Haslach’s population age profile and household occupation rate closely correlate to the city average and resident’s voting habits have recently swung from red to green. Rieselfeld residents have average levels of car ownership and social support recipients, but a greater proportion working, a younger age profile, a higher than average household occupation rate and a predominantly committed green electorate. Lastly, Vauban residents are markedly less likely to be car owners, but are younger with higher household occupancy, have average levels of worklessness and social support recipients, which might be related to the location of a student hall of residence, and are committed green voters throughout.

	Car Ownership	Worklessness	Social Help	Age profile	Occupation Rate	Politics
Haslach	10% Lower	Above Average	Lower than Ave	Average	Average	SPD 2006 Green 2011
Rieselfeld	Average	Lower than Average	Average	Younger	Above Average	Green & SPD 2006 Green 2011
Vauban	30% Lower	Average	Average	Younger	Above Average	Green Throughout

Table 5.4: Summary of District Population Characteristics

Although no official data on income is available, Vauban is believed to be an affluent community (B), and particularly of the well-educated middle class (A), which is reflected in the high levels of privately financed housing, including group build schemes that are accessible only to private mortgage holders (A). The patterns suggest an element of residential self-selectivity, in so far as a younger, potentially more affluent and politically long-term ‘green’ demographic has been drawn to Vauban. Reflecting the discussion in Part A, four principal factors help to explain this pattern:

- Demand for housing from Freiburg’s growing younger population who are attracted to the new neighbourhood schemes;
- The higher level of group-build at Vauban particularly which is attractive particularly to younger families;
- The car-reduced social design which has created child-friendly environments at Vauban and Rieselfeld that are attractive to younger families;
- The environmental design principles underpinning Vauban and Rieselfeld, which are attractive to the committed green voter.

5.7 Age Structure of Districts Compared

Vauban and Rieselfeld are evidently family dominated neighbourhoods, but the differences in age structure between these districts and others across Freiburg are perhaps most pronounced at the margins of old and young age. Figs.5.13 and 5.14 show starkly how proportions of age groups 6-18 and the over 65s vary. The variance of Vauban and Rieselfeld with the rest of the city in these two indicators can clearly be seen.

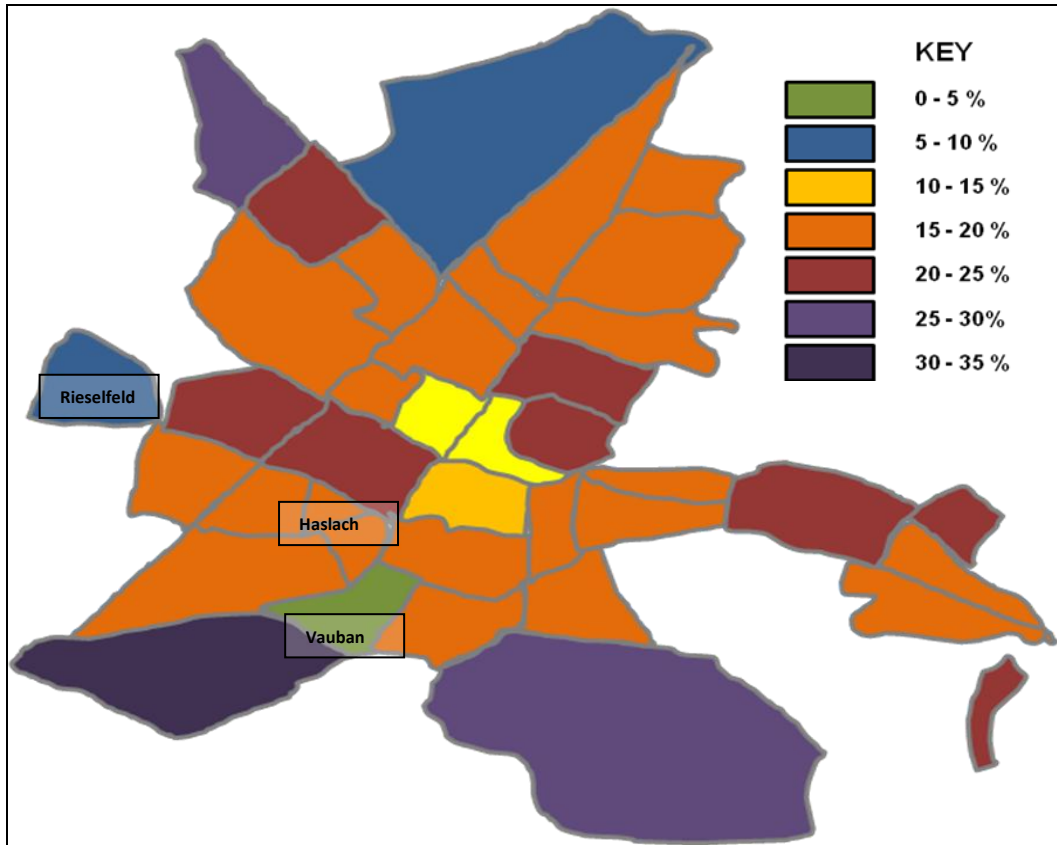


Fig.5.13 Freiburg age profile over 65s (Data: Freiburg City, 2010c)

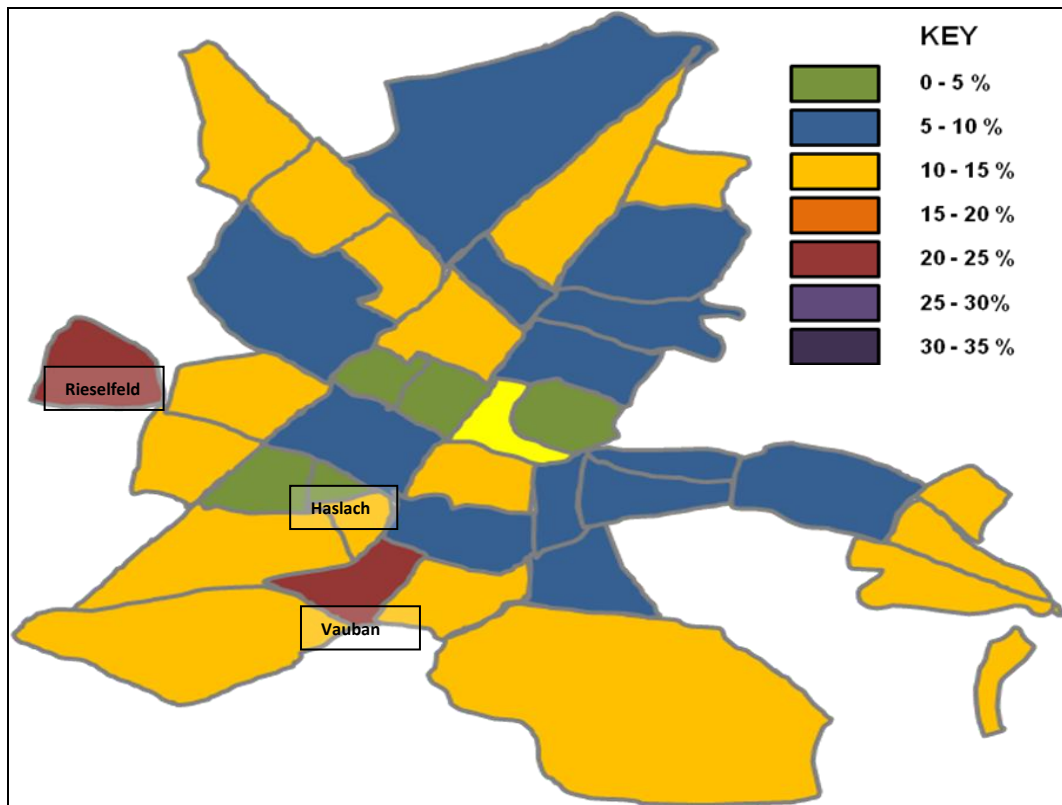


Fig.5.14 Freiburg age profile 6 to 18 year olds (Data: Freiburg city, 2010c)

Specific data for over 65s from the three sample neighbourhoods are shown below in table 5.5.

	Vauban	Rieselfeld	Freiburg
Over 65's (%)	2.1	5.7	16.9

Table 5.5 Proportion of over 65s in the 3 Study Neighbourhoods (Freiburg City, 2010c)

Vauban and Rieselfeld contrast with other suburbs by having high proportions of children and low proportions of retired and elderly. Such contrasting profiles are depicted graphically in Fig.5.15 showing the structure of Rieselfeld with its high proportions of parents and young children, compared with the outer suburb of Landwasser which in 1999 had 14.3% of its population in the 6-18 year old bracket and 20.1% in the over 65 category. By 2009 the proportion of 6-18 year olds in Landwasser had dropped to 11.8% and the proportion of over 65s had increased to 27.8%.

Importantly, this suggests that many of Landwasser's early inhabitants from the 1970s have remained as a cohort *in situ*, and that the turnover of housing has remained low as a consequence. The predominance of young families at Vauban and Rieselfeld makes for comparisons with Landwasser and other neighbourhoods of Freiburg when they had been newly completed.

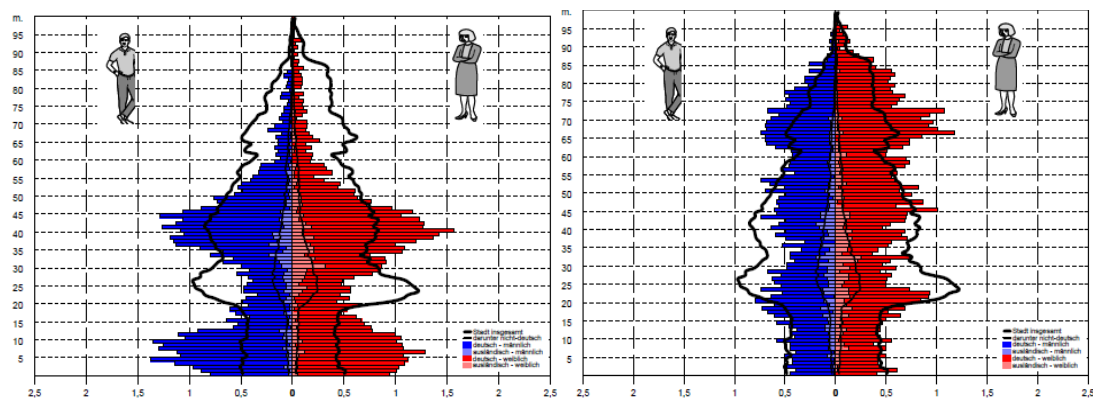


Fig.5.15 Age Profiles of Rieselfeld (A) and Landwasser (B) Freiburg mean in bold black and immigrants in light (Freiburg City, 2007d)

Vauban has a similar profile to Rieselfeld – with a slightly lower proportion of older residents, but Vauban's close neighbour - St Georgen (süd) has even lower levels of young people than Landwasser at 8.8% and 35.9% of over 65s. St Georgen is another residential development constructed predominantly between the late 1960s and 1970s – albeit low rise

housing compared with Landwasser's modernist blocks and greenery, and many of its early settlers seem also not to have left. Vauban seems to play a complimentary role by bringing a younger demographic into the area which helps to maintain shops and services, including the local secondary school which is attended by children of Vauban.



Fig.5.16 Secondary School in St Georgen & relation to Vauban (arrows denoting catchments from two districts)

There is a significant possibility that Vauban will follow a similar path: a new development pitched at a certain population sector (B), in which the bulk of the population moves in at around the same time, creating a demand 'bubble' for schools and services which passes-through as the children grow-up and collapses as they leave, after which the remaining population ages and requires a different range of services. Yet it is also possible that St Georgen and Vauban will serve to counter-balance as the age profile of each fluctuates. To an extent this 'coupling effect' can also be seen between Rieselfeld and its closest neighbour Weingarten with its similarly ageing population. Yet if such temporal-demographic counter-balancing does occur between neighbourhoods it will be an unplanned consequence (A & B), but this is perhaps a lesson for future development in which demographic concentration is likely.

5.8 Internal Relations

It was earlier noted how residential design can impact on the development of neighbourly relations, particularly in respect to levels of traffic, and Robert Putnam (2000) more directly argues for a link between neighbourhood design and the development of social capital. Different neighbourhood models are represented in the three developments compared in the data; 'car-reduced' in Vauban, 'transit-orientated' in Rieselfeld, and 'regular' when taking account of the different housing forms within Haslach that range from the broad streets of the garden suburb to dense terraced housing and apartment blocks. Notwithstanding the different built form and 'philosophical background' of each of the three neighbourhoods, two influential background conditions are the same between them. Firstly, they are similarly well-connected by public transport, and secondly, each has 'home zone' style streets in which

other needs are put over the passage of vehicle traffic. Community development is considered at three different levels – along streets, across each development, and in terms of how residents of each development consider their neighbourhood’s level of integration into the wider city.

5.8.1 Street Relations

Residents were asked how many people they knew by name on their street. An overview of the results is given below in table 5.6. Although the range of results was considerable, varying from zero in the case of residents who had recently arrived to 150 for one long time resident in Haslach, the average from each development portrays an interesting story of neighbourly relations in which Vauban residents know an average of three times as many of their neighbours as residents of Haslach, with Rieselfeld residents approximately halfway between the two.

	Vauban	Rieselfeld	Haslach
Sample Number (N)	89	86	73
Min	0	0	0
Max	120	100	150
Average	39	25	13

Table 5.6: Street Relations

Residents were asked how often they greet a neighbour in the questionnaire survey and the results appear to support the patterns of street and development friendship development noted above, with 73% Vauban residents greeting a neighbour daily, 48% in Rieselfeld and 36% among Haslach residents. Patterns of neighbourly contact shown in Fig.5.17 may be explained by three principal factors. In the first instance a basic sociability between neighbours must exist, and in Vauban this is likely to be affected by the group-build approach used in Vauban particularly. Secondly, residential design may exert an influence on social interaction – such as through incidental contact, which relates to a third factor of the travel patterns of residents and particularly the likelihood of residents being in the same place and at the same time. Anecdotally, Vauban resident Ian Harrison commented that when taking the tram, he had to leave his house deliberately early in order to allow time for the conversations that would inevitably occur on the short walk to the tram stop (C).

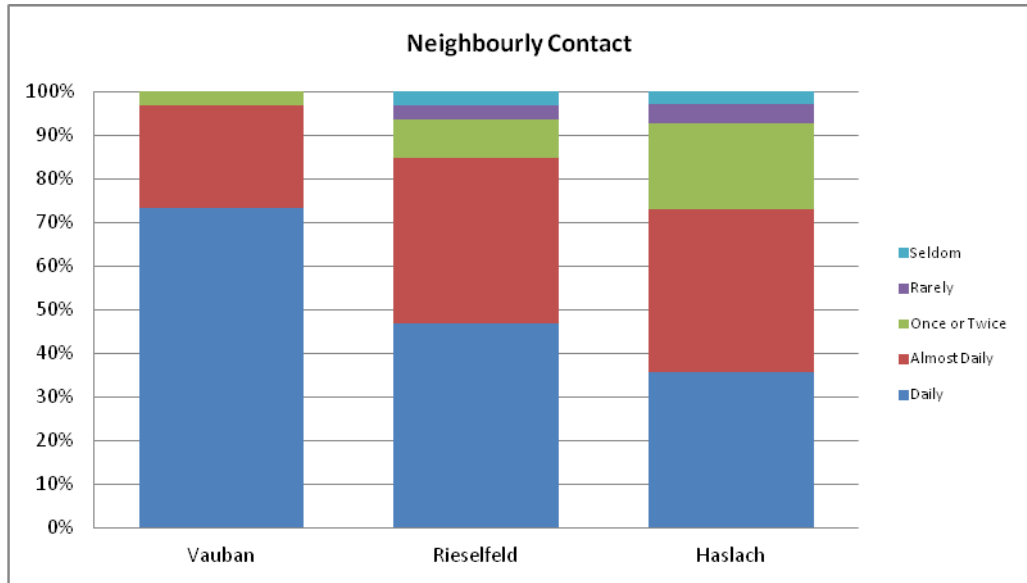


Fig.5.17 How often a neighbour is greeted

5.8.2 Neighbourhood Relations

Corresponding patterns emerge over friendship development at the neighbourhood scale. On average, Vauban residents know nearly five times as many people in their neighbourhood than residents of Haslach. An element of caution needs to be exercised, firstly as these measures are for the most part just estimates. Although respondents at the Rieselfeld market were observed taking considerable time, effort and care to complete their questionnaire, it is unlikely that the Vauban resident who declared first name knowledge of 1000 residents had actually counted them individually; removing this response alters the overall average from 95 to 85.

The pattern may relate to the substantial differences in household occupancy, as shown in official Freiburg City Authority data, at an average of 2.95 for Vauban due to the higher proportion of children there, 2.56 for Rieselfeld and 1.89 for Haslach which compares with the overall Freiburg average of 1.92. If ‘persons known’ are converted into ‘households known’ using the household occupancy data for each of the developments, the differences narrow somewhat to an average 32 households for Vauban residents, 25 households at Rieselfeld, and 11.5 for Haslach residents.

	Vauban	Rieselfeld	Haslach
Sample Number (<i>N</i>)	89	88	73
Min	5	5	0
Max	1000	300	200
Average	95	64	22

Table 5.7: Persons known on development

There are striking similarities between the patterns obtained from the three neighbourhoods of Freiburg with the results of a pilot study undertaken in three types of street in Hackbridge in South London, and reported in chapter three. The latter study consisted of a 'car-free' street in the BedZed development, two quiet residential streets and a busy main road. Residents of the car-free street had been in residence for an average of approximately 4 years but had 8 or so acquaintances, whilst those on the busy road had been there for 15 and knew 5 of their neighbours by name. Appleyard *et al*'s (1981:27) seminal study of street communities in San Francisco made a distinction between 'friends' and 'acquaintances' that has not been made in the Freiburg and Hackbridge studies. Appleyard *et al* reported an average of 3 friends and 6.1 acquaintances per household on the lightly trafficked street, 4.1 and 1.3 respectively on 'medium' street and 3.1 and 0.9 respectively on 'heavy street'. An important point of note is that because the residential streets in all three of the Freiburg neighbourhood are designated 'home zones' that would fall under the heading of 'light' under Appleyard *et al*'s terminology, traffic levels do not account for the patterns described above.

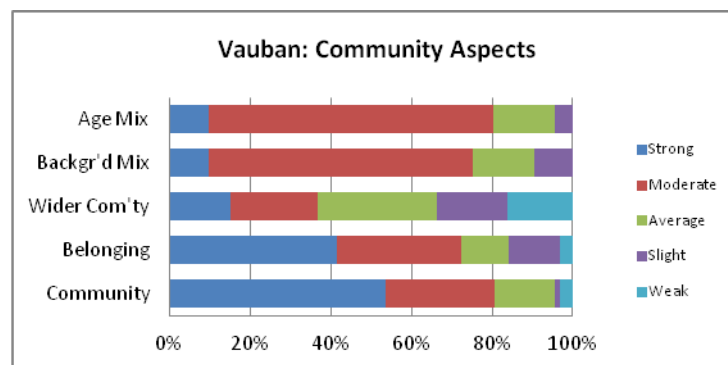
A more likely explanation is the greater residential density created by the predominance of apartment blocks along the residential streets of Vauban and Rieselfeld may account for the very high results in these developments compared with Haslach, and certainly compared with Hackbridge and San Francisco. Indeed, Bramley & Power (2009:34) note that 'Higher densities may also mean that people are more likely to meet each other on the street than in lower density areas'.

5.9 Community ‘Cohesion’ and External Relations

5.9.1 Internal Cohesion

Perceptions of relative community cohesion were gauged through questions about how residents thought people of different ages and backgrounds mixed, the sense of belonging to their neighbourhood they felt, and their impression of community strength. As Fig. 5.18 shows, the results on age and background mix from Vauban and Rieselfeld are very closely matched, with about 80% of residents in each stating that different age groups mixed together well or moderately well, and over 70% in each thought that people of different backgrounds mixed well or moderately well. In Haslach these results were slightly less positive at 70% and 57%, respectively although a greater proportion of residents thought that the neighbourhood was ‘average’ in respect to how different age and background groups mixed with the result that similar and small proportions of residents in all three developments responded negatively.

Results diverged much more dramatically over the sense of belonging that residents felt to their neighbourhood community, with positive responses constituting 70% at Vauban, 60% at Rieselfeld but just 22% at Haslach. Conversely, 15% gave a negative response to this question in Vauban, approximately 25% in Rieselfeld but over half of respondents in Haslach. Lastly, over 80% of Vauban residents thought their neighbourhood had a strong or moderate sense of community, approximately 65% at Rieselfeld and just 23% at Haslach where about one third thought there was a slight or weak sense of community.



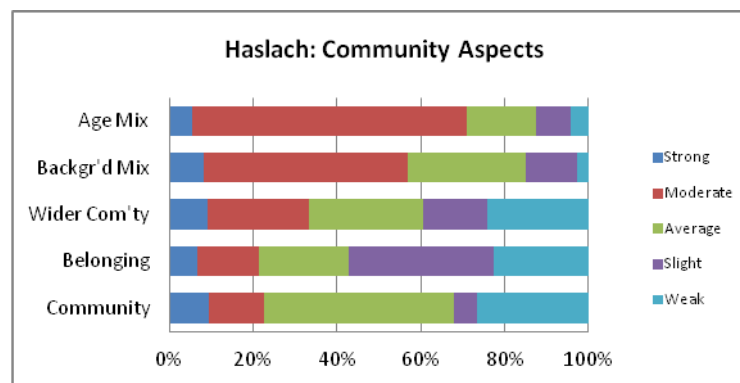
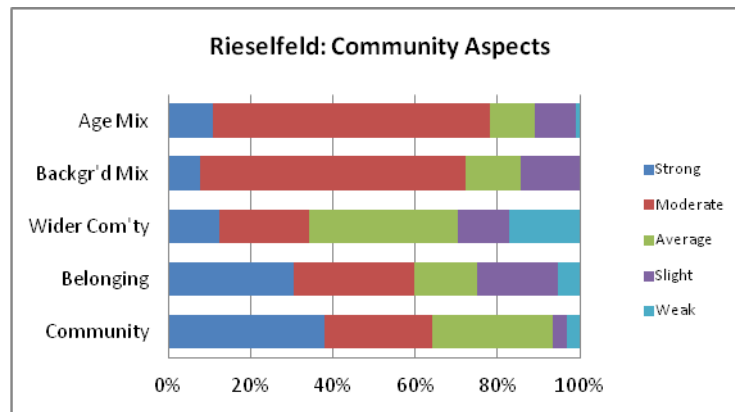


Fig.5.18 Community Aspects

Indicators of community cohesion from resident questionnaire surveys are naturally subjective, and individuals' perceptions are shaped by a range of different factors, not least experience and aspirations. Yet the patterns that emerge from a range of different questions and measures are consistent, and this is likely to relate to the patterns of social interaction shown in section 5.8, and also to the community-based method of housing delivery at Vauban and Rieselfeld.

5.9.2 External Relations

Vauban and Rieselfeld appear to be highly sociable communities, yet it was noted at the beginning of the chapter that strong communities can become insular and inward-looking. In the last section it was suggested that Haslach, Rieselfeld and Vauban are structurally bound to neighbouring districts and the wider city in different ways. To summarise, Haslach's location is relatively central and its centre is located around an arterial route out of the city. Vauban is a discrete suburb whose main economic hub is on its periphery, is shared with its neighbours and is located along a major artery out of the city. Rieselfeld is located out of the city and contains a range of shops and services in its centre, but receives a regular flow of outsiders through its function as a hub in the wider transport network. So do these different approaches

to physical connectivity to the wider city reflect on how the residents themselves perceive their relations to the wider community?

Residents were asked how far they felt part of a wider local community outside their development and to respond on a five point scale ranging from ‘strongly’ to ‘not at all’ (Fig.5.19).

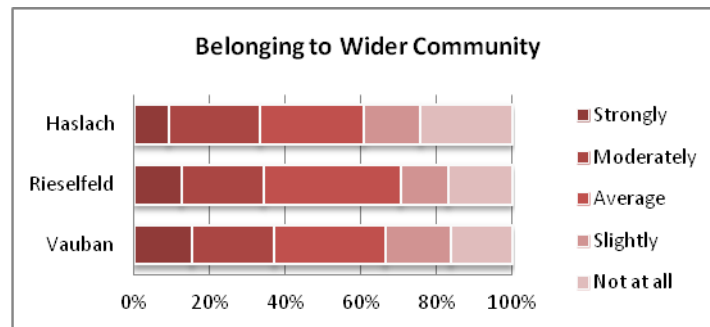


Fig.5.19 Perceptions of belonging to a ‘wider community’

Fig.5.19 suggests that Haslach residents were less likely to feel a sense of wider belonging than residents of Rieselfeld and Vauban. Here, the survey bias needs to be factored – with a greater proportion of younger respondents represented from Haslach compared with the others. To illustrate this, older respondents of the long QA survey form at Haslach tended to be more positive than on this matter than younger respondents to the short QA form. Detailed analysis of why younger residents should feel more ‘disconnected’ from the wider community would require a depth of investigation beyond the scope and would probably strike on matters of ‘rootedness’, social preferences and the development of social networks across the city. Although the average Haslach respondent had lived in the neighbourhood for 10.75 years compared with 7 and 5.75 years at Vauban and Rieselfeld respectively, this masks a great deal of variability previously shown in Figs 5.13 and 5.16. Moreover, a 2007 study by the Freiburg City Authority (2007e) found that 72% of Rieselfeld and 65% Vauban residents had moved in from other parts of Freiburg, meaning that many potentially still had social networks across the city. However, it is striking that Haslach residents were earlier reported in Fig. 5.18 as feeling less connected to their own neighbourhoods than those of Vauban and Rieselfeld, and are similarly report feeling less connected to the wider urban community.

Although there is a pattern of difference between the developments on this issue, the extent of difference is not particularly dramatic – perhaps a significant point in itself, which suggests that Vauban and Rieselfeld are not detached and insular communities, from the point of their residents. Indeed, Vauban is opened up to its neighbouring districts through having a peripheral shopping and transport hub at Paula Modersohn Platz, whilst secondary school pupils attend school in nearby St Georgen. Physically at least, it avoids being enclosed and

insular; or in the words of one interviewee, ‘It is not a paradise. It does not have a border around it’ (D). These aspects are arguably the physical manifestation of the city’s strong neighbourhoods philosophy.

5.10 Social Capital

Although the measures of community strength and cohesion obtained from questionnaire surveys can provide an indication of social capital – relationships of reciprocity and trust that was explored in earlier in chapter three. Within each neighbourhood, a more robust and direct evaluation can be obtained from how willing parents are to allow their children to roam freely. Although this matter can be complex, with a range of factors brought to bear on parental outlook and perceptions, the basic contention that parents will be more willing to allow their children to roam freely in neighbourhoods in which social capital is strong was found to be credible from residents’ accounts (C,G & J) and from informally observing activity in each neighbourhood. In the survey, questions were directed to parents of children aged seven or less. Due to the different survey format for Haslach, meaningful results were obtained from just Vauban and Rieselfeld.



Fig.5.20 Children playing in (a) Vauban, and (b) Rieselfeld

At Vauban all respondents were happy to allow their children to play in sight of their home (Fig.5.21), 10% were not happy to allow their children to venture alone and out of sight, whilst 6% would not allow their children to venture out of sight but accompanied by their friends. The results from Rieselfeld were broadly similar, although 5% would not permit their young children to play even in sight of their home, 14% would not allow their children to venture alone and 11% would not allow their children to venture out of sight but accompanied by friends.

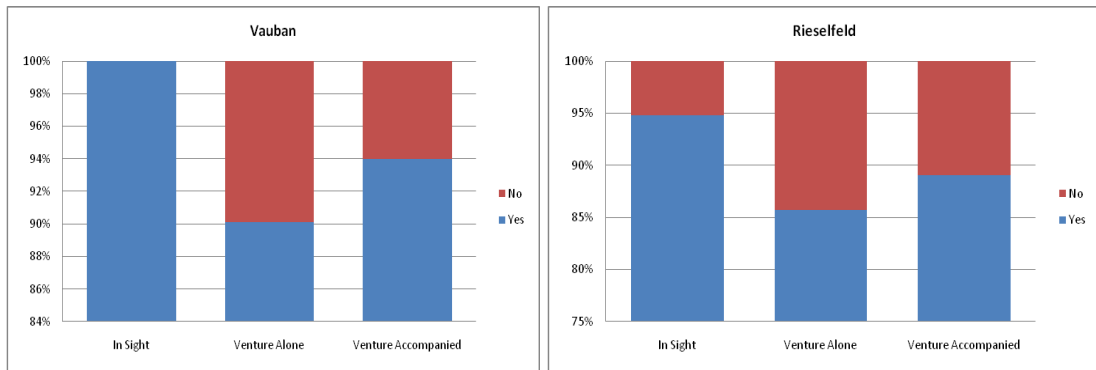


Fig.5.21 Perceptions of safety for young children

Residential design features create an objectively safe environment for children and explain the positive attitude of parents towards their children’s independence. Rieselfeld and Vauban both have an abundance of green spaces and recreational areas between residential blocks and, as mentioned earlier, there are 30 km/h (19 mph) speed limits across both developments and ‘home zone’ designations for residential streets with signage indicating that the streets are multi-purpose, and that traffic does not have right of way over other uses. Yet for such high proportions of parents to be happy to allow their young children to roam freely and alone – 90% at Vauban and 86% at Rieselfeld, indicates a high level of trust among residents, particularly as neither neighbourhood is closed to outsiders. Indeed, adults often appear to be far out of sight and children found playing in some unusual places (Fig.5.22a), however this impression is illusory to an extent as careful design means that there is a high level of natural surveillance from surrounding buildings (Fig.5.22b) even if it is not always obvious; a point that will be explored in greater detail in the next section.



Fig.5.22 Play areas (a) unofficial and (b) ‘official’ - in Vauban

Unpicking the exact causality of the patterns of neighbourhood relations is beyond the scope of this thesis, but the trends are in themselves significant and arguably relate strongly to the three policy strands noted earlier. Mode of housing delivery is likely to be a very significant

factor with a residential self-selection process generated by the group-build approach in the first instance, and the building of community relations in tandem with physical construction. Strong social relations are likely to be maintained and enhanced by the urban design measures related to ‘strong neighbourhoods’ policies and the provision of green infrastructure utilised by social space.

5.11 Summary

Part A identified three policy strands, related to residential car reduction that may have a bearing on social relations in each of the three Freiburg neighbourhoods. These consisted of (i) Freiburg’s ‘strong neighbourhoods’ philosophy, (ii) different modes of housing delivery employed, and (iii) the provision of green space. The data presented in Part B showed that demographic concentration was greatest in Vauban, where the group-build approach was proportionately more common. Data also showed that internal social relations are strongest in Vauban and weakest in Haslach. Somewhat counter-intuitively, in relation to Harvey’s earlier argument that strong communities can build ‘walls’, external relations followed a similar trend suggesting that the communities of Vauban and Rieselfeld were respectively better internally integrated and, perhaps more surprisingly, also better integrated into the wider city.

In section 5.2, three factors were identified as being potentially important for the development of community relations: (i) amenities and service including cafes, (ii) focal points and public space, and (iii) street space. As the provision of services and amenities is broadly similar across the three neighbourhoods this aspect is likely to have only a very limited impact on the patterns of social interaction. Focal points – and particularly the existence of dedicated and ‘animated’ market squares at Vauban and Rieselfeld are likely to be important. These were used extensively in each neighbourhood for twice –weekly markets and other events. The qualities of street space may also have a moderate effect on social contact, with the existence of extensive vehicle-free streets at Vauban and Rieselfeld. However, three further factors have been identified and may be considered important:

(i) demographic concentration – relating to common interests and life stage, including the presence of children which other research (Dempsey *et al*, 2012:134) indicates can exert a positive influence on social relations generally.

(ii) Building layout and particularly the relationship between residential buildings and streets, with the direct and straightforward street frontages featuring at Vauban and Rieselfeld, compared with the often indirect relationship between homes and streets at Haslach, with family homes set back behind extensive front gardens and the entrances to apartment blocks facing away from streets.

(iii) Use of the Baugruppe communal development approach for a quarter of homes at Vauban and a tenth at Rieselfeld. This alone may account for the variances between Vauban and Rieselfeld.

The difficulty in addressing the research question clearly is that the internal social outcomes are likely to be as the result of a 'package' of the three factors. Yet it is possible to identify how the three factors might work in series to produce the social outcomes identified. Here, a basic neighbourhood design concept draws interest and generates a process of selectivity whilst the implementation of development, in this case through the building groups, provides impetus to the development of social relations that are in turn sustained by the design qualities of the neighbourhood. It may also be suggested that the 'sociable', family-oriented designs of Vauban and Rieselfeld contribute to high levels of social interaction in each of the developments, both directly and through the concentration of young families with common interests and where the children engender social contact between parents. Observations would suggest that the latter is a mechanism for sociability within Vauban and Rieselfeld. Although the building group concept of implementation was also identified as a potential factor for creating selectivity, the 'appeal' of the neighbourhood concept can be regarded as having initial primacy of importance. This suggests that the qualities of residential design that contribute towards car-reduction have utmost importance in producing strong internal community relations. A number of these contributory qualities were introduced in chapters two and three and will be discussed further in chapter seven.

Part C: Concluding Discussion

5.12 Conclusions

Relating findings back to the original theoretical framework, qualities of the built environment can be seen to have a defining rather than a neutral role in shaping neighbourly relations, both by drawing a particular demographic profile to a neighbourhood and creating the conditions for social interaction. In the developments that have utilised the Baugruppen approach, the model is embellished by the active engagement that residents have in the design and implementation process (Fig.5.23), and thus on the production of the qualities of both the built environment and on social relations between residents, which are fostered from the outset in these two neighbourhoods. This matter will be discussed in greater detail in chapter eight.

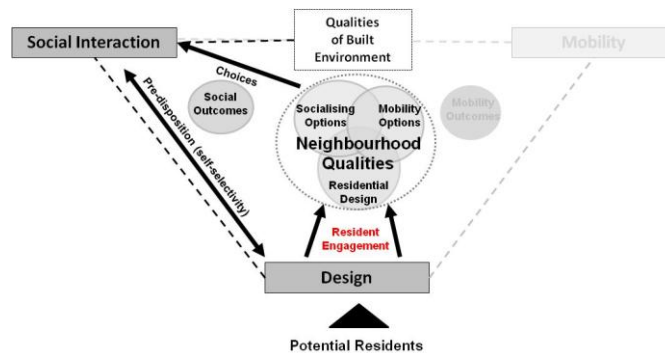


Fig.5.23 Revised Conceptual Framework – based on the Vauban / Rieselfeld model

The pattern of external relations, and specifically the strong feelings of ‘connected-ness’ with the wider city expressed by Vauban and Rieselfeld residents might be in part explained by formal relations, such as social networks prior residency in other parts of the city (Freiburg City, 2007e), or even by current ‘patterns of life’ such as employment that will be considered in the next chapter. It may also relate to the characteristics of the respondents themselves – those from Haslach typically being younger than those from Vauban and Rieselfeld. Finally, it may also relate informal contact influenced by physical connectivity - such as provided by shared community infrastructure and transportation patterns that can exert a control on casual interaction with residents from other neighbourhoods. This matter will be explored in greater detail in the next chapter.

In attempting to address the research question over the influence of car reduction on resident profile and internal and external social relations, section 5.5 discussed the notable differences in population profile of Rieselfeld and Vauban compared with Haslach Gartenstadt – a district which has an overall age profile that closely matches the city average. Rieselfeld was found to

have a younger age profile, a higher than average household occupation rate, with a greater than average proportion of its population employed and roughly average levels of car ownership. Vauban residents were similarly found to be younger than average with a higher household occupancy, average levels of worklessness and are committed green voters throughout. In other words the demographic profiles at Rieselfeld and Vauban indicate an underlying process of self-selectivity; but to what extent is this directly due to residential car reduction?

The answer is less than clear because the two developments use different models to reduce the impact of the car in a broader ‘package’ of measures designed to make the neighbourhoods convivial, functional and attractive. The picture is also obscured by Freiburg’s expanding population which continues to exert a high level of demand on the housing market, particularly for those in the 35-60 year age bracket. For example in 1999 this group accounted for 32.5% of the population and now accounts for over 34%. The concentration of this age group in Rieselfeld and Vauban is therefore largely symptomatic of the need to satisfy demand from this sector. The car-reduction elements follow from the long-term environmental focus of planning policy – itself a product of popular pressure since the 1960s. However, it is also evident that car reduction has a reinforcing role in attracting families by producing a convivial environment and permitting an allocation of different land uses including green spaces – measure which go far beyond the home zones and play areas that are standard practice across the city and represented in this study by Haslach.

5.12.1 Key Arguments

Four sub-questions were posed at the beginning of the chapter; these are addressed in turn.

To what extent do internal neighbourhood relations relate to demographic traits?

Addressing the first of the sub-questions posed at the beginning of the chapter, strong community bonds at Vauban and Rieselfeld are arguably influenced by a self-reinforcing process of selectivity initially on the basis of the neighbourhood concept, given impetus by the ‘building group’ implementation approach, and convivial design permitted by car-reduced design. This conclusion in itself falls short of identifying the process of self-selectivity, which would have entailed a much larger data set and complex statistical modelling. But this chapter has at least demonstrated a range of social outcomes and indicated some of the social processes potentially at work.

How does demographic concentration influence the external relations between residents and the wider city?

The second of the sub-questions posed at the beginning was over the influence of resident demographics on external relations between residents of car-reduced neighbourhoods and the wider city. Respondents from Rieselfeld and Vauban appear to be more integrated with greater Freiburg than those from Haslach. But a greater proportion of younger respondents in Haslach may have influenced this result and additionally the bulk of residents in Vauban and Rieselfeld were found in a previous study to have moved in from other localities within the city. Importantly, however, Vauban and Rieselfeld are physically well-connected to the wider city through transport networks that gave them a nodal significance, and in the case of Vauban, a shared economic hub with other districts. These factors arguably serve to strengthen the destination status of both districts, rather than being districts at the end of the tramline or dormitory suburbs that outsiders merely travel through to reach the city centre.

What impacts do the demographic traits have on surrounding neighbourhoods?

