

# Residential Areas for Households without Cars

## The Scope for Neighbourhood Mobility Management in Scandinavian Cities

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### Abstract

Ecological housing initiatives have proliferated throughout Scandinavia over the past two decades and fostered groundbreaking innovation in the fields of resource efficiency and the reinvigoration of communities in local areas. The travel patterns of residents in such projects, however, remain largely outside the target and the influence of the policy context, and thus constitute an unpredictable 'wildcard' with the potential to seriously jeopardise the sustainability performance even of an otherwise highly innovative neighbourhood. To overcome such shortfalls, recent experiments in some European cities have attempted to incorporate mobility management components into the concepts of new residential developments. These include restricted or demand-responsive parking provision, on-site car sharing, rent and mobility service packages, and specific designs for live-work arrangements and/or functional integration on a neighbourhood level.

Some of these carfree or car-reduced neighbourhoods have now been completed and inhabited for several years. Their history, leading up to a location-specific mobility concept in each case, and their experience with practical implementation and user compliance now allow to provide a critical review of success and failure in this field, and to draw conclusions on how similar approaches may be applied in Scandinavian cities.

### Introduction

This paper is based on a PhD thesis revolving around the evaluation of existing innovative housing developments with the purpose of determining their performance in sustainability terms. The project started in 1997 with a user survey in several residential areas in Greater Copenhagen, where visions and programmes of urban ecology had been implemented (Scheurer 1998, BBM 2001). The Danish section of the study revealed some remarkable achievements in the fields of resource efficiency at home and community development in most case study areas, but simultaneously highlighted a lamentable absence of policies designed to influence or consolidate residents' mobility patterns towards sustainability objectives.

Along the survey results from the study areas of Torup (Hundested), Bo90 (Copenhagen), Hyldebjerg (Albertslund) and Skotteparken (Ballerup) this dilemma will be discussed in more detail. Thereafter the results of a similar survey in five selected carfree and car-reduced neighbourhoods in Amsterdam, Edinburgh, Freiburg, Hamburg and Vienna will be introduced, highlighting the characteristics of mobility behaviour in each site, measured in travelled distance, modal split, location of destinations, vehicle ownership and lifestyle indicators. This research constituted the second major component of the fieldwork for the

PhD thesis (Scheurer 2001). The comparison of these case studies will then be assessed against the necessity and potential for mobility management programmes in residential neighbourhoods in Scandinavian cities.

### **Ecological Communities, Urban and Rural: Who Lives More Sustainably?**

During the 1970s and 1980s a number of ecological housing initiatives started from a grassroots level and accepted the notion that creating an ecological community required substantial input in resources and labour during planning, construction and consolidation of the project. In turn, there was the promise of developing a community that would respond to the genuine needs of the people rather than to commercial forces or political agendas (Jensen 1994, Munkstrup 1995). In some ecological housing initiatives, this vision of self-sufficiency extended to the supply of energy, food and even jobs, resulting in a strong preference for rural over urban locations where an eco-village could perceivably be started outside an existing settlement context to integrate to, and where permaculture practices could more easily be incorporated into the plan. Other groups favoured an urban environment for the many advantages of proximity and diversity it offers, even if this meant compromising the self-sufficiency objective.

In selecting two such eco-communities representing either approach, we tried to answer the question whether the advantages from self-sufficiency practices are or are not offset by the assumption that the residents of a rural community, represented here by the Økologisk Landsbysamfund in Torup (Hundested) invariably travel more than their counterparts in an inner-city community, with Bo90 in Nørrebro (Copenhagen) as our example. The rural eco-village of Torup, located some 70 km outside central Copenhagen along the rail line between Hillerød and Hundested, consisted of some 45 permanent dwellings in 1997. Bo90 is a 17-unit five-storey inner urban apartment block built to ecological standards. Both projects were initiated and largely planned by the residents in the early 1990s. While Torup is organised as a shareholder cooperative without any financial support from government, Bo90 was built by a major non-profit housing company which enjoys reduced-rate loans, tax breaks and other government subsidies in return for affordable and controlled rents.

We expected travel behaviour between these two sites to be dramatically different, but some results are still quite instructive in detail:

- Torup residents only take about 60% as many trips outside their village as Bo90 residents (580 versus 973 trips per capita per year),
- Bo90 residents display over twice the share of non-motorised trips (85% versus 38%), but only about half the number of public transport trips (120 versus 249 per capita per year) of their Torup counterparts,
- The share of car trips is 19% in Torup and 3% in Bo90; in Torup, there is 1 car per 5.1 residents, in Bo90 1 per 17.9 residents. All these figures are clearly below average even for Copenhagen conditions,
- In Torup, there are 65% of carfree households, in Bo90 89%,
- Torup's residents travel on average more than three times the annual distance within the Copenhagen region than Bo90 residents (11,998 km per capita versus 3,853 km), and their average trip length is over five times that of Bo90 (21.4 km versus 4.0 km).

