

A Review of Simplified Streetscape Schemes

by Allan Quimby and James Castle

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Executive summary

Background

Road user behaviour (such as speeding and drink-driving) has generally been recognised as being a major cause of traffic collisions as compared to elements such as the environment (road) or the vehicle. However, there is a growing interest in the way road users *interact* with their physical environment, and how improved road design can be used to promote better behaviour and safety.

Typically safety practitioners have been concerned with reducing driver uncertainty and choice by providing them with timely guidance (via traffic signs and road markings) and by attempting to segregate different road users by the use of signalled pedestrian crossings, cycle lanes and barriers. This process, together with the growth of other visual intrusions such as street furniture and road-side advertisements, can lead to a very visually cluttered road environment that relies on road users being able to filter out what is relevant to them and to ignore the rest. In recent years there has been an increasing interest in traffic management schemes aimed at simplifying the road environment. Some of these schemes simply remove unnecessary signs/street furniture to reduce complexity and driver confusion. Others remove signs/markings to increase driver uncertainty. Some ‘shared space’ schemes have involved the removal of footways and of signs/signals giving priority to drivers (again increasing driver uncertainty). Many schemes involve changes to geometric layout and/or surface texture. Advocates have also argued that ‘simplified streetscape schemes’ can improve public amenity and access at the same time as improving safety. It is suggested that removing signage, increasing uncertainty and giving road users the responsibility for their own actions can reduce collisions by increasing perceived risk (Adams, 1985). This design philosophy differs dramatically from the typical ‘segregate and control’ approach that is normally included in standard road safety design guidelines and in general use.

‘Shared space’ schemes have been introduced in a number of countries, most extensively in the Netherlands and to a lesser extent in Denmark and Germany. Less extensive de-cluttering schemes have also been undertaken in different parts of the UK, such as the removal of pedestrian barriers in the Kensington High Street scheme in London which is currently receiving considerable attention as an example of this type of scheme.

The London Road Safety Unit (LRSU) of Transport for London (TfL) is interested in reviewing schemes where road markings, signage or other facilities have been removed, or their visual impact significantly reduced. The potential safety benefits (or increased risk) associated with such schemes is an especially critical issue, as is the suitability and acceptability of these schemes to all road users - but particularly to vulnerable road users, i.e. pedestrians, pedal cyclists and powered two wheelers. The issue of the how such schemes (that can remove footway kerbs and pedestrian crossing facilities) will affect the visually impaired, wheelchair users and less mobile pedestrians is also an important concern.

As a result the LRSU commissioned Transport Research Laboratory (TRL) to undertake a review of simplified streetscape schemes and their underlying design philosophy, and to consider the applicability of their use in London.

Methodology

There is no readily available body of published research literature on the impact of such simplification schemes, nor is there a clear understanding of why such schemes, which go against historical urban design principles, might or might not work. The applicability of such schemes to busy urban areas and the driving ‘culture’ that exists in the UK (or more particularly London) is also unknown. TRL therefore undertook to identify and research as much information as possible (both published and unpublished) as well as extending the scope of the review to cover more rural examples and other examples of psychological road design.

Information for this review was collected in a variety of ways that included:

- A search of published research materials
- An internal TRL review of relevant (but unpublished) research
- Internet searches
- A direct survey approach to known practitioners
- A more general local authority survey.

Discussion

The review examined issues relevant to ‘simplified streetscape scenes’. It includes a compendium of such schemes that have been constructed, typically in Europe, and reports on evaluations conducted in terms of safety, access and public attitudes. A number of studies have reported that simplifying the driver’s visual scene can bring about safety improvements – or at least not make the situation more dangerous. Although some schemes conducted in a more rural environment are included, the main focus was the applicability of such design ideas to urban areas – and to London in particular.

The review also includes a number of schemes designed with the aim of removing existing road user priorities as well as physical features. These schemes aimed to improve public ‘shared spaces’ by reducing the dominant role often given (or taken) by the vehicle and thus improving amenity - while at the same time improving (or at least not reducing) safety.

The sizeable number and types of different simplification schemes identified, seemingly each with their own particular design features, meant that it was not possible to come up with a simple classification of schemes. Some were designed for sizeable areas such as the centres of a city or village, some involved lengthy stretches of road while others involved a single junction. The marked differences and make-up of traffic flows also made the schemes very individualistic. What also helped to make the different schemes so distinctive was not what was removed, but what was added. The designs often included introduced features such as entry gateways, differently textured and coloured surfaces and sometimes involved replacing traffic signals with a roundabout defined by differently coloured/textured surfacing rather than raised ‘islands’. Such new physical features were often supplemented with reduced speed limits and even traffic diversions.

The review identified a surprisingly small number of schemes that had undertaken proper evaluations in terms of collisions and/or public attitudes. This often resulted from schemes being designed and built by urban designers or transport planners rather than safety practitioners as the aim of the schemes tended to be related to improving amenity rather than safety. An extensive evaluation in terms of safety of about 20 such shared space schemes is currently being undertaken in the Netherlands but the results were not available for inclusion in this review. This highlights the need for more rigorous monitoring of the effect of such schemes on collisions and casualties.

The collision and casualty data identified for this review, did not prove the safety case for simplified streetscapes, or shared spaces, one way or the other. While some of the schemes in the Netherlands showed safety gains others clearly did not. Most of the changes were in damage only collisions, suggesting that many of the schemes were in low traffic flow, low speed areas. Differences in collision numbers and traffic flows mean that extrapolating the Dutch findings to the UK, and London in particular, is not possible. It is also a concern that Dutch road users may have a different attitude to using the road compared to typical London road users so that findings from other counties may not be directly relevant in London, particularly to those roads that are heavily trafficked.

None of these concerns apply to the scheme introduced in Kensington High Street. While this scheme did remove, or at least simplify, certain design elements, it also introduced new features and an extensive holistic redesign of the area, which is arguably the most appropriate way forward. The scheme introduced improvements to pedestrian crossings, changes to road layout, footway widening, new paving, trees and cycle parking, at the same time as removing street clutter and some guard railings. Whether this particular scheme actually qualifies as a ‘true’ simplified streetscape is

debatable, but its success emphasises the importance of engaging in holistic design to suit the 'space' being developed.

It is worth noting that urban design is concerned with more than road safety. Many schemes are conceived as a way of improving the appearance and aesthetics of public space, some strive to improve access, amenity and regenerate streets that have become dominated by motorised vehicle so that pedestrians and cyclists avoid them when possible.

A study undertaken by TRL in 2003 for TfL's Bus Priority Team indicted the limits to which pedestrians in London may be prepared to share a surface with traffic. This study found that below flows of 90 vehicles per hour pedestrians were prepared to mingle with traffic. When flows reached 110 vehicles per hour pedestrians used the width between frontages as if it were a traditional road, that is the majority of pedestrians remained on the equivalent of the footway and left the carriageway clear for vehicles. However, these figures were probably heavily dependant on the type and speed of vehicles using the shared space. The study indicated that pedestrians were more at ease when the traffic flow consisted of buses only rather than a higher mix of general traffic.

This means that applying the simplified streetscape philosophy to the London situation could be successful as long as it is not taken to extremes. Importantly, it needs to be considered on a case by case basis.

1 Introduction

This review has been produced by the Transport Research Laboratory (TRL Ltd) for the London Road Safety Unit (LRSU) of Transport for London (TfL) following a contract let in April 2005.

The LRSU has the main responsibility for London achieving its road casualty reduction targets. At the time of this review, these targets include reductions of 40%, in absolute terms, for all killed and seriously injured (KSI) casualties, 50% for child KSI casualties and an overall 10% for slight casualties taking account of vehicle kilometres travelled, compared with the average for years 1994 - 1998. The 40% reduction targets also apply to individual vulnerable road user groups including powered two-wheelers, pedestrians and pedal cyclists.

While road user behaviour (such as speeding and drink-driving) is generally recognised as being the main cause of collisions, compared to either vehicle or environmental factors, there is now a growing interest in the way road users interact with their physical environment, and how improved road design can be used to promote better road user behaviour and safety.

Typically safety practitioners have been concerned with reducing driver uncertainty (and choice) by providing them with timely guidance (via traffic signs and road markings) and improving safety by attempting to segregate different road users from each other by the use of footways, cycle lanes, pedestrian crossing facilities, bollards and barriers. This process, together with the growth of other visual intrusions such as street furniture and roadside advertisements, can lead to a cluttered road environment (see Figure 1) that relies on road users being able to successfully filter out what is relevant to them and being able to ignore the rest. In recent years there has been increasing interest in traffic management schemes aimed at simplifying the road environment. Some of these schemes simply remove unnecessary signs/street furniture to reduce complexity and driver confusion. Others remove signs/markings to increase driver uncertainty. Some 'shared space' or 'naked street' schemes have involved the removal of footways and of signs/signals giving priority to drivers (again increasing driver uncertainty). Many schemes also involve changes to geometric layout and/or surface texture. Advocates have also argued that 'simplified streetscape schemes' can improve public amenity and access (see Figure 2) at the same time as improving safety. It is suggested that removing signage, increasing uncertainty and giving road users the responsibility for their own actions can reduce collisions by increasing perceived risk (Adams, 1985; Hamilton-Baillie, 2004; Hamilton-Baillie and Jones, 2005). This design philosophy differs dramatically from the typical 'segregate and control' approach that is normally included in standard road safety design guidelines and in general use. However, while this new approach has general acceptance for use in residential areas (e.g. Woonerven or Home Zones) with little traffic and low speeds, which are physically enforced, its potential value in more heavily trafficked areas is less accepted.

'Shared space' schemes have been introduced in a number of countries, most extensively in the Netherlands and to a lesser extent in Denmark and Germany. Less extensive de-cluttering schemes have been undertaken in different parts of the UK, such as the removal of pedestrian barriers in the Kensington High Street scheme in London which is currently receiving considerable attention as an example of this type of scheme.