This question is directed towards investigating the consequences on other neighbourhoods of demographic concentration. Vauban and Rieselfeld have double the proportions of under eighteen year olds, and a striking comparison was made between the age structure of Rieselfeld with its double spike of children and younger adults, compared with the top-heavy profile of nearby Landwasser – another outer district. A number of Rieselfeld residents remarked that the secondary school was oversubscribed. By contrast Landwasser's is contracting. However, Freiburg is a city with a growing population – partly because of graduates remaining after completing their degrees and partly because of increased immigration by foreigners. In this respect Vauban and Rieselfeld satisfy demand from a younger demographic, many of whom have otherwise been forced to live outside the city and commute in to work and therefore the answer to the question in this instance must be 'no'.

5.12.2 Housing Market 'Churn'

The turnover rate of housing across the city appears to be relatively low. It would appear that a high proportion of occupants in the post-war suburbs such as St Georgen and Weingarten are the first wave residents who settled there immediately after the housing was completed. In this context, Vauban and Rieselfeld might be seen to 'counter-balance' neighbouring districts by bringing younger populations into otherwise ageing suburbs. The strong communities that have already developed in Vauban and Rieselfeld suggest that turnover in these developments

may prove to be low also and the prospect of occupancy cycles extending to 40 years and beyond. With its peripheral location, this may prove to be more of an issue for Rieselfeld than at Vauban with its more central locality. In other words, there are important temporal as well as a spatial considerations to be factored with these developments. Fig. 5.24 below describes the inferred occupancy cycle of housing in Vauban.

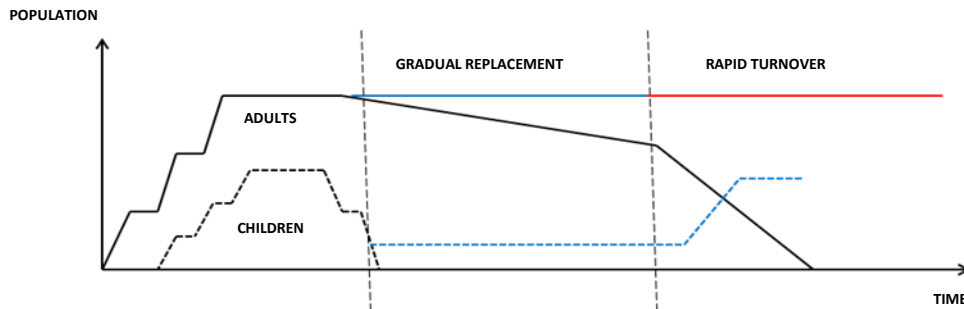


Fig. 5.24 Representation of Vauban’s Inferred Household Cycle

The profile is initially staggered by a phased delivery of housing, and there is an initial peak in children (dashed lines). There follows a low level of turnover (in blue) over a period of twenty years or so until residents reach old age, and the cycle begins once again (red).

How does the pattern described relate to car reduction? Figure 5.31 depicts the experience of Freiburg’s postwar suburbs that can be inferred from demographic data which depicts a low population turnover. This relates to the ‘jeopardy’ of demographic concentration – both spatially and temporally. The evidence presented in this chapter suggests that demographic concentration is a factor that needs to be particularly addressed in relation to residential car reduction because of the attraction of such neighbourhoods for young families, and also because of the particularly strong relationships that develop that lead to a low turnover of housing. One strategy to ensure less pronounced cycles are to introduce long term phasing - perhaps over decades. Another strategy would be for smaller infill developments to stimulate declining districts. The relative merits of these approaches and an evaluation of the relative merits of Vauban and Rieselfeld will be considered in chapter seven.

Finally, from this analysis of internal and external relations, how should car-reduced developments be judged? The overall impression is that there are more positive points than negative. Despite the process of self-selectivity indicated in both developments, both seem to be well integrated with the wider city. Although different design strategies and car reduction policies have been adopted, both developments foster high levels of social capital evidenced by the trust that permits children to roam freely and green areas to be used. Children and adults are therefore likely to be engaged with one another and the wider world. Yet both developments appear to have vibrant local economies that reduce travel to shops and services.

5.12.3 *Lessons for the Four Models*

From this chapter the following four aspects are pertinent for the four models of car reduced development presented in section 4.3:

1. Demographic concentration is likely to occur both from the attraction of the design concept, which may be heavily linked to life stage – specifically to family formation and the arrival of children, and also to the group build mode of implementation which can exclude those without access to private finance. Although this could potentially draw younger families away from ageing neighbourhoods, smaller ‘fresh cell’ schemes such as Dreikönigstraße could be inserted to support declining neighbourhoods and inner-city schemes such as Südstadt used to bring a younger demographic into the inner city.
2. The group build approach means that communities develop as the neighbourhood is realised, and this may account for the very high levels of social connectivity and trust found at Vauban and Rieselfeld.
3. Although low housing market churn seems to be characteristic across Freiburg, the group-build approach is likely to compound the situation because of the bespoke design of the housing stock, suggesting that implementation of large new schemes should be carefully phased or carefully matched with adjacent neighbourhoods with different demographic traits (e.g. Vauban with St Georgen).
4. Group-build and the development of strong internal relations does not necessarily mean that residential communities become inward-looking or ostracised from wider urban society; indeed the reverse seems to be true with Vauban particularly well-integrated, reflecting its strong physical connectivity and integration with neighbouring districts – through shared community infrastructure, commercial hub and nodal significance – as well as its connectivity to the wider city.

Chapter Six

Mobility Behaviour & Car Reduction



What are the key access and opportunity constraints; who is disadvantaged and why?

6.1 Introduction

This chapter examines travel behaviour, the relationship between transport provision and individuals' opportunities and constraints and, with the social equity element of social sustainability in mind (Bramley & Power, 2009), whether car reduced neighbourhoods equate with reduced opportunities for some residents. Indeed, Hägerstrand (1971 & 1990) drew attention to the greater range of opportunities available to automobile mobile individuals whose greater 'daily prisms' enabled them to access opportunities over a much greater geographical extent than those without. Yet spatial accessibility is not defined merely in terms of transport provision, but also in terms of the spatial organisation of needs and opportunities. Thus in Figure 6.1 four different hypothetical scenarios are proposed for a body of residents in a locality. Firstly, that mobility matches a considerable geographical extent; secondly that mobility falls short of geographical extent leading to exclusion from some aspects; thirdly, that the spatial extent of needs and opportunities are reduced and brought within the range of available mobility; and lastly that accessibility is bought by a process of residential self-selectivity. An example of the latter would be an orientation towards physical modes of travel that favour the able-bodied. Travel time and the temporal organisation of livelihoods is intimately bound up with spatial aspects, as recognised by Hägerstrand, and it must be remembered that relative accessibility is not always a straightforward product of distance, for example when there is a need to combine different purposes into journeys.

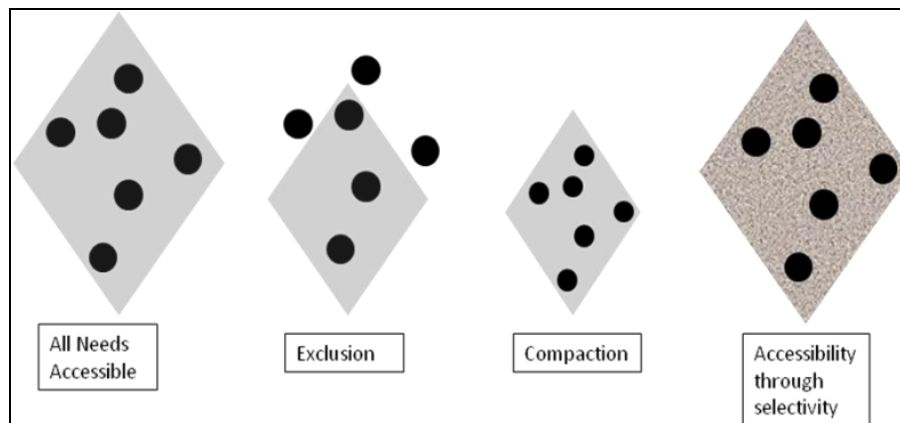


Fig. 6.1 Four Hypothetical Scenarios

This chapter addresses a basic question: does residential car reduction adversely affect the opportunities and lifestyles of the resident population? The question is directed towards the 'Vauban model' where car ownership and use are actively discouraged with stringent measures, but Riesefeld provides a potentially interesting model of compromise where car ownership and use are not curbed but the impacts of the car have been reduced by design. At Riesefeld, there is a potential to reduce car ownership by non-physical means including car

sharing or car clubs, although to-date such schemes have not proven especially popular across the city (B).

On the basis of the younger demographic of residents living in Rieselfeld and Vauban illustrated in the preceding chapter it could be assumed that lifestyles and opportunities have not been restricted, particularly given that half of Vauban residents have actively chosen to forgo car ownership. Yet there are a number of areas of potential weakness in this proposition which require investigation. Firstly spatial and temporal mismatches between car alternative transport services and residents' individual needs exist. Secondly a general problem of transport exclusion can exist with factors ranging from fare costs to perceived threats to safety and experience of anti-social behaviour. Thirdly, specific challenges are presented to some groups, notably to those with impaired mobility but also, and perhaps most pertinently for Vauban and Rieselfeld residents, those with young children.

6.1.1 Relation to the four car-reduced models

The four potential models of reduced car development introduced earlier in section 4.3 are oriented towards car-alternative transport in slightly different ways. The three larger models (1 - Inner Urban, 3 - Suburban and 4 - Urban Extension) feature mixed land uses within the neighbourhood which can potentially reduce travel for basic life needs, all have high standards of cycle and walking infrastructure and all are well if differently connected by public transport reflecting their spatial position within the city as follows:

1. Inner Urban – a high quality bus route exists between the Südstadt development and the main interchange which is approximately 1.5km away; the close proximity of the main interchange means that scheme is well-located to the city's main transport hub.
2. Fresh Cell – the Dreikönigstraße scheme is located 300m from a tram stop serving the city centre, and there are direct if infrequent bus services from a stop adjacent to the site.
3. Suburban – Vauban is built around a tram corridor and has a nodal interchange with direct bus services to outlying districts and villages.
4. Urban Extension – Rieselfeld is similarly built around a tram corridor and has direct bus services to outlying districts and villages, and also tram and bus connections to different areas of the city.

All four models have taken approaches to reduce car use and/or ownership and in so-doing allow residential space to be allocated and structured differently from car-oriented residential development. However, reflecting the need to examine the potential issues of social equity raised earlier, this chapter aims to examine how different mobility options affect travel behaviour and accessibility.

6.1.2 Structure

As with chapter five, this chapter is organised in three parts. The first part sets the scene by exploring Freiburg's transport offer - in terms of the public transport networks both within the city and to its important hinterland, and the link between the built environment and transport infrastructure in the context of the city's post-war reconstruction. It attempts to assess the extent to which Freiburg has an 'equitable' transport offer. After establishing a contextual baseline, the second part of the chapter then looks at the mobility outcomes of residents from the three questionnaire survey sample neighbourhoods of Haslach Gartenstadt, Rieseifeld and Vauban. This part sets out to explore not only what is happening but also why it should be so. Freiburg's fusing together of land use and transportation policies, following what is described as a 'twin-track' approach of transport modal equity and pro-active decentralisation of services, amenities and employment to create commercially and perceptually strong districts is a subject of considerable interest. Finally, Part C tries to match the mobility outcomes investigated in Part B with the policy context set out in Part A: how does Freiburg's theoretical transport offer match the reality of its mobility outcomes?

Part A: Policy Background

6.2 Introduction

Like most European cities, Freiburg's built form has been altered through advances in transport technology. The K9853 Opfinger Straße between inner city Haslach Gartenstadt and suburban Rieselfeld provides a transect through a century of Freiburg's urban history - demonstrating how transport has shaped residential form. Although Haslach Gartenstadt occupies what can now be described as a central position approximately 1.5km from the *altstadt*, it was conceived as a tram suburb in a similar mould to transit suburbs elsewhere. The neighbourhood was constructed between 1910 and 1915 at a time when Haslach was a separate village. Beyond Haslach, Weingarten is a 1960s modernist development of monolithic blocks and parkland that was automobile-orientated in its conception; indeed, by the time of Weingarten's development, the tram line to Haslach had been abandoned and was not extended to Weingarten until the 1980s. Lastly, beyond Weingarten is the new tram-orientated and car reduced Rieselfeld development, which could be regarded as the culmination of Freiburg's macro-scale reversal from the car to public transport dominance.



Fig.6.2 Journey Down Opfinger Strasse: (a) Rieselfeld GS (b) Weingarten (c) Haslach

The importance of implementing high quality public transport system in setting favourable conditions for modern-day residential car reduction was articulated in chapter two, and it was argued that this was because urban form has historically followed transport functionality. In the context of contemporary car-reduced development it logically follows that alternative transportation must be provided in order to cater for the spectrum of needs and destinations in a convenient and cost-effective manner. The public transport offer must therefore be

competitive and equitable. It might also be added, however, that to capture fully the mobility needs of the individual requires consideration of the full geographical extent, beyond the physical and administrative of the city. City-regional car-alternative connectivity may also be considered to be important in providing a strategic framework of transport on the ‘supply’ side to meet user’s demand in a way that reduce the necessity for car travel in the first instance.

6.3 The Rise of Car-Alternative Transport

Freiburg’s orientation towards ‘sustainable’ transport modes arguably began with an early decision to retain the city core’s medieval street layout during its post-war reconstruction. The retention of its original street layout has allowed Freiburg to maintain a permeable urban pattern which encourages walking and cycling, in contrast with other German cities such as Kassel which opted to modify its layout into a ‘superblock’ pattern more suited towards the automobile (Holzapfel: Pers. Comm). Superimposed on this basic urban pattern have been a range of policy interventions including pedestrianisation of inner-city Bertoldsbrunnen, the development of the city’s tram network and the creation of a dense network of cycle routes. However, the car-alternative transport offer extending beyond the city boundaries and into the sub-region is an important component of the overall transport ‘offer’, given high levels of in-commuting and a substantial level of outward travel. This section briefly examines the wider sub-regional transport linkages before focussing on urban transport policies and outcomes within the city itself.

6.3.1 Regional Public Transport

A shortfall in Freiburg’s housing stock has contributed to high levels of commuting from the surrounding region as shown earlier in Fig. 5.1, representing approximately 68,000 daily commuters (Beim & Haag, 2010). Following the success of its multi-modal and city-wide ‘environmental ticket’ in 1984, the ‘RegioUmweltKarte’ or ‘regional environmental ticket’ was introduced in 1991 to serve Freiburg’s entire commuter catchment – bringing together 17 transport companies – including Deutsch Bahn.

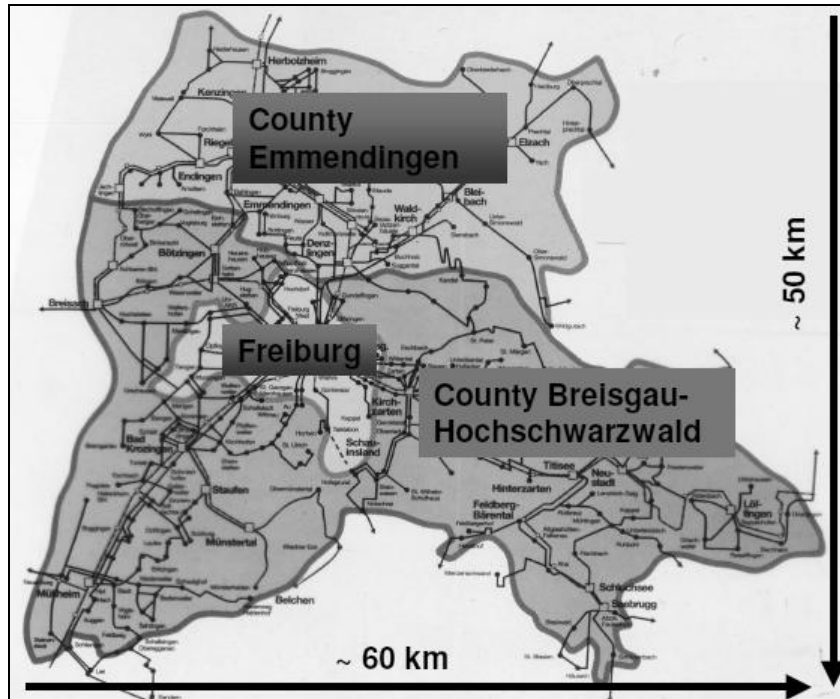


Fig. 6.3 Regional Travel Card Extent (Hildebrandt, 2008)

The effect of the regional ticket was similar to the environmental ticket. According to Hildebrandt (2008), 28,500 commuters switched from the private car and onto public transport. The switch has been assisted through Baden-Württemberg state's considerable financial support to the expansion of the regional transport network, and particularly the Breisgau suburban or 'S-Bahn' rail system (Fig. 6.4b), which opened four new lines between 1997 and 2008 (Buehler & Pucher, 2011) to smaller settlements not served by the national network.



Fig. 6.4 (a) Freiburg's Regional Rail (Beim & Haag, 2010) and (b) S-Bahn Train

In addition to the S-Bahn, a proportion of the state's €400m assistance to regional transport (Beim & Haag, 2010) has been directed towards improving rural bus services and to

coordinating different transport modes in order to create a seamless transport web. This includes the improvement of cycle facilities in regional stations that have experienced an uplift in demand as commuters complete the first of their journey from home to transport stop. Similarly, park and ride facilities have been upgraded in regional stations and on tram interchange hubs located at the termini of Freiburg's tram network. In this way, motorists are not specifically penalised outside of the city, although they are encouraged to change mode at least before entering the city, by means of park and ride. Through a package of hard infrastructure, improved ticketing and better coordination between service providers commuting by public transport from the region into Freiburg city has been opened to a broader cross-section of society beyond those with car access. The broader effect has been to create a seamless web of regional public transportation accessible to all permitting the outward commuting of non car owning Freiburgers of which there were approximately 16,000 in 2003 (Beim & Haag, 2010), and to open the surrounding countryside to all.

6.3.2 Urban Transport Policy

After suffering extensive damage from bombing during the Second World War, Freiburg's reconstruction programme initially followed the trend towards car-orientation. By the late 1960s the city had introduced a string of measures designed to facilitate automobile growth, including the closure of tram lines, the adaptation of inner city streets, extensive car parking and the construction of a highway connecting the city centre to the autobahn (Buehler & Pucher, 2011). But such strategies became increasingly contested and by the late 1960s the political mood had begun to change as a result of public lobbying. Thus, in the early 1970s, Freiburg's government made a reversal of its pro-car stance and introduced a series of policies to encourage alternative transport modes, including a bike network plan in 1970 and expansion of the tram system in 1972 (*Ibid*). These decisions proved providential as the oil crisis began to grip the west in 1973.

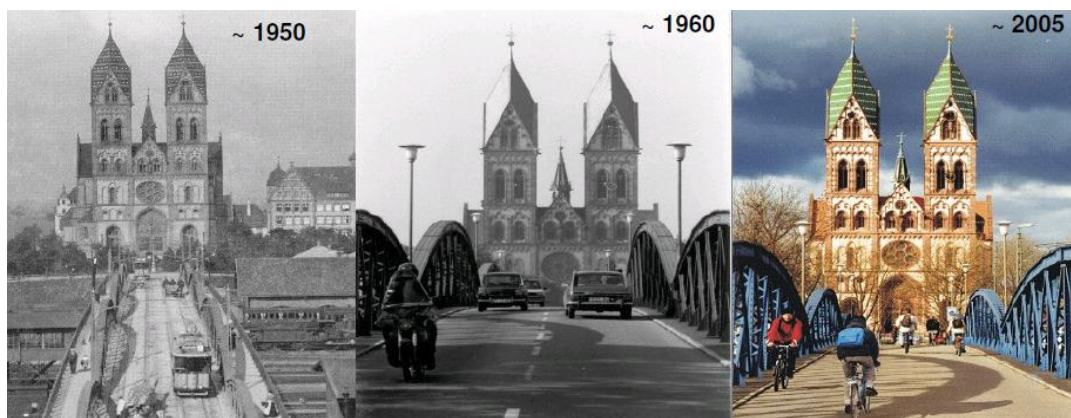


Fig.6.5 The Changing Transport Function of Wiwili Brücke (Hildebrandt, 2008)

According to Hildebrandt (2008) it was the pedestrianisation of Freiburg’s city centre in 1973, which at that time was the most extensive scheme of its type in West Germany, which provided a catalyst for improving the alternatives to car transport throughout the city. It had become physically necessary to ensure that all citizens could reach the city centre without the car. By the time of the 1989 re-authorisation of Freiburg’s Transport Plan the city had developed a ‘cybernetics mobility concept’ that was based on five pillars (Fig. 6.6), namely; (i) to improve the public transport network, (ii) improve cycle infrastructure, (iii) implement measures to restrain traffic, (iv) channel private car traffic, and (v) to actively manage car parking (Hildebrandt, 2010). It was in other words a combination of ‘push and pull’ factors (Beim & Haag, 2010) to restrain car use, generate modal shift and create an equitable transport system. Four of the five ‘pillars’ are examined next in relation to the effects of the policies that have been implemented; the channelling of private cars is not examined specifically as this would fall outside of the scope of this study. Furthermore, public transport is subdivided between the regional and urban networks.

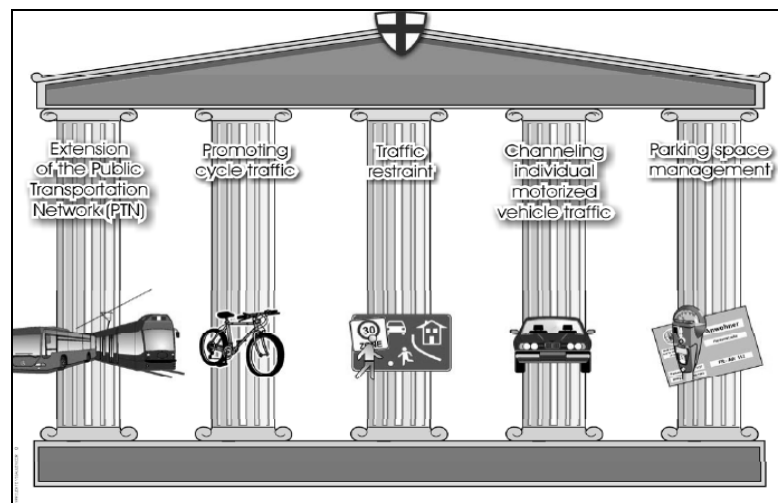


Fig. 6.6 The Five Pillars of Freiburg’s Transport Policy (Hildebrandt, 2010)

6.3.3 The Modern City

By 1979 the city’s second transport plan confirmed a change in overall philosophy and tied land use and transport together in promoting ‘green’ transport modes over the car (*ibid*). Thereafter, development became focussed around public transportation and in 1984 the flat-rate ‘environmental ticket’ was introduced which helped to stimulate the doubling of public transport ridership over the following decade. Support to green modes continued with the expansion of the tram system in the 1980s and the introduction of regional flat-rate tickets and the opening of the regional ‘s-bahn’ train in the 1990s. The resulting tram and bus network (Fig.6.7a) is integrated throughout the city and a division of labour created in which bus services feed the tram system at strategic district nodes – including Haslach, Rieselfeld and

Vauban. By 2001 70% of the city's residents lived within 500m of a tram stop (Fig.6.7b), and this is set to increase with planned extensions (indicated in red – several of which are now complete) that will mean that 83% of inhabitants and 88% of work places are within 600m (Beim & Haag, 2010).

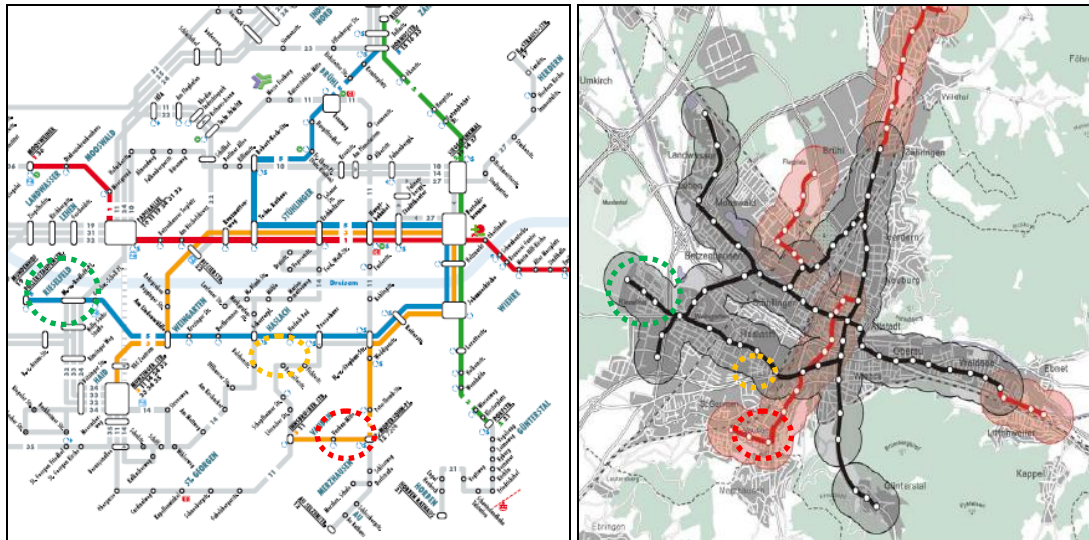


Fig. 6.7 (a) Public Transport Network (City of Freiburg, 2008a) and (b) Population within 400m of Tram (Hildebrandt, 2008)

In 1972 the city had just 29km of dedicated cycle lanes, but today has a network consisting of over 400 km of cycle lanes or cycling priority streets. The city has also invested heavily in cycle storage and secure lock-up points of which there are now over 9000 spread across the city, including the highly symbolic Café Velo adjacent to the main railway station, with storage for 1000 bikes, a repair workshop, shop and bar.

6.4 Car Restraint & ‘Necessary Car Traffic’

Freiburg like West Germany as a whole was overtly pro-car during the 1960s. By the late 1960s, however, the mood had begun to change and by the early 1970s the city's car-dominated land use plan was rejected following popular protest (Buehler & Pucher, 2011). A policy of car restraint has been pursued in tandem with the development of green modes ever since, with the extensive pedestrianisation of the city centre in 1973 an early symbolic act in this stance. In residential neighbourhoods, the city council decided to make all streets 30 km/h zones in 1987 – which covered 90% of all residential streets by 2008, whilst 177 streets were declared ‘home zones’ with 7 km/h speed limits (*Ibid*).

6.4.1 Modal Share and Street Design

Reflecting a policy shift towards car-alternative modes of travel at the macro scale, micro-level modifications in street cross-sectional design have been made across the city in order to

prioritise other modes over the car. An example of such ‘rebalancing’ is described by Jones *et al* (2007:186-187) in the case of Hapsburgerstraße – a major arterial street leading out of the City centre to the northern suburbs of Herdern and Zähringen. Fig. 6.8 shows how the street was re-designed to reduce carriageway space in order to provide generously proportioned cycle lanes and a segregated central reservation tramway which also provides a corridor of grass along the street.

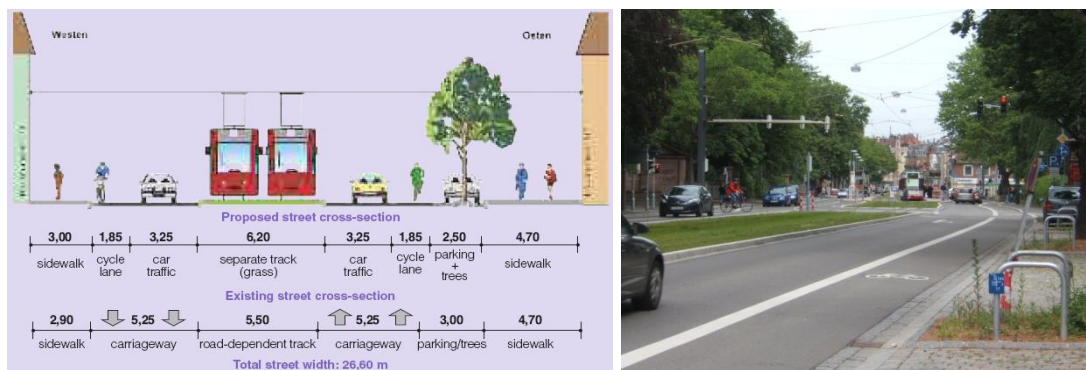


Fig. 6.8 Street Cross-Section with Central Tramway (Diagram from Jones *et al*, 2007)

In an important retail and destination area of the street, a different cross sectional profile was adopted which reduced carriageway space in order to provide space for parking and landscaping, cycle lanes but also with mixed use tram and car space along the centre, separated in time by signalling (Fig.6.9).

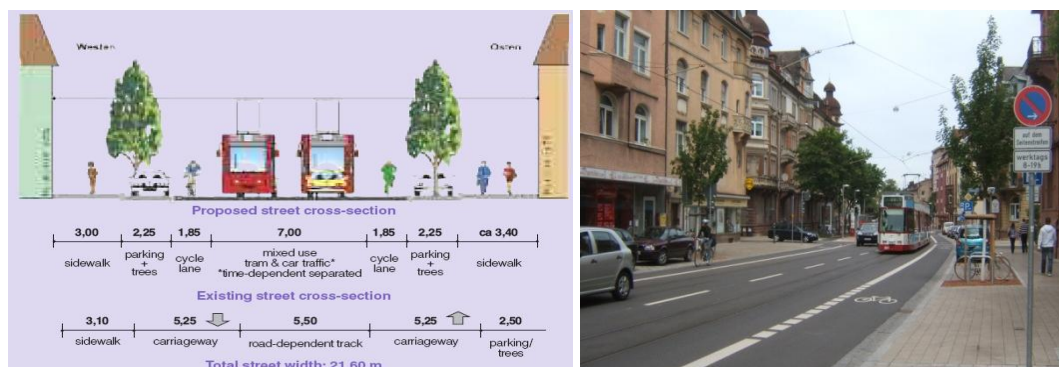


Fig. 6.9 Street Cross-Section with Tram Priority on Carriageway (Diagram from Jones *et al*, 2007)

A significant proportion of Freiburg’s streets have been remodelled way from car dominance and to provide extra space for alternative travel modes. Hildebrandt (2010) notes that nearly half of the city’s tram tracks are now in segregated grass corridors, providing an additional 100,000 sq m of urban green space. The major routes from Vauban, Rieselfeld and Haslach have been similarly treated to provide tram and cycle priority into the city centre. Elsewhere in the city, novel street design measures have been implemented to give tram priority over cars, including the doubling of the road carriageway as a platform for the tram (Fig. 6.10a).

At these ‘cape platforms’ (Holzapfel: Pers. Comm.), passengers wait on the pavement, and road traffic on the respective carriageway is stopped as the tram approaches to allow passengers to transfer.



Fig. 6.10 Car-Alternative Priority (a) Carriageway Platforms (b) Priority Signalling (c) Signal By-Pass for Cyclists

Similarly, simple devices have been introduced to ease the passage of cyclists including the routing of cycle lanes onto pavements and outside of traffic lights in order to avoid interrupting the cyclist’s passage (Fig. 6.10 b & c).

6.4.1 Car Parking

City centre parking has been similarly deterred by a combination of park-and-ride schemes at a number of suburban tram interchanges, pricing and information displays installed to direct drivers early to car parks with available spaces. The city plans to remove all car parking from the city centre in the near future (A). However, the ‘cybernetics mobility concept’ also acknowledges that some journeys need to be made by car. To that end there has also been road widening and improvements to some arterial roads (Buehler & Pucher, 2011).

6.4.2 Overall Effects

The net result of these policy shifts can be seen in car ownership levels. Although Freiburg’s transport policy was heavily pro-car in the 1950s and 60s with the city recording higher than national average levels of motorisation (Fig. 6.11), a turning point came with a decision in the early 1970s to restore the tram network as the backbone of the city. As a result, the rate of increase in car ownership began to wane from the 1970s and car ownership per 1000 inhabitants reached a plateau of just over 400 cars per 1000 in 1990.

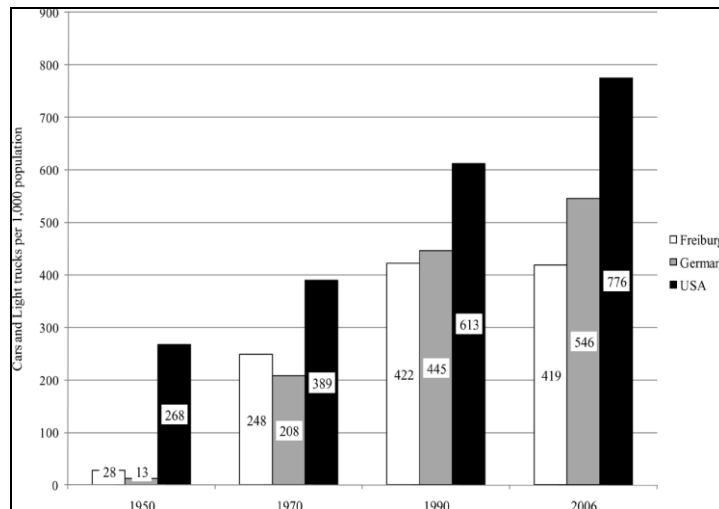


Fig. 6.11 Car Ownership per 1000: (Buelher & Pucher, 2011)

6.4.3 'Necessary Car Traffic'

Although Freiburg may have arguably succeeded in setting conditions that reduce the need to travel by strengthening its districts, and whilst car-alternative urban and regional public transport and cycle networks have succeeded in capturing significant proportions of modal share, an important point is that vehicle ownership in the city appears to have reached a natural 'saturation point'. Private vehicle ownership in the city is lower than the German or state average, but the city's high proportion of students may be as significant a contributory factor to this (B). Yet an important point is that the city is planning for the continued use of the car for a significant proportion of journeys (Fig.6.12), suggesting that the natural extent to which public transport 'supply' can satisfy user demand may also be approaching. Freiburg will continue to plan and cater for 'necessary car traffic' (B) as part of its 'five pillar' strategy.

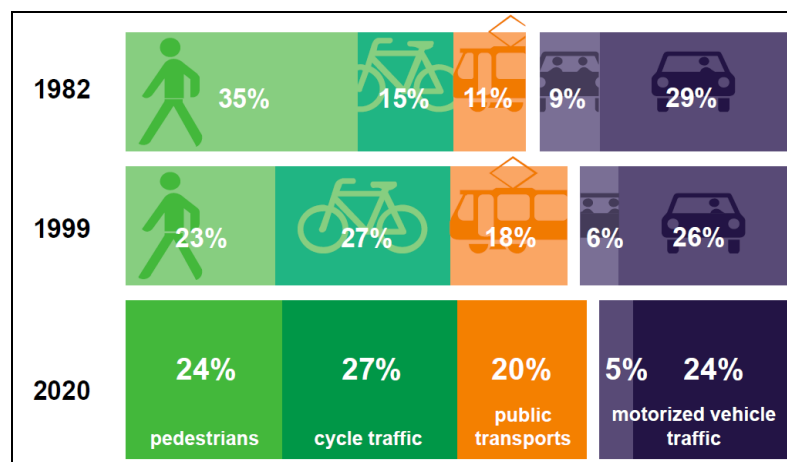


Fig. 6.12 Modal Share in Freiburg (Source: Schick, 2009)

One significant implication is that Freiburg's neighbourhoods will also need to continue to cater for car ownership and use, even if the effects can be mitigated by design. No further 'Vauban' style suburbs are planned for the city (A & B). This reflects both the 'reality' of car ownership levels across the city and a shift of focus towards developing small infill sites as a means to neighbourhood renewal, even if a perceived demand and pressure for further car-free neighbourhoods continues from grass-roots movements in the city (E).

6.4.4 *A City of Equitable Transport?*

Buehler & Pucher (2011) describe Freiburg's public transport as socially equitable firstly because of its extent in serving all parts of the city and secondly because of a ticketing system implemented in the early 1980s, which included the flat-rate environmental ticket accepted on all local transport services. In addition to these two salient aspects, innovative street design and signalling have permitted public transport and cycle networks to compete with cars in overall journey times. The former Director of City Planning, Wulf Daseking, describes the practical reality of this principle applied to his own journey into work from a home in the western suburb of Littenweiler to his office in Stühlinger, just east of the city centre:

I have two or three choices: either I go by car - it takes me around 25 minutes, or I go by tram it takes me 17 minutes, or I go by bike and it takes me around 20 minutes. (A)

This is to describe a journey within the city, but a key element of the Freiburg transport philosophy has been to recognise that successful policy must extend beyond the city's boundaries (Beim & Haag, 2010). With the support of the state government a continuum of seamless public transport has been extended out to the full extent of the city's economic footprint.

6.5 Transport, Urban Structure & Land Use

Freiburg's strategy for curbing overall energy is founded on a policy of limiting travel need in the first instance. A key tenet of this policy is the 'strong neighbourhood' concept in which land use policies are used to direct development, services and retail into strategic inner urban sites – principally the inner city or urban districts. These planning policies are reinforced by Freiburg's two-pronged, 'carrot and stick' approach towards generating a modal shift away from the car through public transport investment and car restraint which has enhanced public transport's role in structuring urban space. Measurable effects of this approach include the doubling of public transport use, a trebling of cycling since the 1970s, the containment of urban sprawl and the establishing of the tram network as the 'backbone' of the city. By binding transport and land use planning policies together the first tenet of Freiburg's sustainable transport strategy has been to minimise the need to travel in the first instance

through a tiered approach to travel in which basic needs are brought as close as possible to the point of need.

6.5.2 *The Structuring Role of Transport*

Although 88% of Freiburg's population reside within 600m of a tram stop, the pattern of the public transport network is arguably as important as its extent. Indeed, it is argued that this city of 210, 000 inhabitants has a 'nodal' public transport structure typically found in a much larger city (B). The pattern of interconnectivity between districts and between different modes (Fig. 6.13), for example feeder bus and tram, which converge in districts including Vauban and Rieselfeld as well as at inner city hubs creates both an accessibility that is attractive to businesses, and a footfall of interchanging passengers that reinforces local retail. By way of anecdotal illustration, one retailer in Rieselfeld estimated that around 30% of customers were from interchanging passengers (I).

