

Home Zones - Reconciling People, Places and Transport

Study Tour of Denmark, Germany, Holland and Sweden - July to August 2000



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I set out on a Winston Churchill Travelling Fellowship simply to study *woonerf* streets or Home Zones in Northern Europe. But it soon became clear that in Denmark, Germany, Sweden and The Netherlands the process of improving the relationship between people, places and traffic had moved far beyond the early Dutch experiments in Delft and Rijswijk. So as well as visiting and photographing residential streets in the countries visited, I found myself introduced to much broader subjects involving town planning, urban regeneration and transport policy. I do not regret this, but it means that Home Zones themselves form only a small part of the extensive notes, literature and photographs with which I returned. I hope this will not disappoint the individuals and organisations for whom the study was intended.

I am indebted to many such individuals for their support. Firstly, I would like to thank the directors, staff and supporters of Sustrans Ltd., the transport charity, my employers for the past five years. I would also like to thank Transport 2000 and the National Childrens Play Council for their enthusiasm and advice. Graham Smith and Don Matthew helped with many useful contacts. It goes without saying that the real value of the tour came from those I met along the way. Their names are listed in the appendices, and I feel remarkably fortunate to have found so many wise and helpful professionals, politicians, technicians, officials, academics and campaigners and local residents, despite undertaking the journey at the height of the holiday season. I would also like to thank Brompton Bicycle Ltd. Their superb folding bicycle made the discovery of so many towns and cities effortless and fun, and provided an immediate talking point everywhere I went.

I would also like to thank my wife Jen for looking after the children and handling all the preparations for our move to America whilst I travelled. And finally, I would like to record my gratitude to the Winston Churchill Memorial Trust for giving me the opportunity to fulfil a long-standing wish to explore Holland, Denmark and Sweden.

THE TRAVELLING FELLOWSHIP - Background

I first heard the term Dutch term "*woonerf*" as a student of architecture when studying housing layouts. The idea of designing streets so that walking, cycling, social activities, childrens play, parking and local car traffic could all share the same space struck me as such an eminently sensible idea, that it would surely become standard practice in the UK. It was the rich visual quality of the early Dutch schemes which was particularly attractive, with the combination of trees and planting, screening, brick and cobbled surfaces and street furniture. To my disappointment, I found myself working with housing developers and traffic engineers who continued to build residential streets designed for the car, with sweeping asphalt radii at each junction designed for 30 mph traffic, and monotonous kerb-side parallel parking combined with ubiquitous yellow lines.

Sustrans work on the National Cycle Network and on the creation of safe routes to schools brought the importance of changing the relationship between cars and people into focus, particularly the limitations imposed on children by ever-growing volumes and speed of traffic. Traffic calming, the reallocation of space for walkers and cyclists, and the need for local networks all pointed towards a renewed interest in the Dutch experiments from Delft and Rijswijk near The Hague, ideas that had clearly influenced a generation of transport and urban planners across Europe. In 1999, the UK Governments Department of Environment, Transport and the Regions (DETR) announced the first pilot "Home Zones" in England and Wales following extensive lobbying by many groups including Transport 2000 and The National Childrens Play Council. Discussions with local authorities and residents groups indicated widespread interest in the subject, constrained by a lack of knowledge and guidance. Clearly, any lessons that could be learned from European experience in traffic planning and street design would be of benefit. Sustrans already has established links with other European countries through the development of bicycle routes, and in particular with Denmark through the "Safe Routes to Schools" programme. It seemed a logical step for Sustrans to help promote understanding and extend the knowledge base in this important area.

The motivation for the study came from home as well as work. My street, like so many others in the UK, has become dominated by parked cars and moving traffic, unsafe for children and cyclists, and disruptive to social interaction. Ten years ago, the residents experimented with ideas for redesigning the street by rearranging the parking. Although it succeeded in reducing speeds, helping traffic flow smoothly, and making it much safer to cross the road, the local highway authority soon brought the scheme to a halt. Now, with official support for 20 mph roads, controlled parking, and even home zones, the time seems right to explore current best practice elsewhere in countries with more advanced transport and urban planning.

THE TRAVELLING FELLOWSHIP – Some Reflections



News of a fellowship at Harvard, starting in September 2000, meant that the travelling fellowship had to be squeezed into the few weeks available following the grand opening of the National Cycle Network at the end of June. This allowed little time for planning and preparation. Advice from numerous sources suggested Holland and Denmark as the natural focus for a study tour, although there are now examples of the "woonerf" principle in almost all European countries. I decided to try and include brief visits to Northern Germany and Southern Sweden if time and budget allowed. The itinerary was planned to allow me to help host a three-day study visit to Utrecht, Delft and The Hague organised by Sustrans for some 25 officials and community representatives from across the UK..

For anyone travelling to study transport, Denmark, Holland, Germany and Sweden are a delight! The ease of travelling by train or bus, supplemented by the Brompton bicycle, meant that it often felt as if I were not really "travelling", and that I should have selected more exotic destinations to fulfil the idea of a "travelling fellowship". Reaching Amsterdam from Bristol on July 4th (my 45th birthday) certainly felt easier than travelling to Bangor or Penzance. I returned on August 15th, six weeks later, having visited some 40 towns and villages (listed in Appendix 1).

I could not have wished for better contacts and more helpful hosts throughout the tour. The key contacts made with government officials, engineers, architects, urban planners, technicians, academics, researchers and campaigners are listed in Appendix 2. In addition I was helped by old friends in Bonn and Hamburg, and made many new ones in all four countries. I was fortunate enough to meet Steven Schepel, head of the Road Safety Directorate at the Dutch Ministry for Transport and Public Works, on my first day in Holland. In addition to giving me much advice about the subject of home zones, speeds policy, safety and other critical issues, I owe him a great debt for contacts with two outstanding practitioners in the subject. Hans Monderman, a traffic consultant in Friesland, introduced me to some radical new directions in traffic planning in the towns and villages of Northern Holland. And in Culemborg, south of Utrecht, I was able to meet with Joost Vahl. Joost was described by Steven Schepel as "the godfather of the *woonerf*", and indeed he had been involved in reconciling traffic and places from his early involvement in Delft and Gouda up until his recent retirement. He was inspirational, challenging, energetic, witty, charming and immensely generous of his time and hospitality. If for nothing else, the trip was worthwhile for making such a valuable friend and contact.

THE TRAVELLING FELLOWSHIP - Learning from Europe

The extent to which the design of streets, cities and transport systems has developed in Europe is simultaneously inspiring and demoralising for those working in the UK. We have much to learn, and a great deal to do! As we cautiously consider methods adopted by the Dutch and Danes 25 years ago, their current initiatives call for much more fundamental changes. It is unlikely that one visit can do any more than encourage further learning and contacts with our European partners in this field.

However, the travelling fellowship has provided an enormous stock of notes, ideas, slides and photographs as a resource for myself, for Sustrans, and for others interested in the subject. The following notes can only touch on some of the themes considered during discussions with my hosts, and I hope they will encourage further formal and informal contacts between practitioners in the UK and the USA with the rest of Europe. I intend to follow up many of the issues touched on in the notes, and to use the slides for teaching, for further articles, and as a basis for a set of guidance notes as part of Sustrans technical publications. The coming year in the USA will offer an opportunity to explore the subject in a country where the relationship between people and cars is as relevant as here in the UK, if not more so.