The LRSU (in addition to many other urban designers and safety practitioners around the world) is interested in finding out about schemes where road markings, signage or other facilities have been removed, or their visual impact significantly reduced. The potential safety benefits (or the increased risk) associated with such schemes is an especially critical issue, as is the suitability and acceptability of these schemes to all road users - but particularly to vulnerable road users (i.e. pedestrians, pedal cyclists, powered two wheelers and the visually impaired and wheelchair users). Importantly, the supporters of such schemes also argue that they have major aesthetic, amenity, regeneration and environmental benefits.



Figure 1 – A ‘cluttered’ streetscape



Figure 2 – A more ‘user friendly’ streetscape

However, there does not currently appear to be a readily available body of published research literature on the impact of such schemes, nor is there a clear understanding of why such schemes, which go against historical urban design principles, might work or not work. Where information has

been published the number of collisions involved is too small to be of practical significance and typically schemes can be very different from each other so that the role of individual elements is unclear. The applicability of such schemes to busy urban areas and the driving ‘culture’ that exists in the UK (or more particularly London) is also unknown.

Unfortunately, the status of such thinking and the resulting schemes is uncertain because of the lack of a clearly defined focus of exactly what is being implemented; and for what reason. While some schemes have a clear design philosophy of simplifying the streetscape (whether by removing signs, road markings, footpaths, pedestrian crossings, traffic signals – or a combination of these) they are often carried out in conjunction with other, sometimes very significant, changes to road layout and appearance. Other major changes such as imposing a reduced speed limit and traffic diversions - either forced or intentionally encouraged (e.g. by traffic calming) - may also be included. Importantly, schemes such as Woonerven and Home Zones that have received a considerable amount of research interest and monitoring, are primarily intended for use in residential areas. This means that it is difficult to provide a simple classification of such schemes, or even evaluate their relative effectiveness, because to some extent individual schemes are unique in terms of why they were introduced, the physical changes made and the ‘psychological’ model of the behaviour change likely to result from the scheme. Such sizeable ‘review’ problems exist even before considering the social and cultural differences of road users in different countries, or even within regions of the same country.

These latter issues are critically important as advocates of such modifications have argued that removing signage (and/or reducing the priorities given to different road users) can improve road safety because road users will take more responsibility for their behaviour and/or will adapt their behaviour (for example as a result of ‘risk compensation’ induced by increased perceived risk) to take account of existing conditions. Unfortunately, there is a considerable body of research evidence suggesting that a majority of drivers behave irresponsibly at least some of the time (e.g. drink alcohol before driving, exceed speed limits, close follow) when they think they will not be detected and punished, and also that many drivers (especially the young/novice driver) are not adequately skilled in detecting traffic hazards and road risk – or matching their risk management skills to their risk perception abilities. However, supporters of simplification and shared space schemes suggest that road users will, if given the scope to decide what is appropriate behaviour, employ things such as eye contact (but perhaps more often ‘body language’ - especially over larger distances or in poor visibility conditions) to interact with each other, determine priorities and behave responsibly and safely in such circumstances.

2 The Terms of Reference and Research Objectives

The Terms of Reference (ToR) for this review were to summarise the available information and studies of ‘simplified streetscape schemes’. More specifically the review was:

- To create a compendium of relevant schemes and their characteristics
- To identify reports and research carried out on the simplification of streetscape schemes, with emphasis on the casualty reduction, collision and traffic impact of the schemes
- To carry out a review of published literature on schemes
- To compile what data is available on such schemes where data has not been published.

The ToR also:

- Indicate the need to consider the relevance of the schemes, and their suitability and acceptability to vulnerable road users, particularly powered two wheelers, children, pedal cyclists and pedestrians
- Mention the need to consider the consequences of such schemes for those with sensory or mobility impairments
- State that the focus of the review should be on urban environments in the UK and Europe, and especially the applicability of the findings to London, and to comment on the statistical significance of any findings reported.

Schemes involving ‘removal’ of, for example, white lines, traffic signs, crossing facilities and pedestrian guard rails are often part of more general urban design schemes that may also involve adding design elements, such as traffic calming, reduced speed limits and diversion of traffic. It should be noted that this report has not focused on schemes that are primarily concerned with issues such as traffic calming, pedestrianisation (that often involves diverting traffic), urban regeneration/street reclaiming, or Home Zones as they cannot be viewed as a ‘simple’ simplification, or because they are not directly applicable for the TLRN network in London. However, where relevant, mention will be made of such schemes. For example, the ideas proposed by David Engwicht from Australia in his recent book ‘Street reclaiming’ (undated), or on ‘mental speed bumps’ (see www.lesstraffic.com) have been taken into consideration, even though it involves residential streets rather than the more commercial areas or trunk roads of most relevance to this review; and also involves making the environment more visually complex – often with the use of ‘human furniture’.

The focus of this review is on schemes that involve removal of elements typically used to control or segregate road users, and that are more relevant to the urban environment. Where possible the review has also considered how these schemes have improved (or reduced) safety and also if they are applicable to the culture and driving behaviour/conditions found in London or the UK, or other European countries that can be considered as being similar.

Because some researchers have argued that little work has been done, from a safety perspective, to justify the use of road markings and signs the review also includes a brief section giving the historical development of traffic management and control systems that incorporate the ideas of signs and lines to segregate traffic and improve safety. In addition the psychological and behavioural aspects of simplified road design, with reference to concepts such as psychological overload, risk compensation and psychological traffic calming (based on increasing uncertainty and complexity and reducing sight lines) have also been briefly considered. The review also discusses the relevant factors to be considered (such as safety, amenity, access and urban regeneration) and suggests a comprehensive framework for evaluation when new streetscape simplification (and shared space) schemes are being considered for London.

It should be noted that any opinions expressed by the authors of this review should not be taken to reflect those of either TRL or Transport for London.

3 Method of Review

3.1 Overall approach

Information for inclusion in this review was collected in a variety of ways that included:

- A search of published research materials
- An internal review of relevant (but unpublished) TRL research
- Internet searches
- A direct approach to known practitioners
- A more general local authority survey.

3.2 Library searches

A number of separate searches were conducted of TRL’s TRACs database. These searches were based on a series of key words that included:

- The various names applied to such schemes such as: shared space, simplified streets/streetscapes, living streets, Home Zones, Woonerven, 20 mph zones, traffic calming, pedestrianisation, Historic Core Zones, etc plus other associated words such as: absence/removal of signing/white lining, psychological traffic calming, self-explaining roads, self-calming roads, accessibility, etc

- The names of the main known practitioners and institutions involved in this area such as: Hans Monderman, Ben Hamilton-Baillie, Bjorne Winterberg, David Engwicht, Phil Jones, etc
- The names of the main known schemes such as: Drachten (Holland), Oostervolde (Holland), Christienfeld (Denmark), Frankfurter Straase (Germany) and Kensington High Street (London).

3.3 E-mail surveys

A sizeable e-mail survey was conducted of parties interested in the spared space concept.

3.4 Internet searches

A series of searches of associated internet sites was made. These included: Transport 2000, Homezonenews, Slower Speeds Initiative, ELTIS (which covers European traffic calming), ARTISTS, Living Streets, DPTAC and DfT. To restrict the area covered by these searches (and identified links) these were done using either Google Scholar or Scirus and commenced using search terms words such as: naked street, shared space, Home Zones, Woonerven, etc.

3.5 Historical search

A historical search of the TRACS database was done to identify information on the historical scientific or empirical rationale and justification for installing traffic signs, lines, footpaths, signals, road markings and other street furniture on safety grounds.

3.6 Information required and requested from local authorities and practitioners

The information of particular interest to this review process included:

- The aims of the scheme
- Any consultation conducted prior to the scheme being introduced
- Any attitudinal surveys conducted before or after implementation
- A description of the scheme (e.g. what was removed, the location, any impact on vulnerable road user groups, proximity to schools, hospitals, residential or commercial area, cost, time period for trials, etc)
- Collision and casualty information collected and their statistical significance
- Other impacts of scheme (e.g. speed reduction, increased usage by pedestrians or changes in vehicle flows at the scheme or surrounding areas, reduced cost of street management, etc)
- Acceptability to non-motorised user groups such as disabled people, pedal cyclists, children and pedestrians.

4 Findings

4.1 General

Relatively little published information was found from the searches of the research literature. This was exemplified in that there did not appear to be any recent detailed published research by Hans Monderman (who worked extensively on such schemes in the Netherlands and is perhaps the world's most famous and leading advocate of shared space schemes) that involve the removal of traffic control (e.g. a simplified streetscape) in addition to the removal of the priorities for different road users.

Although the initial emphasis of this review was on simplification (or removal) of signs and markings and primarily how this impinges on safety, it was found that the scope of the review both expanded

and overlapped concepts such as urban design, public amenity and shared space. While the findings on shared space had direct safety implications - although typically insufficient relevant data has been collected to date - other reasons for introducing de-cluttering and simplification programmes were often not related to safety.

Another complicating issue was that very often schemes involved both sizeable redesign of areas and introducing elements such as entry gateways, reduced speed limits and traffic diversions. The use of textured surfacing is a particular feature of continental schemes and has been widely copied for Home Zones in the UK. This generally meant that it was not possible to separate the effects of specific simplification elements because of other associated changes involving adding or removing physical features and road user access.

Disappointingly, there appears to have been little systematic assessment of the effects of simplified streetscape or shared space schemes - although a more extensive safety review of a sizeable number of such schemes is currently being conducted in the Netherlands. This was particularly the case for locations where there are higher vehicle flows, or higher proportions of heavy vehicles. However, Hans Monderman's Group has collected limited collision information for a small number of schemes and some of TRL's research did provide limited information on safety (e.g. from Historic Core Zone schemes and white line removals) of direct relevance to the review (see Sections 4.7.2 and 4.7.3).