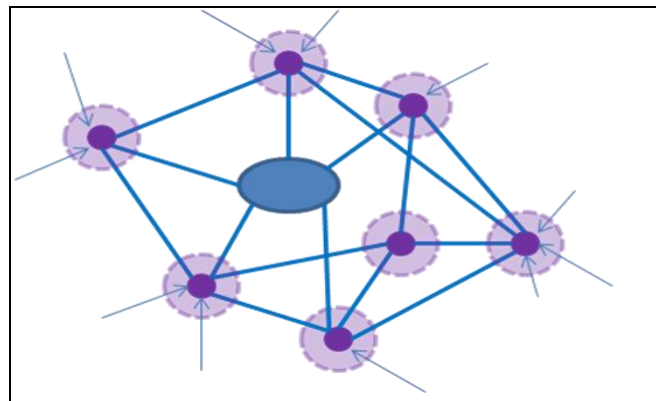


Fig. 6.13 Nodal Pattern of Transport

In addition, good transport connectivity has contributed to the positive image of the city's districts, as indicated by real estate cost, which is likely to have contributed to overall prosperity. As one interviewee notes:

[...] we know that flat prices increase with good access to public transport. So we know that good public transport leads to the consequence that the city districts are seen as very positive [...] (B)

A slight note of caution needs to be added, as the benefits of good connectivity have not been universally felt, and parts of Haslach and nearby Weingarten have not seen the uplift experienced elsewhere in the city with close proximity to the tram (B). However, this is perhaps more a relative than an absolute effect, and as the interviewee conceded, Haslach and Weingarten are not particularly 'bad' districts by any measure (B), and in the broader context of integration and inclusivity could be regarded as a positive aspect. In summary, it may be logically concluded therefore that Freiburg's nodal public transport network with interchange

to feeder services in district-level nodes has been instrumental in setting basic conditions of accessibility and footfall that strengthen the city's districts.

6.5.3 Retail Policy

In tandem with its nodal transport network, Freiburg's 'Markets and Centres' spatial land use policy introduced in 1992 has largely prevented the growth of out-of-town or edge-of-city retail developments and directed retail into urban sites which correspond with the hierarchy of central city, district and village commercial centres (City of Freiburg, 2004). Land use ordinances have set an 800sqm floor area limit for retail stores, with a few exceptions for 'bulky goods' such as furniture and DIY (Hildebrandt, 2008), which has encouraged dispersion of smaller supermarkets to the district scale (A). Grocery and general day-to-day shopping is localised as a result of the restrictions, and one interviewee noted that 'in the whole of Freiburg there is not one shopping mall outside so you go for buying shoes or clothes in the city' (B), in a way that has reinforced the city centre. There may be drawbacks to this policy, for example in terms of the selection of products sold in smaller supermarkets and on costs which have not been explored. However, visual evidence suggests strong trade in the city centre where smaller, independent shops and a large daily market apparently flourish, and similarly the city's districts appear to economically strong.

Freiburg's retail policies have previously been found to have had a profound impact on shopping habits. In a survey of Vauban residents, Nobis (2003) found that nearly three-quarters of residents with cars used them for bulk shopping, but only 10% of the same residents used their cars for their daily shopping needs. It must be noted, however, that this study was undertaken prior to the opening of the tram service to Vauban in 2006.

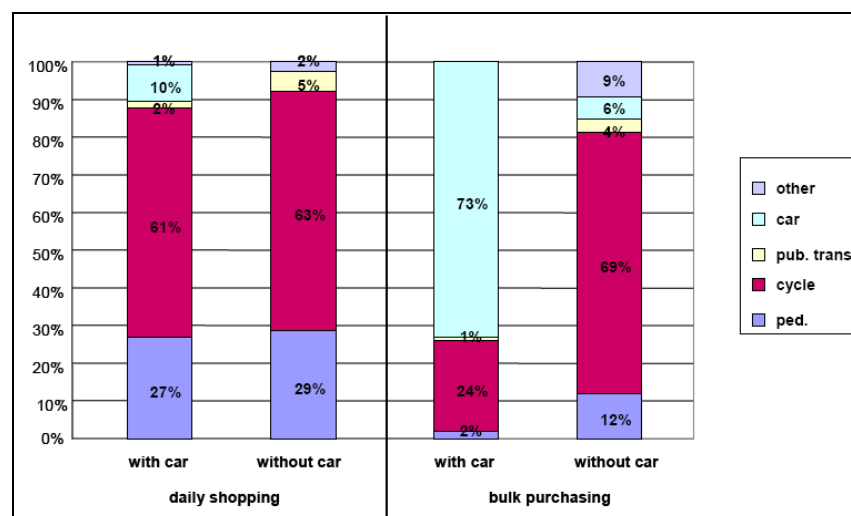


Fig. 6.14 Shopping Trends in Vauban (Nobis,2003)

6.6 Summary

6.6.1 Transport and Social Equity

Buehler & Pucher (2011) argue that Freiburg has a highly socially equitable transportation system, and the review of policy presented above supports this argument which in large part is due to the inclusion of the full range of factors which affect the need to travel. A range of technical devices including priority signalling, segregated lanes for trams and cyclists and number of specific and innovative techniques to street design have sent a clear message about the primacy of green transport modes. Although much of the city's success in generating modal shift has been rightly attributed the investments made to expanding the public transport network and to the introduction of multi-modal ticketing – such large strides are also supported by attention to detail by designers displaying thought to overall journeys rather than just towards individual streets.

6.6.2 Policy Framework

A suite of policies ranging from regional to local transport connectivity, urban design and retail policy have been generated with the aim of reducing travel need in the first instances and private car travel in the second. The three distinctive sets of policies identified in this chapter are:

1. Freiburg's car-alternative transport provision, illustrated by the development of the city's bike and tram networks.
2. Car restraint, which began with the pedestrianisation of the inner city core in the early 1970s and now includes the prioritisation of car alternative modes in street space and routing and the prioritisation of these modes in the design of new neighbourhoods.
3. Integrated transport and land use policies that have developed since the city's post-war reconstruction.

This policy continuum has arguably generated both a top-down conceptual coherence from the policy-makers perspective and a reliable and robust framework from the point of view of the individual which instils confidence. Furthermore, it is argued that car-reduced suburban neighbourhoods of Vauban and Rieselfeld are very much products of the structural coherence in non-car travel that Freiburg has managed to develop since its decision to prioritise green modes in the early 1970s. Against this theoretical policy background and transport-land use

framework, Part B will examine how individuals' lifestyle patterns, accessibility and attitudes bear-out in the three neighbourhood models.

Part B: Car Reduction & Mobility Outcomes

6.7 Introduction

Part A explored the philosophical approach that Freiburg has adopted to transport planning in the face of population growth and a desire to promote alternatives to the car. Through the five pillars of its 'cybernetics mobility concept' together with its 'city of short distances' approach to reducing travel need, the city's transport offer appears to be socially equitable in terms of the parity created between different travel modes. The result has been a stabilisation of overall car ownership levels among the city's inhabitants from 1990 over a period in which overall car ownership in Germany grew by approximately 20%. Through a combination of travel minimisation and the implementation of long term strategies to alternative modes of travel to the car within the city and out into its region, Freiburg would seem to have set the best possible conditions for car reduced residential development.

The aim of Part B is to examine how theoretical conditions relate to the practical reality experienced by residents of Vauban and Rieselfeld particularly, because of the car reduction measures applied in the two neighbourhoods. Because of the need to deploy a different questionnaire format at Haslach, only Vauban and Rieselfeld residents were asked extensively about their perceptions of opportunity and lifestyle constraints. It is also important to try to reconcile these mobility outcomes with the demographic patterns identified in chapter five which noted the abundance of young families in each development. The data presented is from questionnaire survey of residents from Haslach, Rieselfeld and Vauban.

6.7 Car Access

6.7.1 Car Ownership

Car ownership from the household questionnaire sample broadly reflect the official estimates (Fig. 6.15) – the lowest by is far at Vauban (43%) and the highest at Rieselfeld (78%), slightly above that at Haslach (74%), which equates with the official city calculation of 74%. Few residents in any of the developments have no car access at all, although proportionately more residents in Rieselfeld (13%) state that they have no car access than at Vauban (8%), which has greater levels of car club membership and 'occasional access' to another vehicle. In essence, Fig. 6.15 shows that the Vauban population sample is perhaps characterised by a smaller level of car ownership relative to Rieselfeld and Haslach, rather than a large sector of the population with no car access at all.

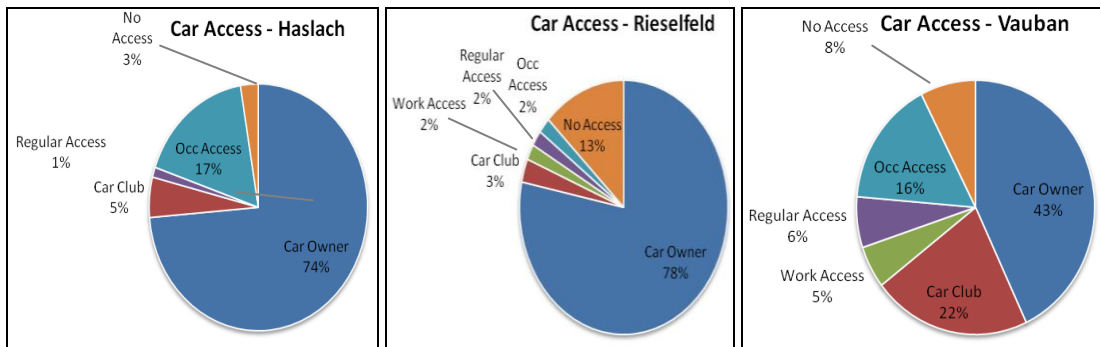


Fig.6.15 Car Access in each of the three neighbourhoods

Residents in Vauban, Rieselfeld and Haslach were asked a number of questions about car parking in their respective developments in the questionnaire survey. With the “car-parking free” nature of Vauban’s design, together with the €17,500 levy per car parking space might be expected to produce a certain amount of negative reaction given the formidable nature of these policies in comparison to the charge-free and seemingly abundant car parking at the other neighbourhoods. Yet the results from the survey reveal a different pattern.

6.7.2 Residential Car Parking

Residents were asked about current levels of car parking compared with their previous address, and from Fig. 6.16 below it can be clearly be seen that the greater proportion of Vauban’s residents have foregone car parking to live on the development, compared with their former neighbourhood. Approximately a quarter of Haslach’s residents in the sample also report that parking is less than where they lived before. Explanatory factors may include the greater proportion of Haslach’s being younger and inhabiting smaller apartments in blocks which placed significant pressure on car parking. For the youngest residents this may also have been their initial move out of their parental home where parking may also have been greater.

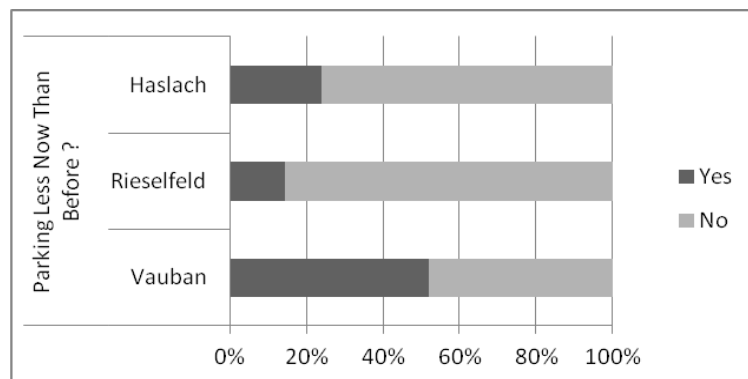


Fig. 6.16 Parking Provision Now and at Previous Address

The reduction in car parking reported in Fig.6.16 is also likely to have had a bearing on perceptions on the adequacy of parking in Fig. 6.17 below. As Rieselfeld residents seem to have experienced less sacrifice in this respect, so their perceptions are correspondingly more positive. When asked whether they felt that there was a sufficient quantity of car parking in their development, Vauban residents were most positive, with 92% responding “yes” (Fig. 6.17) Rieselfeld residents responded similarly, whilst nearly a quarter of residents in Haslach responded negatively. Responses naturally relate to individual circumstances, and the potential link with travel patterns will be investigated later in this chapter. Furthermore, individual expectations and perceptions are also likely to play a critical role, together with a measure of residential self-selectivity. Famous for its car-reducing physical design, Vauban’s residents are likely to have had their expectations managed from the outset and the car management aspects of the development are likely to have had a critical role in attracting a demographic examined in the last chapter, and is considered a positive lifestyle choice by many.

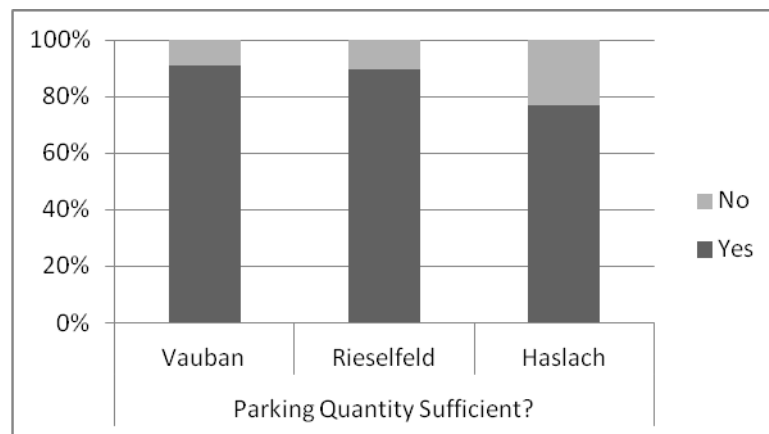


Fig. 6.17 Feelings on Parking Provision

As few residents of Rieselfeld and Haslach pay for car parking, their perceptions of car parking charges are correspondingly positive. Just under two thirds of Vauban’s residents felt that the very steep initial charge and subsequent annual charges were “reasonable”. On the other hand, the provision of car parking for visitors elicited rather a different pattern of responses. Car access and provision of parking has an effect not only on the mobility of residents themselves but also on accessibility from visitors and Vauban residents were least satisfied of the three developments in this respect with nearly half of respondents stating that the on-street, metered parking provided was inadequate for visitors (Fig.6.18). This compares with 36% dissatisfaction at Haslach and 23% at Rieselfeld where parking is on-street or on a private driveway but charge-free.

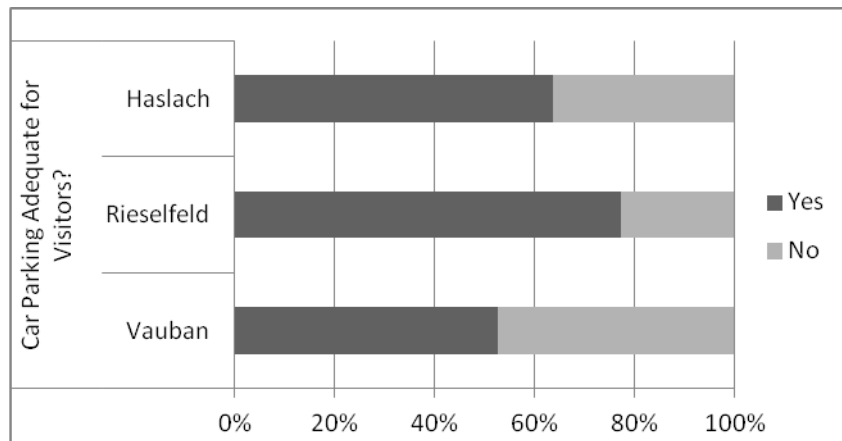


Fig. 6.18 Feelings on Visitor Parking

Ultimately, Vauban and Rieselfeld’s residents claimed to be equally satisfied with car parking on their development at around 80%, compared with just under 70% of the survey sample in Haslach. Management of expectations, residents’ travel patterns and provision for visitors are likely to have a bearing on these outcomes, together with a potentially strong element of residential self-selectivity at Vauban.

Informal, unstructured interviews conducted with a number of residents indicate that the responses recorded from this part of the questionnaire survey and the picture portrayed in official literature are unlikely to have captured the full picture of the car parking situation in Vauban. Anecdotal evidence suggests that a proportion of Vauban residents park their cars in the neighbouring district of Merzhausen, outside of the Freiburg City Authority boundary and where there are no parking controls. The manager of Vauban’s Car-free Association agreed with this suggestion, and estimated that up to 10% of residents might fall into this category (E). Similar problems associated with off-site parking were also found during pilot studies in UK car-reduced and car-free developments at BedZed in South London and Slateford Green in Edinburgh.

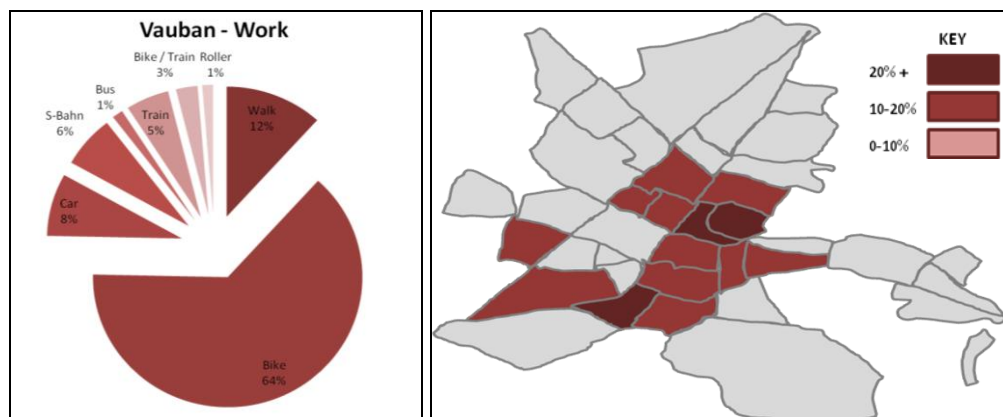
The flaunting of car parking regulations within the development was an issue raised by a number of Vauban residents interviewed (C & G), who complained that self-policing of parking on residential streets was not working. The bulk of Vauban’s residential streets are ‘parking free’ where only loading or setting-down are permitted unless there are extenuating circumstances such as impaired mobility. However, Vauban is largely self-governing in this respect and is not supported by statutory legal powers as the residential streets of the development are private rather than adopted by the City Authority, making enforcement of the car-free rule difficult to achieve.

Problems of off-site parking and on-site rule breaking should not be overstated however as neither in Vauban or at Slateford Green or BedZed did they seem to be widespread or particularly significant issues. But they are potential points of friction both between residents within a development – especially those paying €17,500, and residents in neighbouring developments. They perhaps also serve to illustrate, if it were needed, that achieving car reduction is not simply a matter of designing-out the car from residential development; this can merely push out cars to other places. Moreover, it points towards *reducing individual car need*, as the key to reducing ownership and use in the first instance rather than trying to instigate behaviour change by tackling car ownership as the symptom of the problem of car dependency. Here, the policy of car restraint arguably provides leverage to alternative modes. At Vauban where residential car restraint is greatest, satisfaction with car access is also high – reflecting the policy of providing high quality alternatives to car travel in tandem with policies of restraint, as well as the prevailing attitudes of residents.

6.8 Travel Behaviour

6.8.1 The Journey to Work

The questionnaire survey asked residents to specify the district in which they worked, usual main mode of travel and their average journey time. Modal share and the spatial distribution of employment are shown below (Fig.6.19). Here S-Bahn means *Stadtbahn* or tram and not the regional Breisgau S-Bahn; a point that was clear on the survey forms.



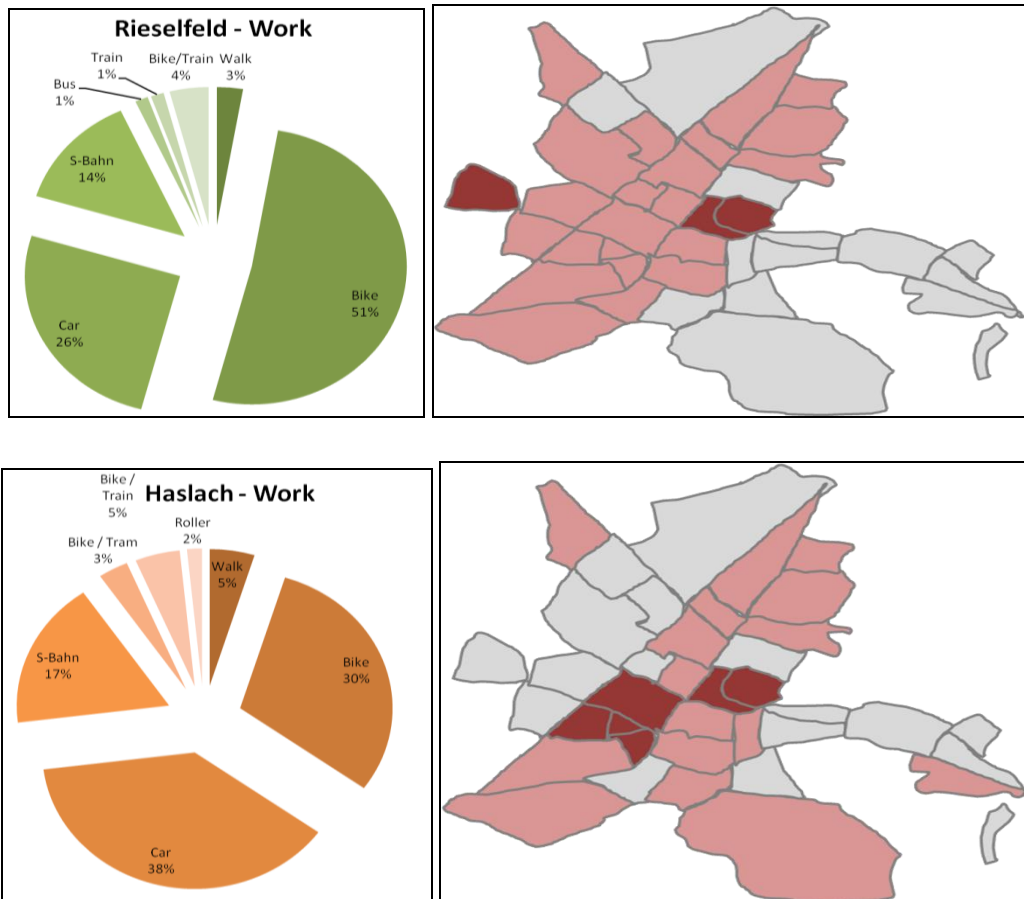


Fig. 6.19 Journey to Work: (L) Modal Share (R) Spatial Distribution (NB: some districts shown in several parts on map)

6.8.1.1 Spatial Distribution

Haslach and Vauban show strikingly different levels of employment concentration, with nearly a quarter of Vauban’s population employed within the district and almost a quarter employed in the city centre. Haslach’s residents appear more diffuse, with 16% working in their district and 12% working in the inner city. Rieselfeld’s pattern of employment distribution is relatively diffuse, with 13% working within the district and about 17% within the inner city. Significant proportions of those who worked within their district specified that they worked at or out of their home, and were sometimes required travel to other localities as part of work.

6.8.1.2 Modal Share

Three quarters of Vauban’s residents cycle or walk to work, compared with just over half of Rieselfeld’s and approximately one third of Haslach’s. Conversely, the car was the single most popular mode among Haslach’s residents (38%), compared with a quarter of Rieselfeld’s residents and fewer than 10% of Vauban’s. However, perhaps more surprising finding is the relatively low level of public transport use among all residents. Only a quarter

of Haslach residents indicated that they used the tram, bus or train most frequently to get to work, with lower proportions of 20% and 15% reported from Rieselfeld and Vauban, respectively. Approximately one tenth of the population of each of the three districts works outside of Friburg itself, with Basel, Karlsruhe and the small nearby town of Emmendingen being notable destinations. This corresponds to the proportion of outward commuters among those of working age reported by (Beim & Haag, 2010), suggesting that the regional public transport service does not just support a one-way flow into the city.

6.8.1.3 Explaining the Patterns

An element of overall caution needs to be exercised, firstly due to the relatively small sample sizes involved. Secondly significant numbers, equating to 10% in Vauban and Rieselfeld and to 19% of Haslach respondents, did not specify the exact locality of their employment - though the bulk of these did give mode type and time. Lastly, travel is also likely to be seasonally affected. A number of residents did state how their travel changed between summer and winter, particularly between walking and cycling in the summer to public transport in the winter.

Yet in terms of defining broad trends from limited data, the patterns of diffusion and modal share depicted above in Fig. 6.19 are also rather compelling. The contrast in levels of spatial concentration and journey-to-work travel mode between Haslach and Vauban are especially striking, indicating that transport might be a spatially limiting factor. Interestingly, however, the relative proportions of those working outside of the city did not vary between developments. Residents of Vauban and Rieselfeld were asked in their questionnaires the extent to which transport options had restricted various aspects of their working lives. The impression gained is that transport options had not generally impacted negatively on employment to any significant extent, although there was a slight suggestion that the journey to work can be more of a problem for Vauban residents. For example transport considerations had prevented two respondents from the Vauban sample looking for work against one from Rieselfeld. Two Vauban residents stated that they had been required to leave work due to travel considerations against none in Rieselfeld. Yet although a slight hint towards travel constraint in Vauban might be interpreted, these results are not statistically significant and the sample sizes are relatively small. Moreover, the overwhelming impression is that mobility constraint with respect to employment has successfully been avoided. It also suggests perhaps that the spatial distributions of employment are characteristic of a process of positive management, whereby residents work in accordance with the best available travel options.

Lastly, residents were asked how long their journey to work took on average (Table 6.1). Inevitably the responses given were not accurately measured and they are potentially influenced by perception. However, excepting the proportion of Vauban residents who walk and the shorter journey time of residents cycling to work in the city centre from Haslach which is more central, the impression given is one of general time equity between modes and between different neighbourhood localities. This could, again, reflect a process of ‘positive management’ – residents live in a locality favourable to access their work (or vice versa) resulting in the varying patterns of dispersal as shown in Fig 6.19. But a spatial diffusion of workplaces across a city is not necessarily an automatic process – and this may relate to the ‘city of short ways’ concept which favours decentralisation through strong districts and neighbourhoods.

	Walk (min)	n	Bike(min)	n	S-Bahn(min)	n	Car(min)	n
Vauban	10	9	19	49	25	5		
Rieselfeld			17	38	21	10	19	19
Haslach			14	19	24	11	23	24

Table. 6.1 Estimated Average Journey to Work Travel Times

6.8.2 Shopping

Residents were asked about their main grocery shopping habits, and also about their use of local shops. The earlier reported pilot studies undertaken in Edinburgh and in South London showed a dramatic rise in car-use associated with bulk grocery shopping. Fig. 6.20 shows modal share and the spatial locality of shopping for residents of each of the three districts. An important point is that Freiburg has limited the size of supermarkets to 800sqm (A) and restricted out-of-town retail, resulting a dispersed pattern of smaller supermarkets.

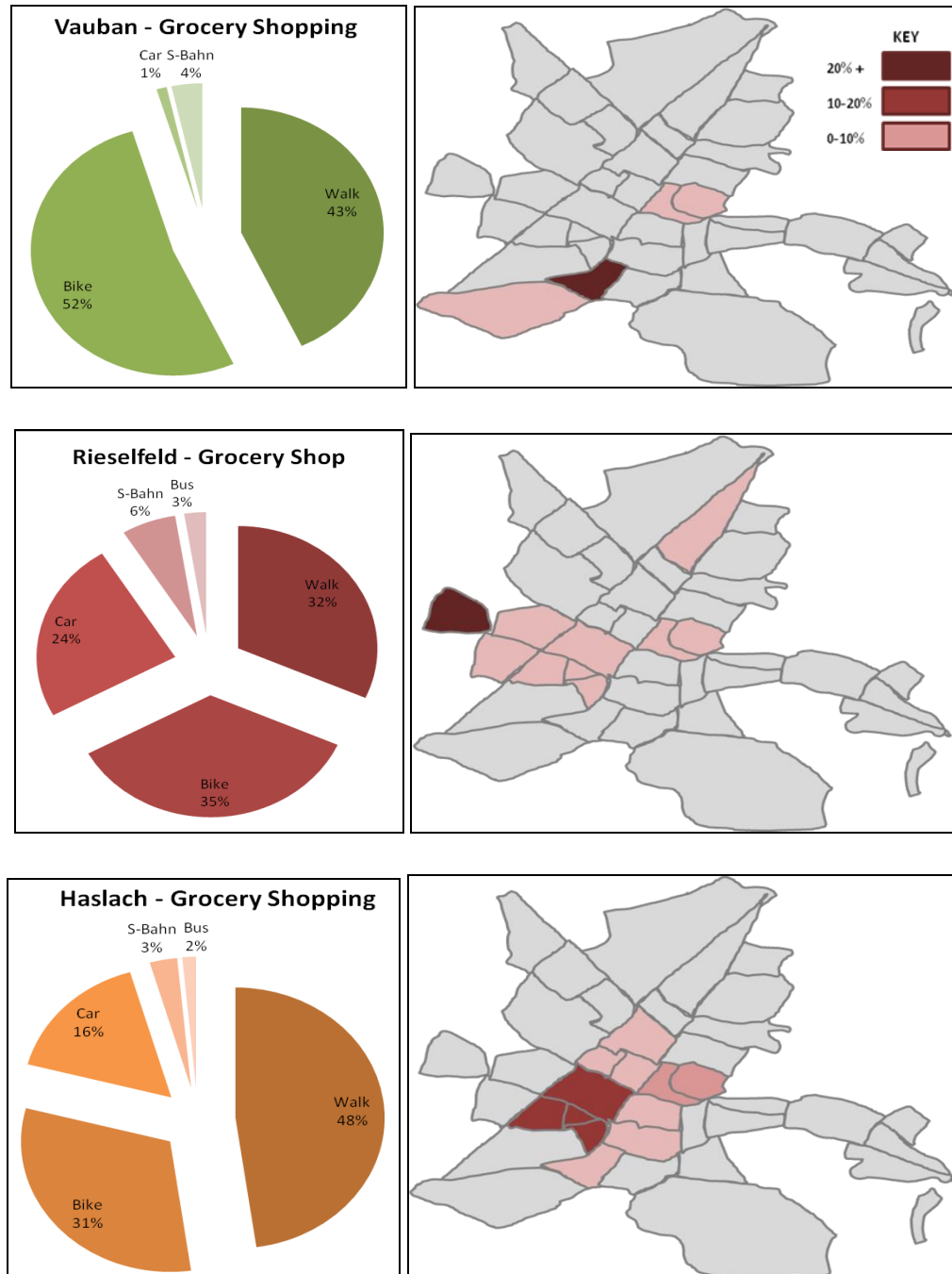


Fig. 6.20 Grocery Shopping (L) Modal Share (R) Spatial Distribution

6.8.2.1 Spatial Distribution

Several findings from the data stand out. First is the concentration of shopping within each of the residents' own neighbourhoods, though slightly less so in the case of Haslach where a greater proportion of residents shop for groceries in the city centre. This pattern is consistent with the pattern of smaller retail outlets, encouraged by restrictions on size and location within the city by planning policies. Vauban has an edge-of-development commercial area surrounding the Paula Modersohn Platz and along Merzhauser Straße, where a number of large retail outlets including several supermarkets are located, attracting shoppers from neighbouring districts including Merzhausen. Additionally, Vauban has a range of smaller grocery shops, including a neighbourhood cooperative and several bakeries along its main axis, and a twice-weekly market in the central market place (Fig.6.21).

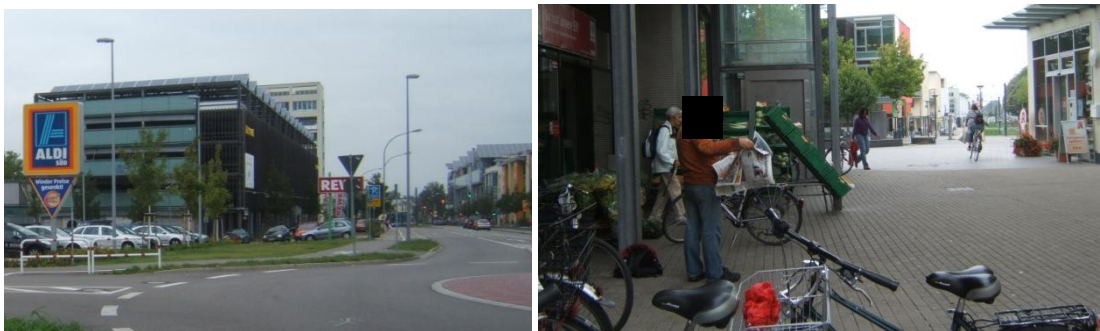


Fig. 6.21 Edge of Development Retail at Vauban (a) Merzhauser Straße (b) Paula Modersohn Platz

As there is only one large supermarket currently in Rieselfeld (Fig.6.22), although another is planned, there is less choice in this respect although there is a wider selection of smaller retail outlets within the development, and a twice-weekly produce market.



Fig. 6.22 Retail at Geschwister-Scholl Platz, Rieselfeld

In contrast to Vauban and Rieselfeld, Haslach has only a limited range of retail and services along its main street – Carl Kistener Straße, consisting of only one medium-sized supermarket and a selection of smaller grocery shops and the occasional fruit and vegetable street seller.

It seems likely that there will be a coincidence between spatial patterns of work and main grocery shopping – shopping after work and so forth. In comparing spatial distributions of work and grocery shopping, this pattern seems most likely at Haslach, although it is not clear whether this is the result of combined or separate journeys. However, perhaps more surprisingly is the modal share associated with each district.

6.8.2.2 Modal Share

Unlike the findings returned from the pilot studies and from empirical studies conducted elsewhere, car use was lower for grocery shopping compared with the journey to work in each district. In Rieselfeld the reduction was negligible, but in Haslach the reduction was greatest, with 16% using a car for grocery shopping against 38% for the journey to work, whilst 79% walked or cycled for groceries compared with 35% walking or cycling to work among Haslach residents. For Vauban residents, car use for the journey to work was largely for travel to places of work outside of the city. An element of caution is required in interpreting the Haslach results, as a significant proportion of the returns came from younger residents of apartment blocks located within 250m of Haslach's main retail area. Although the same level of retail accessibility can be found at Rieselfeld, the provision of generous car parking adjacent to the main supermarket may partly explain the higher car use here, together with car use for grocery shopping by those who also drive to work.

6.8.2.3 Explaining the patterns

Again, there appears to be relative parity in estimated travel times – actual or perceived, between residents in the different localities and between modes (Table 6.2). A suggestion for this, once again, is a determination enshrined in the city's land use policies towards decentralisation, and to ensure that each neighbourhood is able to provide a basic range of needs and that each district has a strong commercial centre. Large edge-of-city stores are able to provide only bulk items (Hildebrandt, 2010) and very large 'superstores' are uncommon.

	Walk (mins)	N	Bike(mins)	N	S-Bahn(mins)	N	Car(mins)	N
Vauban	7	37	7	45				
Rieselfeld	9	25	10	28	12	5	11	19
Haslach	9	32	9	21			9	11

Table. 6.2 Estimated Travel Times for Grocery Shopping

The patterns of grocery shopping, together with the high level of local shop use reported in indicate a high degree of self sufficiency in basic grocery across each of the three districts, which is greatest in Vauban but also significant in Rieselfeld or Haslach. Each district has a strongly identifiable centre containing a range of shops, services and at least one medium-sized supermarket, together with cafes and other venues, and all within a comparatively short distance and easy access of the greater bulk of homes in the neighbourhood. In other words by providing a strong and attractive neighbourhood centre, the need to travel has been successfully reduced, regardless of whether the neighbourhood is car-free or not.

6.8.3 Summary

The spatial and modal share travel patterns presented in this section suggest striking differences between the different neighbourhoods, and particularly the ‘localisation’ of lifestyles at Vauban. This can be recognised as the outcome of a mixed car restraint-car alternative mode policy packages applied most aggressively as Vauban, as well as the attitudes of residents. Thus although causality is difficult to determine – and is certainly beyond the ambition of this research – the patterns do seem to bear relation to policies of the car restraint and car alternative mode provision, with other modes more convenient than the car at Vauban in particular.

6.9 Car Reduction & Mobility Constraint

6.9.1 Cycling

The three neighbourhoods are similarly provided for by high quality cycle routes including dedicated cycle lanes, and residents of each experience the same offer at their destination. However, one basic but essential difference in the cycling provision is in the quantity and quality of cycle storage. Unlike the new developments at Vauban and Rieselfeld, the greater majority of Haslach’s homes were built before the 1970s meaning that particularly those living in apartment blocks are not provided with convenient, secure and level-access cycle

storage. Indeed a short tour of the neighbourhood reveals a great many bicycles chained to railings, lampposts or any other secure point that can be found (Fig.6.23a). Some residents of terraced homes sacrificed front garden space in order to provide cycle storage (Fig.6.23b). By contrast, cyclists needs have been incorporated into the elemental design of Vauban and Rieselfeld, resulting in plentiful and high quality storage (Fig. 6.23c).



Fig. 6.23 (a & b) Bike Storage Problem in Haslach (c) Vauban's Facilities by Comparison

6.9.2 *Public Transport Use*

The questionnaire survey undertaken in Vauban and Rieselfeld asked residents whether their use of public transport was restricted by a list of different factors ranging from safety concerns, financial considerations to routes, boarding and service operations. Just over 40% of Vauban residents and over half of Rieselfeld respondents stated that fare costs were a constraint. This is perhaps a little surprising given the high uptake of the monthly and annual passes among citizens across the city. Indeed Beim & Haag (2010) note that in 2009 86% of the travel on public transport was made by using these passes. An explanation for this outcome simply is that because of the high level of walking and cycling recorded earlier, a significant proportion of residents have not purchased these passes and purchase daily tickets instead when they do need to use public transport. Again, anecdotal evidence would suggest that this is the case with one family asserting a belief that public transport in Freiburg should be free at the point of use (B).

Night time safety was an issue for approximately one quarter of Rieselfeld respondents, more than double the proportion who expressed concern in Vauban. This indicates a specific issue at Rieselfeld rather than a general problem with using public transport at night. One resident interviewed at the Rieselfeld market spoke about a problem with bored youths congregating in groups in the evening near the Lidl supermarket at Geschwister-Scholl Platz, and thought that it could be connected with the social housing that was located in this part of the development. A campervan vehicle was parked close to the supermarket with a sign complaining that the vehicle's tyres had been slashed repeatedly.

Just over a quarter of Rieselfeld and nearly 20% of Vauban's respondents stated that public transport routes precluded use. Although it was not clear whether this meant that other travel modes were used instead or simply that people travel less than they would like to, these results are a little surprising given Freiburg's comprehensive and integrated public transport network. However, this could also be explained by heightened expectations as well as a reflection of genuine shortcomings in the current network, and the planned extensions to tram and bus routes are relevant in this respect.