We learned that residents in both communities make intentional efforts towards minimising the use of cars, but it must also be noted that car ownership in Torup has grown by more than 20%, from 1 car per 6.3 residents to the present level of 1 per 5.1, since our respondents had

moved to the village. This may be connected to the fact that more than half the residents had lived in inner Copenhagen or other urban centres before, where they might have led largely carfree lifestyles that proved no longer tenable in an ex-urban location.

But does Torup's kilometre-racking mobility profile really discredit its ecological vision? During the original survey in 1997, we also took data from a conventional single family housing area in the same municipality (Hundested) as a control case. These figures show some interesting comparisons. Car ownership in Torup, for instance, remains at half the rate of the control case (where it amounts to 1 per 2.6 residents). The residents of the control case made only about a quarter the number of trips (65 per person and year) on public transit that Torup people did, with 19% (Torup: 45%) holding periodical passes. Conversely, the share of car trips, at 57%, was three times as high in the control case as in Torup. The total number of out-of-neighbourhood trips per person and year, at 652, was only marginally higher in the control case than in Torup. While almost two thirds of households did not own a car in Torup, or shared one with other households this group extended to a meagre 9% in the control case, where furthermore 57% of households had lifestyles classified as car-dominated (more than 50% of all trips by car). In Torup, this share was at 4%. In the control case, too, the annual distance travelled regionally was relatively high at about 10,000 km per person, though it was still markedly lower than in Torup.

In the light of these figures, we can tentatively conclude that an eagerly pursued ecological lifestyle within a rural community, in combination with a location near a reasonable rail service, can foster remarkable shifts in terms of mode choice and car ownership when compared to the status quo in such areas. Under prevailing settlement structures, however, a lifestyle aiming at low travel impact in an ex-urban residential location will meet significant constraints, even if collective efforts are made to minimise the need to access destinations outside the neighbourhood. In this respect, an urban lifestyle with its multitude of facilities within walking and cycling distance is at a clear advantage to conform with sustainability objectives, even though its on-site resource management may not be quite as perfected. Torup's mobility patterns furthermore show that many residents do not appear to have deep-rooted relations to the area they live in. Subsequently, many residents' social and professional networks, insofar as they exceed the horizon of the village itself, invariably involve more or less regular trips to destinations in rather distant places. It would be unrealistic to expect this phenomenon to ease down before an adjustment period of many years or even a whole generation, if at all.

The philosophies of Torup and Bo90, however, also represent concurring models of the future sustainable city. On the one hand, there is a vision of introducing more rural, self-sufficient activities into urban contexts in order to combat the alienation between urbanites and basic reproductive processes that characterises the modern city. This concept accepts that urban density may decrease to make room for agriculture and other land-intensive uses associated with reproduction, but vaguely anticipates that self-sufficiency will help establish activity patterns with much lower transport needs than nowadays. On the other hand, a vision that sees traffic as the most crucial problem on the way to sustainability will argue that instead of ruralising the city, it must indeed become more urban and dense in order to make low-transport lifestyles available for most. This perspective aggressively accepts the permanence of functional divisions and mutual dependency between city and country (Newman and Kenworthy 1999, Rådberg 1995).

From the data collected in Bo90 and Torup, we must conclude that a trade-off between these ideals is inevitable, regardless of where an ecological community chooses to locate. But if a choice needs to be made in this regard, the findings also show that under current conditions, it is ultimately more effective to bring sustainability to the people, ie. into the city, than to move

the people to sustainability, ie. out of the city (see Rudlin and Falk 1999). Thus, in an era when social, economic, informational and spatial interdependency between communities, cities and regions is clearly growing, not shrinking as visions of village autarky may wish us to believe, physical transport acts both as the principal agent of opportunity and the most pressing externality in locational decisions. Or, put differently: the greening of resource supply networks like energy, utilities and food - Bo90's main open challenge on the path to sustainability - can be instigated in a step-by-step reformatory process that will take some drastic measures, but given time, appears realistic and feasible under present conditions. The greening of transport patterns and of the spatial organisation of activities that guarantee participation in society outside the recluse of one's immediate community, which is where Torup falls short of sustainability ideals, poses more formidable constraints. It is easier to imagine the dependency of Bo90 on its remaining share of unsustainable resource use to be resolved, than the dependency of Torup on motorised transport, whether public or private.