I leave for Boston with a much greater appreciation of the role that "HomeZones" can play in reconciling different activities and transport. Whilst daunted by the scale of the changes needed in the UK, the work underway in Denmark, Germany, Holland and Sweden fills me with excitement at the possibilities and opportunities for change, changes that extend far beyond the simple first steps of changing streets into living spaces. I think the travelling fellowship has succeeded in its purpose.



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HOMEZONES: RECONCILING PEOPLE, PLACES AND TRANSPORT

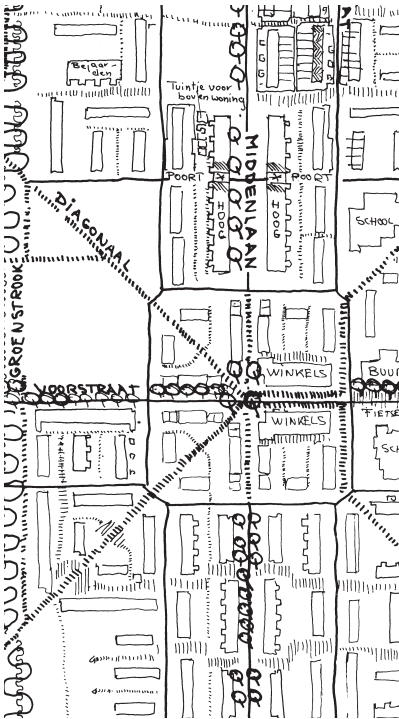
Some Insights from developments in Denmark, Germany, Holland and Sweden

Introduction

The following notes were drawn from a six week study tour of parts of Northern Europe undertaken during July and early August, 2000. The tour was carried out on behalf of Sustrans Ltd., in association with Transport 2000 and the National Childrens Play Council. The costs of the study tour were met by a Travelling Fellowship awarded by the Winston Churchill Memorial Trust. Additional support was provided by Brompton Bicycles, whose ingenious, portable, folding machine provided the main means of local transport in the villages, towns and cities visited.

Sustrans Ltd. is an independent transport charity with over 40,000 supporters. For over twenty years, Sustrans has been promoting practical methods to reduce dependency on the car, primarily through encouraging walking and cycling and the use of public transport. The UKs National Cycle Network was initiated and co-ordinated by Sustrans, who also pioneered the first "Safe Routes to Schools" projects.

In 1999, the government announced a number of pilot "Home Zone" projects for England and Wales. The concept for Home Zones has been developed from the principles for shared-use of streets and public spaces pioneered in The Netherlands in the early 1970s and known as *woonerf* (or *woonerven*). Other countries, many inspired by the early Dutch work in Delft and Rijswijk, near The Hague, developed the principles during the 1970s and 1980s, and similar schemes are now well established in Denmark, Germany, Austria, Sweden and many other countries. Home Zones also feature in the UK Governments recently published 10-year transport plan, and many local authorities include them in their Local Transport Plans.





Interest in Home Zones has grown rapidly in recent years in the UK. In addition to local and national government, publications, conferences and debates on the topic have included the professional and technical institutions (such as the Urban Design Alliance¹), numerous groups concerned with safety and environmental issues, and many local community groups. Transport 2000 and The National Childrens Play Council have successfully campaigned for the introduction of Home Zones in the UK, and have helped organise events and study visits to The Netherlands. Nevertheless, despite growing interest by journalists and the media in the subject, there appears to be an important need for wider understanding of the progress made by our European partners in this vital area.

The primary purpose behind the Winston Churchill Travelling Fellowship was to supplement the study tours organised by Transport 2000, Sustrans and others by providing a wider overview of the processes and context of urban planning and transport policies in Holland and other European countries, and to see how Home Zones might form part of a continuing change in the relationship between people, places and traffic. It also provided an opportunity to establish and strengthen contacts with individuals and organisations engaged in transport and urban planning, and to explore how Sustrans continuing work on the National Cycle Network and Safe Routes to Schools might facilitate the introduction of best practice from mainland Europe into the UK.

Principle Observations

Any brief visit to a number of countries can, at best, only provide some fragmented, subjective observations. Impressions are dependent on the places visited, the time of year (my tour took place during the height of the holiday season, when most politicians and officials were away), chance encounters, the weather and so on. Nevertheless, such observations are worth recording to distill ones own reflections, and to offer some guidance to subsequent research, future visits, and for those developing policies and techniques in this country.

For my part, my general reflections can be summarized as follows:

- As might be expected, the overriding conclusion was that the UK has a great deal to learn from good practice and experience in Europe. As a result of consistent and concerted effort over several decades, all the countries visited were able to **combine high quality public space with the needs of efficient integrated transport systems**. There would appear to be no reason why principles adopted in such countries could not be applied in the UK.

- The *Woonerf*, or Home Zone, has become merely one important element in a **wider set of measures** to protect towns and villages from the adverse impact of the car, and to increase the quality and safety of streets and public spaces. In most of the countries, there is no longer much direct interest in Home Zones in isolation, since they have generally become an established component in broader urban policies.

- High quality demonstration Home Zones are an important step in the process of raising public awareness and confidence in the potential for mixed-use of streets. It is therefore vitally important for the UK to establish a comprehensive set of good quality pilot projects as early as possible.

- Successful policies to **promote walking and in particular bicycling** are vital if an appropriate balance is to be found for the diverse range of users of streets and public spaces. Investment in the infrastructure for safe cycling is both a prerequisite for successful Home Zones, and simultaneously an opportunity for redesign of the streetscape. Home Zones are unlikely to be successful unless other transport and urban planning measures succeed in reducing car dependency.

- The balance between the **segregation and integration** of the diverse users of streets and public space remains the most critical judgement for those involved in preparing and implementing transport and planning policies. Current initiatives, particularly in The Netherlands, to integrate traffic, pedestrians, cyclists and other users of streets, would appear to result in very high quality environments.
- **Reducing traffic** speeds remains the most critical factor for all of the countries concerned. Improvements in safety, more efficient use of space, improved traffic flows and huge improvements in the environmental quality of towns and villages were evident from the progress made in the countries concerned, particularly with the widespread introduction of 30 kph zones.
- Home Zones can be part of a broader debate about the relationship between the social domain, and the domain of traffic. Current initiatives in Holland and in Sweden would appear to distinguish clearly between these two distinct components in the urban fabric, and to look for ways to extend the social domain by reducing areas designed for traffic flow.
- The traffic design experiments in Holland and Denmark to introduce **uncertainty** into design of junctions and spaces as a means to improve safety merit close attention. In many examples in Denmark, and particularly in Holland, removing certainty, consistency and clarity for traffic appeared to offer significant benefits.
- There appear to be few economic disadvantages from controlling and limiting car access in towns. On the contrary, the vitality and prosperity of town centres where traffic had been controlled was impressive in all the countries visited.

Home Zones Observed



Rijswijk: Demonstration Woonerf

The Pilot Projects

Home Zones have now become so common in Holland that they merit little attention. Since the first demonstration schemes in Delft and Rijswijk, the *woonerf* designation has been applied to well over 7,000 streets and residential areas. It is now taken for granted to the extent that many of the shared-use streets visited no longer rely on the familiar blue traffic sign with the symbols for the house, the playing child, the pedestrian and the car. Traffic rarely appears to move faster than around 15 mph in most minor residential roads, and traffic-calming measures such as raised junctions, speed humps and horizontal displacements are largely taken for granted.