6.9.3 Conclusions

In spite of Haslach's central city location and easy access to high quality cycle infrastructure that cycle modal share is significantly lower. Although this finding may simply reflect resident attitudes, it may also relate to the poor storage available across this neighbourhood. At Vauban and Rieselfeld, residents did express concerns over the spatial and temporal provision of public transport services and some residents had specific fears over night time safety. Such matters may put residents of these neighbourhoods at a disadvantage compared with the prevailing norm, but it is likely that the residents in question will have simply restructured their lives accordingly and simply accepted it within the mix of compromises when making the decision over residential location noted earlier by Schwanen & Mokhtarian (2005).

6.10 Modal Equity

By analysing data on modal share and average journey time for residents travelling into the city centre for work, an initial impression can be gained on the extent to which the policy of prioritising 'sustainable' modes works in practice. Table 6.4 shows the average stated journey time for three modes from the three developments respectively into the centre of town. The sample is small; for example only one person stated using the tram for their journey from Vauban and no one used their car from Vauban into the centre of town. Times stated are for the door-to-door journey overall and there are many potential variables possible in the fine detail that has not been captured – for example the exact location of parking in relation to work and home, levels of fitness, precise route taken and exact start point and destination. Average velocity (V_{ave}) was calculated using distances from mid-development to a common point in the middle of the inner city. Distances to this point from each development were 3.5km for Vauban, 5km for Rieselfeld, and 3km for Haslach.

	Bike(mins)	V_{ave}	N	S-Bahn(mins)	V_{ave}	N	Car(mins)	V_{ave}	N
Vauban	16	13.1	15	12	17.5	1			
Rieselfeld	22	13.6	8	20	15	6	18	16.7	3
Haslach	18	10	2	14	12.9	5	13	13.8	3

Table 6.3 Average Stated Journey Times to the City Centre

Travel by bike remained the slowest mode of travel from each of the developments into the centre, but the average velocity difference between the fastest and slowest modes of travel were comparatively narrow: 3.8 km/h between bike and car at Haslach, 3.1km/h between bike and car at Rieselfeld and 4.4km/h between bike and tram at Vauban. The difference between average velocities of tram and car at Rieselfeld and Haslach were very small – at 1.7 km/h and 0.9 km/h respectively.

The somewhat ‘crude’ nature of the data - estimation of journey time and the limited sample size precludes further detailed analyses, yet the impression gained is one of equity between different modes for the journey into the city centre. In spite of the tram’s frequent stopping, there is little difference from travelling by tram or by car from Haslach or Rieselfeld, or by bike and by tram from Rieselfeld into the city centre. Once health and cost-saving benefits are accounted-for, the advantage of taking the car and even the S-bahn are greatly challenged. At Vauban, convenient and widespread bike storage close to home makes cycling an even more attractive proposition than the tram, and in terms of journey time certainly more so than a private car parked in an edge-of-development garage.

6.10.1 Equitable Mobility

By drawing together the different strands of evidence presented in this section along with other secondary data sources, it is possible to compare access to Freiburg city centre from each development by bike, tram and car under a ‘traffic light’ system. This compares different aspects of the journey that are loosely brought together under three categories of ‘access’, ‘route’ and ‘destination’. Although the greater focus is on design and planning aspects that affect travel - from storage to ‘experience’, the cost of accessing each transport mode can also be considered – which ranges from low to very low for bike users to very considerable indeed for car owners, and particularly those living in Vauban.

To illustrate translation of the principle of modal share into the reality of cross-sectional street design in Freiburg and detailed design, an example is given below, depicting travel from

Vauban to Bertoldsbrunnen which is generally recognised to be the city centre. The example shows how restricted car access and parking at both origin and destination creates disadvantages the car driver in the first instance, whilst the bikes and trams have a relative superiority of access to home and destination. Although there is segregation between modes over the bulk of the route, and with different routes used for the final stage of the journey into the inner city, a 'pinch point' created by a bridge on Merzhausen Straße gives priority to trams and bikes, and at junction priority signalling prioritises trams.

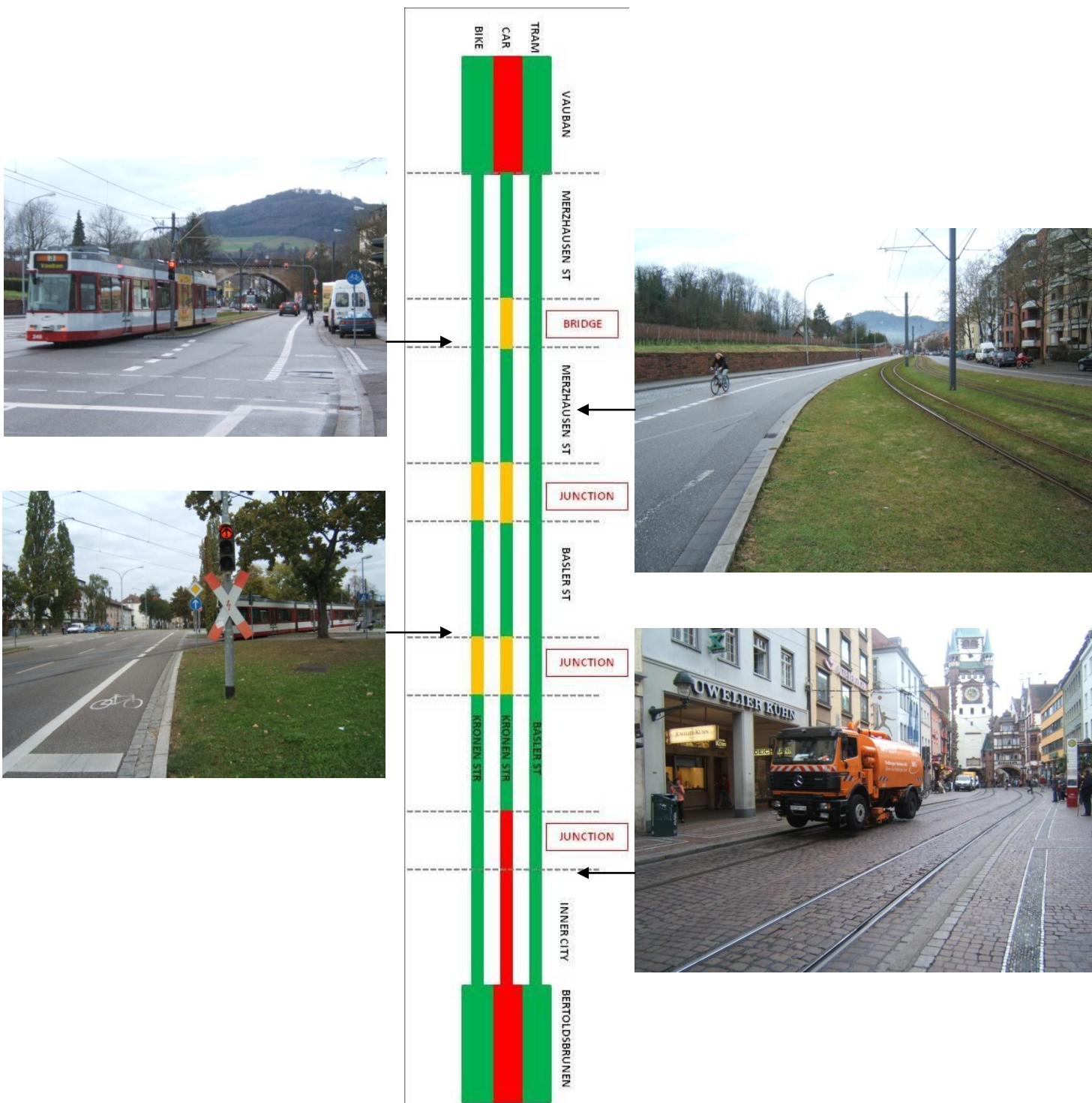


Fig. 6.24 Vauban to Bertoldbrunnen Journey Profiles

In summary, therefore, user experience is summarised below in Fig. 6.25 which draws attention to the mixture of ‘carrot’ and ‘stick’ measures that influence the traveller’s experience when different modes are taken from suburb to city centre.

Vauban		Bike	S-Bahn	Car
Access	Storage	Green	White	Red
	Cost	Green	Yellow	Red
	Network Access	Green	Green	Green
Route	Speed	Green	Green	Yellow
	Experience	Green	Green	Yellow
Destination	Access	Green	Green	Yellow
	Storage	Green	White	Yellow

Fig.6.25 Vauban to City Centre Journey Summary

In Vauban, cyclists are well-provided for bike storage, enjoy dedicated routes into the centre and good facilities universally although cycle lock up space can be a problem in some destination areas. Constraints for accessing the city centre by bike can therefore be regarded as minimal. The questionnaire survey revealed that fare costs and routes did constrain public transport use for a portion of the population, but in other respects – particularly journey time, residents can access the city centre freely by tram. For car drivers, parking arrangements at Vauban are a considerable constraint and once on the route into the city centre road space priority is given to tram services at various points along the route, whilst congestion and car parking present further restrictions. Because of these wider aspects of street design, transport planning and traffic management, Vauban residents are heavily orientated towards sustainable transport modes.

Rieselfeld		Bike	S-Bahn	Car
Access	Storage	Green	White	Green
	Cost	Green	Yellow	Yellow
	Network Access	Green	Green	Green
Route	Speed	Green	Green	Yellow
	Experience	Green	Green	Yellow
Destination	Access	Green	Green	Yellow
	Storage	Green	White	Yellow

Fig. 6.26 Rieselfeld to City centre Journey Summary

Rieselfeld residents enjoy similarly good levels of bike storage, network access and routes into the city centre as those in Vauban (Fig.6.32). Similarly, the public transport costs and route services may be a limiting factor for some but once on the way into the city centre, passengers can expect a smooth and efficient journey. Unlike Vauban, however, residents are not financially penalised for car ownership or heavily restricted in where they can park, but street design and traffic management privileges other modes over car drivers.

Haslach		Bike	S-Bahn	Car
Access	Storage	Red	White	Yellow
	Cost	Green	Yellow	Yellow
	Network Access	Green	Green	Green
Route	Speed	Green	Green	Yellow
	Experience	Green	Green	Yellow
Destination	Access	Green	Green	Yellow
	Storage	Green	White	Yellow

Fig. 6.27 Haslach to City centre Journey Summary

Lastly, Haslach residents in older apartment blocks face an immediate constraint on bike ownership due to the lack of storage facilities (Fig.6.27). In other respects the cycle

infrastructure from Haslach into the city centre is as good as the other developments. Similarly, tram services into the city centre are also the same as for the other developments as no homes are further than 500m from the nearest tram stop. However, from the evidence of the questionnaire results, Haslach residents do feel constrained by the lack of parking in their neighbourhood. This could simply be a subjective response but could also reflect a genuine shortage of spaces – particularly for those living in apartment blocks. Considering all factors together, tram services probably provide the best overall means of accessing the city centre.

6.10.2 Conclusions

Once again the evidence indicates the effects of policies which restrain car use and provide high quality alternatives in a progressively aggressive manner, from Haslach through to Vauban. However, the journey profile from Vauban to Bertoldsbrunnen also show how such policies operate at the wider scale across the city, to make tram and cycle journeys as timely as the private car.

6.11 Summary

Two overall conclusions can be drawn from the discussion in Part B, in relation to the following three facets of policy described in Part A, namely: (i) car restraint, (ii) high quality car alternative travel, and (iii) integrated transport and land use. Firstly, Freiburg has demonstrably tilted the balance of travel away from the car and towards alternative modes of travel, through a combination of reducing travel distances and by giving priority to non car modes through urban design and traffic engineering devices. Secondly, the example of Haslach demonstrates that residents of traditional neighbourhoods can experience relative disadvantage compared with those of the newer neighbourhoods such as through poor cycle storage, inadequate parking and fewer neighbourhood facilities. The lesson here from Vauban and Rieselfeld seems to be in providing shared bike storage facilities.

A number of specific issues have been raised; firstly, in regard to on-site parking violations and off-site parking violations at Vauban, secondly, about visitor parking – an often overlooked matter, and thirdly over safety fears for late night public transport users at Rieselfeld. Vauban might be considered as the most ‘self-contained’ of the three neighbourhoods, in terms of travel to work and shopping, and although the nearest secondary school falls in the neighbouring district of St Georgen, this is a distance of less than 1km from central Vauban. However Vauban’s apparent containment does not equate to its residents being disadvantaged in mobility terms, but rather seems to suggest that essential needs are nearby: the city of short distances concept demonstrated in a way that has not been before.

Given the high quality of car-alternative transport throughout Freiburg, it is unlikely that concern over potential mobility disadvantage has had a dramatic influence on residential self-selectivity in Vauban particularly with its stringent policies. Nor is it likely that potential mobility disadvantage in Vauban has been negated merely by the demographic profile of its residents that are in some ways less likely to experience it as a result. One significant finding in this respect was a decision by one couple, one of whom was wheelchair-bound, to locate to Rieselfeld rather than Vauban due to the better universal accessibility particularly to buildings.

The findings suggest that context is a critical issue in residential car reduction. In Freiburg, residents of suburban Vauban are well provided by a seamless continuum of car-alternative transport across the city and out into the surrounding region. By contrast, in Edinburgh the Slateford Green example cited in chapter three underlines the challenges and potential vulnerability of residents of car-free developments whose mobility patterns differ from the norm. For the Vauban resident, there is a seamless continuity of car-alternative travel from the secure and convenient cycle facilities of the residential block, through the pedestrian-oriented neighbourhood to the city-wide and regional networks. By contrast, in Edinburgh where approximately half of the population commutes by car, Slateford Green residents enjoy little of the seamless continuity of car-alternative travel. The uncertainty created by the ‘buggies on bus’ ban in Edinburgh that was outlined in chapter three was significant both for the residents affected, and as a general principle. Being an anomaly within a wider ‘operating system’ can be problematic. In Freiburg’s case, the operating system has been modified over a period of twenty years.

It is therefore argued that the seemingly insignificant differences in perceptions of mobility between resident groups in the three Freiburg neighbourhoods is in itself significant, given the absence of perceived mobility disadvantage in a neighbourhood such as Vauban which. The twin-track approach of modal parity and travel reduction appears to have created a level playing field of accessibility and opportunities for Vauban and Rieselfeld residents. However, there is an evident danger in assuming that Vauban-style development can be successfully transposed; the evidence in this section suggests that the scheme is very much a product of context and its residents’ pattern of life is supported by a range of long term transport and land use policies at the regional, the city and the micro level of street design.

Part C: Conclusions

6.12 Synopsis

This chapter has explored mobility issues in relation to the question – *does car reduction adversely affect mobility and opportunities?* This central question quickly developed into *how car reduction policies can avoid adversely affecting mobility and opportunities?* It is tempting to believe that demographic self-selectivity can play a strong role in reducing mobility disadvantage where younger and potentially fitter and healthier residents choose to live in such a manner. Yet demographic self-selectivity is not sufficient to negate mobility constraint, particularly as young children bring a different set of needs and challenges which, as evidence from the case of the ‘buggy ban’ in Edinburgh can quickly generate mobility vulnerability.

In Freiburg a wide range of planning policies arguably work in concert to ensure equality of mobility overall, with specific design measures to incentivise ‘sustainable’ transport modes and dis-incentivise car use within the city. These policies range from the post-war reconstruction of the city around a light rail ‘skeleton’, integrated street design and traffic management that prioritise cycling and public transport and, comprehensive neighbourhood planning for shops and services that reduce travel need. Crucially, the latter measure is supported by transport networks with orbital routes and suburban interchanges that strengthen the outer districts through transport nodes and economic hubs which help tie these districts together and give them a linking function between the city and its hinterland. In this way, a set of seemingly basic and somewhat obvious individual policies are transformed into a strong and coherent city-wide strategy that has become greater than the sum of its constituent parts: a city of strong but permeable districts between which citizens are able to flow in a fluid fashion, regardless of car access.

Car ownership remains substantial across the city, even in Vauban where the most robust disincentives and restrictions apply. But contrastingly restrained levels of car-use have been recorded in most aspects of daily life, across the districts from the primary and secondary data sets. In other words, car ownership for the bulk of residents seems to occupy a position of luxury than of necessity, making the city seemingly resilient to a sudden shock in oil prices or other constraints on personal automobile use. Rieselfeld, where no overt car restriction policies exist and where car ownership is just slightly below average levels in particular offers a utilitarian model that induces sustainable travel habits across its citizens in daily life without resorting to stringent curbs. A common story at Slateford Green and BedZed as well as at

Vauban is that stringent curbs have shifted at least a proportion of parking burden onto neighbouring districts, and car ownership is higher in reality than originally estimated.

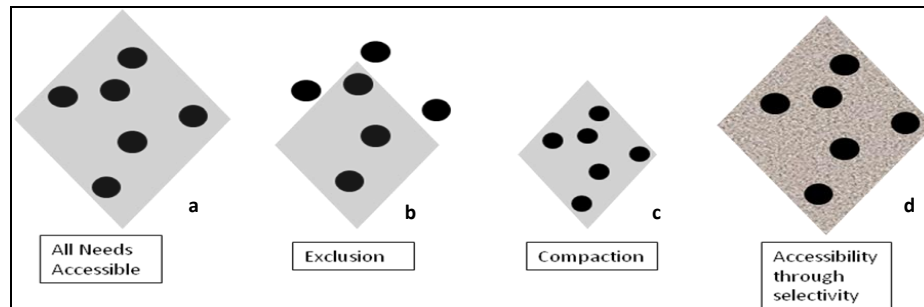


Fig. 6.28 Four Mobility Scenarios

In relation to the four hypothetical scenarios generated at the beginning of the chapter (Fig 6.28), the operation of each of these is evident in different ways. At Rieselfeld and Vauban a younger age profile of residents can be attributed to market demand from that sector rather than the exclusion of older residents due to mobility concerns. However, there is a degree of evidence to suggest that micro-scale issues over building accessibility for the highly tailored homes has factored against Vauban in some instances (Fig.6.28d), with Rieselfeld being regarded as universally more accessible. But in other respects both developments have almost exactly the same car-alternative transport provision, including step-free access to public transport and to movement around each of the developments that would appeal to older members of the community. Both developments have followed the ‘city of short ways’ philosophy in order to reduce travel need (Fig.6.28c). Lastly, although Edinburgh’s ‘buggies on buses’ situation demonstrated how inconvenience and uncertainty creates the potential for exclusion (Fig.6.28b), it more clearly illustrates the need for transport reliability for car reduction to be achieved.

6.12.1 Self-Selectivity and Travel

Building on both Mokhtarian & Cao’s (2008) model of residential selectivity and travel, which was explored earlier in chapter two, and the active role of the built environment on resident profile and travel patterns examined in this chapter and chapters five and three, an emerging model is shown below in Fig.6.29. The model incorporates the conceptual diagram Fig 5.23 developed in chapter five, where the ‘qualities of the built environment’ are regarded as having a defining role in attracting a particular profile of residents, in turn exerting an influence on social interaction, and the overall ‘qualities of residential community’. In addition, this chapter has indicated a link between travel behaviour and neighbourhood qualities, either directly because of planning measures to reduce the need to travel long distances and the disposition of the neighbourhoods towards different modes – such as the

tram, cycling and walking, or alternatively because of the travel preferences (predisposition) of its residents. Fig. 6.29 therefore shows the effect that the process of neighbourhood design and implementation can have in the first instance by drawing a particular demographic of residents, as indicated at Vauban and Rieselfeld - because of the Baugruppen approach. Next, the qualities of the built environment produced will exert an influence on social interaction – for example by prioritising the social function of streets over the movement function, and similarly on mobility by prioritising different options – notably the tram, bus and bike at Vauban and Rieselfeld, where residents need to travel out of the neighbourhood. Lastly, the model shows that social interaction and mobility aspects will feed back once again by attracting particular residents.



Fig. 6.29 Developed Conceptual Framework

Fig 6.30 illustrates how different elements of the process interact. Using Vauban as an example and starting at the bottom of the diagram, one can see how its resident-led design and implementation process – which favoured particular car-reduced design qualities – attracted a particular demographic profile of residents. This process has produced neighbourhood qualities – of physical space, mobility options in relation to the wider city, as well as socializing options, leading to patterns of social interaction and mobility that were described in chapters five and six, respectively.

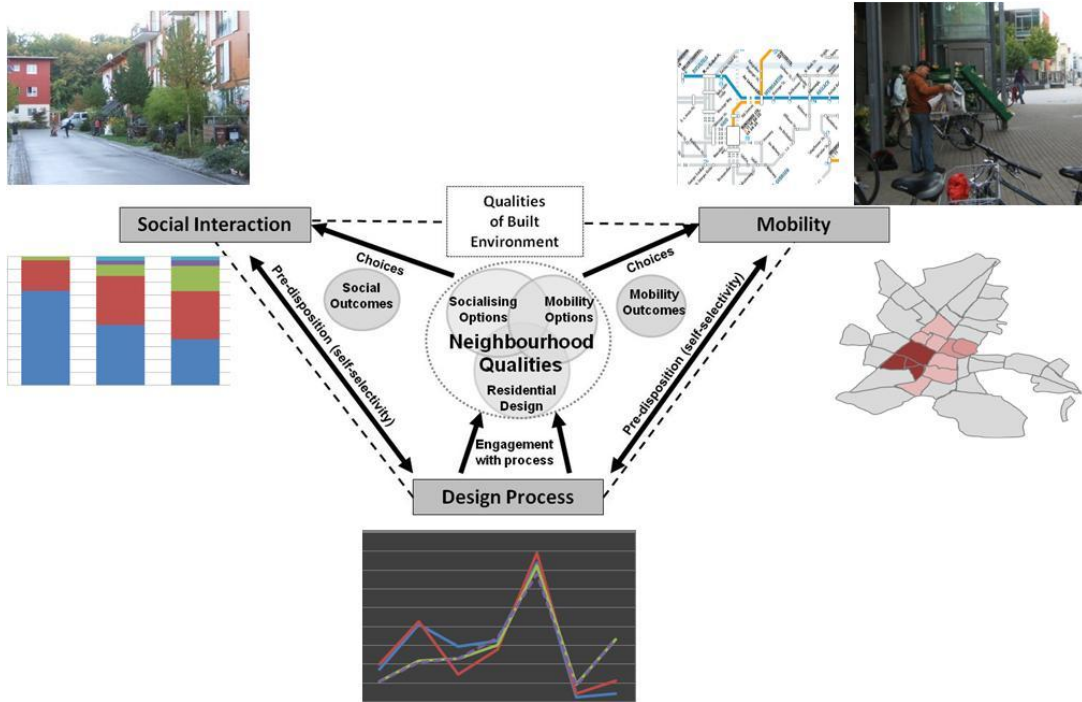


Fig. 6.30 Conceptual Elements Interacting: example from Vauban

The social implications of the interacting processes depicted in Fig. 6.30 most obviously include a degree of self-selectivity suggested by demographic profile, patterns of travel, and levels of social interaction between residents. A more detailed representation of the conceptual model in Fig. 6.36 is given in table 6.5 below using the data from chapters 5 and 6, where green coding represents higher than average, yellow average and red below average.

Set	Factor	Variable	Section Ref	Vauban	Rieselfeld	Haslach
Design	Residential Design	Resident engagement with design process	5.3	Green	Green	Red
		Shared space streets	4.4	Green	Yellow	Yellow
		Separation of parking from homes	4.5	Green	Yellow	Red
		Home Zones	4.4	Green	Yellow	Yellow
	Socialising Options	Clear focal point	5.7	Green	Green	Yellow
		Shared green space	4.5 & 5.7	Green	Green	Red
		Shared play spaces	4.5	Green	Green	Yellow
	Mobility Options	Basic life needs met locally	4.4	Green	Green	Green
		High quality public transport to key destinations	6.2	Green	Green	Green
		High quality walking and cycle infrastructure	6.7	Green	Green	Yellow
Social Outcomes	Demographics	Proportion of 25-35 yr age group	5.2	Green	Green	Yellow
		Proportion of 65+ age group	5.2	Red	Red	Yellow
		Household size	5.2	Green	Green	Yellow
		Not receiving social support	5.2	Yellow	Yellow	Green
	Community	People known in Neighbourhood	5.6	Green	Yellow	Red
		Regular neighbourly contact	5.6	Green	Yellow	Red
Mobility Outcomes	Car Access	Integration into wider community	5.6 & 5.9	Yellow	Yellow	Red
		Non- Car ownership	5.2	Green	Yellow	Green
	Modal share	Non car-use for work	6.6	Green	Yellow	Red
Non car-use for grocery shopping		6.6	Green	Yellow	Red	

Table 6.4 Application and Social Outcomes of Design Elements

6.12.2 *Key Arguments*

In summary, the following conclusions may be drawn from this chapter. Firstly, there is little evidence to suggest that residents in Vauban have been significantly disadvantaged due to curbs on mobility placed by car reduction. This might in part be due to the potential process of residential selectivity noted in chapter five which has created a younger and affluent neighbourhood community, but this argument is not supported. Of greater significance are the measures that have been implemented throughout Freiburg to reduce travel need in the first instance by creating strong districts, and by creating relative equity between different travel options within the city as demonstrated in both perceptions of travel time and in the priority given to different modes by street design. However, it must also be recognised that another mitigating factor is that a half of Vauban households are car owners, and furthermore that car travel forms a substantial proportion of modal share in the city, in spite of countering the national trend. This may be both due to the enduring German ‘love affair’ with the car, and also a reflection of the ‘necessary car traffic’ generated by demand for travel not being entirely met by alternative means.

From this discussion a second conclusion may be drawn, that the overall urban ‘operating system’ has a critical role in supporting neighbourhood car reduction, and whilst the term includes the car-alternative transport package, wider factors that support travel reduction – such as retail policy, are also critically important. The extent of car reduction should fit both the urban context and realistically reflect the way that lives are typically organised in time and space. In this respect, Freiburg has demonstrated that privately owned cars must factor part of the overall mobility package. Conversely it also suggests that residents at Slateford Green are arguably more exposed to disadvantage because the scheme is anomalous to Edinburgh’s operating system as indicated by modal share, than Vauban residents are to Freiburg’s. Site location in relation to a significant transport node is also an important consideration here. Vauban and Rieselfeld may both be considered nodes in their own right, but importantly the tram provides reliable access to the wider network.

Lastly, therefore, the evidence from Vauban and Rieselfeld suggests that although reducing car ownership could have net benefits, such as in terms of overall residential space consumption and embodied energy use in production, car ownership can be de-coupled from car use and the negative impacts of the car within the neighbourhood reduced by design.

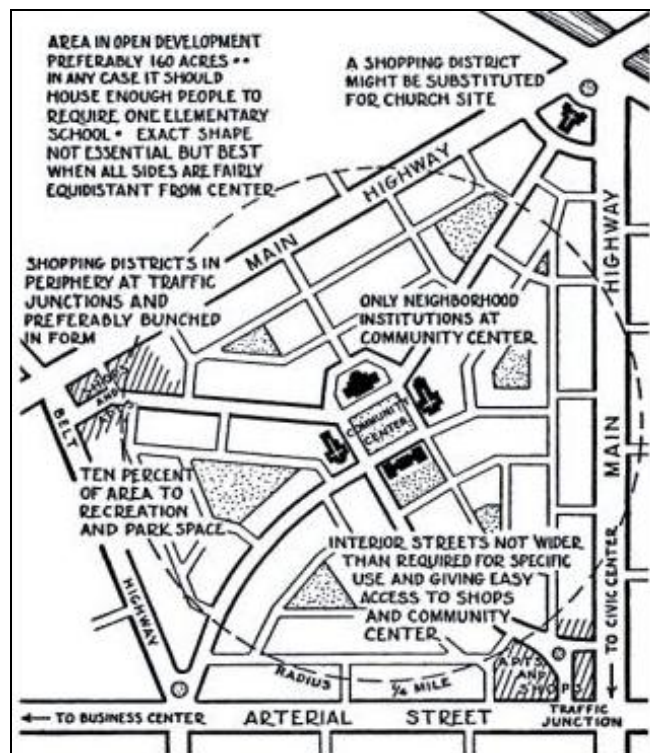
6.12.3 Lessons for the Four Models

The principal lesson for the application of the four conceptual models is to achieve an appropriate 'fit' between model and spatial context which supports the full extent and complexity of residents' accessibility needs. Where measures to heavily constrain car ownership and use are to be implemented, this means a situation and style of development which limits the necessity to travel in the first instance and guaranteed car-alternative travel in the second. Achieving the fit between context and development model is the subject of the next chapter.

Lessons: 1

Residential Car

Reduction & Context



Urban Operating Systems

7.1 Introduction

This chapter considers 'how' residential strategies should be implemented. A critical initial consideration is the starting point for approaching neighbourhood strategies and an appropriate model of development. The argument is that the operating system, defined as the range of policies, measures and transport services which affect patterns of travel across a city or region, rather than the design of the neighbourhood - important though it is - should be the first consideration.

With social equity issues of accessibility and self-selectivity in mind, transport is perhaps the most crucial element of consideration but requires looking at a site in relation to nodes in the transportation network, the quality and usability of the networks in providing car-alternative options and the long term security of accessibility. Other crucial factors include planning policies which extend beyond transport and land use to include, for example, retail as an aspect that can determine the strength of neighbourhoods and exert an influence on travel need. Larger cities are perhaps more likely to have existing patterns of modal share underpinned by extensive and quality public transportation networks, and comparatively developed sub-regional governance structures to provide the geographical scale of support car needed to support car-reduced living. Indeed, Freiburg is perhaps somewhat unusual by general standards for the extent of its car-alternative transport offer for its comparatively small size, though perhaps not by the standards of central Europe, where cities such as Basel, Bern, Karlsruhe and Vienna have comparable networks and patterns of modal share (Buehler & Pucher, 2011) despite being comparatively small in size. Such cities, where modal share is less car dominant, may be particularly suited to car reduced development. In the UK, Melia (2010a & 2011) has identified a 'niche' market for car-free development consisting of groups which the author describes as 'car free choosers' – those who voluntarily live without the car, or 'car free possibles', those who would be willing to forego car access for a better quality of living environment.

Before attempting to determine the lessons for future development, it is worth briefly refreshing and summarising the aim and objectives of residential car reduction. The opening chapter of the thesis explored some of the broad social, environmental and economic sustainability rationale that supported car reduction, including pollution, land consumption and energy security. Chapter two placed residential design with a broader context of land use and transport and specifically the historic influence of transport networks on urban layout. Because urban form has traditionally followed the transport function, the chapter concluded that car-reduced development occupied an uncertain position in countries such as the UK where the private car is dominant. Chapter three looked at the social dimension of

neighbourhoods and the ways in which design could affect well-being, in terms of social interaction, access to basic needs, green spaces and in terms of residential selectivity. The chapter concluded that there was a strong potential for car-reduced neighbourhoods to be highly self-selective through the creation of ‘green ghettos’ that could be regarded as socially divisive.

7.1.1 Design Objectives

Given the persuasive rationale for residential car reduction set out in chapter two, but concern over the negative consequences of selectivity that were presented in chapter three, the design objectives for the purpose of this thesis are defined by a series of basic social considerations. These may be defined as:

- To create sociable neighbourhoods, in which there is a strong likelihood of engaging in social contact both with residents of the neighbourhood and those living elsewhere;
- Accessible neighbourhoods in which residents are not disproportionately restrained in their mobility or ability to access opportunities or to be accessible from others;
- A reduction in travel need in order to fulfil the spectrum of life’s basic needs.

Straightforward as these objectives might seem, chapters five and six have determined that successful implementation – in Freiburg at least, has been founded on a geographically wide and temporally long term vision, supported by detailed and deep policies. Although Freiburg has set out a series of long term visions in its twenty year transportation and land-use plans, and critically perhaps the plans have been linked together, pragmatism has also been a core driving element. Principally this has centred on the need to cater for the market demand for housing within Freiburg’s administrative boundaries, and also to achieve a practical demographic balance in the structure of new developments – to address demand rather than to engage in social engineering. Importantly, each development has included an element of car provision. Indeed, for all the negative impacts described in the opening chapters, the car has consistently been included as part of the mobility ‘package’ in the Freiburg schemes.

7.1.2 Importance of Context

Although there is much to be learned from the policies implemented in Freiburg, context must be recognised as fundamental; approaches that have successfully been applied in one city cannot be assumed to work in another. This makes the task of identifying of measures that have supported successful policy implementation critically important. At the broadest level, Germany’s decentralised political apparatus supports a system of directly elected city mayor

yielding substantial legislative powers that has effectively bridged the gap between a strong local green movement and policy implementation (B & C). Similarly, geography is profoundly important, given the city's strategic central European location, warm climate, and the appealing hills of the Black Forest hinterland that has contained the city's outward development. Compact, temperate and flat: Freiburg's geography has lent it naturally towards cycling and walking, and a large student population has produced a demand for travel by these modes (B).

Nested within the 'macro' scale of contextual conditions including strategic level aspects of planning policy and urbanism, 'micro' level aspects of residential design can exert a 'fulcrum'-like physical determinism that tilts neighbourhoods between car dominance and sociability. That is to say, the evidence from chapter 5 confirms that car dominated neighbourhoods are likely to be intrinsically less sociable (Appleyard *et al*, 1981; Lefebvre, 1974). This raises a question of whether a 'sweet spot' can be identified in which the twin objectives of mobility and sociability are balanced. Yet again, context plays a critical role. Slateford Green was designed with copious and easily accessible cycle storage yet a very low proportion (5%) of residents regularly cycle (Eastwood, 2008) for reasons including the city's overall cycle infrastructure, climate and topography; indeed Edinburgh has a very low proportion of cycle commuting generally at just 3%. Similarly, just because the Slateford Green development is situated between two 'quality' bus corridors of the Gorgie and Slateford Roads has not meant that the bus services will be accessible for all as the 'buggies on buses' case has underlined. In this way, Slateford Green serves to demonstrate how car reduction has the potential to constrain travel, when other mobility options are taken away.

A consistent pattern of enhanced social interaction through reduced vehicle traffic has been obtained in every instance in which it has been measured since Appleyard *et al*'s (1981) seminal work in San Francisco streets. Appleyard *et al* (1981) noted that the specific reasons for this pattern were difficult to pin-down exactly, but were attributed to the character or 'liveability' of each street that in turn influenced related factors, including tenure and turnover and use of domestic space. In the case of Vauban, one might suspect that homogeneity of a 'green' community drawn by a shared desire to live with the principles of 'car-free living' would exert an influence, yet in Rieselfeld the development of street and neighbourhood networks are strikingly strong even in the absence of such profound and unifying principles. The high proportions of families with young children may have much to do with the strong community development found in both developments. Although the presence of children in a neighbourhood can alter community relations significantly, it is argued that a safe environment for children to play in can increase the effect considerably. This is where residential car reduction can profoundly influence community relations – by creating safe

streets, and by turning over land that could have been used for car infrastructure to other purposes – playgrounds, open spaces, wild spaces and so forth.

Evidence from chapters five and six suggests that substantial residential car reduction - along the lines of Vauban, is predicated on excellent city and regional transport infrastructure in order for developments not to become enclaves of the few or the needy. Obvious as this might seem, meeting individual mobility needs without recourse to the private car requires a level of analysis of travel and long term and coherent policies to meet demand. Evidence from developments such as Slateford Green suggests that mere ‘transit orientation’ based on the anticipated journey to work is not enough if the other key elements for life are dispersed or not easily reached with the transport options available. It follows that the incentive of excellent public transport infrastructure in combination with dis-incentives for car-use will create the necessary conditions for reducing car use anyway as will be explored in the next section.

Part A: Macro Context and ‘Operating Systems’

7.2 Needs and ‘Nested Travel’

Building on the findings presented in chapters 5 and 6, the following sections explore a range of important broader contextual factors which, it is argued, should be considered in advance of detailed neighbourhood car-reduced design. This approach is founded on the basic logic, evidenced in the empirical findings from Freiburg that lifestyles and livelihoods are organised extensively over space and can involve considerable levels of temporal complexity. Such spatial and temporal organisation has been supported to a considerable extent by the relative freedom permitted by the automobile, and it therefore follows that the city or region must have policies to reduce the need to travel in the first instance, and a transport offer which permits car-alternative travel in the second.

The operating system concept introduced in chapter 6 describes the interaction of such policies and measures, and typologies of appreciably different systems are presented towards the end of Part A. It should be noted that the term ‘operating system’ has been included as a working definition, and has not been employed as a means to compare the operation of a city with that of a computer. Indeed, the experience of modernism shows that consideration of urban space in machine-like terms, with sentient humans compared to robots, has been an uncomfortable one that has led to undesirable consequences.

In chapter two it was argued that urban form followed the movement ‘function’ as defined by the dominant mode of transport; a rudimentary notion supported by the compactness of historic cities built around foot travel and the sprawl of those designed around the private car. Although the logic seems basic, it raises important question of how residents of car reduced schemes meet their travel needs in places where the car is dominant. Although travel ‘need’ is a contestable term, a lengthy discussion about ‘need’ and ‘desire’ might be avoided by recognising the existence of ‘core needs’. On the ‘supply’ side, Hägerstrand (1971) noted the vastly superior geographical range that a car driver had over a walker and thus a superior potential range of access to opportunities. Evidence from aspects of travel behaviour presented in chapter 6 suggests greater spatial proximity of employment and grocery shopping between Vauban residents and those living in Haslach, and contrasting patterns of modal share with the greater proportion of Vauban residents commuting and grocery shopping by foot or bike. Yet 43% of the Vauban survey sample were car owners, compared with the official average of 48%, and a further 22% belonged to a car club; Only 8% of residents stated that they had no car access at all.

One way of characterising the mobility patterns of the Vauban, and to an extent the Rieselfeld resident is in terms of ‘nested’ prisms (Fig.7.1) consisting of ‘core’ activities represented by work, grocery shopping, school and services. Travel for these activities is met mostly through physical modes of travel, which are feasible because of short distances, ‘push factors’ including good cycle and pedestrian infrastructure and the ‘pull’ factors of car restraint at origin and destination. Beyond the essential core is a layer of ‘regular’ travel such as for meetings, socialising, leisure and bulk purchase shopping. Although detailed travel data has not been obtained for this layer, a greater potential diversity of destinations may be expected and a greater diversity of modes taken to reflect both the greater geographical spread, the practicalities of the situation and also the investment into a private car that half of Vaubaners have taken. Lastly, one might expect an outer layer of occasional travel for social, business and leisure purposes, entailing a potentially wider spectrum of destinations and circumstances which have a bearing on travel mode.