### **Dense-Low Cohousing in Denmark: Urban Ecology and Travel Behaviour**

The two ecological housing areas in Copenhagen post-war suburbs surveyed in this study, Skotteparken and Hyldebjerg, more or less represent opposite ends of a spectrum of approaches taken in an era when the involvement of governments and the building industry in environmental issues had grown more serious. Since the late 1980s, a number of well-funded national and municipal programmes have attempted to support the greening of Danish cities, including in the housing sector, while community initiatives in urban ecology also flourished. The results can be distinguished as either top-down and focussing on building technology, infrastructure and government-initiated social programmes (Skotteparken), or bottom-up with most emphasis on community cohesion and low-budget, (volunteer) labour-intensive improvements to the buildings, open spaces and neighbourhood facilities (Hyldebjerg) (see Jensen 1994).

Both study areas can be classified as social rental housing, with Skotteparken (completed in 1992) owned by the municipality of Ballerup, and Hyldebjerg (completed in 1975) run by a share-owned housing corporation. Both are located in suburbs that constitute sub-centres in their own right, each at a distance of about 15 km from the city centre. Our main interest in this comparison was to determine whether the technological approach to ecological housing taken by Skotteparken has a trickle-down effect into the residents' lifestyles, including personal mobility - and in turn, whether and how the substantial efforts in Hyldebjerg to influence behaviour and awareness actually show in residents' travel patterns. Despite the contrasting approaches to ecological policy, we were quite unprepared for the magnitude of difference encountered in the travel survey:

- Both car ownership and car use (in trips) in Skotteparken are more than double those of Hyldebjerg. In Skotteparken, there is one private vehicle per 4.0 residents - about average for suburban Copenhagen - whereas in Hyldebjerg, there is only one in 10.1 residents. In Skotteparken, 41% of all trips are taken by car, in Hyldebjerg, this figure is 17%,
- Hyldebjerg's residents use public transit for an average of 155 trips per year, while in Skotteparken, only 90 trips per capita per year are taken, despite roughly comparable service quality,
- Skotteparken's residents travel almost 40% more distance within the Copenhagen region (5,968 km per capita per year as opposed to 4,388 km), and their average trip length is considerably higher than in Hyldebjerg (7.0 km versus 6.0 km),

- In Skotteparken, there are 50% of carfree households and in Hyldebjerg 78%.

Since the two sites are not hugely dissimilar in terms of geographical location, functional association within the urban system and resident demographics, more subtle reasons must lie beneath these contrasting travel behaviour patterns. While invariably remaining somewhat speculative, we have compiled a list of possible explanations to help our methodological advancement.

Firstly, the stage of social consolidation varies greatly between the two sites. Nothing about Skotteparken and Hyldebjerg delivers a more obviously contrasting picture than the level of activities eventuating within each community, and the residents' attitudes to the validity of such efforts. Remarkably, a core of neighbourhood activists can be found in both sites, and similarly, there is clearly a majority of residents in either case study area whose role in the process of urban ecology is rather passive. The difference is that the first group has, over the years, taken leadership in Hyldebjerg and secured the support and cooperation of practically all their neighbours (only 4% stated that they found the ecological programme inefficient or more trouble than it is worth). In Skotteparken, despite a string of well-meaning attempts, the promotion of local sustainability remains the niche of a handful of enthusiasts, failing to 'move the crowds'. The process of generating enthusiasm and practical support for urban ecology goals, which is likely to have some effect on residents' decisions including vehicle acquisition and travel patterns, still has a long way to go in Skotteparken if it is to reach the level achieved in eight years of grassroots activity in Hyldebjerg.

Secondly, the dichotomy between Hyldebjerg and Skotteparken is partly representative of two contrasting concepts of living in the city. Some urbanites seek to contribute as much as possible to the creation and recreation of their residential environment and find fulfilment in bringing personal activities and labour into their surroundings and neighbourhood community. Others regard the city with all its opportunities as a large service undertaking, which enables them to purchase conveniences, since they seek to be relieved as much as possible from reproductive labour (Häußermann and Siebel 1987, Gestring et al 1997). This will naturally result in entirely different attitudes to the roles of space and proximity. Again, it is not difficult to find representatives of either group among the residents of both study areas, but the 'home-makers' have a much higher profile and more influence on community life as a whole in Hyldebjerg than they do in Skotteparken. One could say they reached a critical mass level, not merely or necessarily in numbers but certainly in activities and outcomes of such activities. The travel behaviour figures introduced above may well support the view that this effect leads to higher activity containment within the precinct, providing a disincentive to both excessive travel habits and excessive car ownership.