Rijswijk: Street details

Nevertheless, the early demonstration schemes in Holland remain impressive and inspiring. In a well-to-do suburb of The Hague, one leaves the busy main thoroughfare in Rijswijk to find oneself in a set of tranquil streets paved with Dutch bricks, cobbles and pavements. Cars are parked in offset groups shielded by trees, which themselves become the dominant feature of the street. Speed cushions are discrete, and carefully planned into the overall street design, which in turn takes into account a multiplicity of uses. There is beautifully planned seating on corners, play areas separated from the carriageway only by sets of bollards, and a blessed absence of signs and road markings. Street paving patterns have been designed to emphasise the "place" nature of junctions, and deliberately eschew any reference to "the carriageway". The closed views down the streets give a surprising intimacy to the area. Cars move in and out, delivery vans come and go, and children ride tricycles and kick footballs between the cars. Most of the residents I spoke to still grumbled about the constant pressure for parking space, but everyone appeared pleased with the area and proud of its appearance.



Delft: Woonerf

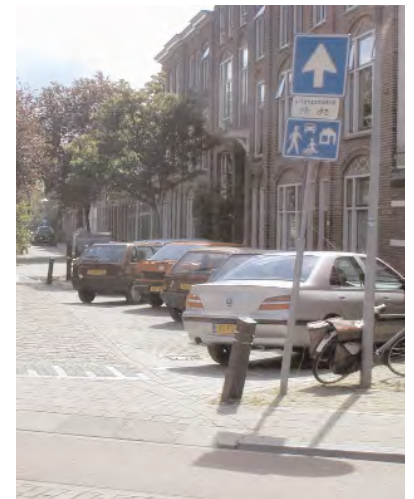
The narrow, turn-of-the-century terraces of Delft were the second of the two original pilot areas. Here again the tranquility comes as a surprise to visitors from Britain. There is less formality about the layout, and the involvement of each community in the design and evolution of the street layout has resulted in a remarkable variety and richness of detail. As in all the *woonerf* streets, the personality and presence of each resident extends well beyond the front doors. Windows display interesting objects and trinkets; benches and paraphernalia abound on the pavements, and much planting and gardening is evident in the public domain. These characteristics extend to the more recent areas of housing development, where the lack of large private gardens is counterbalanced by the use of the street as a space for neighbours to sit and chat while children play.



Delft: New Housing

Parking

One key factor common to all the woonerven in Holland remains the ability to designate specific car parking spaces (usually by a discreet "P" set into the street surface). Each space is carefully co-ordinated with the rest of the street furniture and planting. Although there is still pressure for parking space (less so in Denmark and Sweden), the designation of specific spaces appears to allow residents to resolve the use of such space through local agreements, in contrast to the anonymous free-for-all of typical UK kerbside parking. Simple "controlled parking" regimes were widely in use, giving residents opportunities to park in return for a small annual fee. One overriding conclusion is that yellow lines in the UK remain an ugly and unnecessary traffic element in the social space of residential streets.



Delft: Specified parking



Woonerf sign



Houten: Winkelerf



Utrecht: Koekoesplein School with playground across the street.



Copenhagen: Cars and children share space.

Designations

The standard European sign for the *woonerf* has yet to be approved in the UK. In The Netherlands, its use often seemed unnecessary; the culture of shared use, with pedestrian priority, has spread so widely from the early examples that a special designation for residential streets is academic. There are, however, some interesting variations in the use of the sign and the terms used for the streets to which it is applied. In Denmark and Sweden, the signs incorporate the "15 Km" speed limit designation (c. 9 mph). By contrast, the Dutch deliberately avoid any formal speed limit, referring instead to "striding pace" or similar. In some streets in Germany, the sign is used simply to suggest slower speeds. Interestingly, the Danes have no definitive word for a home zone, referring to them as "Paragraph 40 streets" after the relevant legislation. Indeed, streets in Denmark are often categorized and labelled by their varying speed limits ("15 streets", "30 streets", "40 streets" and so on). The term *Ggade* (in Denmark) or *Grdsgata* (in Sweden) appeared to have slightly different connotations, distinct from the "yard" or "living space" implied by the term *woonerf*. In Holland, one can find examples of shopping streets with the designation *winkelerf* (or "shopping yards"), but as Steven Schepel suggested, Holland is trying to move away from differentiating the use of urban areas. In his view, "the whole city should be one erf!"

Children's Play

The deliberate mixing of childrens playspace and the highway comes as a shock to most UK observers. In Copenhagen's *Kartoffel Rkkerne* ("potato rows"), a delightful set of streets in the north of the inner city, sandpits, basketball nets, play houses and hopscotch grids spread across the roadway. Children run in and out of the bollards that protect the play equipment in Rijswijks streets. In the light of England's early departure from the Euro 2000 tournament, I could not help noticing how much football was being practised on the streets of Holland and Denmark. The most striking example observed of the contrast in attitude to traffic and children was in the Koekoesplein area of Utrecht. Here, the play area for a large primary school (which also doubles as a public square) is separated from the school by a residential road. The need for children to cross this road has been deliberately retained (the street could have been closed to traffic). Instead, the circumstances are made fully apparent to drivers (reinforced by speed bumps), and the need for slow speeds and extreme caution influences the pattern of car movements in the whole surrounding area. But it also brought the children into the presence of traffic, providing an opportunity for developing traffic sense in a safe environment..

Community involvement

All the home zones observed in all four countries shared similar characteristics. Typically these include the lack of separate raised pavements, a variety of surface treatments suited to a pedestrian environment, the use of trees, planting and street furniture to define and screen car parking, the use of bollards and street lighting to define space, and the use of simple "gateways" at the entry points. But yet the striking quality of all the *woonerf* streets is their individuality. There is no common template; every street is treated differently. This, of course, stems from the simple fact that every successful home zone is designed and adapted according to local preferences and circumstances, with residents and users involved at the outset. The process of changing the balance of use in streets has benefited from, and in turn helped to develop, a strong set of local communities in the countries concerned, particularly in The Netherlands. Again and again, those associated with urban planning and traffic issues stressed the importance of setting up the necessary mechanisms to enable people to resolve problems themselves, rather than relying on regulations and the cumbersome hand of authority.

One striking example of a local community taking control of its environment was visible in a suburban street on the edge of Utrecht. The residents of these low-cost municipally owned houses had decided to construct temporary shelters across the pavements in order to create a space in which to enjoy the Euro 2000 football championships together. The cheap timber structures had been swathed in the national teams orange colour, and armchairs, televisions, tables and benches and even carpets spread out from the house fronts into the street. Unfortunately they did not win!