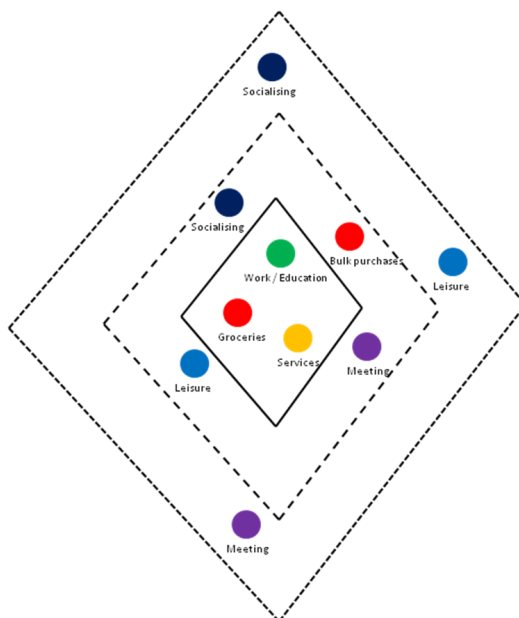


Fig. 7.1 Nested Prisms of Mobility Need



Fig. 7.2 Regional Transport: Kirchzarten Station

Although Fig. 7.1 concentrates on spatial aspects of travel organisation - and it must be recognised that the complexity would increase if temporal aspects of travel organisation were to be considered, the diagram may be seen to reflect Freiburg’s overall approach to mobility management. Planning has concentrated on reducing travel for core activities by promoting strong districts, containing outward development and encouraging car-alternative modes through permeability, infrastructure and organisation. In terms of regular travel, only large bulk-purchase retail is permitted in outer city sites and are well-served by public transport, otherwise the city is well-connected by public transport to the region framed by a rail ‘backbone’ with feeder bus services and ample cycle provision in towns and villages (Fig.

7.2). Yet the car is also recognised as a key component of Freiburg's transport offer both currently and in the future – an important though perhaps not always a 'vital' element of regular and occasional travel. For occasional travel, Freiburg has a similar transport offer to many small-to-medium-sized cities although it is strategically well-located on the high-speed rail line and autobahn between the major cities of Karlsruhe and Basel, and has direct connections across Germany and Europe including from its 'Eurairport' shared with Basel and Mulhouse. In sum, the concept of nested mobility needs presented in Fig.7.1 seems to be born-out in Freiburg and in its region and broadly suggests that car access is desirable for non-core travel, for the average Freiburg citizen and not just the Vaubaner.

7.3 Urban Structure & Strong Neighbourhoods

Freiburg might be described as a 'car-reduced city' in which Vauban and Rieselfeld fit as just two pieces in a much larger jigsaw puzzle that has stemmed from a bold, clear and long term vision of how Freiburg should undertake post-war reconstruction. An early decision was made to rebuild the tram system at a time when other European cities were dismantling theirs, whilst two events – the 1973 oil shock and the 1984 Chernobyl accident swayed decision-makers and the greater public against relying too heavily on petroleum and against any nuclear power at all. The solution therefore was to restrain energy consumption as much as possible by encouraging dense development around a robust 'skeleton' provided by the tram system.

Vauban, and Rieselfeld, can be viewed as products of the wider 'system' of Freiburg; suburbs that are built around a mass-transit system with internal movement orientated towards the foot, 'urban villages' configured for self containment but with allowances made for car ownership and use. They are products of a deliberate strategy to encourage dense growth around its public transport system in a manner that could be recognised as 'smart growth'. Yet Freiburg's structure is not limited simply to orientation around linear transport routes in the much vaunted style of Copenhagen with its five fingers but incorporate districts that serve as functional nodes in a city-wide network. Although the districts fall short of being 'polynuclear' – the city centre asserts an unchallenged dominance in Freiburg, decentralisation has nevertheless been encouraged through widely accessible outer suburbs that form places in themselves rather than being relegated to conduits for flows of traffic in and out of the city. The functional importance placed on nodal suburbs is not unique to Vauban and Rieselfeld. At the end of each tram line is a transport interchange for orbital and regional bus services (Fig.7.3), whilst local feeder bus services criss-cross the intervening stops. It is a system that creates high levels of accessibility in the outer regions and with its expansive catchments for planned journeys combined with incidental footfall from

interchanging which generates economic activity and attendant mixed-use development (Fig.7.4).



Fig. 7.3 Littenweiler: Interchange From Above – Arrow Shows Photo; Fig.7.4 With Mixed Land Use (Freiburg Bild Galerie)

A corollary of the strong district hub is that it serves to fuse different neighbourhoods together. Merzhausen straÙe in Vauban illustrates this well, serving as the commercial and transport focal point for three neighbourhoods- Merzhausen, St Georgen Süd and Unter Wiehre, as well as for Vauban itself. Similarly, at Haslach Carl Kistener straÙe serves as a focal point for the adjacent neighbourhoods of Weingarten and Haid as well as for Haslach itself. Indeed, the pattern of neighbourhoods joined together by local hubs centred around public transport nodes – and perhaps critically by fixed light rail, is replicated across the city.

Because of its role in shaping movement and structuring space the transport network underpins the basic functioning of the city. Figure 7.5 (i) depicts the nodal interconnections of well-developed networks typical of larger ‘polynuclear’ cities which Freiburg faithfully replicates (B). Each public transport node is an interchange point between different transport services – for example the tram and feeder bus services to other districts or outlying villages and towns. Figure 7.4 (ii) on the right shows the radial pattern typical of a smaller city such as Tübingen – a city of 84,000 inhabitants which will be discussed later in the chapter. There are few suburban nodes and consequently few direct public transport services except into and out of the inner city, necessitating greater car travel among residents and encouraging little of the economy-stimulating footfall of Freiburg’s districts.

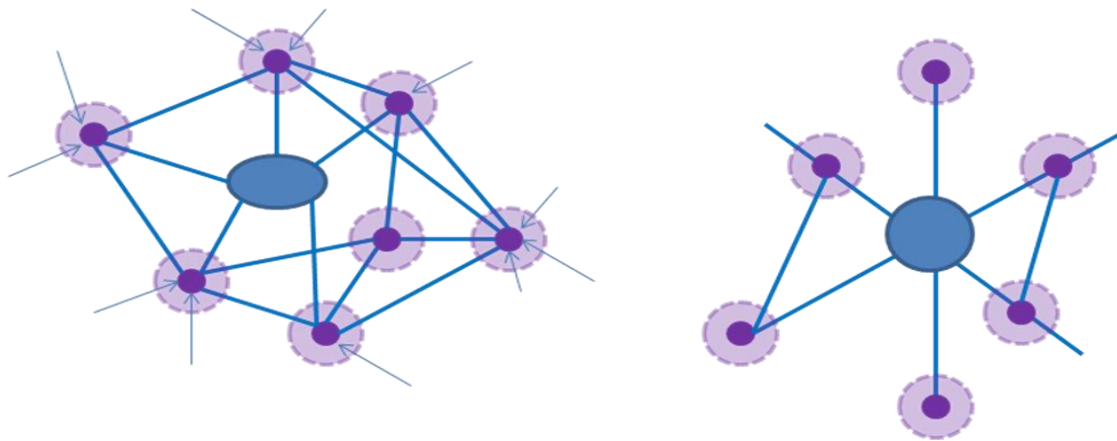


Fig. 7.5 Nodal Pattern of Transport (i) and Radial Pattern (ii)

Building on the basic structure of its tram system ‘backbone’, three further policy measures identified in chapter 6 may be recognised as having orientated Freiburg’s operating system towards strong nodal districts:

1. Street design incorporating traffic restraint (stick) together with the promotion of car-alternative modes (carrot) in the balance of street space, use of ‘pinch points’, priority signalling, segregation and routing of tram and cycle routes, which reinforce public transport use and strengthen the destination role of mixed-use streets.
2. Coordination of public transport services epitomised by the single, multi-modal, regional transport ticket and similarly supported by coordinated timetabling, cross-platform interchange between services at nodal stops and consistent provision for all user groups.
3. Retail planning policies, leading to the fragmentation of retail into smaller stores at sizes suitable for the neighbourhood scale.

7.3.1 Mobility Demand and ‘Necessary Car Traffic’

Even in a city such as Freiburg which evidently has a very high quality car-alternative transport offer and a strong green movement, car ownership levels remain high. This follows the wider national trend towards car ownership and may also suggest that the ‘supply’ of public transport cannot fully meet mobility ‘demand’. The situation has been described as ‘necessary car traffic’ (B), reflecting the desire by individuals to respond quickly to changes in circumstances such as a rainy day, a work meeting or the need to buy bulky goods. Meeting these changing needs presents potentially fertile territory for car-sharing schemes but in Freiburg as nationally in Germany, car clubs have under-performed - in part due to the fact that ‘car-sharing has tended to be organised by small grass-roots organisations with ‘old and

small and not very nice cars' (B). The Freiburg City Authority does not support such schemes directly, but makes provision for shared vehicles by securing parking spaces in new developments through building codes.

7.4 The Urban Operating System

A wide range of transportation, urban design and land use policy factors conspire to influence the way in which individuals organise their lives and lifestyle patterns; a process of interactions that has been termed the 'operating system'. In summary a broad range of urban planning factors exert an influence on the way that cities operate. Freiburg has demonstrated how a car-alternative operating system rests on a continuum of travel need reduction and car-alternative transportation at the macro level which has permitted micro level car reduction, and even in potentially unpromising suburban localities, and across the spectrum of user groups. Importantly, however, it must be recognised that Freiburg's current operating system has been shaped on the back of the up-welling of local opinion explored earlier in chapter 5, rather than by the whim of local planners and transport managers working in a top-down fashion. The message from Freiburg seems to be that the nature of residential car reduction must fit the operating system. This leads to a discussion over how operating systems can be characterised. A number of different approaches are possible, but the way in which a population travel may be regarded as a critical indicator and it is on this basis that Table 7.1 proposes a basic four-part typology of operating system based on overall modal share.

Operating System Type	Description	Measure	Example City ²
1	Car Dominant	Car travel the largest modal share by >10%	Little Rock, AR
2	Multi Modal	No single mode has more than 10% share above others	Freiburg
3	Public Transport Orientated	Public Transport has >33% overall modal share	Basel
4	Physical Mode Orientated	Walking or Cycling form largest mode by >10%	Muenster

Table 7.1 Operating System Typology

Determining a city's operating system on the basis of modal share alone is not entirely straightforward, and particular difficulties may surround the 'public transport orientated' classification, because a number of cities which experience high public transport ridership

² Of cities with approximately 200,000 inhabitants (data from: Buehler & Pucher, 2011; except Freiburg: Schick, 2009)

also experience high walking and cycling levels. However, Table 7.1 provides a basic typological system that attempts to capture fundamental differences in modal share, whilst the term ‘operating system’ serves as a reminder that modal share and overall patterns of travel are influenced by a range of underpinning factors.

7.4.1 Macro Factors

Identifying all of the factors that exert an influence on mobility patterns is a complex exercise, particularly when the full extent of contributory factors, preferences and attitudes are taken into account. Whilst it is not the aim of this thesis to provide a comprehensive analysis of such factors, a range of key policy variables that relate specifically to the viability of car reduced neighbourhoods may be identified. Macro scale policies and factors influencing the potential viability of residential car reduction are set out in Table 7.2, together with a brief explanation. These factors aim to provide an initial means for assessing whether a city and region has a breadth of supporting measures to support localised car reduction, given the range of physical and perceptual factors that influence travel distances, modal share and journey quality.

Set	Variable	Rationale
Mobility	<i>Car Parking</i>	Availability at destination influences use
	<i>Modal Share</i>	Indicates the ‘security’ of public transport services for those reliant
	<i>Transport Structure</i>	Radial / Nodal – support for outer districts
	<i>Transport Organisation</i>	Integration of services - viability as car alternative
	<i>Cycling Policy</i>	Support: network, storage, prioritisation
Planning Policies	<i>Transport & Land Use Planning</i>	Support from integrated & long term planning?
	<i>Retail</i>	Likely support to neighbourhood retail
	<i>Urban Containment</i>	Extent of inward direction
Urban Pattern	<i>Permeability</i>	Permeability influences car-alternative modes

Table 7.2 Macro Level Operating System Variables Influencing Suitability for Car Reduced Neighbourhoods

The mobility variables in Table 7.2 contains elements that are linked but exert a discrete influence on the viability of residential car reduction. In Freiburg restricted inner city car access policies have exerted an influence on modal share across the city and serve as a ‘stick’ measure against car travel. High car-alternative levels of modal share suggests a high level of

security of car alternative means, whilst well organised and integrated transport – both physically and administratively by scheduling, ticketing and information assists in providing seamless car-alternative journeys. Similarly, a nodal structure of public transport can mean reducing the need to interchange as well as the previously-described reinforcing of district hub areas reinforced by retail planning ordinances. The sum of these measures might be described in terms of a reduction of travel need, and a ‘nesting’ of journey types (Fig. 7.6), with core needs met at the district level by walking or cycling, and needs that are less critical on a daily basis met progressively through public transport and the car.

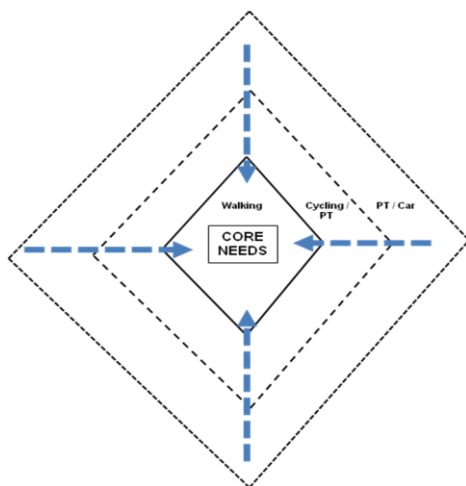


Fig. 7.6 Nested Prism of Travel Needs

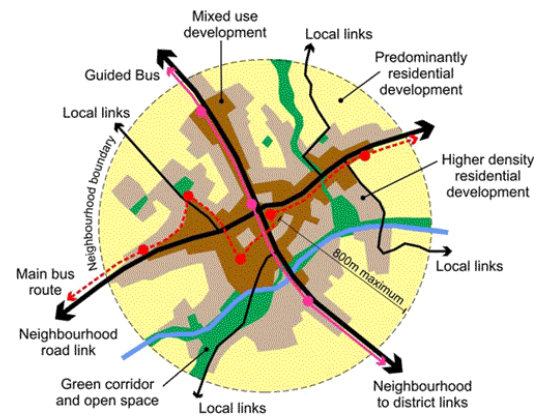


Fig. 7.7 Integrated Land Use & Transport Planning, Cambridgeshire

Fig. 7.7 demonstrates the integration of land use with transport planning, in the form of ‘smart growth’ around a new guided bus system in Cambridgeshire. Importantly however, Freiburg demonstrates that with a nodal transportation structure, the *entire city* can become ‘smart’ in travel terms, rather than creating a ‘patchwork’ of corridors or pockets. The result shown in Fig. 7.8 is a conceptual operating system in which travel need is reduced outright and car-alternative travel usage maximized, where journeys of length are required.

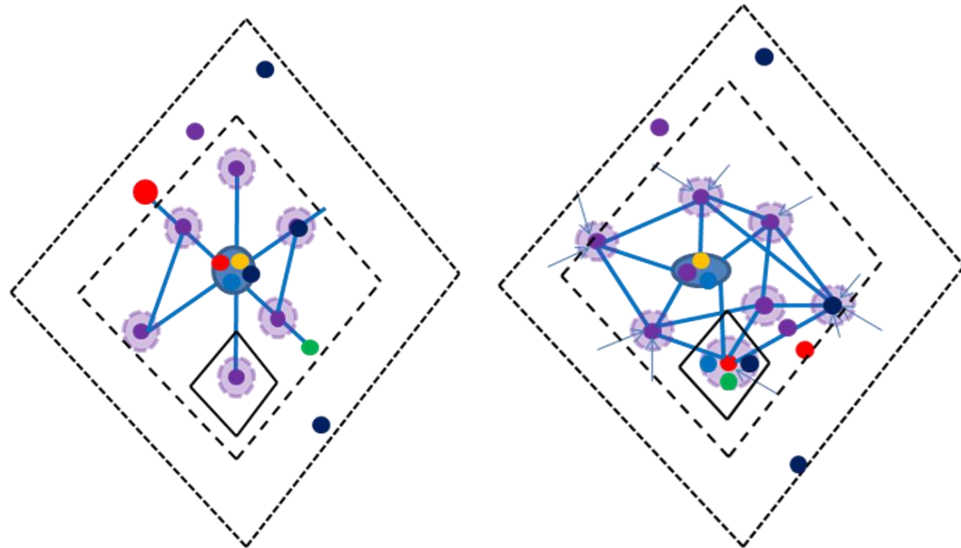


Fig.7.8 Operating System and Mobility (a) Typical City (B) Freiburg

Lastly, it must also be recognized that macro-scale urban pattern or ‘grain’ is an important aspect of the travel reduction or ‘short distances’ concept, particularly where allied with a ‘filtered permeability’ (TCPA, 2007) that makes certain streets and routes accessible to certain modes of travel and not to others (Fig. 7.9).

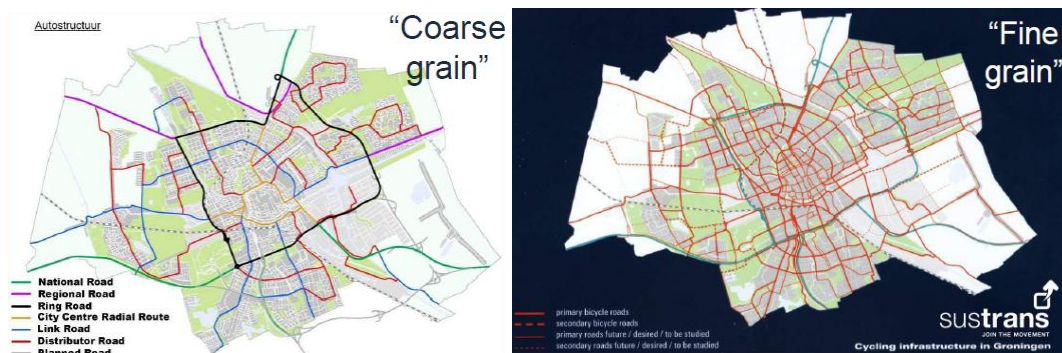


Fig.7.9 Urban Grain & ‘Permeability’ (a) ‘Course Grained’ Networks (b) ‘Fine Grained’ Permeable Networks (Sustrans)

7.4.2 Micro Factors

Having identified and assessed macro scale variables which support the suitability of car reduction in the first instance, another set of factors may be used to identify areas where residential car reduction might be suitable (Table 7.3).

Set	Variable	Rationale
Mobility	Car Ownership	Spatial Pattern of Ownership
Demographics	<i>Income</i>	Likely 'market' pattern
	<i>Age structure</i>	Shrinkage / growth influence on infrastructure / demand
Urban Form	<i>Density</i>	Context for different development models

Table 7.3 Micro Level Operating System Variables Influencing Suitability for Car Reduced Neighbourhoods

Although household car ownership may seem an obvious starting point, causality would need to be investigated to determine whether households are exercising choice - because of access to high quality public transport, for example, or whether such patterns are a product of income or other demographic factors. The age structure of a city and its neighbourhoods may be indicator future prospects including the future viability of services and infrastructure, and may also help to determine the type of design intervention. Lastly, new development or redevelopment needs to relate to its context and although this maybe considered to be a matter for detailed design, overall urban form as indicated by density provides an initial indicator of how development might relate to context, given the very high density levels entailed in car reduced development generally.

Part B: Appraising the Context

7.5 Political Support

High level political support for residential car reduction is often implicit rather than explicit, and because of the range of factors required to create appropriate contextual conditions can mean unintended policy contradictions. Both the UK and Germany illustrate the mixed messages sent by government. For example, Germany has for a long time pursued ‘plural’ policies of supporting its strong automobile industry on the one hand and public transport on the other, whilst the country’s devolved federal political structure gives the states or *Bundes Länder* autonomy and local actors a strong hand in local policy decisions. A devolved political structure has been capitalised by Bremen, Freiburg and other cities in which the public have lobbied hard for fresh approaches to development, and have ultimately had their voices heard.

In the UK, which has a lower level of overall car ownership than Germany and a smaller automobile industry, there has also been a modicum of support for car reduction initiatives and restrictions to limit car use and impacts in new developments. Such measures have been written into national planning guidance and, as chapter two noted, there are fewer barriers to residential car reduction than in Germany. Yet on the other hand such implicit support for car reduction is undone by the UK’s highly fragmented and privatised ‘public’ transport systems, and variable if improving cycle networks, which means that car-alternative travel can often be disjointed or impractical. As Shaw & Docherty (2009) observe, transport has not always featured highly on the political agenda and its role as a spatial, and, by definition, a social organising force has not always been fully appreciated. In the wake of the 1963 Beeching Review of British Railways, Lewis Mumford remarked:

In a nationalized railway system like Britain’s, such a declaration of economic bankruptcy indicates something far worse: a bankruptcy of the social imagination. The ability of a railway line, or any part of it, to make money is no gauge whatever of its actual or its future usefulness.

Mumford, 1964: 10

The operating system is perhaps a clear example of the ‘social usefulness’ of transport and Freiburg’s rail-based infrastructure can be recognised as a critical shaper of space both within the city and out into the surrounding region, an important shaper of lifestyle organisation, and a decisive component in the production of Freiburg’s new neighbourhoods. However, existing underneath such strategic and conceptual policy considerations is the reality on the ground, comprising the micro factors set out earlier in table 7.3. Existing car ownership patterns form

an important factor both in themselves and because of a range of factors which relate to it, both directly and indirectly, including income, age structure and density. The next section explores the nuances of car ownership patterns at the urban scale, before turning to spatial qualities that are important at the neighbourhood scale and finally to temporal considerations in view of potentially low levels of population turnover and wider concerns over demographic change. The section binds together a number of different considerations which together form a platform for exploring a series of different conceptual models of neighbourhood car reduction in the next chapter.

7.6 Current Car Ownership & Usage

A gradient of car ownership is often found to exist across urban areas (Fig. 7.10), which relates to urban density, land uses, transport services and demographic structure, and may be influenced significantly by the preferences of residents themselves for particular neighbourhood qualities.

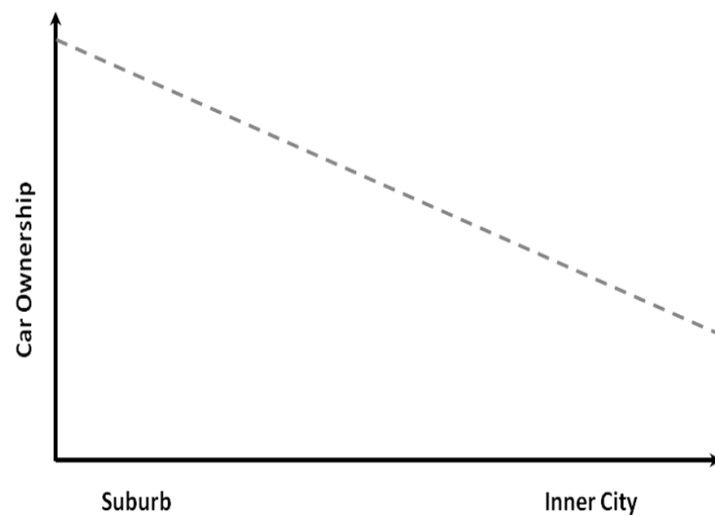


Fig. 7.10 Radial Gradient of Car Ownership

An empirically-based example of this gradient is given below from a cross section of wards between the central and south western suburbs of the city of Bath (Fig.7.11).

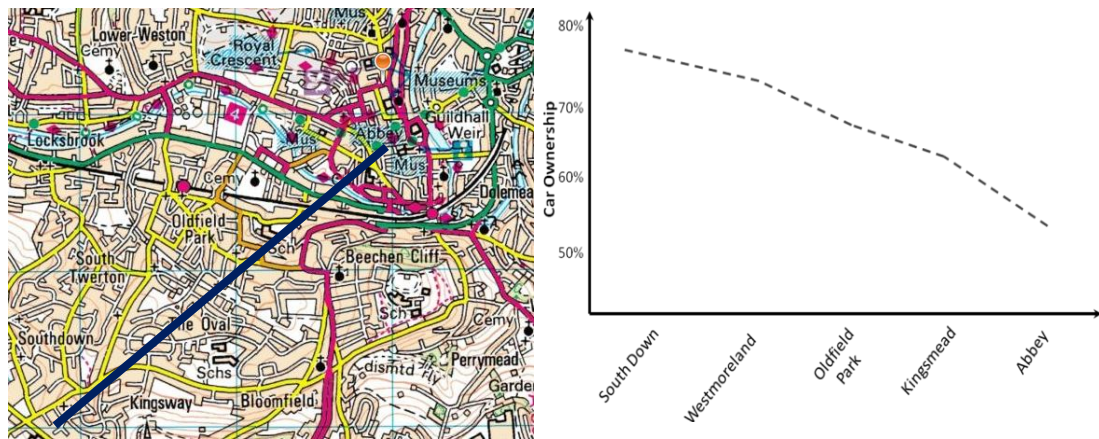


Fig. 7.11 Car Ownership in Bath (a) transect line (b) transect data (Source: ONS, 2001)

The gradient of car ownership serves as a logical starting point for considering appropriate levels of car parking in new housing developments generally and provides a logical basis for car reduction when measures that can act to reduce car ownership levels are brought to bear (Fig.7.12). A reduction in car ownership and use may be achieved through high quality car-alternative transport by proximity to a node, comprehensive cycle network and supporting infrastructure, car sharing and the integration of mixed land uses, services and amenities into development. Although identifying intrinsic car ownership-reducing features of a new neighbourhood is a relatively straightforward exercise, the importance of the overall system is critical. For example, Slateford Green's excellent cycle storage facilities – perhaps unsurpassed in Scotland – has resulted in just a 4% cycling rate for main journeys. Although climate and topography may be factors, the development's facilities are not similarly matched by an excellent cycle network in Edinburgh.

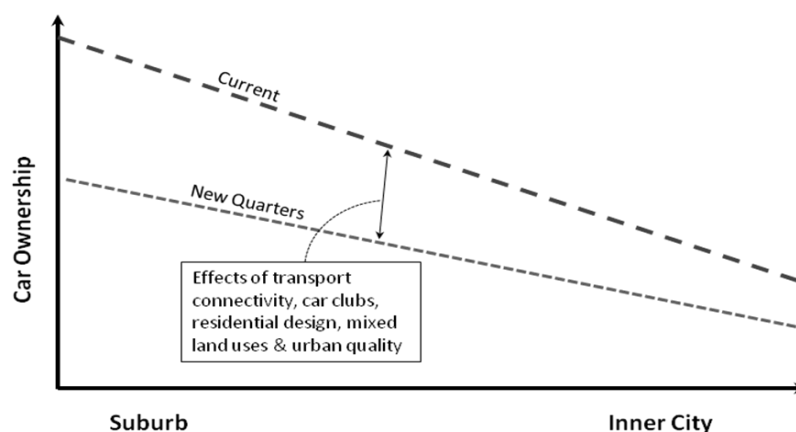


Fig. 7.12 Potential Gradient of Car Ownership

Such a draw-down on car ownership and use cannot be guaranteed because of spatial irregularities of private car-alternative travel provision and also because of 'dissonance' – a

mismatch between the neighbourhood in which people would prefer to live in, from the point of view of travel, and where they end up living in (Schwanen & Mokhtarian, 2005).

Notwithstanding such anomalies among residents, the gradient principle may be considered as basic consideration within a city's overall operating system for the application of a neighbourhood design intervention and appropriate level of parking. Against this background, Edinburgh's Slateford Green scheme appears a little anomalous. Fig. 7.14 shows the gradient of car ownership from Edinburgh's centre to its suburbs clearly. In 2001 the wards surrounding the Slateford Green scheme had some of the lowest levels of car ownership in the city, whilst Gorgie itself returned an overall average of 33-42% of households without car ownership. With 6 parking spaces Slateford Green was designed to deal with 5% household car ownership on site, and explains the need for a substantial proportion of residents to park vehicles off-site. The situation appears to be tolerated by owners of adjacent car parks and by the absence of a controlled parking zone at the present time. However it might be recognised that the imposition of further restrictions such as a controlled parking zone, as recommended by Eastwood (2008) could have a detrimental impact on residents, and particularly for those using a vehicle for work commuting or to support a young family.

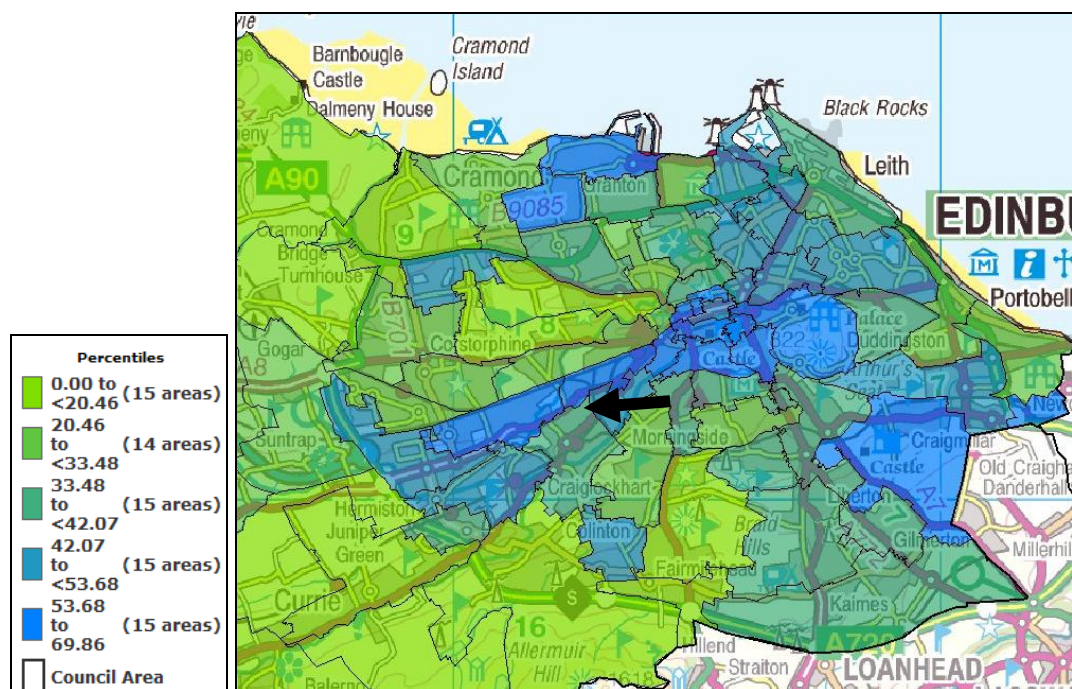


Fig.7.14 Proportion of Households Without a Car or Van (Source: ONS 2001)

The Edinburgh example illustrates why an appropriate neighbourhood model should be applied to take account of the car ownership gradient specifically and the operating system generally. Edinburgh's operating system is 'car dominant', with 48% of all journeys by car – 21% above the next highest mode - 27% of journeys by bus.

7.7 The District Level: Residential Qualities

Car reduction by ownership, use and impact is predicated on the reduction of travel need generally. Although this is an attractive concept in environmental sustainability terms from a policy maker's view, the proposition may be less appealing to the individual because travel seems to have a draw as an end in itself. The author Robert Louis Stephenson once quipped: 'I travel not to go anywhere, but to go. The great affair is to move', in summarising the stimulation of movement. Some travel might be considered to be a basic need. Metz (2008) notes that human body is disposed towards long journeys by foot as an indication of the integrity of travel in human evolution such as for hunting, survival or for to an enable a wider gene pool to be accessed. By definition therefore, if travel is essential to well-being then detrimental side-effects would be expected from the elimination of travel altogether. However, this section explores the relationship between mobility and travel, and the role that neighbourhood qualities in the aesthetic or 'non-tangible' sense plays in this relationship.

An important distinction may be drawn between mobility and travel. Although it might be assumed that travel is the basis for mobility and that to be 'mobile' entails undertaking a considerable amount of travel, a different perspective is provided by Holzapfel (2011) who recently suggested that 'mobility is the opportunity to undertake in the shortest possible time a diverse range of activities that require you to leave home'. By way of illustration, the author suggested that a family living in a central part of Tübingen where all needs are readily accessed in close proximity, has greater 'mobility' than a family living in the countryside outside of Kassel and heavily dependent on long distance car travel for essential needs. The point is a basic one: that travel reduction through proximity should be the basis for achieving mobility not travel.

Although discussion of mobility and travel need has tended to focus on 'functional' lifestyle activities, the literature presented earlier in chapter 2 suggests that 'need' embraces aspects including environmental quality and access to nature. Equally there is perhaps a pervasive monotony about car-dominance in urban areas associated with volumes of vehicles that have effectively created car parks out of residential streets and front gardens into paved parking stands. The literature explored in the opening chapters suggests that a 'sterile' environment, specifically void of nature can undermine mental and physical well-being, and a supposedly 'intangible' effect begins to have tangible outcomes on health and persona.

Urban parks such as those created by Olmsted and Paxton have brought sensory fascination as well as recreational space into the urban landscape. Yet such high quality urban spaces can sometimes be segregated and distant in everyday life, requiring a specific journey and dedicated time. An observable difference in Freiburg from other cities is the integration of

nature in residential areas as an elemental aspect of the ‘city of short distances’ concept that attempts to address the full extent of human social needs and lending weight to its description as a ‘holiday at home city’ (A). In Vauban, the concept has been taken further with the direct substitution of car parking with green space, while Rieselfeld’s superbloc residential structure has created undisturbed space for communal natural areas, garden and allotments.



Fig. 7.15 ‘Fascinating’ Green Spaces: (a) Rieselfeld (b) Vauban

Aside from the tangible effects on well-being, high quality natural areas in residential spaces may be valued as creating an environment that is not only ‘liveable’ but also ‘stayable’ by creating a satisfying experience around the home. This may in turn have other community-building and individual social benefits for children and adults alike through social contact, and encourage greater outdoor activity outside of the home. It also permits an unconscious relationship to develop between human society and the wider world that perhaps touches on a deeper problem of urban-natural disconnection. As Lewis Mumford noted in 1938:

As the pavement spreads, nature is pushed farther away: the whole routine divorces itself more completely from the soil, from the visible presence of life and growth and decay, birth and death. The rhythm of the seasons disappears, or rather, it is no longer associated with natural events, except in print. [...] This divorce from nature has serious physiological dangers that the utmost scruples of medical care scarcely rectify.

Mumford (1938: 253)

Mumford’s focus on well-being has, with the rise of environmental movements since the 1960s, been supplemented by concern at a broader disconnect between human action and environmental change – ‘a turning away from a felt relationship with the natural world’ as Robert MacFarlane (2007:203) recently described the process. The detachment of urban society from the consequences of its actions on the wider world presents significant difficulties for policy-makers, even where individuals read about events ‘in print’. It must be

recognised, therefore, that car-reduced design principles applied to Rieselfeld and Vauban indicates a greater philosophical project for which the organisation of residential space is a critical enabling force. As chapter two noted, such neighbourhood projects were a conscious reaction to the ‘machine age’ tenements and bye-law streets of the industrial city, in the nature-orientated neighbourhoods of Olmsted, Stein, Parker and Unwin and even Le Corbusier and his Modernist protégés. On this basis, it might be said that philosophy retreated from neighbourhoods in the 1960s with only a greatly diminished voice in Britain’s ‘neo Radburn’ housing estates that reflected a new functional organisation of space, centred on the automobile and perhaps a perceived virtue of travel as an end in itself.

Vauban in particular represents a bold expression of philosophy, operationalised through car reduction that has permitted a reordering of residential space, reflecting the prioritisation of relationships between members of its community and individuals and the wider natural world. Importantly however, an abundance of natural space does not appear to have detracted from the overall ‘urbanity’ of the quarter in the way that garden suburbs were criticised by Jane Jacobs (1961). A readily observable fact is that the streets are busy with people. A high overall density and permeability of urban structure lends itself to walking and cycling, and critically a pedestrian footfall that has encouraged local commerce and enterprise, unlike the Radburn and ‘neo-Radburn’ models. In this way, Vauban and Rieselfeld might be regarded as both ‘urban quarters’ as well as modern variants of the garden suburb or city model. Their densities are greater than the 30 dph baseline used by Unwin in the English garden suburbs, and each has created a rich urban ‘intensity’ through close juxtaposition of different elements of housing, retail, workplaces, but with interwoven greenery lending a similarly intense counterpoint. In this way it is questionable whether Jacobs would recognise Freiburg’s new quarters in the same ‘dis-urban’ light as her hated garden suburbs.

7.8 The District and the Temporal Dimension

High levels of young ‘free range children’ in both Vauban and Rieselfeld represent success as the product of a high trust community, but also point to a matter of concern for the future prospects of each of the neighbourhoods. The question of what will happen in ten or twenty years time when the present generation of children leave home is a matter of concern to Vaubaners particularly (<http://www.quartiersarbeit-vauban.de> – accessed 25 Nov 11). This section explores the challenges posed by the influx of residents of a broadly similar demographic profile who remain *in situ* thereafter, creating a low housing turnover and limited population ‘churn’ as a consequence. Although the demographic concentration experienced in car reduced neighbourhoods and subsequent stagnation of turnover poses long-term challenges for neighbourhood viability, an opportunity can also be identified to use

smaller schemes with a younger demographic to reinforce existing and declining neighbourhoods.

The situation of concentration and stagnation is not unique to Vauban and Rieselfeld. Chapter five noted that several of Freiburg's suburbs such as St Georgen and Landwasser had attracted an initial influx of young families when they were completed in the early 1970s. However these neighbourhoods had since experienced a low residential turnover that resulted in a decline in overall population density over time as households shrank due to children leaving the family home, deaths and divorces that had had a negative impact on the viability of local services and amenities. Given the concentrations of young families that they have, there is therefore potential for Vauban and Rieselfeld particularly to experience similar trends.