A third aspect that may influence travel behaviour is the location of parking facilities. The separation of transport modes, as still followed in Hyldebjerg, is no longer part of the dominant urban design paradigm in the 1990s, but a traffic-free residential environment may convey a sense of living without a car that is absent even from the traffic-calmed and pedestrian-priority streets of Skotteparken. Or, put differently: In Hyldebjerg one could reside for years without knowing whether one's next-door neighbours own a car and what kind. The lateral function of car ownership in defining social milieu association or a subjective expression of lifestyle (see Jensen 1999) becomes less relevant under such conditions. This is different in Skotteparken, where front-door parking makes the car immediately visible to everyone else.

And lastly, the travel survey results may very directly be related to the absence of mobility management strategies. Ultimately, we can only speculate whether the partly hypothetical explanations just discussed do sufficient credit to the differences in travel patterns found in

the two study areas. Alternatively, we could just as well accept that these observations are, to some extent, quite simply arbitrary. While this realisation may disappoint our ethos as researchers, it poses a real challenge to policy makers. This is because both Skotteparken, in spite of its advanced standards of resource-efficient and community-supportive design, and Hyldebjerg, in spite of its elaborate strategies of environmental behaviour incentives and neighbourhood interactivity, are almost completely devoid of policies that could influence travel patterns or at least reinforce desirable mobility behaviour. As mentioned earlier, the inclusion of transport issues in ecological policy directed at users, and thus the concept to influence behaviour at the source, is a relatively new phenomenon. It is, however, a consequential shortfall in the set-up of these two projects. Car ownership and use has experienced a surge throughout Denmark during the 1998-99 season (MEM 2000), with strongest growth in suburban areas, precisely where Skotteparken and Hyldebjerg are located. Trends of this kind, which we could discern even during our 1997 survey, may well have continued and accelerated since within the two sites. With regard to the formidable impact transport behaviour has on the sustainability of human settlements, and the fact that it is the only remaining field of greenhouse gas abatement strategies that remains largely out of control, it appears increasingly imperative that ecological housing projects worthy of that term take this issue into account. This dilemma has motivated our selection of case study areas in the second phase of the research and will be discussed in detail below.

### **Carfree Housing Developments after Completion: Do the Promises Hold?**

The unexpected findings on travel behaviour in the Danish case study areas motivated, during the second part of the research, to focus on built examples of residential neighbourhoods where mobility management had been made into an integral component of the overall concept. In this context, the carfree and car-reduced housing projects emerged in several European cities during recent years lent themselves to closer investigation. We ultimately settled on a selection of five further case study examples scattered broadly across the continent. Similar to the Danish part of the study, a number of varying approaches to urban and housing policy as well as to mobility and vehicle ownership management are represented.

- The case studies in Vienna (Autofreie Mustersiedlung Floridsdorf), Amsterdam (GWL-terrein) and Edinburgh (Slateford Green) have primarily been initiated by their respective city or borough councils, which were interested in implementing a carfree or car-reduced demonstration project in collaboration with open-minded developers. In Hamburg (Stadthaus Schlump), this initiative originated with the investors themselves, who won a developer competition on the basis of an innovative mobility management concept.
- In Vienna and Amsterdam, the planning process saw extensive consultation and participation of the later residents. In Edinburgh and in Hamburg, this did largely not occur.
- In Amsterdam and Edinburgh there is a mix of subsidised rental housing, owner-occupied units and units in shared ownership (Edinburgh). Vienna and Hamburg are exclusively rental objects - publicly subsidised in Vienna, market-priced in Hamburg.
- Only in Vienna are residents tied to non-car ownership by their lease or purchase contract. In Amsterdam, a regime of resident-only parking permits throughout the district normally excludes GWL-terrein residents from accessing on-street parking. In Edinburgh and Hamburg, the number of on-site parking bays was reduced (quite drastically so in Edinburgh), but there is no further formal restriction to car ownership. The on-street parking situation in both case study areas is tight but largely unregulated.

- In all case study areas, car sharing vehicles are available on the sites - in Hamburg, these are operated by the property owners themselves. Only in this project and in Vienna, however, do residents receive special incentives for the use of car sharing. Additionally, Stadthaus Schlump residents have access to heavily discounted monthly public transit passes.
- In Hamburg residential and non-residential uses are accommodated within the same building, and apartments were designed with special consideration for live-work arrangements. Amsterdam, too, integrates non-residential uses drawing visitors from the entire city. In Vienna there are some neighbourhood service facilities, while in Edinburgh, non-residential uses are completely absent.