Annanas Straat, Utrecht:
Street shelters erected for Euro 2000 championships



Street as social space

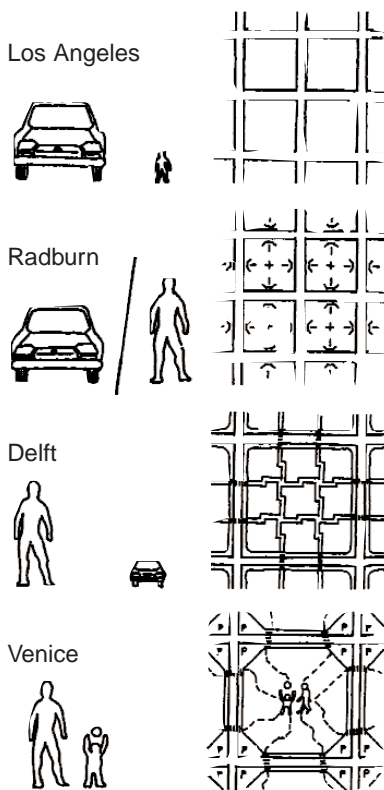


Kartoffel Raekerne, Copenhagen:
Shared street

SEGREGATION versus INTEGRATION

Can traffic, people and places be reconciled?

Home zones present a challenge to many conventional urban planning principles. The defining characteristics of post-war planning in Europe, and especially in the UK, have focused upon the separation of space for different uses. Highway design and traffic systems have followed the same principles, reinforced by a hierarchy of road types set out by Buchanan in 1961². Pedestrians and motor traffic have been seen as incompatible, and the design of streets and cities attempted to define distinct space for both. The motorway and the pedestrian precinct represent the opposite ends of the spectrum, and the pavement or sidewalk distinguishes the pedestrians space in the street from the carriageway. The example of the town of Radburn in the USA gave its name to a set of urban design principles which keep networks for pedestrians entirely distinct from those designed for cars. It remains unclear whether to mix bicyclists with motor traffic, with pedestrians, or to create an intermediary network, and the debate continues to dominate those involved in the creation of bicycle networks.

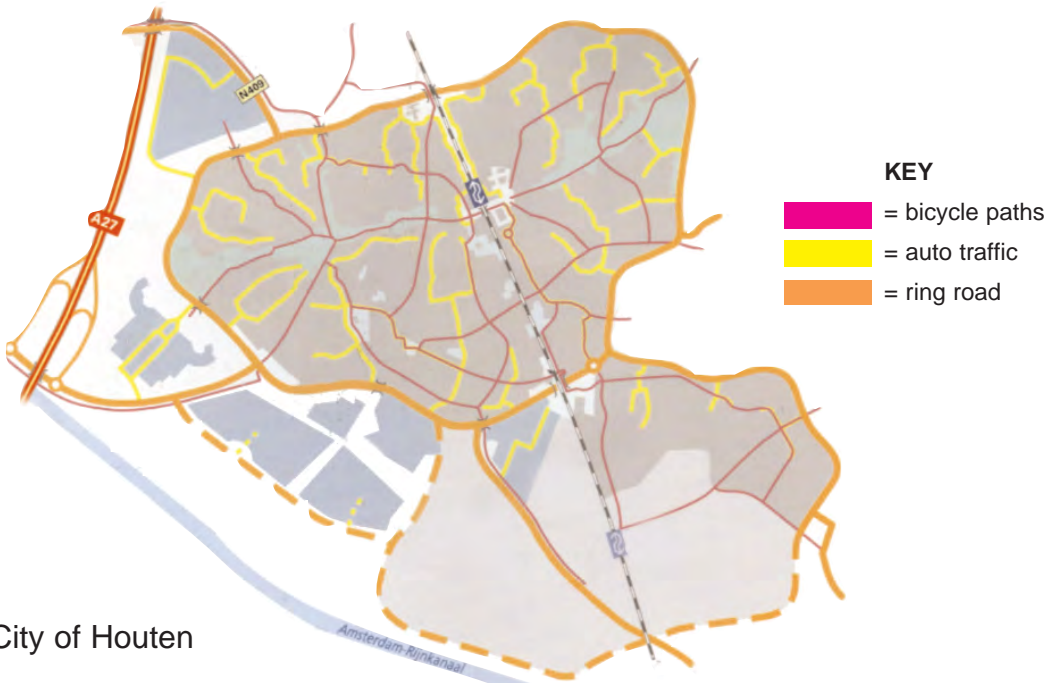


People and Traffic: Four Types
from Jan Gehl "Life Between Buildings"

Home zones challenge this separation, and indeed reverse most of the principles that have governed traffic engineering to date. The *woonerf* principle mixes limited vehicle use with a wide range of other functions. Most importantly, it attempts to interweave the social function of the street with the need for access and mobility. An understanding of home zones and their potential for the UK thus has to take into account some of the underlying planning principles.

Jan Gehl, head of the Department of Urban Planning at the Copenhagen School of Architecture, pointed out the four basic patterns governing the relationship between traffic and more vulnerable road users³. Either cars share space with others and the car dominates (eg. Los Angeles), or cars are kept distinct from others (eg. Radburn), or cars share space with traffic but the pedestrians and cyclists dominate. The final example of Venice (where cars are entirely excluded) is rare on any large scale. The third example provides the principle within which the first *woonerven* were introduced in Delft.

Striking examples of the two approaches to resolving the relationship between traffic and people can be observed in two adjacent towns, both on the railway line a few miles south of Utrecht.



City of Houten

Houten is a new town of around 35,000 people, planned to expand to 50,000 by the year 2005. It is encircled by a ring road, which is the only means of access to its 16 neighbourhoods by car. Cars are unable to cross between neighbourhoods, and have to circulate on the ring road. The centre of the town is dominated by the railway station, and a linear park runs perpendicular to the railway from the east to the western edge. The park is designed around high quality, traffic-free pedestrian and cycle routes, which extend to every corner of the town.

The statistics for Houten are impressive. It enjoys amongst the highest levels of bicycle and public transport use of any town in Holland, together with very low accident rates. A six-year old can easily cross the town by bicycle from school to any neighbourhood, and the peace of the network of paths is broken only by the ubiquitous mopeds (which are allowed to use the cycle routes). House prices are high, and a further expansion of the town is under construction.



Houten: Separate paths for cyclists throughout the city.





Joost Vahl:
Breaking away from road hierarchy

Just 10 minutes south of Houten lies the medieval town of Culemborg. Here, Joost Vahl has worked for 15 years with the municipality to develop and extend the town, which currently houses around 25,000. There is limited access to the old medieval centre by car. Ringing the core are a number of carefully designed car parks. Residents and essential car users can gain access via a smart card system depending on their needs. In the old quarter, there are cars and trucks coming and going, but the busy little streets and thriving businesses are dominated by pedestrians and cyclists.



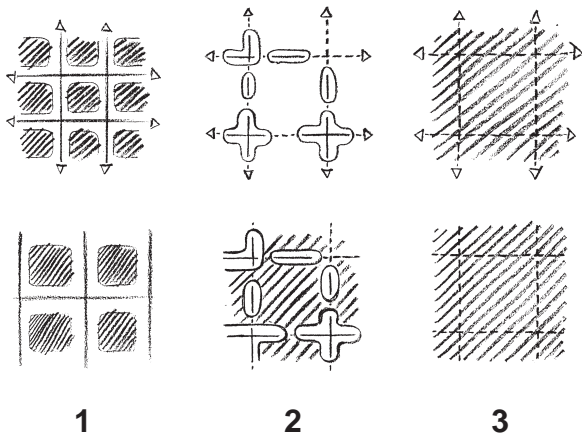
Culemborg:
Integrated traffic and public space.