7.8.1 Long Term Trends

Neighbourhoods experience fluctuating fortunes due to temporal changes in the economic performance of the host city and the demographic profile of its population. The growth of Freiburg's population since the mid twentieth century and through to the present day is almost unprecedented in Germany and can be attributed to a combination of a continuing boom in knowledge-intensive industry and the city's favourable location in the 'heart of Europe' with its appealing climate and environment (A), as well as from the immigration of non-native Germans. The city has grown physically as a consequence, and a feature of a number of the city's suburbs – in line with the wider cultural norm - is that they have effectively become life-long neighbourhoods in which many of the first wave of residents have remained and aged. This has meant a decrease in overall population density with a decline in household occupancy rates as 'nests are flown', families have broken down and pensioners are widowed. Infrastructure demand shifts from services directed towards early life to later life. A resulting redeployment of teachers, doctors and social workers is perhaps relatively straightforward, but fixed infrastructure is more problematic and perhaps most critical is the decline in public transport revenue that exerts pressure for rationalisation that can perpetuate the process of neighbourhood decline.

This sequence is propagated by the concentration of a narrow demographic of residents in the first instance and perpetuated lower residential turnover rates thereafter. The relevance to both Vauban and Rieselfeld can be instantly recognised as both follow Freiburg's post 1960s pattern of attracting high concentrations of younger adults. It is pertinent to consider the likelihood of, and the implications that ageing in situ could have on these neighbourhoods in the long term – and the lessons that might be drawn.

7.8.2 Ageing in Place

As western societies face up to the implications of their ageing populations (Bernard & Philips, 2000:33), Keyes *et al* (2011:59) assert that '[t]o support healthy aging, it is important to create lifelong communities where people can live throughout a lifetime and where older adults can *age in place*.' The concept has obvious appeal to householders who are less likely to need to move in old age as a result, and to policy-makers who can utilise the social capital of close communities as a means to reducing the demands placed on state assistance and to concentrate resources more efficiently in particular localities. The key to such communities is the implementation of universal design standards that enable the 'environment to be used by all people of all abilities in the design of social spaces, recreation, streetscapes, retail and residential buildings, and the creation of transport options to increase mobility and accessibility' (Keyes *et al*, 2011:60). It incorporates the notion of 'visitability' – homes without barriers to external access and internal movement on at least one floor (Pynoos *et al*, 2009:28).

Universal accessibility is a feature of Rieselfeld, but not of Vauban where many buildings do not have step-free access. Indeed it was because of visitability standards that one couple interviewed elected to live in Rieselfeld rather than Vauban. Universal physical design standards may well favour the creation of a lifelong community in Rieselfeld rather than in Vauban. Furthermore, Wulf Daseking also believes that altruism in the Vauban community means that residents 'know what they will need to do' - vacate their homes at an appropriate time in order to allow a new generation in. This would contradict the *age in place* German culture and also the experience recorded by official data in other Freiburg neighbourhoods; it will also mean the eventual breaking of an evidently exceptionally strong community in order to permit the growth of a new one in Vauban. Yet Daseking believes that its current residents have the strength of mind and will to do so in spite of the apparent odds against (A).

But what would the implications be for Rieselfeld? As chapter five showed, the development has a higher proportion (5.7%) of over 65 year olds than Vauban (2.1%), a dominance of younger families means that the turnover of existing housing stock is likely to be low in the short term. On the other hand, Rieselfeld's phased construction since 1996 through to the present day could ultimately translate to a more gradual housing turnover and the retaining of a more balanced age structure, compared to the more condensed construction period at Vauban. Yet even Rieselfeld's near twenty year construction window is likely to be too short to ensure an even rate of housing turnover, as its pronounced age clustering in official data suggests. Unless further housing is added at a later date there is, in theory at least, a probability that the neighbourhood will become 'top heavy' with retired residents in

approximately twenty to thirty years' time as the current generation begin to retire. However, because of the nodal role that Rieselfeld performs in connecting outlying villages with the wider city, a good level of public transport ridership is likely to be maintained. This also means that the district's wider infrastructure will remain accessible to a wider population and therefore utilised. Yet the ageing in situ experience of Freiburg's suburbs and the potential for Rieselfeld and Vauban follow in the same vein does provoke interesting discussion about the approaches that should be implemented to ensure the long term sustainability of neighbourhoods and the related infrastructure – and ultimately the welfare of the residents who live within them.

7.8.3 *Positive Concentration*

Lastly, although it is possible to view concentration in terms of a long term problem, in Freiburg it has also been used positively through small car-reduced schemes inserted into ageing neighbourhoods. Termed 'fresh cell therapy' (A) because the schemes serve to inject a younger demographic into an older overall profile, the effect has been to stabilise the neighbourhood. This approach will be examined in greater detail in the next chapter.

7.9 **Looking Forward**

The driving force behind this chapter has been a basic concern that the principles underpinning successful residential car reduction policies had not been properly understood, and that planning guidance in the UK is in danger of being too simplistic by describing a desirable end point rather than considering the wider measures required to achieve it. 'Success' was defined at the beginning of the chapter as a. the creation of 'sociable' neighbourhoods, b. accessible places in which residents are not unduly restrained in their mobility and c. places that do not experience unduly high levels of residential selectivity. Part A of the chapter therefore began by considering the question of defining travel 'need' and continued by describing the importance of the overall 'urban operating system' – the need to achieve an overall level of non-car ridership in order to guarantee that residents of car-reduced developments do not experience mobility disadvantage. It was also felt that social and travel needs were not always well understood – again being often in danger of oversimplicity by focusing on obvious material needs rather than considering the importance of urban quality that car reduction can play a strong influencing role in. As Mumford (1938:5) noted, "Mind *takes form* in the city; and in turn, urban forms condition the mind"; it is therefore argued that the quality of the neighbourhood environment – the setting for much of

one's life has become philosophically neglected and in many instances reduced to functionality rather than to satisfy wider human need.

Yet although design can be considered in purely spatial terms, the importance of how neighbourhoods operate over time also needs to be recognised, and particularly in relation to Freiburg's experience of lifelong communities. The conceptual pros and cons of the lifelong communities were discussed. Although the notion is socially attractive, a top-heavy, numerically declining and less concentrated population can also bring wider problems for infrastructure providers and local businesses. The root of such problems is the concentration of a narrow age sector which ages in place due to low housing turnover. It is thus theoretically possible to mitigate against the negative effects of concentration by encouraging a broader demographic of householders in the first instance or by introducing controls such as long phasing to build a broader profile of residents over time. Riesefeld's construction over a period of more than 15 years may assist in this process, whereas at Vauban it has been suggested that the non visitability of homes will encourage older residents to leave, and altruism may well also prevail to encourage turnover.

7.11 Lessons Learned

This chapter firstly examined the contextual backdrop conceptualised in the urban operating system, and secondly some of the broader considerations and implications of residential car reduction in relation to mobility, residential quality and long term demography. Accordingly, the lessons learned from this chapter may be organised under two separate headings – the first relating to spatial context, and the second to the institutional and political considerations that have permitted theory to be realised in Freiburg.

7.10.1 Spatial Framework

This chapter has focused on the context considerations for car reduction, and specifically in trying to isolate the key determinants of the operating system – the sum total of the different factors which affect patterns of travel as indicated by overall modal share across a city or region. The strategic view can be considered important because a considerable proportion is derived by the need or desire by individuals to engage in a range of different activities, some of which may be spread over considerable geographical space, depending on local variations in the relationship between land use and transport. These factors have been explored in detail in this chapter. However, a final task is to use the original social interaction-mobility-design conceptual framework that has structured this research as a way to describe how the neighbourhood should relate to the operating system.

The historic perspective presented in chapter two would indicate that if neighbourhoods as social as well as physical units are going to be more than niche developments for the very few, form should follow the wider movement function of the operating system. This would suggest that the two elements should be linked by a ‘continuum of spatial quality’ as Barton (2000:132-133) argues. This is illustrated by the example of Vauban, where the pan-urban spatial qualities of Freiburg - including prioritisation of physical modes and public transport, car restraint and dispersed retail are accentuated (Fig. 7.16) rather than contrasted.

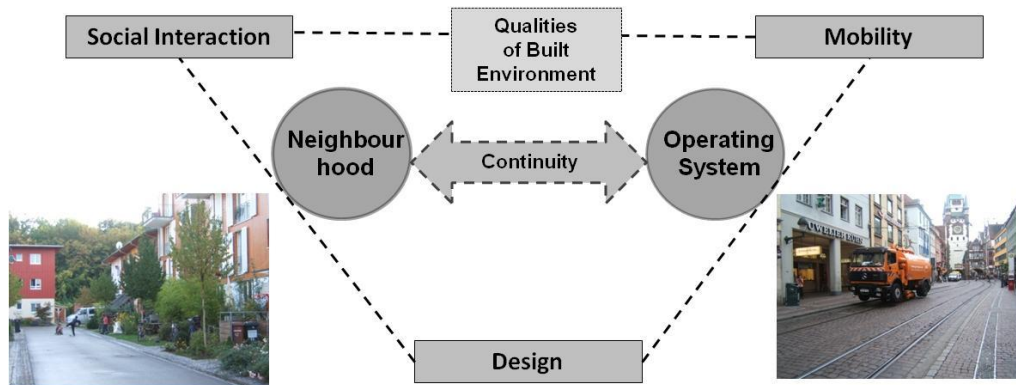


Fig. 7.17 Applied to Freiburg: continuity of neighbourhood and operating system

The next chapter develops this discussion through the introduction of four conceptual models of neighbourhood car reduction which relate to different contextual circumstances and wider urban operating systems.

7.11.2 Political-Institutional Framework

Arguably Freiburg’s greatest success has been in creating the framework conditions that have allowed ‘non orthodox’ neighbourhood schemes such as Vauban and Rieselfeld to be realised. Freiburg’s political-institutional framework, which extends across the city and beyond, has embraced the concept of reducing travel wherever possible through its fêted ‘city of short distances’ approach as an integral part of reducing energy demand. Four principal elements of the framework identified by Buehler & Pucher *et al* (2011) are as follows:

1. *Full integration of land use and transport planning* – in order to encourage a settlement structure which keeps trip distances short and development oriented towards non-car modes;
2. *Citizen involvement as a full part of policy development and implementation* – this has been central in Freiburg’s policy development process for decades – including its integrated land use and transport strategies;

3. *Support from higher levels of government for making local policies work* – perhaps best illustrated by central government’s sustained funding support for local and non-car transportation projects in Germany;
4. *Long term and sustained policies* – today’s Freiburg is the product of policies that began to be implemented over four decades ago.

These four elements can be considered both insightful and daunting. Just as it is argued that Freiburg’s car-reduced neighbourhoods are products born from a wider system, the structure of local government is a product of a wider political system in which power is devolved from the centre to the regions and to strong directly elected mayors. In turn, strong local politicians have brought together different actors representing the full breadth of transport and land use planning both from within the municipality and from the counties bordering Freiburg itself which has enable strong, integrated, long term city-regional plans to develop. Within the city, strong local politicians have created a framework for strong local engagement. At Vauban and to a certain extent at Rieselfeld this has meant that the state has stepped back to allow local groups a much stronger role in shaping the space.

7.11.3 Transferability

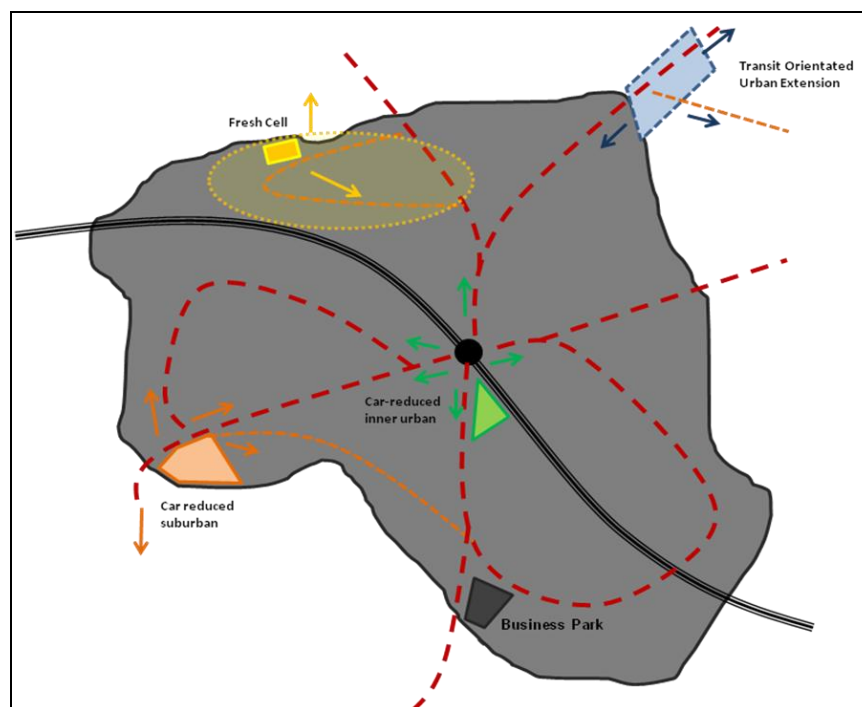
The political and institutional context of Freiburg presents barriers for the transferability of lessons to other countries – for example the UK – which does not currently have a similar structure of strong regional and local government across the board at the present time. This has implications for the suitability of different models under different political regimens. As a general rule it seems likely that more aggressively car reduced neighbourhoods located in less central localities would require a strong local political framework and municipal support, in the form of integrated transport and land use policies, car-alternative infrastructure including cycle and pedestrian lanes, and safeguards for local transport services. A Vauban-style aggressively car-reduced suburban scheme would probably not work under a *laissez-faire* regime, because the necessary safeguards need concrete institutional support. Under such circumstances, an aggressively car reduced scheme arguably be better suited to a central urban locality where travel needs can be met by proximity to mixed land uses and centrally-located transport connections, and would conform to the generally observed trend of diminished car ownership in more central localities. The outline implications for the four models are set out below:

1. Inner Urban: likely to be successful under any political regimen where basic transport system is safeguarded

2. Fresh Cell: likely to be successful under any political regimen
3. Suburban: aggressive car reduction in a suburban locality entails strong political support to keep car ownership low.
4. Urban Extension: less aggressive car reduction entails basic safeguards to transport system to avoid becoming car dominant.

Lessons: 2

Four Conceptual Neighbourhood Models



Implementation & Best Practice

8.1 Introduction

This chapter looks in greater detail at the four ‘loose fit’ models of car-reduced development, that were initially introduced in chapter four and have been referred to repeatedly in the subsequent chapters. Crucially, the chapter also attempts to relate the neighbourhood models, or ‘new quarters’, to the typology of operating systems presented in chapter seven. However, an important theme in the chapter is that due attention should be paid to ‘how’ space is developed, as well as ‘what’ is developed. From the German case study neighbourhoods, the shared experience of residents participating in the initial development process must be recognised as contributing substantially towards community strength. By definition therefore, the different relationship between residents and their living environment under developer-led and professionally managed scheme means that it is doubtful whether similarly strong community bonds can be created through the spatial qualities of car-reduced residential space alone. Thus, it is worth reiterating the point that the question of ‘how’ spatial qualities are achieved is perhaps of equally significance to the social outcomes as consideration of ‘what’ those aspects are. The process of converting theory into reality is an important one, being fraught with technical and administrative obstacles as well as the more elementary challenge of having to convince policy makers and ultimately the general public, particularly if implementation follows a process which differs from the norm.

Yet before embarking on further discussion of these models it is important to consider the terminology employed – a contentious matter that remains to be fully resolved. This thesis has employed the term ‘car reduced development’ as a means to describe the specific design focus of the residential schemes examined, which set out to stridently to restrain the impact of automobile traffic on residents living within the scheme, to reduce automobile reliance, and to lessen per capita traffic contribution to the road network. Terminology has been a consistent problem with ‘car-free development’ often being misinterpreted as schemes built without car parking, as has been the experience in cities such as London. The term ‘car free’ therefore points towards a long term aspiration, but is perhaps unduly confusing; even according to organisations such as Carfree UK and the World Carfree Network, the point seems not to be to design out cars from residential developments altogether. Moreover, such confusion over the term ‘car free’ leads to presentational problems to a general public who may in the first instance take the phrase at face value, and draw the specific attention of those who are not car owners, or who have objections to automobiles.

Although ‘car-reduced’ may provide a better alternative for reporting the typological ‘genus’ of such schemes in theoretical terms, given the importance of a broad range of factors in reducing travel need and creating vitality discussed in the preceding chapter, it too could be

considered as having too narrow a focus. Indeed, it might be said that car reduction is a natural product of ‘good’ urbanism, where form follows the transport function. Indeed, the ‘city of short distances’ approach adopted as a conscious modern development approach in German cities such as Freiburg, Heidelberg and Tübingen, and less consciously in older cities built around pedestrian movement, makes car travel unnecessary in any case. Yet it is an interesting point that Vauban, Rieselfeld and Tübingen Südstadt are described variously as ‘quarters’ or ‘districts’ – terms that seem to imply mixed uses, vitality and a distinctly urban flavour. In short, these terms convey the impression that cars are not needed, but also do not imply that they are anti-car. In order to broaden the lessons for future development – and in particular the four models of car reduction – reference is made to three ‘additional’ mini case studies to which purely observational visits were made.

8.1.1 Tübingen Südstadt Mini Case Study

Although the entire scheme forms a corridor of 6000 homes along the city’s southern fringe along the Stuttgarter Straße, the case study relates to a 2000 home neighbourhood located around the Loretto Platz, approximately 1.5km from Tübingen city centre. The scheme, which is reported in section 8.2, shares many of the residential qualities of Vauban including a spatial separation of cars and homes, limited parking and an overall ‘car free’ urban design concept but without the very high car parking levy charged at Vauban. Like Rieselfeld and Vauban, the Baugruppe approach was adopted to deliver housing. The site has mixed land uses, including schools, shops, cafes and businesses. A high frequency bus service forms the main transport connection to the railway station and city centre.



Fig. 8.1 Tübingen Südstadt

8.1.2 Greenwich Millennium Village Mini Case Study

The Millennium Village in Greenwich, London was intended to showcase social and environmental good practice in residential design under English Partnerships' Millennium Communities Programme (Rogers & Power, 2000). By 2010 approximately 1000 homes had been completed in the first phase of the scheme by developers Countryside Properties and Taylor Wimpey (URBED, 2002). In contrast to the group build and participatory approaches adopted at the Vauban, Rieselfeld, Südstadt and Dreikönigstraße schemes, the Millennium Village was architect designed in its entirety and delivered by volume house builders. The scheme has a primary school, medical centre and a small number of retail outlets on site. Parking is at over one space per household and a busway provides high frequency transport services to a major transport interchange at North Greenwich, approximately 1km away.



Fig. 8.2 Greenwich Millennium Village

8.1.3 Dreikönigstraße Mini Case Study

According to Wulf Daseking this site represents the new approach towards development schemes in Freiburg – where smaller ‘fresh cell’ schemes are ‘injected’ into mature neighbourhoods in order to stabilise local population decline and reduce the effects of a locally ageing population on services and infrastructure. The 200-home Dreikönigstraße scheme, which is also sometimes referred-to as ‘Wiehre Bahnhof’, used the Baugruppe approach to deliver all homes. It is located in Freiburg’s eastern suburb of Wiehre, approximately 1.5km from the city centre. The site has no retail or public infrastructure of its own. Parking is at approximately one space per household and there is an infrequent service from the site to the city centre, but a high quality tram service approximately 300m away provides the main transport link.



Fig. 8.3 Dreikönigstraße

Part A: Car Reduced Quarters

8.2 Car-Reduced Design

The aim of this section is to conceptualise the approaches used in four residential schemes in order to provide four outline models of development and to describe, with reference to spatial context and different operating system types, the situations in which they would be best suited. In order to do this, lessons from the main case study schemes of Rieselfeld and Vauban are drawn out and applied to the Südstadt inner city scheme in the small southern German city of Tübingen, and the ‘fresh cell’ scheme of Dreikönigstraße in eastern Freiburg. The intention is not to provide an exhaustive typology from these four schemes, rather, a basic framework of different models that match different contextual circumstances.

Vauban and Rieselfeld may be regarded as two potential approaches to car reduction that fit Freiburg’s particular circumstances and modern-day operating system. But two models provide only a limited basis for considering future development, in relation to one specific operating system. For this reason further visits were undertaken to the Südstadt scheme in Tübingen which represented a large but inner city car-reduced development, and also to the Dreikönigstraße scheme in Freiburg – an example of small scheme reflecting a new philosophy of infill development as a means to neighbourhood renewal.

8.2.1 Inner City Scheme – Tübingen Südstadt

Rieselfeld and Vauban are suburban developments, but suburbs can be problematic localities for car reduction in smaller cities that lack the comprehensive public transport infrastructure commonplace in larger cities. Freiburg could be described as having the public transport offer commonly found in a city of much greater size. Yet Edinburgh demonstrates that even in larger cities, safeguards to mobility can be undermined. Inner-city localities offer obvious alternatives to new suburbs through a natural proximity to mixed land uses and major transport nodes. However, inner city sites are commonly prime and economically pressured, it is perhaps vital that land-savings through car reduction measures off-set the land take of the highly desirable elements including green spaces and social infrastructure. The Südstadt area of Tübingen - a small city also of the Baden-Württemberg state of southwest Germany, provides a model of inner city development on a comparatively small site (Fig. 8.4). Like Vauban and Rieselfeld, the residential buildings were conceived and built by Baugruppen, within an overall coding framework with the inclusion of mixed land uses. Like Vauban, the site is a partial retrofit of an existing site with traditional building blocks converted.



Fig.8.4 Tübingen SüdStadt (a) approach from Stuttgart Straße & (b) Loretto Platz

Unlike Freiburg, Tübingen which has a smaller population of approximately 80,000 inhabitants currently has no tram system. Transportation to the Südstadt is therefore by bus. The development has provision for car club vehicles and for private vehicles by means of underground garaging. Like Vauban, some street parking provision is available for visitors and the disabled although car access into the neighbourhood core – the Loretto Platz is heavily constrained. A notable difference with Freiburg is the lack of dedicated cycle lanes immediately to and from the Südstadt; cyclists either mix with road traffic or with pedestrians on the pavements. Although the city is making strides to improve its public transport services with work on the implementation of a tram system due to begin in the near future, because of its central location residents of the Südstadt are less likely to encounter mobility disadvantage as a full range of essential needs and transport options are nearby. This reinforces a number of very basic points that need to be considered in residential car reduction: travel reduction by mixed land uses made vibrant through proximity and accessibility to clientele and guaranteed car-alternative mobility within and beyond the city by being close to the city's main rail and bus interchanges.

In Tübingen Südstadt imagination seems to have overcome severe limitations on space, to create an informal, 'wholesome' and expansive quality that includes secluded green passages (Fig.8.5) leading into communal courtyards. Here, as at Vauban and Rieselfeld juxtaposition and unity of elements appear a critical design concept, and an approach which contrasts sharply with the disunity and separation of elements espoused by a modernist movement which succeeded in producing 'dead' spaces with little ecological or amenity value. In the new developments the bulk of green space is communal. Where there are private gardens, boundaries are generally indicated with planted borders or low and unobtrusive fences which creates a seamless flow of space.



Fig. 8.5 Südstadt: (a) Dense Greenery (b) Location Map

8.2.2 *Small Infill Development – Dreikönigstraße, Freiburg*

The small Dreikönigstraße development forms a logical extension to the existing street pattern of the surrounding neighbourhood. Car parking is by means of a large underground garage beneath the development, meaning that priority towards non car uses is given to street space and automobile access is for loading and unloading only.



Fig. 8.6 Dreikönigstraße: (a) Main axis (b) Aerial Picture (under construction) showing Integration into Neighbourhood

The significance of this scheme is both in the application of the principles of car reduction applied in Vauban and Rieselfeld and in the way that comparatively small new developments can profoundly impact on surrounding neighbourhoods. In this way, small car-reduced developments using the Dreikönigstraße model, which tend to attract younger families, are being introduced throughout the city as a means of stabilising the population of ageing and depopulating neighbourhoods (A) where infrastructure and services are under pressure from diminishing patronage.

8.3 Four Model Quarters

Four schemes provide the conceptual basis for four models of car-reduced quarters, which consist of an ex-urban and suburban models that relate to differences in the car-alternative transport offer of the city, an inner-city model, and a small infill scheme described as a ‘fresh cell’ approach which sets out to transform the wider neighbourhood. The ex-urban and suburban models are perhaps most suited to new-build developments, but it is also important to recognise how car-reduced schemes could be introduced by retrofit or could contribute to wider urban renewal. This matter is discussed after the four models are introduced.

8.3.1 *Suburban: Vauban*

Vauban is often touted as a model for car-reduced sustainable development. Yet although its residential streets permit only limited car access and the greater bulk of car parking is peripherally located, it must also be remembered that even here virtually half of households own cars even if the development seems to have successfully de-coupled car ownership from daily usage. Yet this model emerges as the natural product of a city that has, over a period of nearly 40 years created a level playing field of seamless car-alternative transport and a permeable and decentralised structure through the ‘city of short ways’ philosophy evidenced in the doubling public transport patronage and the stemming of a trend towards greater car ownership. This also means that areas in which Vauban style suburban neighbourhoods could be replicated are limited to cities with similar levels of modal share that instils an overall sense of confidence in car independent living. Current candidate cities would include those with exceptionally high levels of public transport use include Basel, Zurich and Berlin.

8.3.2 *Urban Extension: Rieselfeld*

Rieselfeld has emerged as perhaps the most universally viable suburban model, through the combination of sociability and social mixing presented in chapter five, high car-alternative transport share but a more ‘relaxed’ posture towards the private car with an overall ratio of 1.5 spaces per household and average levels of ownership. Here, residents seem to enjoy the benefits of localised car reduction in the form of green spaces, underground or displaced parking, and local economic vitality from a dense form with the benefit of excellence in both car-based and car-alternative transport. It is perhaps the most readily replicable suburban model that could be adopted in areas where it is felt that more aggressive car reduction measures could either produce less desirable outcomes such as high levels of selectivity, the displacement of residents’ private vehicles or potential problems in the marketability of

homes. Candidate cities could be those that have lower levels of car-alternative modal share or less well-developed infrastructure, such as in UK medium to large cities.

8.3.3 *Inner-Urban: Südstadt*

This model applies Vauban levels of car reduction to smaller inner city sites that lend close proximity to major transport interchanges to guarantee robust car alternative transportation, and also travel-reducing mixed land uses. Future candidates would include those cities with heavily radial transport links such as smaller cities, and it could also be a good model for urban retrofitting – the Südstadt being at least a part retrofit scheme around Tübingen’s Loretto Platz.

8.3.4 *‘Fresh Cell’: Dreikönigstraße*

The concept behind such small-scale schemes is to ‘stabilise’ neighbourhoods whose ageing populations have experience declining population levels and falling household occupancy. The new developments which are typically one or two blocks in size, bring small concentrations of younger residents into homes that are often realised through *baugruppen* within schemes that are car-reduced. This approach therefore aims to reinvigorate declining neighbourhoods through small injections of younger residents. But Wulf Daseking notes that ‘the system around the house must be a good one’ (A). In other words, the schemes must fit seamlessly into neighbourhoods that have the right mix of services and infrastructure to cater for the incomers – those that need strengthening rather than those that have already suffered serious decline. There are no specific candidate cities for this flexible model of development.

8.3.5 *Neighbourhood Type and Operating System*

The ‘inner urban quarter’ model, based on the Südstadt, presents a very high density, tight fusion of different land use elements, use of innovative technology for car parking, and proximity to a major urban transport interchange for ensuring mobility for all. The ‘suburban quarter’, loosely based on Vauban is appropriately less dense but with significant car reduction maintained, there is a need for excellent direct connectivity – preferably by both bike or walking and by public transport – throughout the city and not just to the city centre, to rival the convenience of the car and to give the quarter significance as a hub. The ‘urban extension’ model based around Rieselfeld similarly acts as a ‘staging post’ between the city and other suburbs and surrounding regions to give it a place significance, but direct intra-urban connectivity is unlikely to be as developed as the suburban quarter, and therefore a more generous level of parking is permitted. Finally, achieving residential car reduction has not simply been framed merely in the context of creating new quarters, but crucially includes

the reshaping of existing neighbourhoods by ‘fresh cells’ that can help to inject a critical mass of new residents that could help to stabilise or reverse the fortunes of an ageing district without bringing excessive new traffic. Levels of car parking described are based on the experience of the case study neighbourhoods in Freiburg and in Tübingen.

As well as setting the four models of residential car reduction within the spatial context, it is also possible to relate the models to different the operating system typology set out in the previous chapter, which included examples of cities which evidenced different types of operating system based on modal share. Table 8.4 attempts to show optimal ‘compatibility’ of each of the four development models with the four operating systems defined earlier.

1. **Inner Urban** (Südstadt): Aggressively car-reduced – utilises central location accessibility
2. **Fresh Cell** (Dreikönigstraße): Infill with modest car provision in ageing neighbourhoods
3. **Suburban** (Vauban): Aggressively car-reduced
4. **Urban Extension** (Rieselfeld): Multi-modal but designed to reduce car impact and use

	Development Model			
	1	2	3	4
Operating System				
I Car Dominant	Yellow	Yellow	Red	Yellow
II Multi Modal	Green	Green	Yellow	Green
III P-T Orientated	Green	Green	Green	Green
IV Soft Modes	Green	Green	Green	Yellow

Table 8.1 Compatibility of Operating system and Neighbourhood Typology

Table 8.1 shows that models 1, 2 and 4 could be implemented under a car dominant operating system (I). Model 1’s central location should place it close to a central transport hub and near to a range of services and amenities, whereas models 2 and 4 integrate comparatively high levels of car parking. Model 3’s below average parking provision and suburban location mean that it is less suited and risks displacing parking into adjacent neighbourhoods. All models

could be suited to multi-modal (II), public transport orientated (III) and soft-mode orientated operating systems (IV). A slight doubt exists over whether a multi-modal operating system provides optimal conditions for a Vauban style (Model 3) development, because of the potential level of car ownership that may be envisaged. This raises an interesting question of whether Vauban is ideally suited to Freiburg. Although existing car parking infringements within and outside of the development suggest that car provision at the development does not fit perfectly with the circumstances of all households, more compelling evidence exists in the higher car provision introduced to later phases of the scheme. Lastly, a soft-mode orientated operating system (IV) may not be ideal for an urban extension model (4) where long travel distances are entailed.

8.4 Neighbourhood Renewal & Strategic Impacts

Each of the four models presented could provide strategies for neighbourhood renewal that would involve a degree of retrofitting, but the *fresh cell* approach provides perhaps the most readily applicable approach, being based around the concept of providing a new nucleus or nuclei of smaller developments into an existing neighbourhoods. The development sites are often vacant previously developed land, whilst the completed schemes can bring broader if 'light touch' changes into the neighbourhood through a critical influx of new residents to support transport services, shops and amenities and through the creation of green spaces and other infrastructure. Such cells might be integral components of more comprehensive forms of urban renewal. In the modernist Freiburg suburb of Landwasser a comprehensive renewal scheme is underway that has already brought the conversion of one residential tower block to the passive building standards that feature in Vauban and Rieselfeld and there are plans for further conversions. The masterplan for Landwasser will see the implementation of *fresh cells* of housing into some of the disused open spaces between the tower blocks (A). Wulf Daseking also aims to internally reorganise the living arrangements of Landwasser's tower blocks in order to generate a demographic mix that will see young and old juxtaposed. In effect, Landwasser's renewal scheme could see the implementation of universal design standards suitable for its existing lifelong community of residents, many of whom moved into the newly completed suburb in the 1970s. Plans for Landwasser could see it become a 'retrofitted Rieselfeld' - if in essence rather than in physical style. Freiburg is by no means alone in its ambition; a similar lifelong retrofit community initiative at Mableton in Atlanta has recently been described by Keyes *et al* (2011).

Both Landwasser and Mableton have set out to cater for ageing in place rather than to pursue other policies such as supportive housing that residents can move into elsewhere. But perhaps most pertinently both Atlanta's Regional Commission (ARC) and Freiburg's planning

authority have noted the importance of universal standards in neighbourhood design. The strength of this approach is that the many of the design principles are as equally relevant for the very young as they are for the old or the mobility impaired. A mother with a child buggy and shopping is likely to appreciate step-free access as much as an elderly person with walking difficulties or a wheelchair-bound person. Similarly, Hågerstrand (1971) compared the mobility extent of the elderly with young children, making the ‘city of short distances’ philosophy as relevant to the practical daily experience of the old as it is to young families, rather than simply being an high-level approach to reducing emissions by cutting travel. It is perhaps for this reason that ARC has endorsed the principles of New Urbanism that attempts to set out a ‘utilitarian’ set of design principles.

8.4.1 Mobility

By orientating residents away from the private car, car reduction may be used as a means to supporting existing public transport services, and potential creating new ones. Fig. 8.7 below shows the major transport routes of a small to medium sized fictional city that has a central railway station supported by major bus routes shown in red. Like many cities of this size, car ownership and use is very high, which means that the public transport network is relatively basic – mostly spanning out in ‘hub and spoke’ fashion along radial corridors from the central interchange, often entailing a change of service for those wishing to travel between different parts of the outer city where businesses and retail have located.

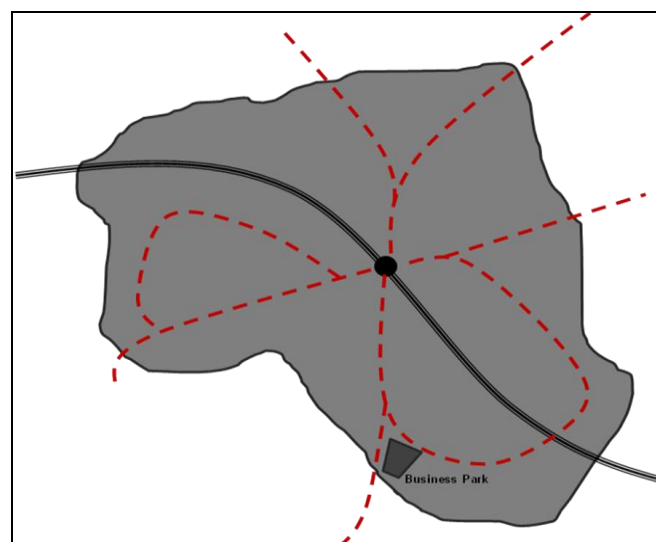


Fig. 8.7 Small – Medium City: Basic Transport structure

Fig 8.8 below shows how the four models relate to and influence the public transport services on offer. Because the inner urban quarter is a product of its proximity to a major transport

interchange serving all parts of the city, the change is negligible. Similarly, the suburban quarter follows good transportation links that were previously in place, but the car reduced nature of the scheme has placed pressure for improved services and the demand for a new route (in orange) to the edge-of-city business park. Although the urban extension model has been designed with greater car use by residents in mind, a critical mass of residents has placed sufficient demand for a new route connecting an outlying settlement with the suburb. In this way, the new suburb has become a 'staging post' where residents arriving from outside can change onto connecting services. Lastly, a modest 'fresh cell' scheme in an existing suburb with an ageing population is shown to have a transformative effect on transport connectivity by creating demand for a new transport or improved route that benefits the entire neighbourhood.

An elemental point about the four different models is that they attempt to combine 'realistic' levels of car parking with car alternative transportation in order to provide a level of accessibility that will support the range lifestyle patterns associated with the full cross section of society, and not just a specific sector. In this way, the built form of each model attempts to follow the basic transportation structure, although improvements to public transport services are likely to result from a substantial population with restricted car access. Each new quarter would begin to bring improved transport benefits to the wider locality – ranging from improvements to transport services along a particular corridor, or the availability of shared car club vehicles through to modifications to street design in order to accommodate improved cycle infrastructure. Parity in journey time and travel experience, as demonstrated in Freiburg, may begin to be achieved in ways that engenders a process of wider urban transformation.

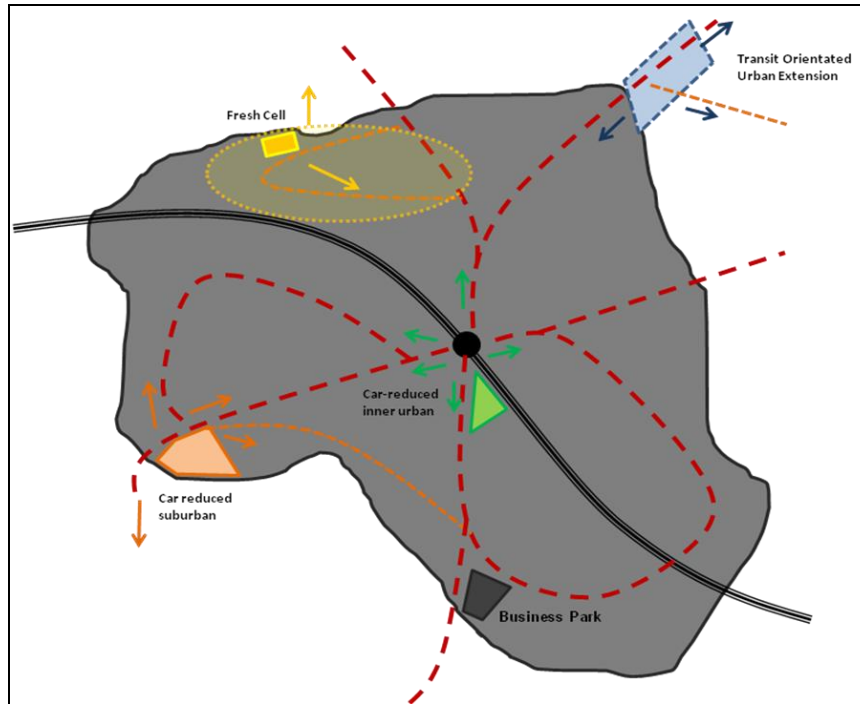


Fig. 8.8 Four Models Applied

8.4.2 Wider Effects

New developments of a significant scale can have profound effects on surrounding neighbourhoods, in terms of demands placed on existing infrastructure, new infrastructure provided, demand for shops and amenities and so forth. In the Fresh Cell model, such wider effects are deliberate. At Vauban, the basis for the Suburban Quarter model, new shops and businesses serve neighbouring districts, children of residents attend a local school in St Georgen – a district with an ageing population, and residents in neighbouring districts interchange onto a new tram line connecting Vauban and the inner city. Similarly, Rieselfeld serves as a hub for outlying settlements and peripheral districts, for shopping, amenities and employment as well as for transit into the city. Lastly, new Inner Urban Quarters can be instrumental in regenerating depopulated and economically disadvantaged inner city areas – providing a stable population throughout the day. Such schemes could also form part of a coordinated strategy for generating substantial volumes of new housing without recourse to high rise apartment blocks which have both restricted market sector appeal and limited suitability particularly for historic towns, and also as a means to avoid encroaching on contested green belt sites.