While the results of the mobility behaviour survey in the four sites were designed to be comparable, the varying spatial and transport conditions in the four cities have to be taken into account when interpreting the results. Edinburgh and Vienna, for instance, are cities with relatively weak functional connections within their surrounding regions, and have historic centres with a strongly dominant position with regard to employment, retail and cultural facilities, both probably supported by these cities' capital functions and lateral location in geographic-territorial terms. Vienna, however, has about four times the population of Edinburgh. In contrast, Amsterdam forms part of a highly interdependent and polycentric agglomeration known as Randstad Holland, and its historic centre, while accommodating a host of retail and cultural uses, is not the part of town where most employment is concentrated. Hamburg and Freiburg (see below) can be considered as occupying an intermediate position in both respects.

Furthermore of importance is the traditionally strong stance of the bicycle in Amsterdam, which, in contrast, fulfils a rather marginal role in Edinburgh. The quality of public transit is quite exceptional in Vienna, compared to the other three cities, while the (doubtful) honour of providing the most convenient-to-use road system within the sample goes to Hamburg. The case studies in Amsterdam, Edinburgh and Hamburg are each located at about 3 km from the city centre, while Vienna's Floridsdorf, at the opposite side of the Danube, is about 9 km away. In Vienna and Amsterdam, tram stops have been integrated into the developments. In Edinburgh and Hamburg, there are high-frequency bus routes in close proximity to the study areas; in Hamburg, it is also possible to reach two metro stops within some ten minutes walking distance each.

The divergence of the approaches pursued in these case studies is clearly manifest in the travel behaviour of the residents:

- The share of carfree households amounts to 92% in Vienna, 74% in Edinburgh, 62% in Amsterdam and 25% in Hamburg. Conversely, the number of private vehicles is 1 per 2.0 residents in Hamburg (thus exceeding the city average!), 1 per 5.8 in Amsterdam, 1 per 8.8 in Edinburgh and 1 per 27.8 in Vienna. It is important to note, however, that the number of cars has declined in all four neighbourhoods since before the residents moved in. Additionally, in Amsterdam (9.7 passenger trips per vehicle per week) and in Hamburg (6.7), existing cars are used relatively infrequently, resulting in a lower share of car trips (10% in Amsterdam, 24% in Hamburg) than vehicle ownership rates would normally suggest.
- The share of non-motorised trips in Amsterdam (at 73%) is almost twice as high as in Vienna (38%), with Hamburg (58%) and Edinburgh (51%) occupying an intermediate position. Conversely, in Vienna public transport (490 trips per capita per year) is used

over three times as frequently and in Edinburgh (315 trips) over twice as frequently as in Amsterdam (149 trips) and Hamburg (134 trips).

- The average trip length in Edinburgh is 4.3 km and in Vienna 7.0 km, which in both cases is approximately equal to the distance between the case study area and the city centre. In Amsterdam (9.9 km) the high average length of work and education trips stands out, with destinations in more than 25 km distance in 19% of all cases. In Hamburg (7.4 km) the home office phenomenon becomes apparent: while all responding households were economically active, every resident only takes an average of 5.5 work and education trips per week - in Edinburgh (7.6), Amsterdam (8.1) and Vienna (9.2) these figures are much higher despite lower employment rates.
- The total regional distance travelled per capita in Amsterdam (8,842 km) is more than twice as high as in Edinburgh (4,033 km); besides the difference in size of the metropolitan catchment areas this is due to the aforementioned travel patterns in the work/education and leisure sectors. Hamburg's result (5,620 km), after allowing for the home office factor, shows striking similarities to Amsterdam. Vienna (5,846 km) also occupies an intermediate position, probably induced by the somewhat peripheral location of the study area, resulting in a relatively large share of 41% of all trips to exceed a distance of 6 km.