Joost's work on the outskirts of the town represent a superb illustration of how a grid layout can be used imaginatively, and how traffic can (in his words) be "tamed" to the social needs of the occupants. It also illustrates the logical, longer-term extension of the *woonerf* principle. The approaches to the town signal the change from a hierarchical road system. Every detail deliberately avoids the language of standardised traffic engineering, and emphasise a new relationship.

Joost worked on the earliest of the *woonerf* schemes, and he has retained all the energy and passion of the 1960s radical. Although recently retired as a well respected writer and thinker in urban design, planning and safety, he has never removed himself from hands-on, practical, detailed work. His unbureaucratic, imaginative style has been applied to towns across Holland, as well as to major arterial roads in France. He uses "*objects trouØ*" in his work, has designed his own lamps and street bollards (from rather stylish upturned yellow waste bins from France), and loves building paths and memorable spaces. He keeps a standard road-workers tent which he uses as a dummy to test whether existing road widths are really necessary; if no congestion or traffic problems arise after the tent has been in place for a few weeks, he can demonstrate that the road can be narrowed and the space used for something else!



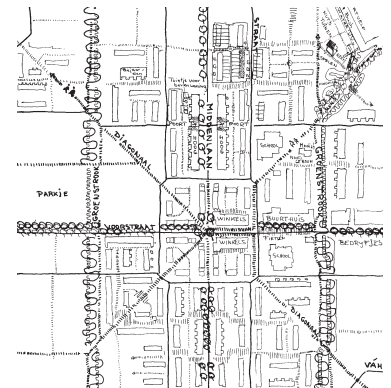
Culemborg details



1. Traffic flows separate calmed residential areas.
2. Major arteries are adapted to overcome severance.
3. The city as a coherent social zone; traffic volumes determined by environmental capacity.

A simple, brilliant diagram from one of Joost's books⁴ illustrates why less attention is being paid to basic home zones in Europe, but why they are so important in a broader change in urban priorities. It is entitled "Differing ways of segregating or integrating buildings and road network." In the first stage, the home zones are located in gaps in the road network, a network which clearly structures the town. In the second (middle) stage, the main road network is modified to create links between the residential areas. Finally, in the third stage the social area encompasses the whole town structure while motor traffic plays a secondary role; speeds are reduced and controlled, and the environmental capacity of the place determines acceptable traffic flow.

Culemborg represents the best example I found of the third stage in this process; a whole city where traffic shared the whole urban fabric in a secondary role. New housing merges effortlessly with old. Far from being monotonous, the grid offers an opportunity for Joost to demonstrate a simple design principle. He describes needing just three or four "ingredients" to combine together to create limitless combinations of good recipes. "Butter, eggs, cheese." Three simple variations of street designs, which combine together at the intersections to create unique, memorable spaces. One ingredient might be a path lined with trees on a raised floodbank, another might be a simple road with a dyke along one side, a third might be a street punctuated with bridges.



from Joost Vahl's sketchbook

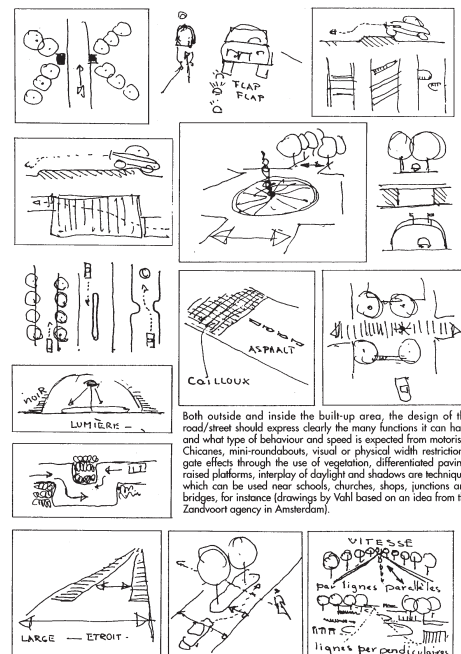


Culemborg junction: Traffic signals removed and entrances narrowed.

On the periphery of Culemborg, Joost showed me some of his junction designs, variations of which were to be observed throughout the tour. At a busy intersection, and again at a crossing between a cycle route and an important road in and out of the town, all indications of priorities have been removed. At the former, a circular hump has been placed in the centre of the junction which is designed to be ambiguous. Some drivers treat it as a road hump, others as a mini-roundabout. Despite (or because) of its lack of clarity, the junction works remarkably well, even in heavy traffic. Traffic moves slowly but steadily, with drivers relying on eye contact to negotiate priority. Joost describes the principle as "you have to make a junction dangerous to make it safe!". Elsewhere in Culemborg, Joost has introduced sheep to graze strips of public land, ensuring that the animals have to cross the road and concentrate the minds of drivers. The sheep look contented with their role as traffic calmers!

Houten, and Culemborg merit careful attention by anyone interested in contrasting approaches to urban design and the relationship between traffic and places. Culemborg is particularly impressive in its detailing, and for the quality of its "cooking". The principles indicated in Joost's evocative sketches are visible everywhere. As we pedalled around the town, it was apparent that Joost was a well-known and popular local figure, and trusted and admired by local residents. It is a relationship which would be remarkable in the UK; a planner who is so closely and intimately associated with the development of his home town.

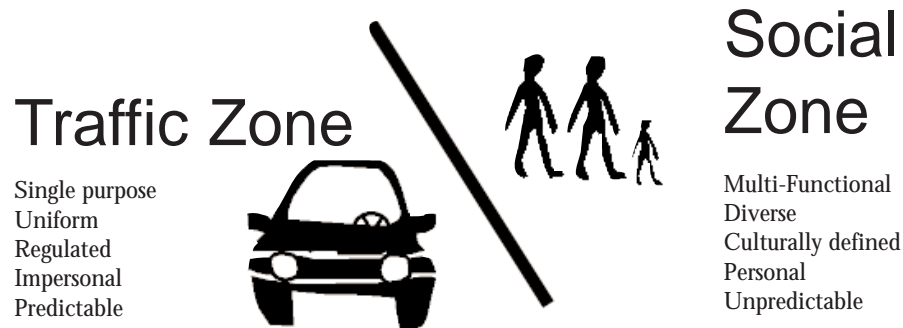
from Joost Vahl's sketchbook



Both outside and inside the built-up area, the design of the road/street should express clearly the many functions it can have and what type of behaviour and speed is expected from motorists. Chicanes, mini-roundabouts, visual or physical width restrictions, gate effects through the use of vegetation, differentiated paving, raised platforms, interplay of daylight and shadows are techniques which can be used near schools, churches, shops, junctions and bridges, for instance (drawings by Vahl based on an idea from the Zandvoort agency in Amsterdam).

THE TRAFFIC WORLD AND THE SOCIAL WORLD

Home Zones and the development of the *woonerf* principles were further clarified through a morning spent with Hans Monderman, touring a number of rural settlements in his native Friesland in the north of The Netherlands. Hans is a traffic engineer, and advisor to three provinces in the region. During our tour, he talked about the essential differences between human behaviour in the traffic realm, and the characteristics of human interaction in the rest of our lives. A simple diagram illustrated the contrasts.