Although Woonerven (Home Zones) schemes had been in place for a number of years, particularly in the Netherlands, these were not considered to offer critical information of direct relevance to the main interests of this review. The majority of schemes that were identified - and especially those that had monitored collisions - were typically for small areas, isolated junctions, or street schemes that were in low speed, lightly trafficked areas. Many of them had only been in place for a relatively short period of time. This means that even if collision data was collected it was insufficient, at present, to produce statistically significant (or convincing) results. Ideally what is required is a long-term programme monitoring different types of schemes and suitable control areas. It is expected that a limited amount of such data will eventually become available in the Netherlands as a result of ongoing plans to provide more up-to-date information on a number of existing schemes (although perhaps without any control or exposure data) and the data being collected for the ongoing EU Shared Space research project currently taking place in 5 countries (see section 4.5).

Also, although the Kensington High Street scheme will soon have collected 3 year before and after data, the results of a single scheme will be insufficient to draw any firm conclusions, and in any case this scheme is not strictly a straightforward de-cluttering scheme.

Finally, many of the reported schemes are in continental Europe (particularly in the Netherlands, Denmark and Germany) so may not be directly relevant to the UK and the London driving culture and environment. In particular the Netherlands has a long history of road users sharing road space and catering for vulnerable road users, particularly cyclists, so that Dutch road users may have a different, more relaxed approach to such schemes than would be the case in the UK where aggression and competition, rather than courtesy, often shapes road user behaviour. Certainly there are cycle riders in London who will willingly criticise the space given to them by drivers, and similarly there are many drivers who consider that many cyclists show little respect for traffic rules.

4.2 Classification of schemes

Although one objective of this review was to provide a simple classification of simplified streetscape schemes in practice this proved difficult. While it is possible to consider urban and rural schemes and schemes based, for example on average daily vehicle and pedestrian flows the limited number and variability of schemes makes such a classification unhelpful since perhaps the main interest is on the physical signage simplification involved. The fact that some schemes are area wide, while some are for a single junction or a stretch of road, also makes it difficult to place schemes into a single, simple classification. Similarly, while it is possible to consider schemes that removed road signs, white lines, pedestrian crossings, pedestrian barriers and footway kerbs, in practice the same scheme often involved different treatments of the various elements so that a straight forward classification would

not be helpful. Also, in some cases rather than removal, de-cluttering involved reducing the numbers, or size, of signs. This complexity can be exemplified when considering the number of kerb treatments that have been used to segregate the pedestrian footpath from the road. Examples of the range of different levels of segregation that can be categorised include, either in isolation or combination:

- Standard height kerb segregation
- Low kerb segregation
- Separation by bollards
- Delineation via parking
- Delineation via colour and/or surface texture
- No delineation.

Another factor that made a simple classification difficult was that the majority of simplification schemes involved adding certain new elements to the redesign, or even completely changing the road layout, while some simplification schemes involved marked changes such as reduced speed limits, traffic diversions and segregation of different types of road user.

In spite of this it is important to categorise schemes to some extent if (eventually) a suitable framework for evaluation or implementation is required. Rather than classify schemes into a sizeable number of physically determined typologies, it may be more valuable to classify them into a smaller number of schemes that are different at the strategic level. Such a classification might be:

- Schemes that ‘simply’ reduce (or remove) signs and markings but keep normal priorities (e.g. drive on left, pedestrians have right of way on crossings)
- Schemes that retain the normal physical features (e.g. kerbed footways) but remove normal priorities between different road users
- Idealised ‘shared space’ schemes with neither signs nor priorities.

Within each of these more general types it would be possible to have subgroups to more accurately define what the scheme involved in its entirety.

4.3 Schemes in the Netherlands

This review considers schemes in the Netherlands as a separate topic area because this is where the concept is generally thought to have originated from the earlier ‘Woonerf’ approach developed in the 1970s. In fact both Holland and Germany, and perhaps to a lesser extent Denmark, have a long tradition of examining street design with a different philosophy to that normally used in the UK. For example, in 1993 the Road Directorate of the Danish Ministry of Transport published *An improved traffic environment: a catalogue of ideas*, (DMoT, 1993) that contains many images similar to more recent developments in Holland. However, the reason for reporting on schemes in Holland in more depth is that a limited quantity of ‘before’ and ‘after’ collision data are available for some schemes introduced by Hans Monderman in Freisland. Unfortunately no data for before or after speeds were available, though the schemes often included a reduction in the speed limit.

Perhaps what distinguishes the design approach initiated in the Netherlands from that in other countries (which appears to have started to be used outside residential areas around 1993 in Freisland) is the idea that, in the absence of traffic signals and road markings to govern behaviour, road users need to make eye contact with each other. Introducing ambiguity into ‘ownership’ of highway space, by reducing or removing carriageway delineation, is intended to encourage users to behave more cautiously and to negotiate priority with one another. Such a novel approach, getting away from the segregation determined by designers concerned with accepted design practices, was fundamental to the individual schemes briefly considered below.

Currently available collision data for a variety of schemes is summarised in Table 1.

Oosterwolde (de Brink junction/Rode Plein)

In the market town of Oosterwolde in Freisland, the de Brink road junction has been converted into a shared space where drivers, cyclist and pedestrians mix together determining who takes priority by using informal social rules rather than by defined priority rules. Before the scheme, the site was a traffic signal controlled crossroads with traffic islands between the lanes. Although the redesign largely removed signs and lines, the identification of ‘place’ was strengthened by a distinctively coloured surface treatment and a scattering of pedestrian barriers, bollards, tree planting, seating and new lighting. Roads approaching the junction and the limits of the carriageway were also identified with a different coloured and textured stones (see Figures 3 and 4).

This scheme was introduced in 1998 and currently collision data is available from 1993 to 2001, with more recent data now being collated. From 1993 to 1997, the 5 years before the scheme was introduced, 8 damage only and no injury collisions had been recorded. From 1999 to 2001 (the 3 years after the scheme) there had been one serious collision and 8 damage only collisions. Although collisions for the year 1998 were not included in either the before or after period – since the actual date of the scheme was not indicated on the data file – in 1998 itself, 6 damage only collisions were recorded. Perhaps the majority of these occurred in the period immediately after the scheme was implemented, but these figures cannot be interpreted to support the junction being made safer as a result of its redesign.

This scheme also extended away from the junction along a shopping street. Signs and normal road markings were again removed and coloured and textured surfaces used to segregate vehicles and pedestrians, the appearance being enhanced by a patterned design built into the road surface. The footway was almost level with the road, marked with a different textured surface and separated by bollards from the road, lighting and trees. It is documented that here casualties had fallen by 10% in the three years since the scheme was introduced.



Figure 3 - Oosterwolde (de Brink junction/Rode Plein), street level view



Figure 4 - Oosterwolde (de Brink junction/Rode Plein), aerial view

Oosterwolde (Makkinga)

Data was also available for another scheme in Oosterwolde. The Makkinga scheme comprises two junctions 25 metres apart at the edge of a more residential area and involved providing different textured surfaces to suggest cycle lanes and roundabouts (but with no raised island) that extended across around two-thirds of the 2 junctions (see Figure 5). This meant that it was impossible to drive through the junctions without driving across at least some of the 'roundabout'. This scheme was constructed in 1997. Before the scheme, there were road signs and a 50 km/h speed limit; as part of the scheme, the signs were removed and the limit was reduced to 30 km/h.

Collision data was available from 1993 to 2001 so that discounting the year the scheme was introduced meant that there was both a 4 year before and after period. While no fatal collisions were recorded at any time, there were 2 injury collisions in the 4 years after the scheme compared to none before, while there were 2 damage only collisions in the four years before the scheme compared to 3 after the scheme had been introduced. 3 damage only collisions were reported in 1997, the year the scheme was constructed.



Figure 5 - Oosterwolde (Makkinga)

Drachten (Kaden-Torenstraat)

Another simplified space scheme was introduced at a central crossroad junction in Drachten. Here the traffic signals were removed and replaced with an open square (with a textured surface different from the approach roads) with no traffic being given the right of way (see Figure 6). Although the centre of the space had a very large ‘roundabout’ indicated in a different texture and colour this was at the level of the street and so presented no physical obstruction to vehicles. Pedestrians were free, within limits, to cross where and when they wished.

Although this was a relatively busy junction, at least compared to Oosterwolde, with vehicle flows of around 17,000 per day and pedestrian and cycle flows of around 2,000 per day – the scheme appeared (at least in the short term) to reduce collisions. In the seven years before the scheme was introduced (in 1999) 30 collisions had been reported including 4 involving injury. In the two years following the scheme only 4 collisions (all damage only) were recorded.



Figure 6 - Drachten (Kaden-Torenstraat)

Drachten (Kaden-Dwassva)

This scheme at a crossroads again involved removing traffic signals and an extensive redesign of the road layout. Cycle lanes and parking spaces were clearly indicated with different textures and colours and tree planting was carried out to increase the feeling of ‘place’ and to calm traffic. Two pedestrian crossings marked with contrasting paving were provided on the busiest arms but very close to the junction (see Figure 7).

This scheme (which carried approximately the same traffic flows as Kaden-Torenstraat) did not appear to show the same safety benefits. Collision data was monitored from 1993 until 2001 with the scheme being constructed in 2000. In the 7 years before the scheme there were 3 injury collisions and 17 damage only collisions. In the single year following the scheme (2001) there were 7 collisions including one injury collision. To address this continuing collision problem it is planned to reduce the speed limit at the site from 50 km/h down to 30 km/h.



Figure 7 - Drachten (Kaden-Dwassva)

Drachten (Torenstraat-Vogelzang)

This scheme in a lightly trafficked residential area was constructed in 2000 and removed traffic lights and provided a coloured space that was extended away from the junction to emphasise cycle lanes between the footway and the carriageway.

As with Kaden-Dwassva only one year of after collision data was available compared to 7 years before data. There were no fatal collision recorded at the junction and while injury collisions had decreased (from 3 in 7 years to 0 in the 1 year after the scheme was in place) damage only collisions increased from 7 in 7 years to 3 in a single year.

Opeinde

This scheme involved a larger area than many typical junction schemes. The entry points of the town (or at least that part of the town involving the scheme) were clearly marked with a large ‘gateway’ or tubular steel arch (see Figure 8). Inside the gateway the road layout is different from that typically encountered. There were no ‘normal’ road markings and kerbs and roads are surfaced differently to denote a change from a world where traffic had priority to a public space where appropriate social behaviour is expected. Road widths were reduced from 9 metres to 6 metres and kerbs removed – and although pedestrian, cyclist and vehicle space was indicated it was not physically segregated in the typical way.