Part B: Implementing Car Reduction

A common and potentially important element of the Freiburg and Tübingen neighbourhoods conceptualised in the four models is the cooperative build approach taken to implementation, meaning that residents have been actively engaged in the design and development process from the outset. The essence of the Baugruppe approach is that residents pool their finances together, are able to ‘tailor’ their building within the framework of a building code set out in a site masterplan, and oversee the realisation of their building. A social community is developed as the buildings are constructed and buildings become individualised and expressive. Germany has a tradition of individual self-build and approximately a half of all new homes are delivered in this way (NaSBA, 2011). By contrast, the UK, where housing delivery is dominated by a small number of volume builders, has one of the lowest rates of self-build in the western world at approximately 10% (*ibid*), a situation that the British government has recently signalled its intention to change (DCLG, 2011).

Part B argues that the means in which new development is an integral part of the ‘social project’ of residential car reduction, in so far as the intrinsic qualities of physical space can play only a restricted role in engendering constructive social outcomes alone.

The next sections briefly review the delivery mechanisms for new residential development by comparing the UK model which is described as a ‘passive’ regime, and a rather more ‘active’ Freiburg model, and by means of observational evidence, demonstrates how each ‘regime’ leads to a different relationship between residents and neighbourhood space. Although this thesis has not set out to compare the UK and German experiences specifically, it nevertheless serves as a useful means to draw out lessons for future best practice. Certainly the current British government has adopted this approach with its ‘Localist’ project to ‘re-scale’ elements of the planning system down to local communities and measures to generate an upward momentum in custom build housing, including group self-build; a new momentum which is briefly surveyed in section 8.7.

8.5 Delivery Frameworks

Building on the policy guidance documents reviewed earlier in chapter three, this section reviews the policies and legislation that exist to support the delivery of residential car reduction in the UK and Germany quarters, both directly by planning policy, and also by supporting measures that shape the operating systems within each country. A number of elementary but important systemic differences Germany and the UK are identified. In order to

capture some of the key differences, table 8.2 summarises key aspects of governance, operating system and planning provisions.

Aspect		Germany (Freiburg)	UK (Generally)
Governance		Federal - promoting strong regionalism; delegation of power to directly elected mayors	Strongly central – regional tier being abolished except in London; metropolitan councils in larger cities; current localism policy
Operating System	Public Transport	Strongly organised by region and city; largely state owned	Fragmented and privatised; Integrated Transport Executives only in larger city-regions
	Streets & Roads	Local Authorities manage non-strategic streets & roads	Local Authorities manage non-strategic streets & roads
Planning	Scheme	Spatial planning; some national policy but largely regionally based	Local spatial planning by LAs towards national guidance
	Development Policy	20-year land use and transport plans; site-specific guidance as needed	Local Plans / DPDs; site-specific SPGs as needed
	Residential Car Reduction Policy	Requires exemptions to regulations including garage law	Support in current national guidance (under review); S106 / S48 agreements

Table 8.2 Summary of Key Organisational Aspects Contributing to Car Reduction

8.5.1 Governance

As table 8.2 shows, there are significant differences between Germany and the UK. Germany's federal political system means that significant powers are held and important functions of governance are discharged at the regional level, and further powers are held by directly elected mayors and councils at the municipal level. This system closes the distance between locally elected politicians yielding significant strategic decision-making powers over planning and transportation, compared with the present UK system although the system is currently being overhauled to strengthen local democracy with the introduction of directly elected mayors in some cities (HMG, 2012). The German governance system has been critical to Freiburg's evolution. In the 1970s and 1980s and responding to popular public demands, the Green Party mayor - Dr Rolf Böhme - introduced integrated public transportation and land use policies that established the modern city's operating system, thereby setting the conditions for Vauban and Rieselfeld (Böhme, 2001).

8.5.2 *Operating System*

In Germany, public transport is organised accordingly by management at both state and municipal levels, whereas in the UK only the larger metropolitan regions have an umbrella authority to coordinate public transport. These aspects are important as governance and the organisation of public transport have a strong bearing on the operating system which constitutes the overall setting for neighbourhoods and car reduction policies. In Freiburg, cooperation between its single municipal transport provider – the VAG and surrounding municipalities has meant the integration of public transport services, including the introduction of a single regional ‘environmental’ ticket that has been credited with a doubling of passenger traffic in the decade between 1983 and 1993. Responsibilities for streets and roads are similarly divided in Germany and the UK, with the strategic network managed by the state, and non-strategic streets and local roads locally managed.

8.5.3 *Planning*

Differences in the planning system between Germany and the UK are perhaps less pronounced with both countries adhering to forms of spatial planning and with functions discharged by local planning authorities operating at similar levels, though without a consistent level of strategic planning in the case of the UK. The mechanisms for development in the UK and Germany bear a degree of similarity. In the UK the broad concept of development is set out in Development Plan Documents (DPDs) that support the core strategy of the local plans which sets out a medium term vision for development. With the concept of development agreed in principle, a Local Authority may produce Supplementary Planning Documents (SPDs) or Guidance (SPG) that set out a more detailed framework for design. In Germany, an equivalent the Städtebalicher Rahmenplan (Ferber, 2000) forms the equivalent of SPDs and SPG; these are non-binding documents for use by developers during the detailed design process prior to obtaining detailed planning permission.

In Germany, as in the UK, planning regulations separate land uses through zoning – although there is provision for mixed use development. In former industrial and military sites Ferber (2000) reports that a specific tool – the Städtebalicher Entwicklungsmaßnahme – was invoked to create extensive mixed-use development at Tübingen Südstadt. Specific measures for residential car reduction through S106 agreements in the UK and the ‘Garage Ordinance’ in Germany were discussed in chapter three for ‘car free’ development. Current UK national guidance, which is currently under review, supports the notion of minimising the requirement for parking to the lowest possible level. It might therefore be concluded that whilst German cities have better control of the operating system, through being able to manage state-owned public transport, and are therefore better able to set the background conditions for car

reduction as Freiburg has demonstrated, delivering car-reduced development is perhaps more straightforward under British planning.

8.6 Implementation Models

This section explores two contrasting models of implementation – the ‘active’ regime as in which residents are engaged with the design and realisation process from the outset, and the UK developer-led ‘passive’ approach in which residents purchase or rent ‘off the shelf’ and have no active engagement with the delivery process. The contrasting approaches are shown to have important long term implications, literally as the active model encourages community building with building construction; a situation which makes for later translation into how sites are managed, spaces are utilised, and the overall ‘feel’ of each scheme.

8.6.1 The ‘Active’ Building Consortia Model

Although building consortia present an interesting model for locally organised development that results in bespoke design, draws upon active resident participation, and can result in homes that are cheaper to build than purchasing on the open market, there are limits to the extent that model can be replicated and a certain number of drawbacks. In each of the German developments the land was publicly owned or purchased by the state at a comparatively low cost and made available for purchase by Baugruppen consortia (A & B). A point of note is that the uplift in value of the building plots purchased by the Vauban Baugruppen contributed significantly to the cost of the tram extension into the neighbourhood (B); profit was reinvested by the City Authority into bolstering public transport. This model of land uplift capture and reinvestment shares a degree of similarity to a number of the English new towns including Milton Keynes (Hall & Ward, 1998) where agricultural land purchased was sold on as development land, and the subsequent gain initially captured by community trusts for later investment until it was abolished in the early 1970s. Public bodies in the UK have been discouraged from retaining significant tracts of land since that time meaning that developments of scale would more likely than not be on land purchased by a private operator; a significant obstacle to a new quarter developed by private consortia of individuals and households.

A number of drawbacks identified earlier regarding consortia-led development include potentially encouraging processes of residential selectivity, generated by the need to provide private finance (B & C), and the public housing provided in Vauban and Rieselfeld is physically different in character and less integrated into each development. Yet the early engagement of residents into design and building process of their home, block and neighbourhood is also recognisable. A subjective comparison of two street scenes from

developments of a similar age, the Greenwich Millennium Village – a developer-led scheme in London, and Vauban reveals a number of readily observable differences (Fig. 8.9).



Fig.8.9 Weekend Street Scenes (A) Greenwich Millennium Village & (B) Vauban

In Vauban it is striking that there are virtually no CCTV cameras or elaborate security arrangements in the German developments. Homes typically open straight out onto the street or open access outdoor landings, whilst communal car parks are also freely accessed by foot (Fig.8.10a). Neighbourhood green spaces have been designed with a purpose in mind – weather for play or repose. Few areas are designated as off-limits to the general public, boundaries tend to be ‘soft’ (Fig. 8.7b) and fences that exist are generally discrete. In sum, one could describe a spirit of self-reliance in the German case studies: that it is up to residents to look after themselves, each other and their environment.



Fig.8.10 Open access parking (a) and soft boundaries around residential property (b)

In Tübingen Südstadt a striking result of resident-led involvement is an abundance of potted plants (Fig. 8.11) that serve to add character and lessen the impact of street furniture such as lamp posts.



Fig. 8.11 Potted plants in Tübingen Südstadt

8.6.2 *The 'Passive' Developer-led model*

The Greenwich the Millennium Village's public space exudes a more 'passive' character which is a logical consequence of the more disengaged relationship that residents have from the development process compared with the Baugruppe, and consequently have with their home environment. The bulk of natural space within the residential area is in the form of easily maintained landscaped borders. Recreational space is situated remotely away from homes, whilst an adjacent and newly created wetland 'ecological park' is strictly an observational area only. With the exception of a number of houses, homes in the development are accessed within security-controlled lobbies, communal gardens and parking are fortified so as not to be accessed by the public, and CCTV cameras survey every street of the neighbourhood. Residents have few responsibilities as a result. The contrast between Greenwich's overwhelmingly 'passive' spaces from the German models is marked. Because little is expected of residents, it is suggested that a spiralling situation is created in which little is given back in return. In other words, a tripartite relationship between social interaction, residents' engagement with their environment and the built environment seems to exist (Fig. 8.10); or put differently, social capital permits human capital to be deployed in a way that shapes fixed capital, and the cycle continues. Consequently, there are no pot plants dotted around the Millennium Village, but there are plenty of security cameras.

8.6.3 *Spatial Design & Quality*

The 'passive' nature of public space in Greenwich seems linked to a spatial separation of functions at the most elementary level. This is typified by the separation of recreational space from homes in contrast to the German developments. Such separation seems appropriate for games that need space and create noise such as ball games, but again, because no provision

has been made for residents – children in particular – to make use of public areas, the absence of activity has been noticed in repeated trips to Greenwich on weekends and evening times.

Such ‘disunity’ of purpose seems to be characteristic across in retail and services. Although retail units have been positioned around a central square and strategically across the development, the majority have remained empty. Indeed at the time of writing in mid-2011, and with 1100 homes completed, only five out of eight units are filled, consisting of a pharmacy, a launderette a convenience store, coffee shop-cum-beauty salon and an estate agent. A retail park located less than a mile away or less than five minutes by bus features a large Sainsbury’s superstore, making for difficult trading conditions for smaller retailers within the village, although an additional 800 homes that are planned may bring a critical mass of customers to make further retail viable. But the contradiction between intention and reality has a clear parallel with Alex Marshall’s depiction of Celebration, Florida where the town’s ‘true’ high street is described as being located off the freeway ramp, rather than including the faux-traditional shops within the town itself. An overall car parking ratio of 0.85 across the development that could be considered to be ‘generous’ for a ‘sustainable’ neighbourhood suggests that the bulk of households may or be expected to have vehicles with which retail may be accessed.

Lastly, the Millennium Village’s sense of ‘disunity’ seems compounded by the extensive parkland that its website celebrates. Once again, this seems to consist of ‘passive’ space that bear a degree of resemblance to the ‘dead’ spaces of modernist developments, and which generates distance without necessarily adding amenity, recreational or ecological value.

8.6.4 Communal Space Management

The management of communal space reveals stark differences between the active and passive models. A dilemma is reached over how new schemes are managed, where responsibilities lie, and expectations that are placed on the residents themselves. On one side there is an argument in support of utilising ‘human capital’ – based on the notion that most individuals can contribute in some way, and that self-organisation will naturally result from the absence of imposed leadership from above. On the other side exists a counter-argument over the risk from inaction and disagreement – that individuals have different wants, including non-involvement and that management can only be provided by a professional and non-partisan body. Here, one might also recognise a degree of self interest on the part of the developer by minimising perceived risk from a marketing point of view, and an opportunity to secure a long term income from management fees.

The Millennium Village is a highly managed site, in which residents pay for the services of a site concierge, maintenance and security, and although a community forum exists, there appears to be little expectation of day-to-day resident involvement or responsibility. By contrast the German developments are resident managed, with upkeep arrangements made by each building and by volunteer groups for site maintenance, whilst security provisions are minimal. Once again, the community-building concept of the active regime is confirmed, whilst under the passive regime there appears to be little expectation and perhaps the diminished prospect of community development.



Fig.8.12 Millennium Village Central Square (A) Showing Busway, and (B) CCTV Camera

8.6.5. Summary

In this section the process by which development has been implemented has emerges as an important consideration to the social and spatial outcomes generated. In other words *how* development is implemented seems to be an important consideration alongside *what* is created, even if the balance between these two factors in producing social outcomes requires detailed further investigation. The overall quality of the communal spaces produced under developer-led and resident-led approaches have been described as ‘passive’ and ‘active’, respectively. Residents of the former are users of spaces created and managed for them, and residents of the latter are active participants in creating and managing the space. A number of primary elements of each ‘regime’ are summarised below in table 8.3.

	Active Regime	Passive Regime
Neighbourhood Layout	Neighbourhood Forum / City	Development Group / City
Building Design	Building Consortia / City (coding)	Development Group / City (coding)
Landscaping	Neighbourhood Forum / Consortia	Development Group
Maintenance of Communal Space	Forum / Volunteer Groups	Management Company

Table 8.3 Primary Implementation Elements

If the shared experience of design and construction of a new neighbourhood is important to the forging of relationships between residents of active 'regimen' in Vauban and Rieselfeld, then the relative importance of car reduction measures may seem questionable. However, the properties of space may be considered as an 'enabling' factor for the development and continuation of relationships between residents through social interaction. Residential car reduction may be seen to establish a basic environmental quality – a convivial setting that is conducive to social interaction, all other factors being equal. Yet it may be seen how an active development regime provides impetus to the forging of neighbourly and community relations through shared experience, with a convivial neighbourhood environment encouraging the social contact necessary to sustain strong relations. To relate this back to the theoretical framework therefore, although residential design may be regarded as a 'fulcrum' that controls the balance between social interaction and mobility (Fig. 3.15), in Vauban the active role of residents in building the 'fulcrum' in the physical sense meant also that a social community was constructed.

Limiting the impact of the car in Vauban has permitted a pattern of density development that blends high density with high quality green space and crucially, the utilisation of residential streets as communal space, to permit relationship-sustaining social contact beyond that expected from a resident-engaged neighbourhood more heavily orientated towards the car. Relevantly, the basic geography of lifestyles explored in chapter six did not vary significantly between Vauban, Rieselfeld and Haslach residents. Indeed, a number of Vauban residents lived very mobile lifestyles, but it would appear that the strongly-rooted nature of relations and the increased opportunities for neighbourly contact permit strong neighbourhood relations to be maintained in Vauban. However, it may be recognised that attempting to forge Vauban levels of community in developer-led and highly managed schemes where resident participation is low will almost certainly fall significantly short.

8.7 Prospects and Transferability to the UK

8.7.1 Overview

Although this thesis has not set out to exhaustively examine the transferability of neighbourhood car reduction concepts from Germany to the UK, this section reflects on some of the key opportunities and barriers. Arguably the UK - and England specifically – is a particularly good focus for exploring transferability issues, firstly because no current example of an aggressively car-reduced scheme currently exists in England, secondly, because a long term shortage in housing supply (Hamiduddin & Gallent, 2012) puts pressure for a significant uplift in delivery, and thirdly 'new' modes of housing delivery including 'custom build' housing are being supported by the government (HMG, 2011b). The latter offers the prospect

of the ‘group build’ style schemes employed in Freiburg and Tübingen. Furthermore, car reduced development could offer a means for delivering housing with commensurately lower levels of traffic than is normally generated (Melia *et al*, 2011).

8.7.2 Germany and the UK: Differences and Similarities

Significant differences exist between the UK and Germany in the organisation of government, the levels at which power is exercised and in the structure of public transport exist. This means that German cities and their regions are perhaps better able to set the wider conditions to support car-reduced neighbourhoods even if British planning has offered a smoother administrative path to delivery. Unpacking the elements that have contributed to the delivery of residential car reduction in Freiburg identifies a critical relationship between bottom-up grass roots movements driving development from below, and top-down facilitation by local and regional government in setting contextual conditions, overcoming administrative barriers and providing overall coherence and integration of the schemes and the wider city. In other words, the Freiburg schemes have been achieved by the partnership of ‘micro’ organisations from below, and macro-scale governance facilitation from above. Freiburg has recently signalled a change of approach away from large suburban style schemes towards smaller ‘fresh cell’ schemes aimed at supporting existing and declining neighbourhoods.

In the UK, the structure of governance and its planning system is undergoing a process of reform which arguably may assist in the delivery of car reduction – in England and Wales specifically. A significant plank of reform was a system of local spatial planning introduced under the New Labour government by the 2004 Housing & Compulsory purchase Act (HMG, 2004) requiring local planning authorities to develop Local Development Frameworks (LDFs) in consultation with the public and interested parties, with a ten year minimum vision set out in a core strategy document. Although the LDF suite of documents has recently been streamlined into Local Plans under the Localism Act (HMG, 2011a), the process is founded on a system of public participation and engagement that has recently been strengthened by the Coalition government’s ‘Localism’ agenda giving potential empowerment to communities through neighbourhood planning, including a referendum-based ‘Community Right to Build’. A number of towns and cities are to receive directly elected mayors under the provisions of the Act. In essence, a stronger relationship between community-based groups and local government introduced under local spatial planning is set to be enhanced, although transportation will continue to be organised in a market-based way except in the largest cities where umbrella transportation groups exist.

This means that the Vauban-style suburban quarters may continue to be unsuited to British cities of a similar size to Freiburg, because of the difficulties in creating an operating system

able to provide the necessary contextual support under a privatised and fragmented operation of public transport. Alternative schemes such as the inner-urban model with its proximity to a central transport node, the outer urban model with its more generous car provision, and smaller ‘fresh cell’ model with ‘realistic’ parking levels in existing neighbourhoods may be better suited to the UK, given the weaker organisational support that is currently available.

8.7.3 Implementation

Having identified styles of car-reduced development that may be suited to the UK, there remains a question of implementation. The Baugruppen resident consortia model of collective implementation is virtually unprecedented in the UK, a small number of small co-housing projects that bear a degree of conceptual similarity have been created in recent years (Williams, 2005), with some implemented through resident consortia, and all with an emphasis on sharing. Co-housing differs from the Baugruppen concept because it is a permanent typology of building – usually incorporating shared facilities and space, in contrast to the Baugruppe which is a transient consortium established for the development phase and with no long term legal status. However, the community self-build model has recently been established in the UK, although the schemes have tended to focus on the realisation of individual dwelling houses. The 37 home self-build scheme at Ashley Vale project in Bristol is currently the largest community self-build project, entirely financed from individual mortgages (www.selfbuild-central.co.uk – accessed 12th October, 2011) and in typology terms would be most closely aligned with the ‘fresh cell’ model by bringing a younger demographic into a ‘mature’ neighbourhood. The bulk of the homes are in the form of individual houses, built in a wide range of individual styles (Fig.8.13) and are built to high environmental sustainability standards. Car reduction measures centre on reducing the impact of automobiles via a central car-free green space and a main shared surface street that forms a cul-de-sac to automobiles. Reduction in car use is achieved by means of bike storage and access to Bristol’s comprehensive cycle network, however, no attempt has been made to limit ownership with all homes having at least one space adjacent to the building. Although parking provision is generous compared to the German schemes, a number of ‘no parking’ signs in turning areas and outside homes indicate that infringements are a problem here.



Fig. 8.13 Community Self-Build: Ashley Vale, Bristol

The promotion of ‘custom build’ housing as laid out in government’s National Housing Strategy raises the prospect of substantial new neighbourhoods (HMG, 2011b:14-15) similar to Ashley Vale but supported by the release of public land in a way similar to Vauban and Rieselfeld. Considerable interest has been shown by government in the Baugruppe approach, as evidenced by the creation of a £30m fund to support group custom build projects (HMG, 2012) and by the National Self Build Association (NaSBA) which authored a national Action Plan for custom build housing (NaSBA, 2011a & b) upon which the government’s strategy has been partly based. There is much detail to be worked in how such neighbourhoods could be implemented, and the strategy announced that local authorities across England would need to develop action plans to support custom-built homes. Yet with its modest Ashley Vale self-build neighbourhood, Bristol can be recognised as a leader in this field, and could prove to be fertile territory for future pioneering development.

8.7.4 Planning Policy

The danger of presenting conceptual models for future development is a temptation to ‘short-cut’ the due process of good design from first principles and with close consideration of context. The four models presented in Part A may therefore be viewed as providing a ‘loose fit’ conceptual basis for reducing the dominance of the car in the residential environment. Specific considerations discussed include:

1. Recognising that residential car reduction takes many forms – from superblocks that create car –free enclaves in the Rieselfeld suburban model to small infill ‘cells’ in existing neighbourhoods which, through an ‘injection’ of new residents, can have a broader transformative effect on transport services and amenities;

2. Matching car reduction with the wider transport network, to ensure that residents have access to car-alternative motive networks that reflect the full extent of accessibility across a city and beyond, and not merely ‘typical’ journey to work patterns or proximity to a single transport route into the city centre;
3. Encouraging residents’ creativity and contribution toward shaping their neighbourhood and immediate space by recognising that there should be limitations to design specification and that space can be created to engage residents actively

8.7.5 The Four Models: Transferability Considerations

This thesis has continuously stressed the importance of achieving a good fit between neighbourhood model and operating system. By way of distilling the discussion of this chapter, this section explores a straightforward question: *what are the barriers to building a Vauban style development in an English city?* The transferability considerations which this question poses are set out under four headings: (i) operating system, (ii) neighbourhood concept, (iii) delivery concept, (iv) detailed car reduction measures. These are considered in turn.

1. Operating System: the compatibility matrix presented earlier in table 8.1 suggests that an aggressively car-reduced scheme such as Vauban are best suited to public transport or soft mode oriented regimen. Even Freiburg’s ‘multi-modal’ operating system provides only just enough support for the scheme, and there is some evidence that transgressions in car parking and ownership occur. In the UK a similarly aggressive, suburban scheme would only be viable in the largest of cities such as London and Manchester, where multi-modal operating systems reflect the important elements of strong strategic governance, a dense and robust transport network and integrated spatial land use and transport policies. The urban extension, fresh cell and inner urban models would be most generally suited to the smaller English cities.

2. Neighbourhood Concept – the main obstacle to the implementation of the three larger obstacles is land availability. Large inner urban opportunity sites are rare in smaller conurbations. Suburban and urban extension sites are often subject to urban containment policies or cross territorial boundaries between planning authorities, which can make development difficult to bring forward in the absence of a German style stable layer of strategic governance.

3. Delivery – the Baugruppe style delivery mode requires strong municipal support to create the institutional framework to permit the groups to take their schemes forward.

In addition to a reticence on the part of local authorities to support a delivery mode which is - as yet - untried in England, there are three potential practical barriers:

- i. Land - group build usually requires public land;
- ii. People - evidence from this thesis indicates that such schemes may have greater appeal to younger residents; older residents may be discouraged
- iii. Finance – private finance may be difficult to obtain.

4. Car Reduction Measures – the majority of the individual components used to achieve reductions in car impact and use in the four models are already in use in England, but the limiting of car ownership would present a considerable step change that local authority planners might find difficult to accept.

A footnote to the final point is that attitudes towards driving and vehicle ownership seem to be changing across the 18-25 age group (Goodwin, 2012). A continued trend could make the introduction of more radical measures to limit ownership more feasible.

PART C: CONCLUSIONS

Four car-reduced quarter models of varying scale, context and typology were investigated and used were investigated and presented as ‘loose fit’ models for future development. The first model – the suburban car-reduced model based on Vauban was recognised as the most difficult to achieve, and was therefore not recommended unless cities had an extensive car-alternative transport offer and decentralised structure. The second model – the suburban transit-orientated model based on Rieselfeld was felt to be more universally acceptable because of a greater tolerance to greater car use and less extensive car-alternative infrastructure. The third model was the inner city car-reduced model inspired by Tübingen’s Südstadt development and was thought to be particularly relevant to cities with a heavily radial transport structure, such as smaller cities. This model was also thought to be particularly relevant to retrofit schemes because of the central location of the neighbourhoods. The last model – the ‘fresh cell’ approach was based around the concept of inserting new development within existing and mature neighbourhoods that were suffering from a long term decline in household occupancy that made local services less viable.

Freiburg’s use of a ‘fresh cell therapy’ approach to stabilise and rejuvenate existing neighbourhoods marks a shift away from large scale new development towards smaller-scale approaches that attempt to produce wider impacts. The city is also about to embark on a larger scale retrofitting scheme in the modernist suburb of Landwasser, where new housing ‘cells’ form part of a wider package of measures that aim to make the neighbourhood environmentally as well as socially sustainable. It was suggested that the ultimate outcome could be to reshape Landwasser into a new Rieselfeld – in essence rather than in physical look. The concept of neighbourhood modernisation through retrofit and renewal could provide an attractive scheme of approach for policy makers, and follows a broader historic trend of urban adaptation and change to the wider context.

In order to make residential car reduction achievable, the importance of access to a high quality public transport network was stressed as a basic precondition as a key aspect of the ‘operating system’, and realistic levels of car reduction that might be anticipated from a combination of different measures to reduce travel need and promote car alternatives.

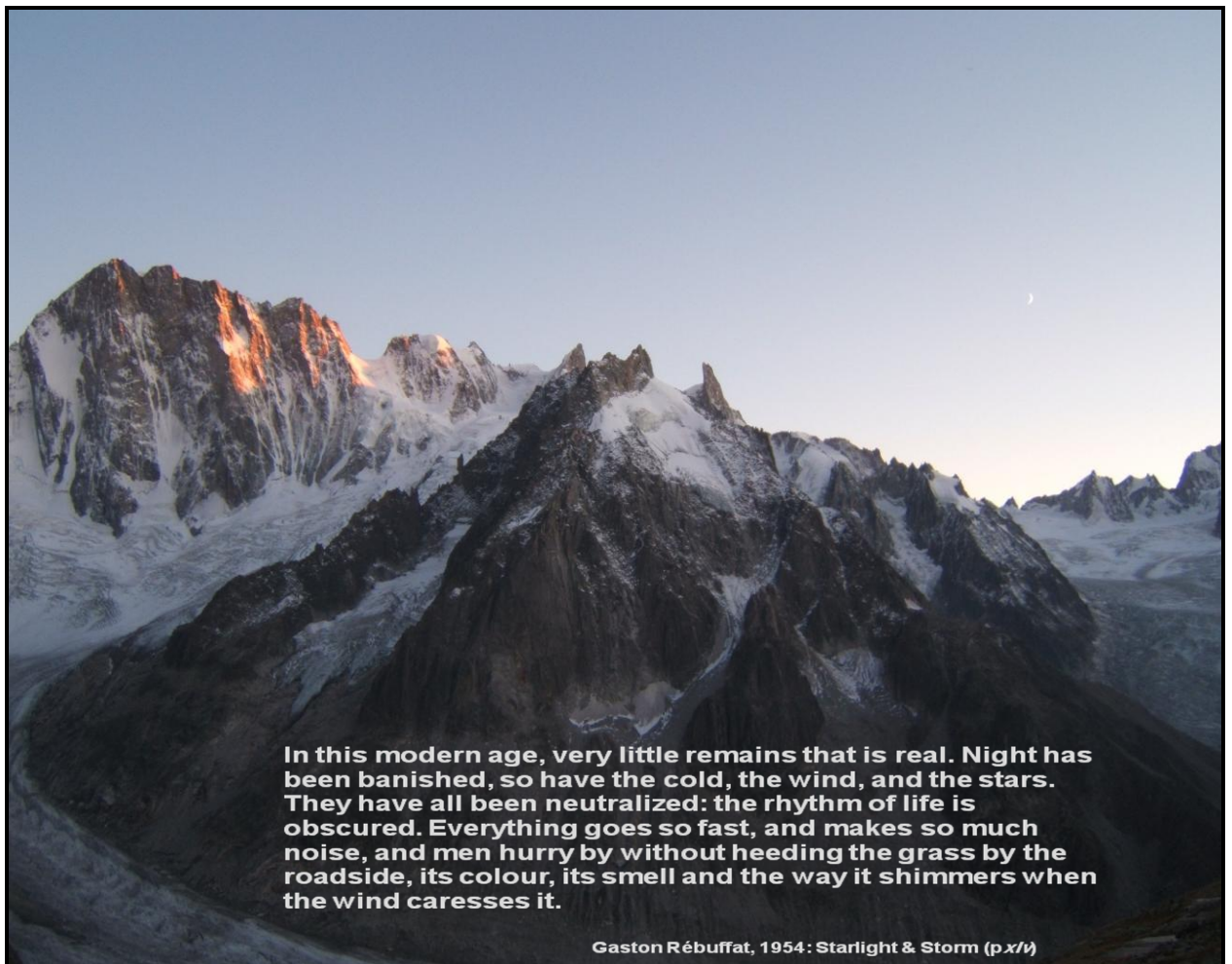
With respect to the development of community relations in the new development sites, a comparison between the German case study sites in which Baugruppen took responsibility for designing and constructing each building, against the developer-led Greenwich Millennium Village revealed the limits of the latter model. Residents of the Millennium Village had no

role to play except as consumers, and as a consequence community space was described as 'passive' rather than 'active', and this had a corresponding effect on how space was used, and on the 'feel' of the development in terms of creativity and activity. Although such differences might be described as systemic, it must be remembered that Baugruppen represent a radical and recent departure in Germany. In Britain, the speculative nature of development inevitably leads to a minimising of risk – and the Millennium Village was described as a scheme where nothing was left to chance, and thus virtually all responsibility for the management of communal space was invested in a management company. Although the situation is understandable, a different model was suggested based on the operation of Vauban's cooperative shop, where residents agree to dedicate an agreed amount of work time per annum or pay a fee in lieu. It was suggested that this arrangement might serve as a model for community engagement for site maintenance, whilst guaranteeing that the work is undertaken.

A question remains over the viability of the Baugruppe model in the UK, although there seems to be no legal reason why such a model could not be applied. Indeed, many cooperative systems continue to exist and be created in different sectors, including in housing. However, in Freiburg and in Tübingen the schemes have been predicated on local authority support – in making the available for use to cooperative building groups and for the implementation of transport infrastructure in ways that are hard to envisage in the UK's market-led approach. Yet it was suggested that in the UK it may be possible for building groups to put in a collective offer for land, or for a single organisation to purchase then make the land available to shareholders. At prime, inner-city sites such arrangements may be untenable. Yet as a concluding thought, some inner urban public land is clearly wasted in open air car parking where a multi-story car park would have a greatly reduced footprint. In a number of cities such sites would not necessarily be appropriate for high rise transit-orientated development; but could instead host a Südstadt-style compact but liveable new urban quarter.

Chapter Nine

Conclusions, Critical Reflections & Recommendations



9.1 Introduction

This thesis began as an academic enquiry into what was initially believed, and commonly presented to be, the technical domain of car dependency and the built environment – the perceived problems associated with automobile orientation, and the negative impacts on social, economic and environmental sustainability. The specific focal point of the thesis – the car in the neighbourhood – draws together issues of community cohesion and equity that provide twin poles of a framework for social sustainability (Bramley & Power, 2009; Dempsey *et al*, 2012). In spite of the geographical extent over which lives have become shaped around, the home environment remains a critically important anchor point, both in terms of the amount of time spent and variety of functions performed.

Having recognised both the scale and the often insidious nature of car dominance in the earlier chapters, the remainder of the thesis has been directed towards identifying strategies that address the issues identified. The latter part of the thesis has argued that efforts to reduce car ownership must be consistent with the wider context, or ‘operating system’, as the arrangement of supporting transportation and planning strategies were collectively termed. In order to demonstrate how the lessons may be applied in different spatial contexts, evidence from the case study research was elaborated by means of additional evidence to provide four broad models of residential car reduction for different scale and localities in chapters seven and eight. Importantly, the strategic impact of car reduced schemes has been recognised, as a means to propagating a district-wide shift away from car use by supporting existing infrastructure and creating demand for improvements. The creation of such positive ‘externalities’ is integral to the ‘fresh cell’ model, yet the other models provide similar contributions – for example in Vauban’s extension of the Freiburg tram system that has improved transport services to intermediate districts, and a similar extension of Freiburg’s tram network to serve Rieselfeld, providing improved public transport access to surrounding villages.

This chapter attempts to conclude the thesis by summarising the key contributions of the research to academic theory in Part A, and more directly towards practice in Part B. Although such division relates to a long-standing debate about the relationship between planning theory and practice, and more specifically whether a ‘gap’ exists, why it should be so and how it should be ‘bridged’ (Alexander, 1997), it may firstly be accepted that policy plays a linking role, but secondly, the integration of theory into policy follows different pathways. The line between theory and practice is a permeable perhaps arbitrary one, particularly if it is accepted that the aim of all theory is to influence practice. Nevertheless, the two groupings provide a useful means to divide key findings between those that may best contribute to knowledge at a

theoretical or strategic policy level and those that are better directed towards the operational or practitioner level.

Part A: Theory

9.2 Residential Car Reduction

A three-part framework for residential car reduction was developed in chapter three around approaches which in turn aim to reduce (i) car ownership, (ii) car use and (iii) impact in the residential environment by means of different measures often implemented together in a coordinated fashion in different ‘packages’. This framework is critically important as a basis for exploring the complexity and the multitude of approaches that are possible in the field. A number of confusing terms exist within the academic literature, notably the term ‘car free’ development which has been applied to Vauban – a neighbourhood where the car is clearly an integral facet. The ‘car reduced quarter’ is therefore proposed as an umbrella term both because it more accurately depicts the reality, and offers an organising framework for relating design measures to specific desired outcomes. For the purposes of this thesis, and stemming from the rationale in support of residential car reduction set out in chapter one, the desired outcomes broadly consisted of the creation of neighbourhood settings which encourage social interaction, where accessibility for all user groups is maintained for the full spectrum of core needs.

The theoretical framework validated from pilot studies in the UK formed the basis for testing the relationships between mobility, social and design within a single frame of focus in the three neighbourhood models investigated in the Freiburg case study. Although the theoretical framework served as a valid approach to research into the social implications of residential car reduction, relationships between the key elements found to not be necessarily straightforward. The first research sub question asked whether *there was evidence of demographic concentration in relation to private sector housing* in relation to car-reduction. The question implied that car reduction provides a focal point around which highly selective communities are created, that are closed to some sections of society on mobility grounds. Chapter five found that the Freiburg neighbourhoods were highly selective, though not necessarily because of car reduction *per se*. Yet such selectivity did not mean that they were insular and inward looking communities as wider planning measures have encouraged strong relationships between the schemes and surrounding districts and the wider city. The second question addressed mobility and considered whether some residents suffered *mobility disadvantage* as a result of living in such a scheme. The conclusion from chapter was that there was no evidence of mobility disadvantage, and the basic reason here is because of the measures that Freiburg and its surrounding region have implemented in order to encourage non-car travel.

Overall directions of causality of the social and mobility processes set out in the research framework are depicted below in Fig. 9.1. The model shows how the resident-led design and implementation process provides an initial mechanism for self-selectivity, because of matters of life stage and access to the necessary private finance discussed in chapter five, and this exerts a profound influence on social interaction and mobility patterns in turn.

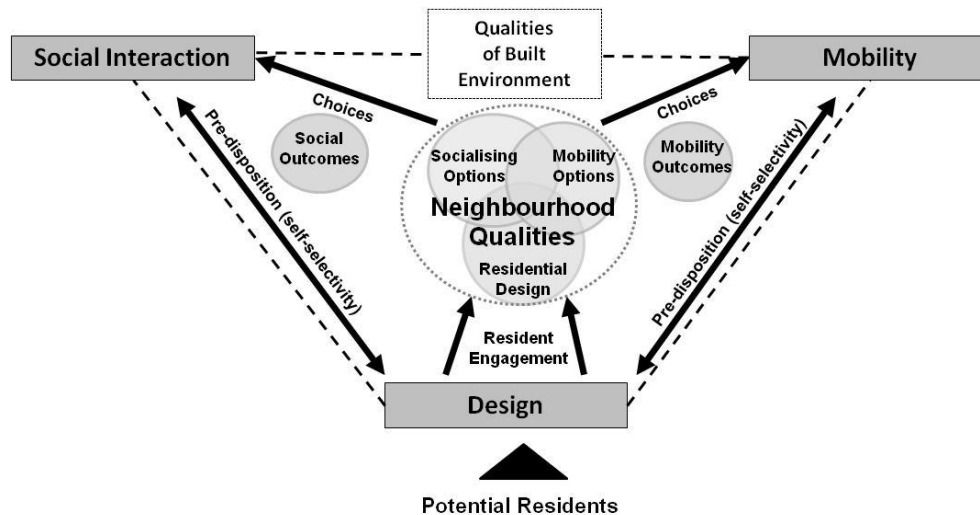
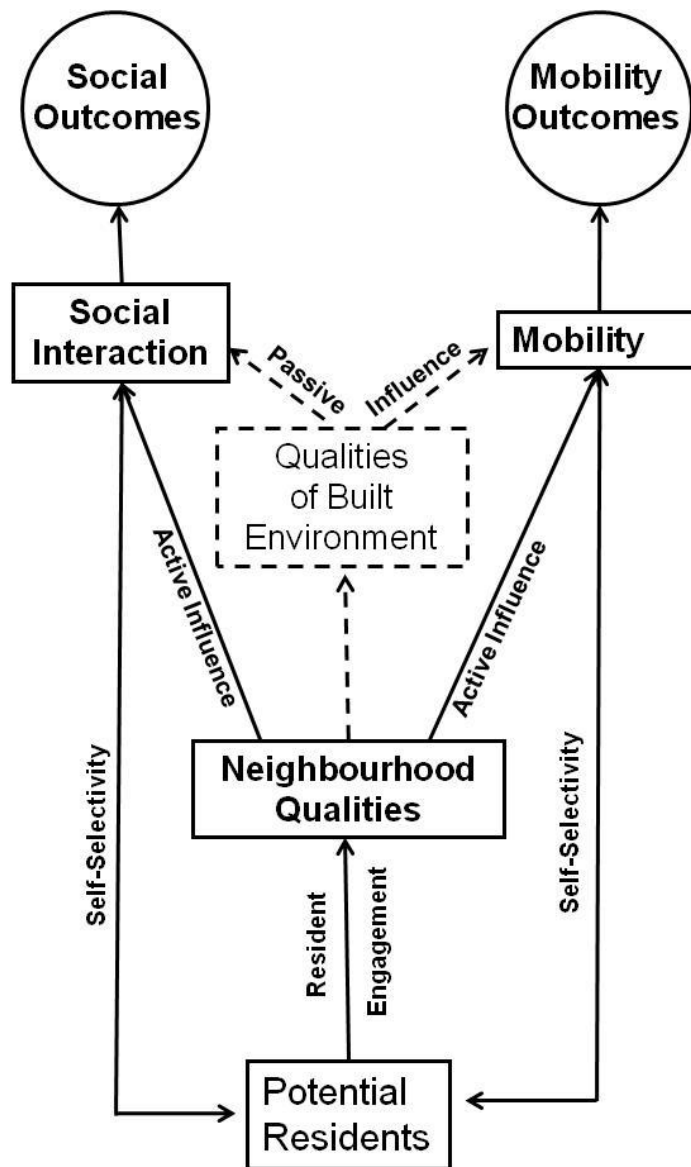


Fig. 9.1 Theoretical framework showing directions of causality

Having been tested during the empirical phase, the principal components of the theoretical framework may be reorganised into a basic conceptual model for mobility and social outcomes in relation to the residential environment, which is shown below in Fig. 9.2. The model incorporates both the influence of neighbourhood qualities in directing residents ‘actively’ towards different options – such as the strident measures to limit car ownership or use through physical or significant financial restraining measures, or more passively by producing qualities of the built environment to encourage particular outcomes to occur.