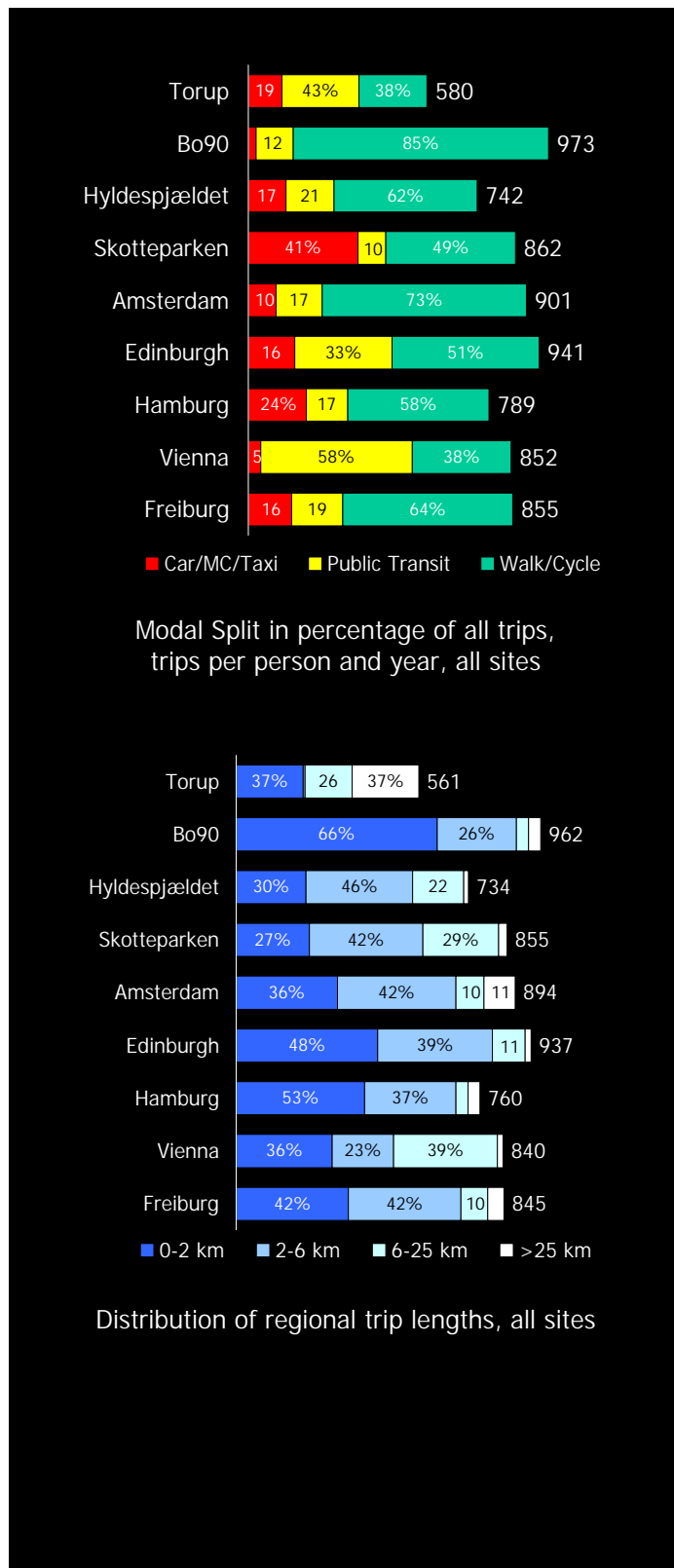
The experiences from these four surveys indicate first and foremost the importance to develop 'the right concept in the right place' with regard to carfree and car-reduced housing; there are no off-the-shelf solutions. This may well be understood as a call for extensive resident participation within the planning process and not least in making decisions about mobility management measures. It is perhaps no coincidence that the projects in Hamburg and Edinburgh, where resident participation has never been a major issue, show the largest proportion of lifestyles that are not very compatible with the goal of car-reduced living. In Slateford Green, this effect is somewhat compensated by the project being targeted to groups whose car ownership is traditionally low throughout the city, and whose activity patterns are oriented towards the vicinity and the city centre, encouraging walking, cycling and public transport while offering little scope for car use. Both criteria, however, do not apply to Stadthaus Schlump. On the one hand, residents there are relatively wealthy - higher-income media professionals are particularly well represented - which typically translates into high car ownership rates and the availability of resources to maintain even a sparsely used vehicle. On the other hand, the activity patterns of the residents, with the exception of a significant number of largely pedestrian shopping, errands and leisure trips within the district, are characterised by a level of spatial dispersion and temporal irregularity that makes them largely unresponsive to specific offers like discounted public transport passes and car sharing. These are obviously not the most conducive conditions for a successful mobility management programme - but there is clearly scope to further optimise existing mobility services towards the real needs of users, if such solutions were explored in an open discourse within the community.

The experiences from Amsterdam and Vienna allow for a comparative evaluation of physical and legal approaches to parking reduction and their translation into actual travel behaviour. Neither project quite achieves the extent of non-car ownership expected, which would amount to 80% of households in Amsterdam and 100% of households in Vienna. In practice, both approaches leave a number of loopholes, ranging from using a car park outside the district to informal car sharing, from private use of company cars to open subversion of the rules. The extremely low share of car trips in Amsterdam and the low usage rate of existing vehicles,