Figure 8 – Opeinde

The scheme in Opeinde was introduced during 1998, and collision data was currently available from 1993 until 2001 so that it is possible to compare a 5 year before period (ignoring 1998 data) with a 3 year after period. In the before period there was 1 fatal collision (perhaps the reason for obtaining support for such an extensive, and expensive, scheme), 7 injury and 24 damage only collisions. Following the scheme collision numbers reduced to only one injury collision in 3 years and 5 damage only in the same period. Unlike some other schemes reported here there was no increase in damage only collisions immediately following the introduction of the scheme. In fact in 1997, there were 8 damage only collisions recorded while in 1999 there were only 2.

Donkerbroek/Oldeberkroop/Wolvega

This review also obtained preliminary (and provisional) collision data for 3 more small Dutch schemes – see Figures 9, 10 and 11.

The Donkerbroek scheme used different colours and textures to highlight a junction. Injury collisions were reduced from 1 in 5 years to none in 3 years, while damage only collisions increased from 11 in 5 years to 9 in 3 years, with 6 damage only collisions being recorded in the year the scheme was introduced.



Figure 9 – Donkerbroek

In Olderberkoop the whole village was redesigned and the speed limit was reduced from 50 km/h to 30 km/h. In the 6 years before the scheme there were 3 injury collisions and 14 damage only collisions. In the 2 years following the scheme, there were no injury collisions recorded and 5 damage only collisions.



Figure 10 – Olderberkoop

In Wolvega, traffic signals were removed from a busy cross road junction. No fatal collisions have ever been recorded at this junction, although there had been 1 injury collision in both the 4 year before and after period. There were 4 damage only collisions in the 4 year before period only two in the after period. Unusually no damage only collisions were recorded either in the year that the junction was reconstructed or in the following year.



Figure 11 – Wolvega

Summary of collision data

The collision data reported here are from a small number of schemes constructed in Holland for which data was available, often the ‘after’ data is for only a short period of time. One often quoted comment from Hans Monderman is that there has never been a serious collision *after* the introduction of any of the schemes he has been involved with. With the one exception, this was also the case *before* the introduction of the schemes considered here. While some schemes show an improvement in damage only collisions some show the opposite. In addition there should be some concern about the numbers of damage only collisions, which appear to take place in the year the scheme was introduced or the following year. This suggests that for a period of time following a new scheme road users are adapting to their new environment and that while learning the new priority rules quite frequently get it wrong.

Table 1 Summary of Collisions

Scheme	Before Period	After Period	Number of Collisions Recorded	
			Before	After
Oosterwolde (de Brink /Rode Plein)	93-97	99-01	8 damage only	1 serious 8 damage only
Oosterwolde (Makkinga)	93-96	98-01	2 damage only	2 slight 3 damage only
Drachten)Kaden-Torenstraat)	93-98	2000-01	4 slight 26 damage only	4 damage only
Drachten (Kaden-Dwassva)	93-99	01	3 slight 17 damage only	1 slight 6 damage only
Drachten (Torenstraat-Vogelzang)	93-99	01	3 slight 7 damage only	3 damage only
Opeinde	93-97	99-01	1 fatal 7 slight 24 damage only	1 slight 5 damage only
Donkerbroek	93-97	99-01	1 slight 11 damage only	9 damage only
Olderberkoop	93-98	00-01	3 slight 14 damage only	5 damage only
Wolvega	93-96	98-01	1 slight 4 damage only	4 damage only

4.4 Other schemes in continental Europe

A number of other mainland European schemes were identified during the course of this review:

Christianfeld

This scheme in Denmark aimed to tackle the high collision rate at the town's central traffic intersection by 'introducing ambiguity and urban legibility'. Instead of more signs, controls and segregation the scheme removed all conventional traffic engineering and relied on surface treatments to announce a notion of 'place' – with the city centre being reclaimed from being dominated by traffic. No particular direction of travel or type of road user is given priority and this is interactively 'negotiated' by individuals.

Before the change, the junction experienced an average of 3 killed or serious injuries (KSIs) each year. There have been no such collisions in the 3 years following the scheme. Also it has been noted that tailbacks and delays at the junction during peak periods have also been reduced. The removal of

signs and regulations appears to improve safety and capacity - even though traffic speed is reduced at the junction delays are also reduced.

As a result a sizeable number of similar schemes have been introduced in Denmark. The initial 'experiment' layout is now adopted as common practice and no disbenefits have yet been identified.

Word of mouth evidence suggests the same process is also taking place in Norway – although no evidence or data was forthcoming for this review to confirm whether this is actually the case.

Frankfurter Straase, Hennef

This German scheme was introduced into the main road passing through Hennef, a town with a population of 40,000 people. The road was part of the national road system and was a 'typical' main road with an annual average daily flow of around 12000 vehicles per day.

In 1989 the street was remodelled to give priority back to pedestrians and cyclists. This was done by narrowing the carriageway (from four down to two lanes) in order to provide a wider footway and a paved strip of granite cobbles along the centre of the road to help crossing pedestrians - with lighting columns coming from frequent and sizeable concrete bollards designed to prevent vehicle intrusion (see Figure 12). This dividing strip, the bollards, the proximity to other traffic and the presence of pedestrians encouraged drivers to slow down without the need for speed humps or other physical obstructions. The design also provided cycle lanes on the footway, footway level metered parking and provision for vehicles to be safely passed by encroaching onto the granite strip (if unoccupied by pedestrians).

Although the scheme was deemed a success in that it reversed the economic decline of the businesses in the road, it did not prove possible to obtain any collision statistics on the scheme, although it was reported that traffic speed were reduced.



Figure 12 – Frankfurter Strasse

4.5 Ongoing research programmes

A review of European traffic management design schemes that consider issues such as streetscape simplification - or shared share – needs to make reference to two ongoing EU sponsored research projects.

The 'ARTISTS' project (Arterial Streets towards Sustainability) is looking at ways of redesigning public space to reduce the dominance given to motorised traffic and to improve access and amenity for all road users. They are conducting a number of Case Studies that have redesigned areas in Sweden, Denmark, Greece, Spain and England (London). Although these schemes do promote the idea of good urban design to reduce the intrusion of motor vehicles they are not directly applicable to this particular review. For example the scheme in London (the north of Trafalgar Square) is very much a pedestrianisation scheme – that removed traffic as well as control devices.

The 'Shared Space' project (again with EU support) is much more relevant to this particular review. However, the project, which is carrying out a wide variety of shared space projects – with a design philosophy that removal of signs and lines can result in safety, amenity, congestion and environmental benefits – will carry out Case Study trials in Bohmte (Germany), Ejby (Denmark), Emmen, Harren and District of Fryslan (Netherlands), Ipswich (England) and Ostende (Belgium).

The results of these case studies are not yet available – in fact some of the schemes have yet to be built. The project is not due to finish until 2007.

4.6 Buses in pedestrianised areas

In 2003 the Bus Priority Team of TfL commissioned TRL to carry out a study of public transport in London Borough Pedestrian Priority Areas (PPAs) to obtain factual information on which guidelines for the safe and successful sharing of pedestrian space with public transport might be based. The research examined the effects of public transport operations in six London PPAs.

- Clapham – St. John's Road
- Croydon – George Street/ Crown Hill
- East Ham – High Street North
- Harrow – Station Road/ College Road
- Hounslow – High Street/ Staines Road
- Kingston – Clarence Street/ Wood Street.

Survey data on the flows and speed of vehicles, both permitted public transport and prohibited vehicles, were related to peoples use of the exclusively pedestrian footways and the shared road space to examine behaviour and attitudes towards the shared area. The incidents and types of actual, potential and perceived conflict between pedestrians and vehicles were examined, together with the avoiding action taken by each. Attitudinal surveys explored the pedestrian perceptions of the schemes and collision analysis enabled the perceptions to be related to actual safety records. Inter-site comparisons and modelling were used to identify the factors influencing safety.

The following overall conclusions relevant to shared space were reached.

Pedestrian attitudes

- Concerns were expressed about bus speeds and the extent of access by vehicles other than buses. Identified conflicts between vehicles and pedestrians mainly involved careless driving and high speeds
- Pedestrians tended to find crossing the road easy, though even in areas with low vehicle flows they needed to check the road carefully before crossing.

Pedestrian movements within the area

- No relationship was found between relative density of pedestrians and traffic flow. Consequently vehicles travelling through a site only had a localised effect on pedestrian flows, in terms of time. The relative density of pedestrians was defined as the percentage of pedestrians observed in a 2m² area within the road, compared with the number observed in two areas of the same size on the footway.

- Relative density appeared consistent, irrespective of the number of pedestrians present at a given site. Pedestrians were not spreading into the road as their numbers increased. Instead it was most likely that local attractors influenced movements.
- Fewer pedestrians walked along the road as the number of vehicles passing through the site increased. This indicated that they were treating the road less like a part of the pedestrian area and more like a standard road.

Vehicle flows and pedestrian area limits

- Relationships between vehicle flows and changes in pedestrian movements were found to end when vehicle flows exceeded about 90 to 110 vehicles per hour. For such flows the road, shared space with vehicles, was treated as a standard road. Pedestrians rarely walked along it and tended to use the edge areas as footways. The change in behaviour resulted in fewer conflicts.

Another way of interpreting the results is that the pedestrian area's road space will be used like an ordinary road, with no pedestrians walking along it if:

- Traffic (other than bus) flow exceeds 50 vehicles per hour with an 85th percentile of speed of 30mph, or
- If traffic (other than bus) flow exceeds 100 vehicles per hour with an 85th percentile of speed of 25mph, or
- If traffic (other than bus) flow exceeds 200 vehicles per hour with an 85th percentile of speed of 20mph.