From a sketch by J. Monderman

In essence, his view was that space is either designed for traffic (eg. the motorway), or it is designed for social activities. The two are not compatible, although cars can easily coexist in the social realm. Home Zones, and the work of progressive urban planners, is about extending the social zone and limiting the impact of the traffic zone. Coming from a practicing traffic engineer, such views seem persuasive and refreshing! The logic of his argument extended to the design of space in towns and villages; if the local community decide that their priorities are for the "social zone", then the space should not be defined by the needs of traffic.

To illustrate the point, he showed me an example of a village (Opende), where a new road had been designed solely for the needs of passing traffic. The presence of activity alongside the road, such as shops or a church, were ignored in the design. By contrast, in another village, Makkinga, all the signs and road markings relating to traffic had been removed, and the street designs reflected the historical pattern and morphology of the settlement. As well as offering a charmingly uncluttered environment, the removal of warning signs and priorities had not resulted in more accidents. On the contrary, the number of accidents had fallen over 10%, and speeds had been significantly reduced. Hans suggested just one sign on the entrance to the village; "No traffic engineers allowed unless chaperoned"!



Gateway sculpture emphasizing transition to social space.



Makkinga, Friesland: No traffic markings



Oosterwolde, Friesland: No road markings, no kerb radii. The highway as social space.

Another example of this philosophy for extending the social zone and taming traffic could be seen in the town of Oosterwolde, where a busy intersection, formally controlled by traffic signals, had been redesigned into a simple square with no reference to the passing traffic. In common with Joosts traffic junctions, the edges had been kept square (eschewing conventional traffic radius curves), and there were no road markings or signs whatsoever. Many cars and trucks still crossed the square, but the lack of any conventional road space meant that the traffic naturally acceded to the use of the square for caf  tables, children on skateboards, and the comings and goings of people on foot and on bicycles. It was a cheap, simple solution, and once again the accident statistics were impressively low.



Road design in response to architecture.

Hans Mondermans ideas and suggestions deserve a report in themselves. He talked eloquently about the role of social values in changing traffic behaviour. In particular, he believes that roads and signs should respect human intelligence and powers of observation. He showed me a photograph of a rural road next to a farm yard and gate. On the road were cow-pats. In the foreground stood the standard European warning triangle illustrating a cow. Hans throws up his hands in despair; "What do you expect to find.wallabies?!" His approach to road safety and traffic design relies on using the ability of human societies to order their world around social values, rather than through rules and regulations. To the three "Es" often discussed in relation to speed control (Engineering, Education and Enforcement), he adds a further "E" Ethics. He urges the use of the environment of any road as a means to inform the design of the traffic realm, and to allow roads to "tell the story of their surroundings", to take account of "the travelling landscape".



Lund:
Traffic and social life share the streets.



Odense: Conventional road markings removed.

Hans also stresses two themes which crop up frequently amongst urban planners in Holland, Denmark and Sweden. The first involves the use of eye contact as a means of ensuring safety (which in turn has important implications for speeds policy). The second concerns the use of traffic calming features which have a clear logic within the overall design and concept of the road. "Do not wage war on cars" was a favourite saying of Hans, as he showed me examples of randomly-placed speed humps and ugly, inappropriate barriers.

In all the best examples of home zone designs, and especially in the work of Joost Vahl, traffic calming measures are positioned so as to form part of an overall design. In some towns, poorly designed traffic calming measures look like barricades erected during civil disturbances, barricades which only serve to distance the driver from reading the architectural signals of the social zone. By contrast, Joosts traffic calming elements in Culemborg all follow a clear logic; humps are positioned to mark the point where roads crossed ditches or culverts, or to highlight intersections, or to mark out special places.

The principle of drawing a clear distinction between the traffic world and the social world is taken further by the Dutch Governments current initiative known as *Duurzaam Veilig* (Sustainable Safety). This programme will require municipalities to draw a clear distinction between those roads intended for transit, or for through-traffic of any sort, and those roads where the priority is for social activities. Many roads currently combine both functions, and the move to define entirely separate roles for these two types is a demanding task for planning and highway authorities. Although many people I met were sceptical about how far such a radical approach could be carried through, *Duurzaam Veilig* represents a further extension of the *woonerf* principle.



Albarntewartier, Odense:
15 m.p.h. zone



Central Lund, Sweden:
30 k.p.h. throughout



Denmark: speed de-limit sign

SLOWER SPEEDS



At the core of efforts to reconcile people, places and traffic lies the issue of speed. The *woonerf* principle is built on the notion of reducing the speed of cars such that they no longer represent a threat to vulnerable road users. 15 kph speed limits (9 mph) are adopted in Danish home zones, and there is an assumption that traffic moves little faster than walking speed.



Poorly designed traffic calming.

In all of the countries visited, the emphasis has turned away from the introduction of home zones and streets with 15 kph speeds towards achieving area-wide reductions. In Copenhagen, the City Council had hoped for final approval for an overall 40 kph speed limit, although this decision has yet to be finalised. Elsewhere, most municipalities were moving towards the introduction and extension of 30 kph zones. The "Tempo 30" campaign is central to German efforts in safety programmes, and around 80% of Bonn is now within 30 kph zones. The *Verkehrs Club Deutschland* (VCD) is leading a large-scale public awareness campaign concerning speeds under the title "Children have no air bags". That speeds of 50 kph (30 mph) are inappropriate to urban areas would appear to be widely accepted across the countries visited, and each country and municipality had programmes in place to reduce speeds.



Intelligent roads - junction of footpath and road.

The Swedish university town of Lund, just north of Malmö, has recently introduced a general 30 kph speed limit in the whole central area, supported by clear signs on billboards on all the approaches to the City. David Edman, the traffic officer for the Municipality, who showed me around the city, was impressed by how easily the concept had been accepted after initial scepticism in the local press and media. No large scale engineering measures were necessary, although widespread improvements in the road layout and infrastructure are underway to capitalise on the change. Reduction in speed is, he pointed out, central to the reallocation of space in the city, and all other measures to reduce the impact of the car flow from this single issue.



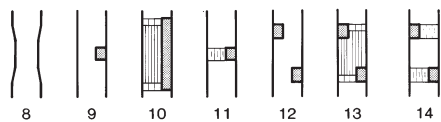
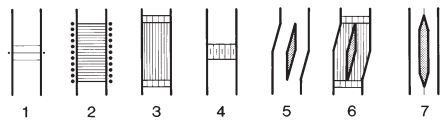
Traffic calming intergrated with urban design.

It appeared that Denmark, in particular, suffered from the proliferation of different speed limits for different streets. In one small quarter of Copenhagen, one can encounter signs for 15 kph, 20 kph, 30 kph, 40 kph and 50 kph speed limits. The confusion was often made worse by the use of "end of 30 Km zone" signs used to mark the entrance into a home zone. The general introduction of 30 kph (20 mph) speed limits for urban areas would appear to offer the simplest, and most easily understood, means to adapt the relationship between traffic and people in towns, and consistency across European urban areas would reinforce local campaigns. In most instances, such a move would require switching the emphasis away from *woonerf* areas with their very low speeds. However, it was notable how the most successful residential areas, whether in Rijswijk, Delft, or Culemborg, required no obvious signing or posting of formal speed limits. The architecture of the street layout was all that was required.