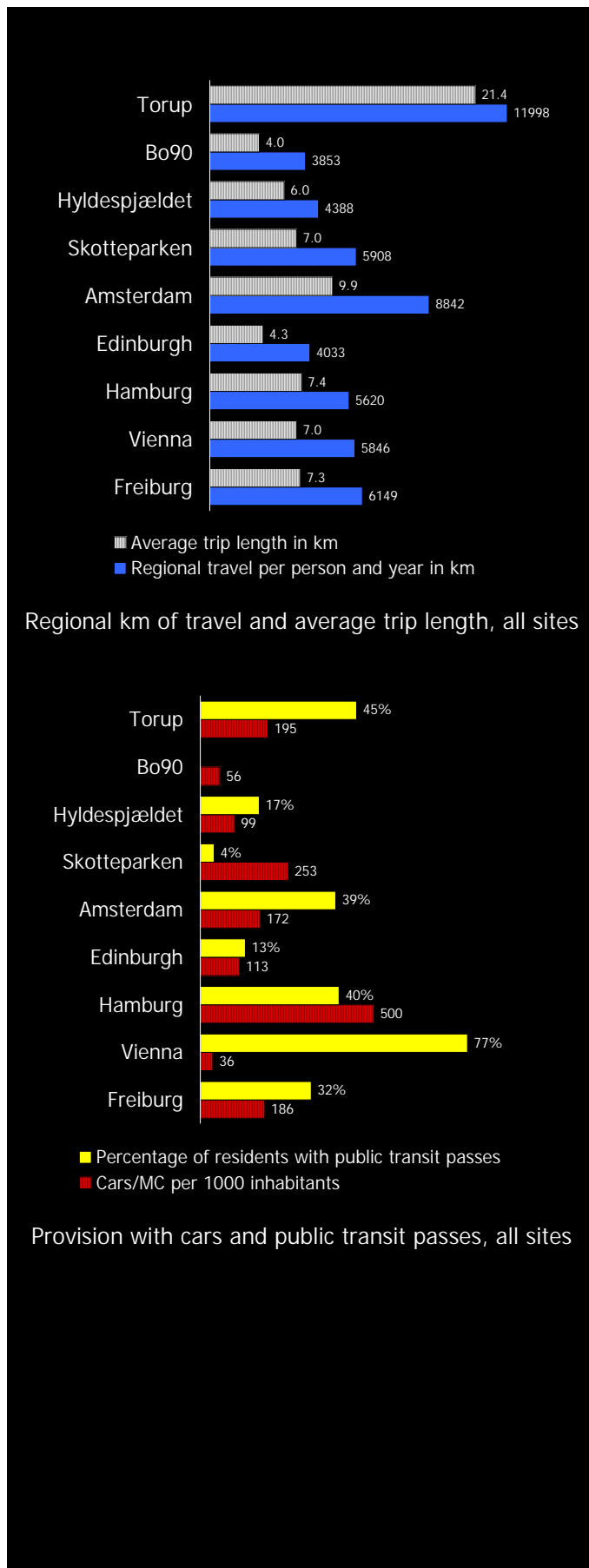
however, could be seen as an indication that difficulties in accessing the car - if no parking space is found in the vicinity of GWL-terrain - do indeed have an influence on mode choice.

## Freiburg-Vauban: A Synopsis of Sustainability Experiences and Visions



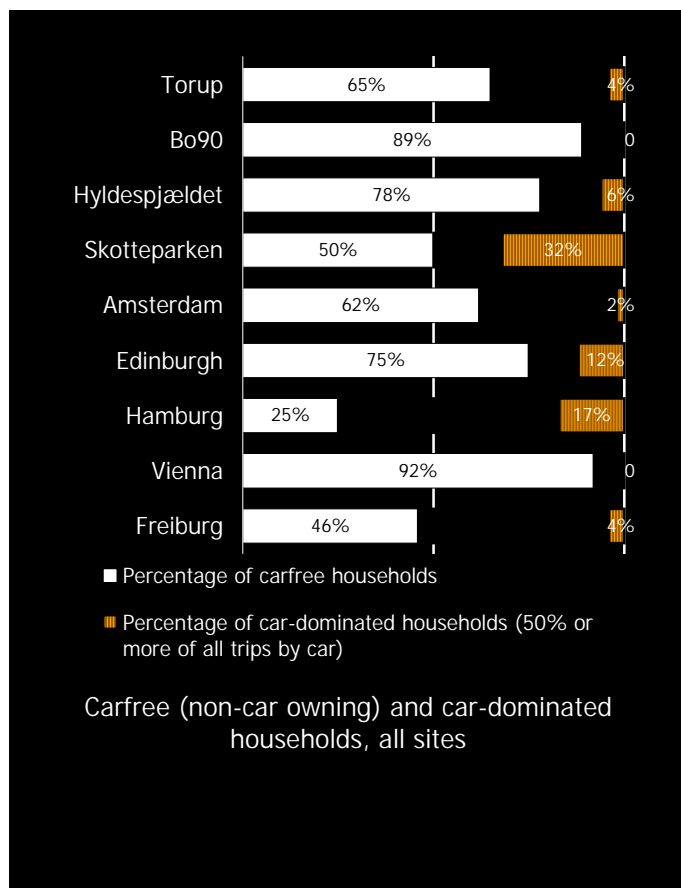
Our remaining case study area describes the ambitious quest to synergistically combine best practice in both resource efficiency, community development and mobility management in a new urban district for 5,000 people and by maximising the involvement of future residents in the planning process. Vauban's completed first stage largely consists of owner and rental housing cooperatives implementing visions of community-oriented living in projects instigated and designed by the users. In a complicated contractual arrangement that serves to make an explicit segregation between the costs of housing and parking, the new district is targeted at both car owning and non-car owning households, with the latter exempted from having to purchase a parking space by obliging themselves in writing to abstain from car ownership. Accordingly, parking facilities are concentrated in a major structure on the perimeter of the district while the immediate residential area is only accessible to motorised vehicles for loading and unloading purposes, and in cases of emergency. Vauban is located 3.5 km south of Freiburg's city centre at the edge of town, but public transport is currently limited to a peripheral bus route until completion of a tram line traversing the district in 2005.