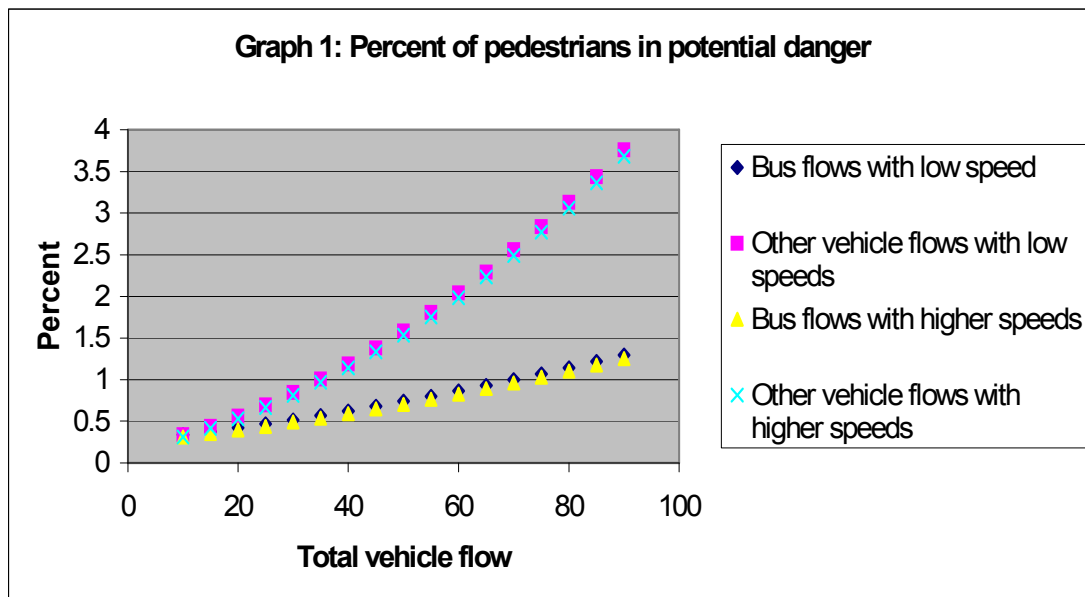
Conflicts within pedestrian areas: up to 90 vehicles per hour

- Public transport only had a small effect on the number of pedestrians walking along the road. However, increasing flows of other vehicles in the area had five times the effect. The largest influence was an increase in the 85th percentile speed. An increase of 1 mph was found to be equivalent to increasing bus flows by 90 buses per hour.
- A flow of 100 vehicles per hour was predicted to result in up to 40% of pedestrians in the road, or 3.5 % of all pedestrians in the area, being in potential danger. Increases in speed also had a large impact on potential conflicts - see Graph 1.

Conflicts within pedestrian areas: greater than 110 vehicles per hour

- Pedestrians were found to treat such areas as a standard road, with most choosing to walk along the footway and cross the road only when necessary.
- Fewer pedestrians appeared to be in potential conflict with traffic under these conditions, compared with areas with lower flows. It was suspected that the observed changes in behaviour reduced the possibility of potential conflicts.

- Numbers of collisions in these areas were higher than those at lower flow PPA's, implying that a higher percentage of pedestrians that come into potential conflict with traffic were in actual danger at these locations.



Access for People with Mobility Impairments

- The study indicated that surface paving materials need careful consideration because incorrect or inappropriate use can lead to confusion for visually impaired people. Sufficient colour contrast between the footway and road was considered to assist in the demarcation of the area for partially sighted people.

The information above appears to indicate that in PPAs there is a self limiting factor on pedestrians using the area identified for vehicles as shared space at around 100 vehicles per hour. Speed of vehicles also had a very strong influence on how pedestrians used the shared area. It would be reasonable to assume that these factors would also apply in a shared space scheme. Therefore in the London context shared space designs would be appropriate where vehicle speeds could be kept as low as possible and volumes were less than 100 vehicles per hour.

4.7 Streetscape simplification schemes in UK

4.7.1 London schemes

Completed Schemes

Kensington High Street

Kensington High Street is regarded as one of the capital's premier shopping areas. In 2000 the Royal Borough of Kensington and Chelsea (RBKC) started a major improvement scheme (RBKC, 2004) - see Figure 13 - that included:

- Simplified road markings
- Recalculation of traffic signal timings
- Introduction of additional pedestrian crossings
- Replacing existing staggered pedestrian crossings with straight across crossings

- Widening of footways and narrowing of carriageway
- Introduction of new paving, trees and improved cycle parking facilities
- Removal of street clutter and guard railing.

Extensive 'before' and 'after' studies were undertaken to determine the effects the scheme had on the area. These showed that:

- Pedestrian flows increased by 7% overall, but the effect was variable at different locations in the scheme
- There was a large increase in the number of pedestrians crossing the High Street at Derry Street, but a decrease in the area of Kensington Church Street
- Cycle flows increased, particularly eastbound in the morning peak by 30%
- Cycle parking fell by 10% at formal cycle stands and 44% away from cycle stands
- Traffic flows decreased, however in the period between the before and after studies Congestion Charging was introduced and would have been likely to have had an effect on traffic flows.



Figure 13 - Kensington High Street – after changes

A review of collisions in the before and after periods has recently been made available. The 'before' period was for 3 years prior to the implementation of the scheme. The 'after' period so far available is only for 28 months, instead of the 'matched' 36 planned; therefore the figures in the following table must be taken as being only provisional. The figures show the collision rates for the scheme itself as well as for the whole region - which can be used as a 'control' to allow for other changes resulting from the introduction of the Congestion Charge.

Table 2 – Casualty figures for Kensington High Street

Type of Collision	Kensington High Street Average Annual Number of Collisions			Borough Average Average Annual Number of Collisions		
	Before	After	Percentage difference	Before	After	Percentage difference
All	65.7	33.8	-48.6	1043.3	655.5	-37.2
Pedestrian	26.3	8.3	-68.4	293	160.5	-45.2
Bicycle	11.7	8.3	-29.1	152.7	99	-35.2
Motorcycle	15.3	8.3	-45.8	287	200.3	-30.2

The figures suggest that the scheme has had a marked and positive effect on collision figures, especially for pedestrians and motorcyclists. Bicycle collisions have fallen at a slower rate than the global figure for RBKC, however the number of cyclists has increased.

In addition to monitoring collisions, a series of road user surveys were conducted to gauge public response to the scheme. Separate surveys were conducted on shoppers, pedestrians and minority user groups (which included wheelchair users and the partially sighted). In general, attitudes to the scheme were very positive although around half of those interviewed disliked the tactile paving used in the scheme. The area was considered to be more attractive and cleaner after the scheme was introduced and the location was still judged to be 'safe' by the majority of those interviewed, with the 65+ age group in particular reporting more safety benefits than other age groups. The removal of the guard railings did not appear to raise any safety concerns and users reported that crossing the road was now much easier. However, around 40% of those interviewed thought that more guard-railing was needed, with a high proportion of these being parents with prams and the partially sighted. Wheelchair users appear to have benefited from the removal of the staggered crossings.

While in general the public were very positive regarding the improved amenity, safety and environment benefits of the scheme, it is worth commenting that although the scheme is often cited as an example of 'simplification' (since some barriers and other street furniture were removed) it should properly be considered as a holistic re-design of the area that produced (on average) a simplified space although many features were added as part of the scheme.

This review was required to make suggestions about how new schemes might be properly monitored and evaluated. It is suggested that the extensive consultation and assessment policy adopted as part of implementing the Kensington High Street could serve as a model for evaluating any new schemes that are being planned or built.

Schemes under development

Exhibition Road



Figure 14 – Artists impression of Exhibition Road

The Exhibition Road area of South Kensington is home to an interesting mix of residents and an extraordinary cluster of world class museums and institutions. These institutions attract over nine million visitors a year, making the area one of the most important cultural destinations in London (From www.rbkc.gov.uk/EnvironmentalServices/general/ex_roadintro.asp, 27/06/05).

The streetscape along Exhibition Road is currently cluttered, confusing to visitors and unfriendly to pedestrians, despite being almost the busiest street for pedestrians in South Kensington - and perhaps the most significant ‘intellectual highway’ in Britain – this is not evident because its (lack of) design and identity and it bears the scars of years of neglect.

To address these problems a scheme is being prepared that will be based on the principles of shared space – see Figure 14. The key elements of the scheme will be to:

- Integrate vehicle and foot traffic effectively whilst preserving the road’s important function as a vital transport link serving people from the whole surrounding area
- Encourage and support better use of the public domain, especially adjacent to the museums
- Create an attractive environment for pedestrians
- Discourage through traffic from some of the streets close to South Kensington Station, including the southern end of Exhibition Road and Thurloe Street
- Preserve and improve the amenity and quality of life for those living in the largely residential surrounding area
- Follow principles of ‘inclusive design’. These help ensure that the route at both street level and underground will meet the highest standards of accessibility and inclusion for all members of the community
- Provide public art to animate and enrich the streetscape

- Provide coach parking either on or off the South Kensington site
- Safeguard residents' parking.

As the scheme has not yet been built it is not possible to provide any collision or user attitude information in this review.

There is a major difference between the proposed design for Exhibition Road and the majority of the other schemes detailed in this report. Although a large proportion of the schemes reviewed have removed the physical separation between the carriageway and the footway (i.e. the kerb) there is still an indication given to the areas that are primarily for use by vehicles and pedestrians. This indication is normally achieved through the use of different surfacing materials or colours and sometimes by the use of bollards. The proposal for Exhibition Road is to integrate vehicle and pedestrian areas and to have a single theme to the surface from building line to building line. Existing traffic signal control will remain at junctions at the ends of the scheme, however pedestrian facilities will be improved and certain turning movements may be banned. The scheme is following the principles of an 'inclusive' design and an 'Access' Consultant has been appointed to work with a steering group to ensure the needs of various disability groups are catered for.

Elmfield Road, Bromley

Elmfield Road is located in Bromley town centre. The road lies between the Glades Shopping Centre and Bromley Mall shopping centre, which is currently under redevelopment. The London Borough of Bromley is keen to improve the shopping experience in the area and they are therefore proposing to design and implement a scheme as a simplified streetscape.