9.2 Social & Mobility Considerations

Social considerations related to social interaction, perceptions of community and social capital, both by directly questioning and by surrogate questions such as on children’s freedom to roam. Questionnaire based research was ‘triangulated’ from unstructured interviews and observations. Although recent studies by Christina Schings (2009) touched on some issues of community development and relation to the wider city that confirmed the findings in chapter five, this study is the first to have compared different neighbourhood models and attempted to explain the outcomes found. Mobility considerations related to the way in which people organise their lives, travel and consider the mobility options available to them. It is the only such study to have done this in the Freiburg neighbourhoods – the only previous study of modal share in Vauban having been undertaken by Claudia Nobis prior to the completion of

the neighbourhood and the opening of the tram extension in 2005 (Nobis, 2003), and the only study that has attempted to compare different neighbourhood models in Freiburg in mobility terms.

9.3.1 Social Considerations

The evidence presented in chapter five and earlier in the literature reviewed in chapter two indicates that without intervention, car reduction can lead to higher levels of residential self-selectivity than would ordinarily be expected in new developments, and particularly where resident-led group build approaches are used. Although the finding echoes the work of Handy *et al* (2006) who similarly found evidence in the United States to suggest residential self-selectivity occurred in ‘walkable’ neighbourhoods, these studies have not been able to determine causality, and in the case of the Freiburg neighbourhoods, there are a number of potential factors beyond those related to travel which could influence selectivity. For example, the city’s housing shortage in relation to its burgeoning younger demographic and the *Baugruppen* model of collaborative private financing employed in Vauban and Rieselfeld are factors that are likely to have been instrumental in attracting younger families. In turn, both the concentration of families with young children and the collaborative decision-making process required by the *Baugruppen* and community fora are likely to have contributed to exceptionally high social bonds within both developments. These factors are difficult to separate from the ‘sociable design’ features incorporated into each neighbourhood, although interviews with residents and observations from the fieldwork indicate a very high level of ‘meeting and greeting’.

Although the social bonds within each of the new neighbourhoods are strong, it seems that this has not made the neighbourhood communities insular and unwelcoming to outsiders. Residents seem to feel a strong sense of belonging both towards the wider Freiburg community, although this is likely to be influenced by the fact that a significant proportion has previously been resident elsewhere in the city. Several aspects of planning were identified as assisting in the process of inter-neighbourhood mixing, including the shared use of facilities and infrastructure including schools and shopping areas, and the strategic significance placed on both Vauban and Rieselfeld as transport interchanges connecting the tram with feeder services. Both neighbourhoods have open central axes to the outside to draw the outsider in.

It can also be concluded that there is no evidence to support the theory that demographic concentration found in Vauban and Rieselfeld has adversely affected other neighbourhoods. The strategic sharing of facilities and infrastructure has allowed some services to be supported, particularly in the case of Vauban and its neighbouring districts – and notably in

the case of St Georgen secondary school where the district's ageing population will have cast the school's future into some doubt.

The discussion in chapter five raised two important and related points. The first was the trend for population 'stagnation' evident from demographic data of all Freiburg districts over a twenty year period. The data reveals that residents in a number of districts built in the 1960s and 1970s settled *en mass* and have aged in place in a process that has led to district population decline, decreasing household occupancy and a subsequent pressure for the rationalisation of infrastructure including transport services in these areas. Vauban and Rieselfeld look set to repeat this pattern although Rieselfeld's longer construction timescale and greater age mix may partly mitigate it. The situation needs to be watched by the Freiburg government, and it was suggested that future development could benefit from better management of the temporal dimension – such as through phased construction, if a greater mix of ages cannot be garnered from the outset. Contrastingly, however, the second point was that demographic concentration in car reduced developments could be deployed as a tool for supporting ageing neighbourhoods. Termed 'fresh cell therapy' by Wulf Daseking this fourth model of development has been demonstrated by infill development at Dreikönigstraße in Freiburg's eastern suburb of Wiehre.

Lastly, it has been argued that social need in the context of the built environment is often presented in terms of functionality and social relations. It is argued that a 'deeper' but necessary relationship with the natural world for reasons presented in chapter two is an often overlooked element of social need. Green spaces are often discussed by planners in purely functional terms – for recreation, biodiversity or as 'green lungs' for air quality improvement; language that understandably reflects an unwillingness to explore deeper value of such space. This can result in the separation of high quality natural spaces from residential areas as demonstrated in chapter eight with the Millennium Village. By contrast, a feature of Vauban, Rieselfeld and Tübingen Südstadt is the fusion of natural spaces in the urbanism, where quality rather than scale has evidently been deemed to have greater importance in the heart of each development.

9.3.2 Mobility

The three elements of car reduction provide a basic conceptual framework for considering different models of residential car reduction. Stringent design and financial constraints at Vauban have had only a modest impact of reducing household ownership levels to one third below the Freiburg average. However, both Vauban and Rieselfeld have succeeded in reducing daily usage dramatically, although it can be argued that the pattern relates as equally to the operating system of Freiburg as to intrinsic design of the developments themselves.

Lastly, both Rieselfeld and Vauban have adopted grid-based street patterns to create car-free blocks, interspersed with streets that predominantly prioritise non-traffic aspects through simple shared surfaces supported by home zone regulations.

Although chapter six found little evidence of mobility constraint associated with car reduction, it was initially suggested that residential selectivity could be an important factor in mitigating mobility shortfalls. Although there was some evidence to support this theory, analysis of travel patterns and Freiburg’s urban and transportation structure indicates the importance of broader policies that reduce the need to travel throughout the city, through the creation of strong neighbourhoods and the creation of modal equity. The effect is a ‘nesting’ of travel in which ‘core’ needs are met local and accessible by physical means, whilst progressively less ‘vital’ needs requiring greater travel distances are met by public transport and even the private car (Figs 9.3 & 9.4).

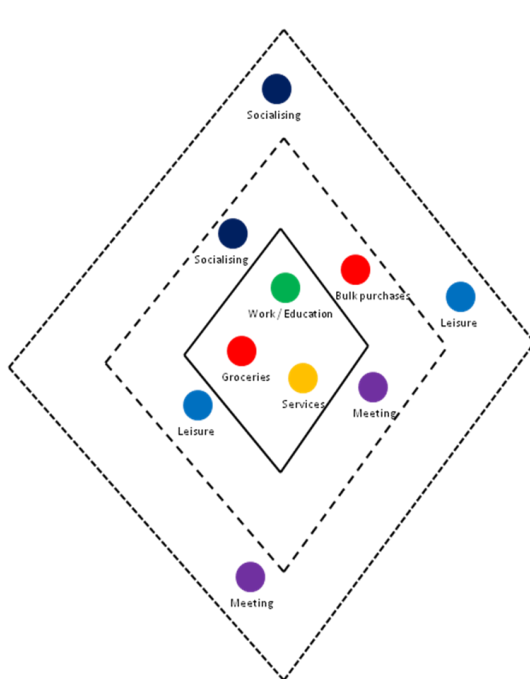


Fig. 9.3 Nested Travel Needs

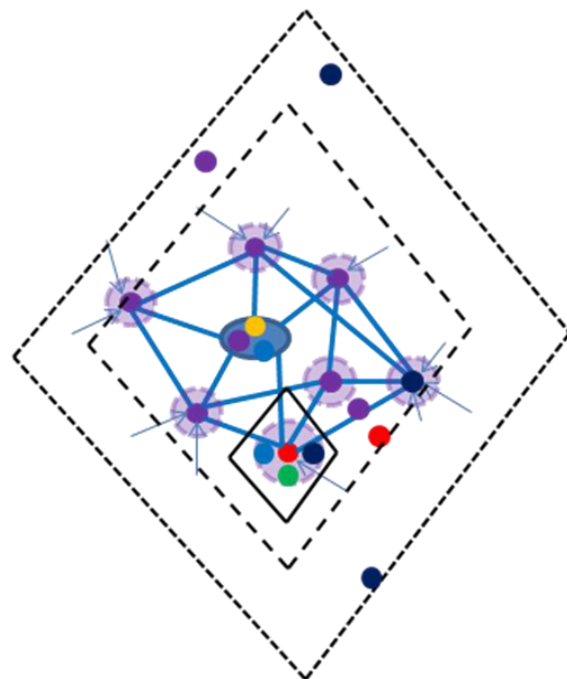


Fig. 9.4 Relative to Urban Structure

The approach is both very simple but also very bold, requiring a high level of long term commitment from a wide range of stakeholders, contributing to the ‘operating system’ of the city.

9.4 Creating a ‘Level Playing Field’: The Operating System

The new neighbourhoods of Vauban and Rieselfeld are deeply embedded in Freiburg’s ‘narrative’ and embody, in distilled form, urban planning principles found across the city, including an emphasis on physical and public transport, decentralisation and long term

commitment. This presents a considerable challenge for drawing out the lessons and recommendations. Freiburg's post-war reincarnation from a provincial medieval university city to a forward-looking exemplar of sustainable living is steeped in a combination of, bottom-up innovation and direct action and bottom-down political support and facilitation, combined with attention to fine detail. Twenty year transportation and land use visions have helped to shape the modern city, whilst pioneering individuals and groups inspired new technological innovations in housing – from Rolf Disch's solar housing to the green protest movements. In this way, Freiburg can be considered a case study in 'joined-up' and green thinking that has transcended party politics. This could be described as the 'Freiburg mentality': green and socially conscious but enterprising also. The mentality is not universally shared and as Wulf Daseking noted, the new developments have not been without their detractors, but a critical mass has been drawn from the different sectors of society to assemble a vision and a shared way of thinking.

9.4.1 Operating Systems & Modal Parity

In Freiburg chapter six described the urban 'operating system' as being one of relative parity in modal share between public transport, cycling and the car, against an overall backdrop of travel reduction enshrined by a 'city of short distances' philosophy. This has been achieved through final detail, such as in the design of streets that permit the uninterrupted progress of cyclists and the tram system at the expense of the car, although it is important to note that the car retains an important place in the city's current transport 'offer' and forms one of five pillars for future transport policy. In this way, Freiburg's operating system serves as the backdrop for the success of its new neighbourhoods in reducing car use whilst guarding against the creation of insular communities or 'ghettoes' ostracised from the wider city. The conclusion from this discussion is that a city must have an operating system orientated towards car-alternative means in order for such neighbourhoods to integrate successfully without undue disadvantage, selectivity or problems of car parking. A basic typology of four operating systems indicated by modal share was proposed in chapter seven, consisting of:

- I. Car Dominant – where car travel is the largest modal share by >10%
- II. Multi modal – where no single mode has more than 10% share above others
- III. Public-Transport Orientated - public transport has >33% overall modal share
- IV. Physical Mode Orientated - walking or cycling form largest mode by >10%

Although rudimentary, the typology provides a means to providing a basic statement of transport performance, and by definition, the type of car reduction model that may be appropriate.

A range of elements may be identified that influence the way that residents within a city behave and move. Although the quality of car-alternative travel is an important element, the role of transport as a critical space shaper which can influence urban vitality and the need to travel in turn, has been emphasised in this thesis. Of relevance is the structure of the transport network, exemplified by Freiburg's nodal structure with outer district interchanges that have created both footfall and accessibility. These provided optimal conditions for the city's ban on out-of-town retail, and a maximum floor area for grocery stores that has encouraged fragmentation of retail to neighbourhoods, and demonstrably influenced travel patterns as a result. The effects of this package of measures may have contributed to Vauban residents' relative containment compared with Haslach residents' comparatively dispersed pattern of grocery shopping.

9.4.2 Comprehensive Car-Alternative Transport

Patterns of car ownership and car use in Freiburg are similar to patterns that one would normally expect to find in a much larger city such as Berlin or London. It is suggested that it is because a similar three-point, city-wide package of car restraint, car-alternative transport excellence, and short distances between land uses apply. Three potentially significant conclusions might be drawn. The first is that the urban 'operating system' described in chapter seven is of critical importance in changing travel behaviour rather than car ownership *per se*. Freiburg enjoys an exceptionally high level of public transport patronage and use of active travel modes across the board, because of an operating system that has created a 'seamless web' of affordable car alternative travel and a parity between different transport modes. Because of this, other neighbourhoods in the city have Vauban-like levels of modal share; indeed one could say that in this regard that Vauban is relatively unexceptional in the context of Freiburg. However, the second point is the existing patterns of relatively high car ownership but relatively low daily use presents an area for further investigation. Why do residents continue to own and maintain cars that they use much less in comparison with Germans living elsewhere? Reasons could include affluence, as demonstrated in Vauban with residents' willingness to pay a high car parking levy, use of the car for leisure activities which this thesis has not explored in detail, it could also be related to perceived or actual need of a car for work, or it could be a legacy of attitudes and perceptions that have become ingrained. Indeed, one policy manager interviewed suggested it is likely to be culturally ingrained and may also relate to the need to travel elsewhere in a car dominant country. This is an area for

further investigation, but the high car ownership-low car use situation could offer further potential for car-sharing and car clubs beyond the current levels of uptake.

The third and final point is basic; simply, it is not only in the larger cities that change can happen and Freiburg and Tübingen are proof of this. Freiburg has recently produced a Charter for Sustainable Urbanism (Academy of Urbanism, 2011) that sets out twelve guiding principles. A key unifying thread of the charter is decentralisation - both physically in terms of built form and politically in terms of governance – the ‘city of neighbourhoods’ and participatory governance from the bottom-up. This could be interpreted as a notion that lends tacit support to the British government’s *localism* drive towards greater bottom-up decision-making from the neighbourhood scale. However the essential principle, as Wulf Daseking acknowledges is for policy-making to be ‘grounded’ in and built on a social instinct which has a tendency to dissipate over a certain scale. The contention is that smaller cities are notionally better suited to this concept of strategic planning policy built-up from the district level, because the range from highest to lowest levels of decision making is less than in larger metropolitan areas. Some of the difficulties associated with achieving long term and deeply embedded planning policy in an age of hypermobility are reflected on in the next section, yet Freiburg seems firmly established as a model towards smaller cities that often perform poorly in terms of car use compared with their larger metropolitan counterparts. It is an important point for the UK cities, where there is often a significant contrast in the quality of public transport between the larger metropolitan areas such as Greater Manchester with its extensive tram network, and even moderately smaller cities such as Bristol which has a population of over 400,000. In the UK there are fifty eight cities excluding their urban regions, representing a combined population of approximately 8 million, that are between the size of Freiburg (220,000) and Tübingen (88,000) and the findings of this thesis are perhaps particularly significant to these.

9.5 Research Priorities and Recommendations

There is an inevitable trade-off between breadth and depth in a matter as pervasive as car dependency and the relationship to the built environment. Although this thesis has aimed for depth in its empirical focus, its contribution to this topic is relatively modest and is centred on one city, supported by limited findings from elsewhere. More detailed research is required in order for the conclusions to be substantiated from other case studies. Specific areas for investigation include:

- A. **Terminology** – the term ‘car free’ development should be discarded as it is misleading, divisive and arguably undesirable unless part of a wider car-free city or car-free society. The historic narrative explored in chapter two suggests that car-free cities or societies will not be created from a ‘neighbourhood first’ approach – a strategy which, as the Slateford Green case suggests, risks ostracising residents from society. Vauban was the product of three decades of ‘reorientation’ away from the car across Freiburg; a city without aspirations to be car-free. ‘Car reduced’ offers a better overall typology whilst the outward facing term ‘quarter’ arguably provides a more inclusive alternative that embodies similar ends to car free development without making the car a point of contention. The focus should be on reducing car ownership, usage and impact at the neighbourhood scale through ‘good’ urbanism and by measures to encourage substantial modal shift at the wider urban and regional scale.
- B. **Planning for Social Need** – perhaps the most difficult aspect of the research for this thesis has been in addressing social need. In planning this has tended to concentrate on the physical aspects of inclusion, accessibility and social interaction at a purely functional level. It is perhaps because treatment of the aesthetic and non-tangible qualities of place-shaping have tended to belong to architecture that there sometimes appears to be a missing dimension in planning of response to the built environment, evidenced through mood and well-being that is better understood by psychologists. Consciously or sub-consciously done, such aspects were found to have been central in the design philosophy of the new developments of Freiburg and Tübingen, creating a rich and fascinating environment which fuses the ‘buzz’ of Jane Jacobs’ urban streets, with elements of Howard’s town-country. Analysis of Freiburg’s urban structure reveals a ‘nested’ pattern of mobility formed around strong neighbourhood hubs, in which ‘core’ needs are accessible easily by physical modes.
- C. **The Urban Operating System** – empirical evidence from Freiburg suggests that elements that combine to shape the way that people travel provides the essential foundations to neighbourhood car reduction. The operating system concept is arguably a critically important one in understanding how residential car reduction can be implemented. Freiburg took approximately thirty years to orientate its operating system away from car travel and demanded strategic thinking, cooperative working between departments, high levels of civic engagement and attention to fine detail as well as long term vision and commitment. Although the operating system concept has been developed in this thesis, it must be recognised that only a basic typology has been provided and based on an important but restricted number of variables. Further research and development of the concept must be undertaken to truly understand the

interactions between planning, transportation and wider policies in providing a firm platform for residential car reduction.

- D. **Car Ownership and Use** – one of the more surprising elements of the empirical findings in chapter 6, supported by other studies undertaken in Vauban and evidence from BedZed in London is an apparent de-coupling of car ownership and daily usage. Limited evidence suggests greater car use for bulk grocery shopping and for social and leisure use, but this is evidently an area for deeper investigation both to identify the causal factors and also the potential for further household car ownership reduction through shared ownership schemes. Given that car clubs are an important aspect of the existing Vauban transport offer, it is pertinent to ask whether further measures could be implemented to address the significant number of cars that spend much of the time parked and unused.
- E. **Transport Evaluation** – high quality car-alternative transport must be regarded as one of the cornerstones of a comprehensive car reduction policy. Yet there remains a significant level of uncertainty over the costs and benefits of different schemes and approaches, how these should be represented and the significance placed on each. Long-standing negative ‘externalities’ of automobile use including atmospheric pollution, health and social impacts remain external to the evaluation process. There are undoubtedly positive externalities too. Similarly, some of the wider benefits of public transport – for example on urban quality, social interaction and health remain elusive. This is important as the analysis of cost:benefit provides the basis for evaluation of different schemes.
- F. **Street Design** – the conversion of the ‘big idea’ into fine detail of design must be regarded as a salient feature of Freiburg’s success in generating modal shift. It is through the design of its streets that the city has been able to create relative parity of travel speeds between the car, the bike and the tram on major arterial routes from the suburbs to the city centre. A clear bike-tram-car order of priority prevails at ‘pinch points’ such as narrow sections of streets, bridges and traffic lights. Specific examples of devices referred to in chapter 6 include the routing of cycle lanes around certain traffic lights and the use of road carriageways as part-time tram platforms at tram stops. Similarly, the ‘City of Neighbourhoods’ policy means a clear prioritisation of the ‘place’ dimension of district centres as noted at Hapsburgerstraße in chapter 6. The translation of strategic thinking into detail in the street is a matter for potential future examination.

Part B: Lessons for Practice

9.6 Four Neighbourhood Models

Rather than attempting to produce a prescriptive and potentially inflexible ‘toolkit’ of design measures, four basic and ‘loose fit’ car-reduced residential models based on real-life schemes were introduced in chapter four, and a means to focus the lessons learned from the empirical work. Importantly, the four residential models built on the findings of comparative research into the social and mobility aspects of three Freiburg neighbourhoods presented in chapters five and six. The following conclusions may be made in relation to the provision of parking for car reduced schemes:

- A minimum sufficient car parking should be provided in keeping with the location-specific ‘gradient’ demonstrated in chapter eight in relation to Bath and Edinburgh.
- In smaller cities such where public transport networks have a tendency to be radial, it is only the most central of localities that are likely to be suitable for aggressive reductions in car parking.
- Less central localities should focus on reducing car use by concentrating on modifying the urban operating system through better long term provision for active modes, intelligent use of existing services through travel planning and car sharing, and measures to mitigate the impact of vehicles through urban design.

In addition it may it may also be recommend that parking within such neighbourhoods should be regularly reviewed and turned over to other uses, such as green space should it become surplus to requirement. This is believed to be a realistic rather than idealistic proposition for smaller cities with higher levels of car use and less well-developed public transport than their larger counterparts.

An underlying message from Freiburg is that size is no barrier to ‘big thinking’ on sustainability. Indeed it is possible for smaller conurbations to be more dynamic than their larger counterparts. However, smaller cities can suffer a relative disadvantage in public transport provision – often lacking the critical mass of population for perceived viability in a privatised market. Freiburg has a city and regional public transport network of a density, quality and user cost that is found only in the very largest of UK cities and it enjoys very high patronage levels and has generated self-reinforcing patterns of urban development as a result.

Building on the findings presented in chapters five and six on social and mobility outcomes from comparative studies of three Freiburg neighbourhoods, the four models of development introduced in chapter four were revisited in chapter eight. The models were defined as follows:

1. **Inner Urban** (Südstadt): Aggressively car-reduced – utilises central location accessibility
2. **Fresh Cell** (Dreikönigstraße): Infill with modest car provision in ageing neighbourhoods
3. **Suburban** (Vauban): Aggressively car-reduced
4. **Urban Extension** (Rieselfeld): Multi-modal but designed to reduce car impact and use

In chapter eight, a simple matrix offered a basic comparison between each neighbourhood model against and the urban operating system (Table 9.1).

	Development Model			
	1	2	3	4
Operating System				
I Car Dominant				
II Multi Modal				
III P-T Orientated				
IV Soft Modes				

Table 9.1 Operating System and Development Model Compatibility

These ‘loose fit’ models attempt to provide a starting point which recognises the need for sensitivity to context – in relation to transport networks for example, and also recognising the wider impacts that these developments can have.

The models therefore do not attempt to prescribe levels of parking, but this would be expected to be set at the lowest possible level commensurate to local patterns. Freiburg provides a study in the integration of land use and transport planning – specifically around a reinstated light rail system that has been extended out to its new neighbourhoods. Although alternative

modes of public transport such as Bus Rapid Transit could provide a similar transport ‘backbone’ Freiburg’s experience is supported by wider evidence from the literature to suggest that light rail can be particularly popular, thereby generating patterns of development that are desirable from a sustainability point of view. Taking forward the three-part framework for car reduction it must be recognised that:

- Car reduction takes many forms from superblocks and infill cells to substantial suburbs;
- Car provision must correspond with the wider transport network to ensure that residents have access to car-alternative motive networks that reflect the full extent of accessibility across a city and beyond, and not merely ‘typical’ journey to work patterns or proximity to a single transport route into the city centre;
- Residents’ creativity and contribution toward shaping their neighbourhood should be maximised.

9.7 Implementation and Transferability

Implementation may be considered to be an important aspect if residential car reduction is considered to be a ‘social’ as well as an ‘environmental’ project. Chapter eight drew attention to the differences between the typically UK style of passive or consumerist approach compared with the participatory approach pursued in Freiburg and Tübingen. Although there are drawbacks in the participatory approach - in the potential residential selectivity created, for example, residents become stakeholders in their neighbourhoods from the outset and are allowed a degree of expressive liberty, within an overall unifying framework. This can lead to significant differences on both the physical qualities of space and on social relations, where residents are required to collaborate from the outset.

9.7.1 Transferability Issues

Significant challenges must be recognised in transferring and implementing development conceived in one context and applying it in another another. Although part of the contextual challenge has been described with reference to the ‘operating system’ of prevailing and potential travel patterns, there are also significant cultural barriers to change. Indeed, a ‘Freiburg mentality’ has been previously referred-to, though defined loosely in terms of environmental and social consciousness with an enterprising spirit. There are aspects of Freiburg’s history that may have contributed towards this spirit; an initial conservatism that

saw the tram system reinstated during the city's post-war reconstruction at a time when other cities were dismantling theirs, followed by green radicalism that emerged in the late 1960s, and a comparatively large university that continues to draw and retain a younger population. The narrative of sustainable urban development is superimposed on this basic storyline. Just as success might be said to breed further success, so Freiburg has created a virtuous mentality of sustainable development. It is a locally ingrained mentality that may not travel as easily as the conceptual models for development that have emerged from it.

An intriguing aspect of the Freiburg story has been the relationship between activist movements, the city government and the region – a model of partnership working between actors, agencies and departments at different levels. There are lessons to be drawn for other countries including the UK, where a similar spatial planning approach has been in existence since 2004. More recently, the UK's Coalition Government has set out to encourage proactive community involvement through neighbourhood planning and the introduction of a Community Right to Build, and to stimulate individual involvement in the development process through custom build housing. The government's National Housing Strategy (HMG, 2011) tasked local authorities with drawing up action plans to support custom build housing, including by group self build, effectively tasking local authorities with facilitating custom build in a process that echoes Freiburg's support to its grass roots movements and *baugruppen*.

9.8.2 Four Transferability Considerations

Specific transferability considerations which examined in chapter eight relate to following four headings: (i) operating system, (ii) neighbourhood concept, (iii) delivery concept, (iv) detailed car reduction measures. These were considered against the question of attempting to produce Vauban-style development in England:

1. Operating System: the compatibility matrix presented earlier in fig. 9.5 suggests that an aggressively car-reduced scheme such as Vauban are best suited to public transport or soft mode oriented regimen. It was therefore felt that the 'urban extension', 'fresh cell' and 'inner urban' models would be most generally suited to the smaller English cities.

2. Neighbourhood Concept – it was recognised that large inner urban opportunity sites are rare in smaller conurbations and suburban and urban extension sites are often subject to urban containment policies or cross territorial boundaries between planning authorities, which can make development difficult to bring forward in the absence of a German style stable layer of strategic governance.

3. Delivery – the Baugruppe style delivery mode requires strong municipal support to create the institutional framework to permit the groups to take their schemes forward. The following three practical barriers were identified: (i) land - group build usually requires public land, (ii) people - evidence from this thesis indicates that such schemes may have greater appeal to younger residents; older residents may be discouraged, and (iii) finance – private finance may be difficult to obtain.

4. Car Reduction Measures – the majority of the individual components used to achieve reductions in car impact and use in the four models are already in use in England, but the limiting of car ownership would present a considerable step change that local authority planners might find difficult to accept.

9.8 Policy Recommendations

The following firm practice-oriented recommendations can be identified:

- A. **Residential Packages** – car reduction should be consistent with the overall context of the city and should not consider the neighbourhood first. However, retrofit schemes should give consideration to the incremental implementation of car reduction measures in line with changing car ownership and car use habits.
- B. **Neighbourhoods through Time** – it is recommended that consideration is given to how new neighbourhoods are likely to fare over time, both internally in terms of the demographic concentration and ageing in place recorded in Freiburg, and also in terms of how neighbourhoods with populations of differing maturity can operate with one another. An important aspect of the temporal dimension is thinking about small car-reduced ‘fresh cells’ can be used to stabilise mature neighbourhoods, such as by supporting transport services, which can create a greater strategic effect for car reduction.
- C. **Four Neighbourhood Models** – based around three elements of car reduction (ownership, usage, intrusiveness) as a basic framework, with parking provision sensitive to context but at the lowest realistic level. Consideration should also be given to the strategic effect that car reduced quarters can have in producing wider change. For example in Freiburg both Rieselfeld and Vauban were linked with the development of the tram system. In chapter eight it was suggested that the implementation of car reduced schemes could be linked to the enhancement of car-alternative infrastructure.

- D. **Proximity** - the need for mixed land uses to reduce travel need and to create vibrant spaces is well known. Natural spaces have tended to be separated in order to provide space and repose for people and fewer disturbances for wildlife, however Vauban, Rieselfeld and Südstadt demonstrate that it is possible to bring dense natural spaces into the heart of new development. In Vauban and Rieselfeld these spaces are connected by way of natural corridors - which make use of the reduced surfaces given to the car- to larger green areas on the periphery. In this way a vibrant fusion of the wild and natural and the man-made and urban is generated.
- E. **Collaborative Financing of Housing** – support should be given to new models of housing finance, including the provision for Local Authorities to be able to support such schemes under shared ownership schemes. This would differ both from the Co-housing model which automatically implies the sharing of certain facilities, although this could also be an option, and it would also differ from the Baugruppen model in Germany which is directed almost exclusively towards private financing through mortgages, and which has made mixed tenure blocks virtually impossible in the neighbourhoods studied.
- F. **Retrofitting** – although the bulk of the empirical research presented in this thesis has been directed towards new-build development, it is highly relevant to existing neighbourhoods. As a city, Freiburg has retrofitted an extensive tram system, pedestrianised its city centre, remodelled its arterial streets and undertaken extensive neighbourhood renovation in order to alter the pattern of life of its residents. Vauban itself is a partial retrofit of a former military site, but because of the nature of the city's modern-day operating system, residents of older neighbourhoods have mobility patterns that are similar to those of the Vauban resident. Elsewhere, older cities and neighbourhoods that were built around pedestrian travel, the tram and even the railway provide rich potential for retrofitting.
- G. **Active Implementation** – the discussion of residents' engagement of communal space in chapter 8 was based on differences in the 'regimes' in operation in the German neighbourhoods, and a British counterpart, the Millennium Village in Greenwich. Conceptual differences were identified that were believed to have led to the different outcomes noted. This is an area in which further investigation is needed, in order both to substantiate the arguments made in the chapter and also in order to identify ways in which active resident participation can be engendered as a means to strengthening communities and generating 'creative' spaces.

9.9 Two Final Thoughts

A great many questions have been generated in the process of researching for this thesis, that have become matters for reflection. Some matters have lent themselves to being integrated in earlier chapter whilst others have not. Having drawn together the conclusions of the empirical work and preceding review of literature and policy, the purpose of this part is to dedicate a limited amount of space to reflect on matters of relevance that could not easily be included in earlier chapters.

9.9.1 *Travel Need and Desire*

It has become easy to discuss travel need in purely functional terms of access to shops, jobs, people and opportunities. This is perhaps because data on functional or ‘tangible’ aspects is readily obtained such as from a census or survey. Yet, as noted in chapter two and repeated throughout this thesis there are less tangible aspects about which knowledge is less readily obtainable, or for which methodologies and knowledge may lie outside of the planning domain, but this does not mean that such aspects are less important. Urban quality may be regarded as one such aspect, and one may reflect on Paul Goodman’s quote from chapter one that ‘[twentieth century man] seemed to be constantly going from where he didn’t want to be to where he didn’t want to stay’ (Goodman: 1960 (quoted in Duany *et al*, 2005: 85)). Although travel may be seen to exert a certain draw in its own right, one might also reflect on the ‘push factors’ imposed by a poor quality residential environment. Evidence presented in chapter two, including research from the fields of environmental psychology and public health suggest a link between environmental quality and social response that urban commentators including Jan Gehl (1971; 2010), Jane Jacobs (1961) and Lewis Mumford (1938) among others had suspected. Far from being bland expanses of grass interspersed with trees, it is striking that the first urban parks pioneered by landscape gardeners such as Joseph Paxton in Britain and Frederick Olmsted and Calvert Vaux in the US were complex places containing scenes and vistas for designed for ‘psychological nourishment’. Environmental psychologists have singled-out a property – ‘fascination’ as evoked by scenes and experiences that provoke interest and wonder that are important for psychological health. The rationale has a straightforward logic: humans evolved in the wild but have become urbanised in the space of just a few generations, suggesting that a conscious desire for ‘progress’ might have somehow out-paced our psyche’s ability to fully adjust to a comparatively new way of living, in evolutionary terms.

Car domination may well have been instrumental in this, having become the focal point for the production of spaces better suited to the machine rather than human. Basic functional needs became physically separated over long distances connected by routes that were ‘sterile’

because they were not designed to be lingered in. Since the late 1950s in the UK, it might seem that virtually every aspect of planning became subordinate to this singular aim, with roads re-engineered from streets, the patterns of development that have emerged, and sodium street lighting casting a ubiquitous pale orange haze. The process of ‘dissociation’ might be seen as the logical product of this process.

9.9.2 *‘Peak Car’*

Although the development of a ‘distance intensive’ and automobile orientated society abetted by an automobile-orientated urban landscape is not an easy matter to redress, if indeed it is found that redress is required, signs of a perceptible macro change have emerged from recent research by Metz (2011) and Goodwin (2012) showing potential peaks in both car ownership and overall travel in the UK (Guardian, 25th September, 2011). Changing attitudes towards driving are reported in young adults aged 17-20 years old, of whom 35% currently hold a driving licence, compared with 48% twenty years previously. The research asserts that:

Car manufacturers are worried that younger people in particular don't aspire to own cars like we used to in the 70s, 80s, or even the 90s. Designers commonly say that teenagers today aspire to own the latest smartphone more than a car. Even car enthusiasts realise we've reached a tipping point.

Guardian 25th September, 2011

The article reports that in response to the change, car manufacturers themselves are reportedly developing new ‘pooled’ ownership models in which drivers can select a car from a pool on a daily need basis, if one is needed at all. It will of course be seen whether the current peak manifests itself into long term change or becomes just a temporary plateau perhaps linked to the fate of the economy. However, at the current time it does suggest that a wider societal change may be occurring across the breadth of developed societies (Goodwin, 2012). If it continues into the medium and long term the trend may have profound implications for the use of urban space including the provision of road space for alternative transport uses and maximum car parking, minimum density policies (Newman, 2012). Similarly, this may create retrofit opportunities in existing residential developments, with the ‘grey space’ of car parking and other car-related infrastructure put to alternative uses, for which Vauban serves as a model.

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3. In your opinion, is the car parking provided in your development:

- A. Sufficiently close to home? Yes No D. At a reasonable cost? Yes No
- B. Of sufficient quantity? Yes No E. Adequately provided for visitors? Yes No
- C. Less than at your previous home? Yes No F. Satisfactory Overall? Yes No

4. At your current home address, have transport considerations

- A. Prevented you from looking for a job? Yes No
- B. Prevented you from accepting a job offer? Yes No
- C. Prevented you from changing jobs? Yes No
- D. Required you to change your job? Yes No
- E. Required you to leave paid employment? Yes No
- F. Required you to work fewer hours? Yes No
- G. Prevented you from taking education or training? Yes No
- H. Restricted your children's school choice Yes No N/A
- I. Prevented you from visiting friends or relatives Yes No
- K. Prevented friends or relatives from visiting you? Yes No

5. Do the following considerations restrict your use of public transport?

- A. Daytime personal safety Yes No B. Night time personal safety Yes No
- C. Fare Costs Yes No D. Lack of information Yes No
- E. Problems boarding transport Yes No F. Difficulties with prams etc. Yes No
- G. Times of Services Yes No H. Routes Served Yes No
- I. Lack of Child Facilities Yes No J. Reliability Yes No

6. Local Travel

- A. Do you use shops / services located within a mile of your home? Yes No
- B. If yes, how often in an average week? Once 2x 3x 4x 5x 6x Daily
- C. Which one travel mode do you use mostly? Car Bus Walk Cycle Train Taxi

7. Leisure Air travel

In the past 12 months how many of the following return flights have you made for non-work reasons?

- A. Domestic / Europe B. Medium Haul (3-6 1/2 hrs)
- C. Long Haul (7hrs+)

B. Community

- 8. How would you describe the general 'community spirit' in your development
A. Strong B. Moderate C. Average D. Slight E. Weak
- 9. To what extent do you feel a sense of 'belonging' to your development's community?
A. Strongly B. Moderately C. Average D. Slightly E. Not at All
- 10. How far do you feel part of a wider local community outside the development?
A. Strongly B. Moderately C. Average D. Slightly E. Not at All
- 11. Do you believe that people of differing backgrounds mix and get along in your development?
A. Definitely B. Mostly C. Somewhat D. Not really E. Not at All
- 12. Would you say that your development is a place where people of all ages mix and get along?
A. Definitely B. Mostly C. Somewhat D. Not really E. Not at All
- 13. How many people do you know by name:
A. Definitely B. Mostly C. Somewhat D. Not really E. Not at All
- 14. How often do you greet a neighbour in an average week?
A. Daily B. Almost Daily C. Once or twice D. Rarely E. Seldom
- 15. Do you feel your development provides a secure environment for children aged 7 or below?
A. To play unsupervised but in sight of the house? Yes No Unsure
B. To venture out of sight of the house alone? Yes No Unsure
C. Venture out of sight of the house with their friends? Yes No Unsure
- 16. Overall, do you feel your development is:
A. A good place to raise children? Yes No Unsure
B. Is a safe place to walk around alone after dark? Yes No Unsure
C. A good place for elderly people to live in? Yes No Unsure

C. Design

17. How far do you agree with the following statements on your development?

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
There is adequate green space					
The housing is too dense					
It is sufficiently quiet					
It has a strong identity					
There are a good range of services					
Residents take pride in their homes					