ADAPTIONS TO MAIN ROADS

Woonerven and residential home zones were the object of the study tour. However it proved impossible to consider the development of residential streets in isolation from the work underway to reduce the impact of main roads in all the countries visited. Indeed, meetings with officers in the government ministries and municipalities in Denmark, Germany, Holland and Sweden would always refer back to such initiatives. Joost Vahls diagram had helped clarify the importance of the relationship between urban areas and surrounding roads if home zones were not to merely remain "ghettos" within barriers dominated by traffic.

In Denmark, much has already been achieved through a programme with the somewhat clumsy title of "Environmentally Adapted Through Roads". This initiative grew as an alternative to creating bypasses around Danish towns and villages. The programme has encouraged the development of traffic calming techniques and measures to soften the impact of roads, and there are examples in and around almost every town and village. It would not be helpful to try and catalogue these techniques here, but there are excellent publications



from the Danish Road Directorate and SWOV (The Institute for Road Safety Research) in The Netherlands.

A Catalogue of Traffic Calming Measures.
Danish Road Directorate

It is interesting to note the high esteem with which British roundabout

design is held! In Denmark, Holland and in Lund in Sweden, I was taken to admire examples of junctions where traffic lights had been removed, and new roundabouts introduced "in the English style" to reduce speeds and improve safety. It is reassuring to know that British traditions in traffic engineering have made at least some contribution to European street design. However it was notable that almost every example incorporated pedestrian and cycle lanes combined with narrowings on the approach lanes in more convincing style than most UK examples. Accident figures from both the Danish Roads Directorate and SWOV in The Netherlands indicated that the major benefit lay in reduction in the severity (rather than the number) of accidents.

Of greater interest were the increasing number of examples of busy junctions designed to remove all indication of priority, where traffic signs and guidance had been removed (along the principles of Hans Mondermans work in Friesland and Joost Vahls junctions on the approaches to Culemborg). In Christiansfeld, a historic town in Jutland, the former traffic lights, road markings and signage on the busy central crossing in the town have all been removed. Measures have been installed to slow cars on the approaches, but otherwise the junction works efficiently and safely entirely on the principle of requiring eye contact between drivers, and an emphasis on the historic, civic and social functions of the space.



Utrecht: Adaptions to reduce speed in urban through road.



Lund: Roundabout



Lund: New Roundabout with cycling and pedestrian paths



Christiansfeld, Jutland:
Traffic signals removed.

BICYCLING, HOME ZONES, AND PUBLIC SPACE

– some brief thoughts.



Maastricht: Going to school.



Hamburg: Going to the park.



Utrecht: Home from school.



Copenhagen: Family outing

I set off for Holland determined NOT to be distracted by giving too much attention to cycle routes and cycling infrastructure, but to concentrate on street design and home zones. Once again this proved impossible. It was apparent both from observation, and from discussions with all concerned with the relationship between traffic and cities, that the level of cycle use, the quality and coherence of the cycling infrastructure, and attitudes towards cycling in general play a key role in improving the quality of public space. In turn, *woonerf* principles had themselves clearly contributed towards the development of bicycling. Shared use residential streets increase the permeability and safety of the city for residents and cyclists, as well as providing children with safe environments right outside their doors in which to learn and develop cycling skills and to gain confidence.

Astonishment at the sea of bicycles parked outside every railway and bus station in the Netherlands is a familiar reaction for any visitors from the UK. A landscape of saddles and handlebars greets you on arrival in Amsterdam; in Groningen and Odense there are multi-storey bike parks, and the ease with which bicycles are integrated with public transport continued to impress throughout the tour. Heavy old sit-up-and-beg bicycles carrying an adult with two, three or even four children are everywhere, and the lack of concern about helmets helps to reinforce cycling as part of the "social zone". In every residential street, bicycle parking helped to define and enclose space.

All of the bicycle organisations with which I had contact (the Dutch *Fietsersbond*, the Danish Cyclists Federation, and the *Verkehrs Club Deutschland*) emphasised the vital role played by the bicycle in providing a benchmark for traffic speeds. Purposeful travel on bicycle over level ground averages just less than 30 Kmh., and provides a useful benchmark for maximum traffic speeds. Throughout Holland, and in an increasing number of streets in the other countries, the "bicycles excepted" sign appears under traffic prohibition signs. Two-way cycling in one-way streets is seen as a particularly important means of reinforcing the informal, social nature of such spaces, and suppressing the dominance of the car. Bonn City Council has a programme to extend two-way cycling along most one-way streets; in most Dutch towns and cities (and especially in Amsterdam!) such signs and regulations are academic.

Delft: shopping trip





CONCLUSIONS AND RECOMMENDATIONS



Many individuals who have been observers or participants in the development of home zones emphasise two fundamental points. Firstly, there are no inherent cultural or social differences between Britain and other countries in continental Europe which should inhibit a change in the balance between people, places and transport represented by the development of home zones.

Secondly, home zones represent just one important first step in a long process to integrate and combine the various social and functional aspects of communities. Learning from our partners will not allow us to omit the differing stages in this development, although it may well allow us to move faster through the process.

Demonstration Projects

The widespread and continuing influence of the *woonerf* examples in Rijswijk and Delft demonstrate the vital importance of implementing high-quality, demonstration projects as early as possible, both to test ideas and (more importantly) to raise public awareness of the potential benefits from such changes.

Community Involvement

Home Zones stem from local communities taking collective decisions about what their streets and neighbourhoods should be for. Stronger community organisations may be necessary in order to exploit the potential for shared-use streets, and such bodies may in turn grow from participation in such decisions. It is vital that the evolutionary nature of home zones is accepted and understood, so that schemes can experiment and adapt over time through a number of small changes. The design and development of a computer-based graphics package that would allow communities to explore and visualise alternative configurations for their streets would be of huge benefit.

Speed Reduction

General speed reduction in urban areas and minor roads is a key condition to the introduction of home zones. 20 mph limits provide the context for home zones, and the UK should move rapidly to join other countries in Europe in extending their use. The examples of Lund, Bonn, and other cities suggest that extensive physical changes are not always necessary. Reductions in speed can free up significant amounts of space for other purposes, space that can sometimes be sold to raise funding for home zone schemes.

Bicycling

The promotion of walking and, in particular, cycling are essential to the creation of successful home zones. It is vital to exploit the presence of cyclists as a means to determine appropriate speeds, and to encourage cycling to exist as part of the "social" zone (as opposed to the "traffic" zone). Creating safe and extensive links between home zones can be combined with the creation and extension of cycle networks.

Parking

The creation of home zones requires local communities to take clear decisions about parking, and to set up mechanisms to solve the problems that arise from rationing space. Controlled parking zones are essential to their success, and it is vital that parking provision is clearly defined in the design of streets, rather than simply being allowed to take space wherever kerbs exist. The abolition of double yellow lines, and the introduction of a simple discrete parking plaque (along the lines of the P inset into many Dutch streets) should be a high priority for the DETR and local authorities.



Street Design

Removed from the regulated world of traffic, limitless creativity is possible in the use and combination of the planting, street furniture and surfaces. Low level lighting (designed for the pedestrian rather than the car), "walking trees" or lamp columns positioned to define space, enclosures, gateways, sculpture, variations in levels, different surfaces and textures offer the opportunity for huge variation, interest and individuality within the built environment.