The design of the scheme has not yet been completed, however the Borough Council are keen to evaluate how successful the scheme will be once it has been implemented. To this end a study has been commissioned that looks in detail at how the street is currently used and the interaction between motorised and non-motorised users. The study will be repeated once the scheme has been completed to allow an appraisal of the effect of the scheme. Although at this stage only the 'before' study has been carried out, the depth and quality of that study will enable an in depth assessment of the principles behind simplified streetscapes.

Other London schemes

During the course of this review a number of other simplification and shared space schemes were identified in London. However, it proved impossible to obtain any conclusive collision, or other information, relevant to this review. As previously detailed this is because these schemes will primarily be introduced as an improvement to the local amenity rather than as a scheme to improve road safety. They also tend to be at a fairly early stage in their development. Therefore it would prove beneficial to undertake an assessment of their existing collision history as part of this report. Schemes that might be of future interest were identified at:

- Balham
- Bromley
- Ludgate
- New Bond Street
- Seven Sisters
- Sloane Square.

A number of schemes aimed to improve the highway landscape in London have been developed through the Street Scene Challenge. Through the Challenge £1m is made available each year to fund a wide range of initiatives to enhance the street scene. The following are a few examples of such schemes that have already been completed, although they are not essentially simplified streetscapes as there is very little vehicle movement they do demonstrate the kind of changes that can be achieved.

Aldermanbury

The Street Scene enhancements and landscaping in Aldermanbury have been undertaken in connection with the construction of the new Guildhall entrance. Most of the site is within the Guildhall Conservation Area and St Lawrence Jewry Church, which is to the east of the pond, is a Grade 1 Listed Building.



Figure 15 – Aldermanbury

The enhancements include new paving, seating, planters and tree planting. The existing row of nine lime trees on the east side of Aldermanbury was retained as part of this scheme.

The pond area has been an underused space, largely because of the lack of seating. Several limestone benches have been positioned around the pond with hedges forming a screen behind them (retrieved from www.corpoflondon.gov.uk).

Devonshire Square

Devonshire Square has been re-landscaped to create a more usable and attractive public space as part of the Street Scene Challenge.



Figure 16 – Devonshire Square

The carriageway was constructed using grey granite setts and the footway has been paved with York stone. There are now trees on the south side of the square mirroring the existing trees on the north side. The granite surface of the square, along with the raised pedestrian tables at the entry points are

designed to signal to drivers that they are entering an area where they can expect pedestrians and should moderate their speed accordingly (From www.corpoflondon.gov.uk).

Moor House Street Scene Initiative

The Moor House scheme made substantial improvements to the street scene in Moorfields and London Wall by linking together the landscaping scheme around Moor House with the Corporation's scheme for significantly altering the junction of London Wall and Moorgate.

The scheme included closing a small section of Moorfields to vehicular traffic, re-landscaping the area that is currently a traffic island, introducing more tree planting and seating, and upgrading all paved surfaces south of Moor Place (From www.corpoflondon.gov.uk).



Figure 17 – Moor House Street

Paternoster Row

The Paternoster Row Street Scene project centres on the reconfiguration of the carriageway at Paternoster Row that no longer functions as an access road to the Paternoster development. The carriageway has been reshaped to create a rounded turning head, this is installed at the existing footway level, and surfaced in large 300mm x 150mm granite setts.



Figure 18 – Paternoster Row

This creates a unified area that is more pedestrian friendly, with the vehicles separated from the York stone paving through the use of wooden bollards, similar to those used in St Pauls Churchyard at the

western end of the Cathedral. The reshaping of the carriageway, repaving with York stone and granite setts and tree planting was carried out as part of an overall improvement plan for the whole area to the east of the Paternoster development (From www.corpoflondon.gov.uk).

Watling Street

The Street Scene Challenge at Watling Street is part of the broader traffic scheme in the Queen Street Area, covering Queen Street, Cannon Street, Cloak Lane, Queen Victoria Street, College Street, College Hill and Dowgate Hill.

Watling Street is closed to traffic from 8.00am to 6.00pm Mondays to Fridays between Queen Street and just east of Watling Court freeing this area for pedestrians during these times. The landscaping between Queen Street and Bread Street included repaved the carriageway with granite setts and the footways with York stone paving. The Cordwainer Statue has been re-sited in front of St Mary Aldermary Church, the planter replaced and there is improved seating. The New Change end of Watling Street was also being repaved with granite setts in the carriageway and York stone paving in the footway. (From www.corpoflondon.gov.uk).



Figure 19 – Watling Street

4.7.2 Historic Core Zones

The Historic Core Zone project involved a small number of ‘experimental’ urban schemes that were trialled in the UK and are included here as they are directly of interest to the ‘de-cluttering’ focus of the review. The 3 schemes described here were an initiative of the English Historic Towns Forum and although they were not conceived of as providing a simplified streetscape, the intention was to minimise the impact of modern road design on historic town centres. Common themes running through the individual schemes are high quality surfacing materials, reduction in the size, number and sympathetic mounting of traffic signs, and the introduction of controlled parking zones to reduce the three former schemes are described briefly below.

Halifax

The scheme in Halifax (Wheeler, 1997) comprised traffic calming to reduce vehicle speeds, widening footways at the start and end of the scheme, revision of on-street parking, minimising street clutter by

reducing the number of traffic signs and fixing those remaining on to walls where possible or on 1m high tubular hoops - see Figure 20.



Figures 20 - Halifax Historic Core Zone

The scheme achieved a one-third reduction in traffic volumes, and the 85th percentile speed fell by 8mph from 20 to 12mph at the western end but rose by 1mph to 20mph within the scheme. The scheme also had a positive effect for pedestrians with 73% of regular visitors considering that it had improved the ease of walking and 51% considering that it was easier to cross the road.

Due to the fact the earlier report on this scheme provided collision information for 5 years before the scheme, but only 6 month of 'after' collision information, a supplementary analysis was conducted as part of this review to cover a 5 year after period. This revealed that while seven injury collisions were reported during the 5 years prior to scheme installation, 8 were reported in the 5 years after completion although no corresponding 'exposure' (e.g. vehicle and pedestrian flows) was available. However, of these collisions only 1 in the before period involved a pedestrian, but in the after period 5 involved pedestrians, including 1 fatal and 1 serious.

Shrewsbury

The High Street Route in Shrewsbury was improved as part of an Integrated Transport Plan for the town centre (Wheeler, 1999a). The work included reducing the carriageway width to 3.5m on a one-way section and 6.0m on two way sections, surfacing the carriageway with granite setts, widening footways, creating loading bays, disabled parking bays and bus stops and making the whole route a restricted loading and waiting zone to reduce the number of traffic signs needed. The traffic signs that remained were mounted in a manner to reduce their visual impact on the surroundings. Eleven informal pedestrian crossing places were also created using dropped kerbs and contrasting surfacing - see Figure 21.

The scheme resulted in a 29% decrease in the volume of traffic and the 85th percentile speed was reduced from 21mph to 14mph.

There was little impact on the number of pedestrians crossing the road, with 52% making use of the informal crossing points. However pedestrian flows in one part of the scheme increased by 25%. The scheme has been viewed as having a negative effect for cyclists due to the narrow carriageway and the use of setts. The number of cyclists dropped from 65 a day before the scheme was implemented to 20 after implementation.

Public attitude surveys undertaken following completion of the scheme indicate that although 70% thought the scheme had improved the appearance of the town centre, less than half of regular visitors

thought it had benefited pedestrians crossing the road and 75% thought it had adversely affected cyclists.



Figures 21 - Shrewsbury Historic Core Zone

Again additional collision data was collected specifically for this review extending the after period from the 6 months in the published report on the scheme to 5 years, to match the before period. This analysis found that in the five year period before the scheme there were 13 reported collisions and 14 in the five years after. In both periods, 9 of the collisions involved pedestrians. However, there may have been other changes made to the area since the completion of the scheme and no traffic/pedestrian flow comparisons are possible.

Bury St. Edmunds

The historic core zone scheme was intended to address a number of problems including through traffic, pedestrian/vehicle conflicts, on-street parking, servicing and visual intrusion of traffic signs (Wheeler 1999b). The scheme involved defining a threshold entrance to the zone, introducing a 20mph speed limit, rationalising road signs and providing more space for pedestrians - see Figure 22. The scheme was introduced in two phases, the first in Hatter Street and Whiting Street, and the second in Crown Street and Chequer Square.



Figures 22 - Bury St. Edmunds Historic Core Zone

On Hatter Street / Whiting Street traffic flows decreased by 13% and the 85th percentile speed reduced by 2mph to 20mph. The proportion of cyclists in the traffic flow rose from 2.5 to 4.2%. Following the alterations pedestrians were more likely to cross Hatter Street and Whiting Street than to cross at the adjacent junction areas. Attitude surveys indicated mixed views on the effect of the scheme on cyclists, with the most common complaint being the narrow width of the traffic lane. Two thirds of regular visitors thought the changes had benefited pedestrians. Collision data revealed that in the 5 years prior to the introduction of the scheme there were 4 reported collisions, none of which involved a pedestrian, and in the 5 years after completion there were 3 collisions, 1 of which involved a pedestrian.

On Crown Street traffic flows fell by 16% but vehicle speeds were little changed. The proportion of cyclists fell slightly from 1% to 0.6%. As with Hatter Street/Whiting Street views on the effect on cyclists were mixed. About half of regular visitors though the scheme had benefited pedestrians, but less than one third perceived an improvement in the environmental impact of traffic. In the 5 years prior to the introduction of the scheme there were 4 reported collisions. In the 5 years after there were two collisions, one involving a pedestrian. The other involved a cyclist resulting in serious injury.