Within the section of Vauban we surveyed there are 46% carfree and 54% car-owning households. Compared to before moving to Vauban, car ownership declined quite markedly from 1 vehicle per 4.0 people to 1 per 5.4. Almost four times as many trips (64%) are taken by non-motorised modes than by car, which is the



third highest figure of all case study areas after Bo90 and Amsterdam. Public transport, despite the lacklustre service standard, is used for an average of 166 trips per capita per year, more than in Amsterdam and Hamburg. Annual regional travel distance (6,149 km per capita per year) and average trip length (7.3 km) are quite similar to Vienna figures, despite Freiburg's much smaller size at 200,000 inhabitants; what is apparent here is a significant share of work and education trips along the Upper Rhine corridor, and the popularity of the southern Black Forest region for recreational purposes.

Vauban appears like a treasure of dreams and visions materialised in urban space, and it is hard to conceive that something like discontent could spread in the midst of this child-friendly, communicative and imaginatively and diversely designed neighbourhood. Yet a clear majority of residents had critical attitudes towards the mobility management concept, and a formidable minority even rejects it outright. This refers not so much to the carfree character of the district per se, which continues to enjoy broad support and to seven out of eight respondents provided a compelling reason to move to Vauban. But there are some serious irritations about details: Who is allowed to park their car for how long in the residential streets? How can households be dealt with who are neither full car owners nor fully car-free and who thus slip through the radar of the parking provision arrangements? How can the concept be enforced without damaging the social atmosphere through excessive corrective measures? And how can visitors from outside Vauban be convinced that they need to park their vehicles in a commercial garage just like in the city centre, and take a walk from there to



their final destination?

It is obvious that each of these questions requires renegotiation of the mobility management concept. But then Vauban could scarcely be better equipped to facilitate such negotiations and their constructive resolution: Most residents have accumulated a rich body of experience how to transform diverging opinions into common goals during the inception and planning phase of their housing cooperatives. A highly respected residents' association and participation agency has dealt with conflict mediation and consensus finding from the outset and in the process, evolved into a knowledge centre of sustainable neighbourhood development. The importance of such participatory decision making structures to consolidate sustainability oriented lifestyles, including and particularly innovative concepts of mobility management, can hardly be emphasised strongly enough.

## Conclusion

The findings demonstrate the remarkable impact local mobility management schemes can have on residents' car ownership and travel behaviour patterns where they are instigated and supported by a broad consensus of stakeholders. The participation of users in maximising the benefits from carfree residential environments as well as in taking on specific responsibilities for their maintenance and further evolution thus proves a crucial ingredient to the success of neighbourhood mobility management. In a Scandinavian context, mobility management programmes could become a highly desirable supplement to the strong regional tradition of subsidiary democracy in housing precincts, alongside other sustainability-related tasks such as waste management, management of open spaces and community facilities, which are already under residents' control in a number of places. This would help ecologically oriented neighbourhoods to determine and improve their performance on all relevant sustainability indicators.

The findings of this survey, however, also make it abundantly clear that successful programmes of travel impact reduction in residential neighbourhoods cannot be separated from physical conditions, particularly the neighbourhoods' location in the urban context, their internal design for different modes of transport and their level of multifunctionality.

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See also <http://www.wistp.murdoch.edu.au/research/carfree.html>