Human Interaction

Home zones succeed through extending the social environment into the traffic zone. This works best when the regulations and signage associated with the traffic world are removed. Indications from recent junction designs suggest that stripping out the lights, signs and road markings can also allow junctions to function more safely, more efficiently and more cheaply. Encouraging the use of eye contact, the most effective means of human communication, would seem to be an appropriate governing principle for taming traffic and successfully integrating the use of the car into environments designed for people.

Footnotes

1. For example, *Returning Roads to Residents. A practical guide to improving your street.* The Institution of Civil Engineers. 2000
2. *Traffic in Towns.* Ministry of Transport. 1963
3. *Life between Buildings.* Jan Gehl Von Nostrand Reinhold Company, New York. 1987
4. *Traffic Calming through Integrated Urban Planning.* H.G. Vahl, J. Giskes. Amarcande 1990
5. *Sustainable Safety A preventive road safety strategy for the future.* AVV. Ministerie van Verkeer en Waterstaat. The Netherlands. 1999
6. See *Best practice to promote cycling and walking.* Part of the ADONIS report. 1998

Appendix 1

Cities and Towns Visited

NOTE: Places explored for more than one day highlighted in bold

THE NETHERLANDS

Amsterdam
Utrecht
Gouda
Schoonhoven
Ijsselstein
The Hague
Rijswijk
Delft
Maastricht
Groningen
Leeuwarden
Oosterwolde
Makkinga
Drachten
Haarlem
Broek in Waterland
Opeinde
Culenburg
Houten

DENMARK

Copenhagen
Hørsholm
Allerød
Kluge
Prøstø
Ringsted
Roskilde
Sorø
Næstved
Helsingør
Nakskov
Maribo
Fåborg
Odense
Assens
Christiansfeld
Haderslev
Sonderborg

SWEDEN

Malmö
Lund

GERMANY

Aachen
Bonn
Hamburg
Kellenhusen
Holst



Appendix 2

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Appendix 3

Definition: The Woonerf or Home Zone

The original definition and expected standards for a *woonerf* were set out by the Dutch Ministry of Transport in 1976, and these 14 articles are listed below.

Many of these original principles have been amended and changed since 1976.

1. A *woonerf* must be a primarily residential area.
2. Roads or road networks within a *woonerf* must only carry vehicular traffic, with an origin or destination within that particular *woonerf*: through traffic should be excluded.
3. No road within a *woonerf* should carry a flow of traffic, which will affect the character of that road as part of the *woonerf*.
4. The impression that the highway is divided into separate roadway for motor vehicles and a footpath must be avoided. There should be no continuous difference in cross sectional elements along the length of the road.
5. Vertical elements such as plant tubs and shrubs must not restrict visibility.
6. The entrances and exits of *woonerven* must be so designed that they can be clearly recognized, and it must be obvious to drivers of motor vehicles that these roads are access roads.
7. The boundaries of parts of the highway intended for parking should be clearly marked and as a minimum the corners of the parking space should be marked.
8. There must be adequate parking facilities for residents of a *woonerf*, although provided that there is surplus car parking capacity available in the immediate vicinity of the *woonerf*, the supply of parking spaces may be lower than demand.
9. On those parts of the highway intended for use by motor vehicles, features must be introduced which will reduce the speed of all types of vehicle. These features should not be more than 50 metres apart.
10. The features referred to in article 9, should not be located so as to cause vehicles to pass close to housing which fronts directly on to the street.
11. In accordance with the regulations, the features referred to in article 9 should create no danger to traffic passing over them.
12. Adequate street lighting must be provided to ensure that all features, especially those referred to in article 9, are fully visible at night.
13. Areas specially designed as play areas must be clearly identified so they can be readily distinguished from those areas that can be used by vehicles. Where possible play areas should be physically separated from those parts of the highway used by vehicles.
14. The word *woonerf* must be displayed along with the blue *woonerf* sign.

Appendix 4

Bibliography, references and suggested sources of information

- Appleyard, D., 1978, *Liveable streets*, University of California Press, San Francisco
- Beth, L. and Pharoah, T., 1988, *Adapting residential roads for safety and amenity*, South Bank Polytechnic, London
- Buchanan, C., 1963, *Traffic in towns*, Penguin, London
- Children's Play Council, 2000, *Home Zone News*, National Children's Bureau, 8 Wakley Street, London EC1V 7QE.
Newsletter on UK pilot home zones. Issue 1 December 2000 www.homezones.org.uk
- Danish Roads Directorate, Copenhagen
-1998, *Urban Safety Management: overview of Danish experience*
-1998, *Design of major urban junctions: a review of guidelines*
-1999, *Speed management in urban areas: a framework for planning*
-1996, *Environmentally adapted through roads.*
- Department of the Environment, Transport and the Regions (DETR), 1998,
Places, Streets and Movement: A companion guide to Design Bulletin 32, London
- Gehl, J., 1987, *Life between Buildings: Using Public Space*, Van Nostrand Reinhold, New York
- Hass-Klau, C., 1990, *The Pedestrian and City Traffic*, Belhaven Press
- Hass-Klau et al., 1992 *Civilised Streets: a Guide to Traffic Calming*, Environment and Transport Planning. Brighton
- Institut Wohnen und Umwelt, 1986, *Tempo 30: Modellversuche in Darmstadt*, Darmstadt
- Institute of Civil Engineers, 2000, *Returning Roads to Residents: a Practical Guide to Improving Your Street*, ICE, London
- Institute of Civil Engineers, 2000, *Designing Streets for People: An Enquiry into the Design, Management and Improvement of Streets*, ICE, London
- Institute of Traffic Engineers, 1989. *Residential Street Design and Traffic Control.*
- Ministry of Transport and Public Works, The Netherlands, 1987, *Evaluation of the Delft Bicycle Network plan.*
Final Summary Report, The Hague
- Ministry of Transport and Public Works, The Netherlands (Schemers, G.), 1999,
Sustainable Safety - a Preventative Road Safety Strategy for the Future. The Hague
- Mowatt, A., 1992, *Traffic Calming: A Code of Practice*, Kent County Council
- Pharoah, T., 1992, *Traffic Calming Guidelines*, Devon County Council
- Royal Dutch Touring Club, 1980, *Woonerf*, ANWB, The Hague
- SWOV (Institute for Road Safety Research), 1985, *Towards Safer Residential Areas*, Ministry of Transport, Leidschendam 15
- SWOV, 1985, *Reclassification and Reconstruction of Urban Roads in the Netherlands.*
- SVOV, 1998, *Best Practice to Promote Cycling and Walking.* Adonis Project. Danish Roads Directorate
- TEST, 1989, *User Friendly Cities: what Britain can learn from mainland Europe*, London
- TEST, 1988, *Quality streets: How Traditional Urban Centres Benefit from Traffic Calming*, London
- Tolley, R.S., 1990, *Calming Traffic in Residential Areas*, Briefi Press, Tregaron
- Transport 2000, (Sloman., L. and Wenban-Smith, J.), 1999, *Living Streets: a Guide to Cutting Traffic and Reclaiming Street Space*,
Transport 2000 Trust, London
- Vahl, H.G. and Giskes, J., 1990, *Traffic Calming Through Integrated Urban Planning*, Armacande, Lyon
- Verkehr Club Schweiz, 1989, *Lust auf Tempo 30*, VCS, Postfach, 3360 Herzogenbuchsee