Table 3 Summary of Historic Core Zone Collisions

Scheme	Year installed	After period	Number of collisions recorded	
			for 5 years 'before'	for 5 years 'after'
Shrewsbury	97	98 - 02	13 (9 ped*)	14 (9 peds)
Halifax	96	97 - 01	7 (1 ped)	8 (5 peds - 1 fatal, 1 serious)
Bury St. Edmunds Hatter St.	96	97 - 01	4	3 (1 ped)
Bury St. Edmunds Crown St.	97	98 - 02	4	2 (1 ped, 1 cyclist - serious)

* 'ped' signifies pedestrian collision

4.7.3 Other examples of UK urban schemes

Shenley Road, Borehamwood

Borehamwood is a large town in Hertfordshire, situated north-west of London between the M1 and the A1. Shenley Road is the only through route for traffic and carries more than 1000 vehicles per hour. (From www.newlifeformainroads.org.uk, 27/06/05).

Shenley Road is also an important local shopping centre, which used to suffer from many of the problems associated with a traffic-dominated main road. It was noisy, polluted and congested. Illegal parking and street clutter were major problems. In the evening, when the road was clear, traffic speeds were high.

In 1989 an experimental scheme was proposed for a limited section of Shenley Road to tackle the traffic problems and improve the local environment. The success of this scheme, and its acceptance by the public, led to it being extended along the entire road (see Figure 23).



Figure 23 – Borehamwood

Shenley Road was redesigned around the needs of pedestrians, making it safer for people to cross the road while still allowing through traffic. Raised tables at regular intervals and a central refuge along the length of the road make it easy for pedestrians to cross. The central refuge is wider where the raised tables occur to encourage pedestrians to cross at these points. However, people can cross almost wherever they like, due to the slow traffic speeds. Observation surveys showed that the majority of drivers stop at the raised tables when pedestrians want to cross.

Signal-controlled junctions were replaced with mini-roundabouts, resulting in smoother traffic flow and less congestion. Trees, seats, cycle racks, play equipment, attractive paving and street lamps have helped create a more pleasant and sociable environment.

Key features of the scheme include:

- Pavements were widened and carriageways narrowed
- Raised tables were built at regular intervals along the road. These slow traffic down and serve as informal crossing points for pedestrians
- Signs warn motorists that pedestrians may cross at raised tables
- The raised tables are level with the pavement so it is easy for people with pushchairs and people in wheelchairs to cross the road
- When the scheme was implemented, users of the street were advised that it was necessary to make eye contact with drivers
- A low central reserve was implemented along the entire length of the street, enabling people to cross at places other than the raised tables
- Marked bays were provided for parking and raised bays provided for loading
- Raised parking bays were provided for disabled drivers
- Traffic speeds have fallen and pedestrians find the street easier to cross.

This scheme is not strictly relevant to the shared space concept as it is based on informal raised pedestrian crossing points and safety improvements have been gained by physically reducing vehicle speeds. However, it has been suggested that the slow traffic speeds allow eye contact to be made between drivers and pedestrians and that this is a key factor in the scheme's success, adding weight to the 'theory' behind simplified streetscapes.

Park Lane, Sunderland

The Park Lane scheme – see Figure 24 -was undertaken to support the development of a new public transport interchange in Sunderland. Park Lane forms a link from the interchange to the main shopping area of the city.



Figure 24 – Park Lane, Sunderland

In terms of the classification of simplified streetscapes, it is probably one of the most complete examples, especially of a shared space scheme, in the UK. The scheme involved the removal of through traffic and the removal of all segregation between pedestrians and vehicles. Street furniture, artwork and block paving have been introduced. The edge of the carriageway has been nominally indicated by the use of contrasting coloured block work.

There are no access restrictions for traffic and pedestrian and vehicles mingle freely. Road layout and other changes nearby have reduced vehicle flows on Park Lane significantly. There has been no detailed evaluation of the impact of the scheme, however anecdotal evidence and usage indicates the scheme has been well received and has been effective in maintaining lower vehicle speeds and improving community amenity.

Poundbury, Dorset

In 1993, the Duchy of Cornwall began building Poundbury, an extension to the market town of Dorchester, in the West Dorset District of South West England (Thoine, 1997). Poundbury differs from the types of development which were normal at the time of its inception, in a number of ways:

- Its overall settlement form is considered as an insertion into the pre-existing cultural landscape of the Dorchester region, rather than as a standard development package
- Its public space structure forms a highly-connected network, rather than a set of cul-de-sacs
- Its “interface” relationship between buildings and public spaces is more direct, with few intervening front gardens or forecourts
- Its pattern of land use is more varied than is generally the case in modern developments, with work places in addition to dwellings, and with a higher proportion of social housing units within the residential element itself

- Its detailing gives the public realm “figural” quality, rather than forming the then-typical field of “space left over between buildings”.

The highway layout was designed to reflect a traditional Dorchester village rather than comply with modern design standards and comprised of a series of courtyards with interconnecting through routes. Corner radii and visibility splays are significantly reduced.



Figure 25 – Typical street in Poundbury

No specific research has been carried out in relation to road safety and insufficient time has passed to allow an analysis of collision trends. However, investigations have been carried out into residents’ perceptions of living in the development (Butina-Watson *et al*, 2004). An extract about road safety from the research report is included below:

“Respondents showed a very marked aversion to ‘through streets’ as contrasted with cul-de-sacs; only 9.5% agreed or strongly agreed that ‘through streets are better’, with 67.0% (almost seven times as many) disagreeing or strongly disagreeing. The fact that so many residents are nonetheless so satisfied with the overall quality of Phase One suggests rather strongly that the public spaces are not *seen* as ‘through streets’: perhaps the high level of enclosure produced by their curved forms, with consequent short sight lines, is at the root of this perception. In any case, both residents and experts seem quite happy in road safety terms. One resident in our discussion group told how he had to pull out of his parking court very slowly on his way to work every morning: he found this marginally inconvenient, but acknowledged the safety payoff for pedestrians and cyclists. The expert view is also quite sanguine in road-safety terms. The county highways officer responsible for overseeing the layout, asked whether he would have changed anything with hindsight, felt that except for a couple of very small details he would do it the same again.

Research by *Designing for Homes* (DFH) reports the following comments provided by one retired owner-occupier: “It’s a domestic road but having to take 40 foot artics, which is dangerous as it’s a residential road. With children.... You couldn’t possibly let them play in the street”. A discussion group, on the other hand, thought the roads quite safe, but agreed that they were mostly not very play-friendly: “they’re quite narrow, like lanes, so balls would soon break people’s windows.”

This view was supported by the researchers own observations. The only place where the research team saw children playing in public space was in the ‘undercroft’ of Brownsword Hall, but the DFH research suggests that some parents do not see even this space as safe, quoting families from the affordable housing:

“It’s not safe to let our children play in the main square or under the town hall. These are always cars manoeuvring and you can’t tell where they might come from.”

Home Zones

Home Zones (akin to Woonerven in Holland) are residential streets in which the road space is shared between drivers of motor vehicles and other road users, with the wider needs of residents (including people who walk and cycle, and children) in mind. The aim is to change the way that streets are used and to improve the quality of life in residential streets by making them ‘friendly’ for people, not just for traffic. The layout of the street should emphasise this, so that it is perceived that non-motorised users have priority.

Home Zones are not strictly relevant to the subject of this report as they are by definition residential streets with very light vehicle flows, ideally less than 100 vehicles per hour, vehicle movements are a fairly minor consideration compared to the use of the streets by the pedestrians and they involve the use of physical rather than psychological measures. While Home Zones aim to give priority to pedestrians and residents, the concept of Shared Space schemes is that the priority between vehicle movements and pedestrians is balanced to meet the needs of both. Both concepts theoretically have similar principles and a brief consideration of Home Zones is therefore included. A review of the pilot schemes is currently being undertaken, but it has not yet been published.

A typical example of a Home Zone scheme is Magor Village in Monmouthshire. Magor Village is one of nine pilot Home Zone schemes set up by the Department for Transport (Layfield *et al*, 2005). The village has a population of around 5000 and lies on the B4245. The Home Zone is to the south of the B4245 and the measures introduced included:

- Gateway treatments, 20mph zone and home zone signing
- Flat topped road humps
- High quality paving materials
- Extensive planting and bollards
- Reduced carriageway width.

There was substantial support for the Home Zone from local residents. In surveys undertaken before the scheme was introduced 58% of respondents thought it was a good idea. An after survey indicated that 64% were in favour of the scheme. Two thirds of the respondents to the after survey thought the Home Zone had made the appearance of the streets more attractive. When asked if the scheme had made motorists more or less considerate to children playing, 61% of respondents thought the scheme had made no difference.

Throughout the scheme the 85th percentile speed of vehicles was reduced by around 4mph, the actual speed depended on the location of the survey equipment. Home Zones tend to be introduced in areas where there are very few collisions. In this case there was 1 slight injury collision in a 'before' study period of 7 years and therefore it will be very difficult to assess if the collision rate have reduced as a result of the scheme. However non-injury collisions and incidents mentioned by respondents appear to suggest that these incidents may have been reduced.

4.7.4 Some rural schemes in the UK

White line removal

Although white lines have been used for the past 90 years on roads in the United Kingdom, very little research appears to have been conducted into their effect. However, recent studies showed that under certain conditions, for example, where there is a 30mph speed limit, their removal can reduce free flow driving speeds. An example is the village of Starston in Norfolk, where unpublished research shows speeds were reduced by 7mph as a result of removing central white lines (Figure 26). A similar study in Wiltshire (Debell, 2003) showed that there are safety advantages to be gained by removing centre lines in 30mph zones in some circumstances, as the removal resulted in a 35% reduction in collisions and a 5% reduction in speeds.



Figure 26 – Removal of white lines in Starston in Norfolk

Another study involving seven sites (in Wiltshire, Oxfordshire and Hampshire) compared the number of injury collisions occurring on about 150 miles of main road both before and after the roads concerned were marked with double white lines and associated markings. When the changes in collisions on these roads were compared with those in the whole of the surrounding police districts

during the corresponding periods it was found that there no statistically significant increase or decrease in collisions associated with the addition of the (double) white lines. However, one concern about this study was that drivers were not complying with or even aware of, the requirements of the new markings during the introductory period (HMSO, 1965).

Quiet Lanes

The pilot Quiet Lane projects do not directly relate to this review due to their rural setting. Quiet Lanes form a network of minor rural roads suitable for shared use by vehicles and non-motorised users. They already have low traffic flows and speeds and rely on changing “hearts and minds” of drivers, so that they become more aware of the likelihood of encountering non-motorised users on the road, rather than traffic calming measures or reductions in the speed limit (see Figure 27).

The concept involves three key elements:

- Local community involvement to encourage a change in user behaviour
- Area wide direction signing strategy to re-route traffic away from Quiet Lanes
- Quiet Lane signing.

Two schemes were included in the pilot project, one in Norfolk and the other in Kent. Attitude surveys were undertaken both before and after the implementation of the schemes. Support for the schemes was strong in both the before and after surveys with at least 75% of respondents in favour. However a large proportion, one third in Norfolk and one half in Kent did not believe the scheme was working in practice (Kennedy *et al*, 2004a; Kennedy *et al*, 2004b). Although flows reduced, there was little change in speeds.



Figure 27 - Quiet Lane in Norfolk

Countryside Traffic Measures Group

The Countryside Traffic Measures Group was set up in 1997 by the Countryside Agency and the Department for Transport to support innovative rural traffic management schemes (Kennedy and Wheeler, 2001). The schemes were intended to provide traffic calming schemes that were more sympathetic to the context than hitherto. Schemes were implemented in the villages of Stiffkey, Blakeney and Wiverton in Norfolk, Occold in Suffolk and Charlwood in Surrey.

On the approaches to Stiffkey, gateways were introduced comprising new signs and sandy coloured patches on the road surface. In the village centre a 20mph speed limit was introduced and supported by a sandy coloured road surface without white lines to impart a country-lane 'feel'. A short length of imprinted surfacing with a 6mm upstand was added outside a shop (Figure 28). This surface is used variously by large vehicles (as an over-run area), by pedestrians, for parking and as a cycle lane. Changes in Occold and Blakeney were minor, but included a signs audit.



Figure 28 - Overrunnable footway in Stiffkey in Norfolk

In Charlwood, gateways were again used, emphasized by the use of rumble strips or simulated narrowings. In the village centre, the road was resurfaced using imprint surfacing, which changed the character of the noise made by passing vehicles, and white lining removed. The footway was widened and informal pedestrian crossings installed.

4.8 Simplified streetscapes and disabled people

Some practitioners and 'pressure' groups have expressed concerns about how simplification schemes might affect the access and safety of people with a disability. The main concern is perhaps those with a visual impairment who might not have any physical clues (e.g. tactile paving) as to where they should cross the road – or to provide a clear delineation between what would be the footway and the roadway. While many simplification or shared space schemes appear to provide non-visual guidance about channels by having different surface textures, it is clear that visually impaired pedestrians will find novel schemes, at least initially, hard to 'read'. However, the scheme in Kensington High Street did hold a series of consultations to take account of disabled people and attempted to overcome any problems that were identified.

It is not clear that such schemes in the Netherlands paid as much attention to their suitability as was the case in Kensington.

The Joint Committee on Mobility of Blind and Partially Sighted People (JCMBPS) is currently in the process of developing a policy statement on shared space in the public realm. The JCMBPS is an

independent body consisting of representatives of the principal organisations of blind, deaf-blind and partially sighted people with a specific interest in mobility.

There are 8½ million disabled people in the UK, including over a million blind and partially sighted people. Almost 2 million people with significant sight loss would have difficulty, even with the aid of glasses, in recognising a friend across the street. Many also have additional disabilities, particularly hearing loss, and experience serious problems moving around the built environment.

The draft JCMBPS policy (personal communication, 2005) states:

In principle, JCMBPS fully supports the aim to reduce traffic speeds and make the streets a safer place, as for blind, deaf-blind and partially sighted people a safe and accessible pedestrian environment is fundamental to independent mobility.

There are a number of measures, which the shared space concept suggests to create caution and slow drivers down, which JCMBPS supports and believe will particularly benefit the mobility of blind and partially sighted people in the public realm. These are as follows:

- the narrowing of the carriageway and increasing the size of the footway
- rationalisation of street furniture
- increasing of lighting
- provision of seating at regular points along the road.

There are however a number of measures which this concept suggests which JCMBPS has very serious concerns over with regard to the safety and mobility of blind, deaf blind and partially sighted people.

The main areas of concern for the JCMBPS are:

- the reduction or removal of delineations between surfaces used by motorised and non-motorised users
- reliance on eye contact to negotiate space
- assumptions that 15% of drivers behave badly no matter what (a statement attributed to Hans Monderman)
- the effect on negotiating such spaces ('way-finding') for blind and partially sighted people
- removal of controlled crossing points
- mixed use with pedestrians and cyclists.

JCMBPS has concerns on the removal of the standard kerb in terms of the effect of this on blind, deaf-blind and partially sighted people way-finding.

Many blind, deaf blind and partially sighted people use the kerb edge as a tool for guidance and way-finding. Whilst some shared space schemes remove the separation completely, others retain some separation but there is considerable variation in its treatment, including standard height kerb segregation, low kerb segregation or delineation via colour and/or surface texture. However, the use of colour and texture to portray information on the use of the space, and required behaviours, may not be sufficient to be safely used for way-finding for blind, deaf-blind and partially sighted people. This is the case for a number of reasons. Currently in Britain, tactile surfaces are mainly used to indicate a potential danger and therefore to use them for directional purposes on a large scale may be confusing and inappropriate. The height of the textured surface needs to be carefully considered, as it needs to be of a certain height for people to be able to detect it underfoot. This height, when used over a larger area, may be problematic for other users who prefer a smooth surface. The use of colour for delineation needs to be carefully considered, as people who are partially sighted require sufficient contrast between colours and tones to be able to detect them, and this is not a solution for blind people with little or no residual vision.

The skill of way-finding for blind, deaf blind and partially sighted people is often enhanced by 'following' pedestrian traffic flows. Where no barriers or pavement confine the majority of pedestrians to maintain one/two-directional travel and encourage the capability to cross open areas at

will, the blind, deaf blind or partially sighted person can become disorientated and this could lead to them travelling in an area which is undesired and/or wholly inappropriate.

The JCMBPS also have concern over the lack of uniformity between the shared space schemes and also within them. Blind and partially sighted people require uniformity and familiarity to be able to effectively way-find. Additionally, the JCMBPS has very serious concerns over the comments attributed to Ben Hamilton Baillie that ‘Using eye contact and careful observation to negotiate space’ and ‘Eye contact and human interaction replace signs and rules’. The key issue with this approach for blind, deaf-blind and partially sighted people is that for many blind and partially sighted people the approaching car cannot be seen, never mind being able to achieve eye contact with the drivers

JCMBPS have also expressed concerns about when cars are not prepared to automatically give way to pedestrians. People who are partially sighted may not be identifiable to drivers, as there may be no outward sign of their disability (e.g. a guide dog or white cane) which may mean that drivers are not aware they are required to act differently.

The summary in the JCMPBS draft policy states:

JCMPBS essentially support the key aim to reduce traffic speed and make the street a safer and more pedestrian friendly place. JCMBPS fully supports a number of methods that are suggested in the Shared Space concept to achieve this such as increased pavement width, lighting, and rationalisation of street furniture.

JCMBPS has major concerns about claims of increased safety generally created by the removal of the segregation between vehicles, cyclists and pedestrians, removal of controlled crossing points, and the replacement of these ‘segregation and control’ measures with negotiation via eye contact. Until adequate research is undertaken into the effects of removal of these in relation to safety and way-finding for blind, deaf blind and partially sighted people, then we firmly recommend that central and local government and other agencies do not proceed to implement or support such schemes.

Potentially, the introduction of the Shared Space concept could reduce even further the confidence, ability and safety of blind, deaf-blind and partially sighted people to use the pedestrian environment. This means the exclusion of an increasingly larger number of the population from a space that is being proposed for them. It is generally recognised that a public ‘shared space’ should be for everyone including the blind, deaf-blind and partially sighted people, in addition to those confined to wheelchairs.

4.9 Why do we need traffic signs and markings?

One of the issues to be considered in this review on the likely effects of streetscape simplification was to consider the theoretical and empirical evidence for such signage being there in the first place. This is both a historical and traffic management question. While the seemingly obvious answer (perhaps) “to improve safety and provide guidance and help to road users” was likely to have been an early reason, the issues of controlling congestion and safety audit must now be considered as reasons for having signs, lines, barriers and signals. Most of the information included here was obtained from the Department for Transport’s publication *‘The History of British Traffic Signs’* (1999).

The background to the possibly provocative question of why signs are needed, is to raise the issue of what is the optimum amount and type of visual information that should be provided. Too much information can produce cluttering and mental overload, while too little can induce uncertainty and confusion. This particular question is even more complicated in that it needs to cater for both the local driver and the visitor, the novice and the experienced driver, for the young/novice and the elderly driver, as well as those travelling at night and in heavy rain when visibility is severely reduced.

It was not until after the First World War that white lines really began to appear on the roads of Britain, and during the 1920's their use spread rapidly. In 1926 the Ministry of Transport issued a circular to local authorities on white lines in order to achieve some consistency and to prevent their

overuse. These recommendations covered the uses as lane lines, stop signs and warning signs (e.g. at bends and junctions). These guidelines also allowed for the use of the word "SLOW" to be added in some cases. Interestingly, the circular stated that it was essential to consult the police before laying any white lines.

A general circular on traffic signs issued in 1930 also included the use of "TURN LEFT" and similar worded road markings with arrows at roundabouts and in one way streets. "LOOK LEFT/RIGHT" markings for pedestrians were also recommended.

In 1933 'The Report of the Departmental Committee on Traffic Signs' commented that "there can be no doubt as to the great value of the contribution to public safety made by "white lines used on carriageways", but warned that "an over-lavish use will tend to reduce their effectiveness generally". The recommendations of the Committee were based on the 1926 Circular with some additions and amendments in the light of experience. In particular they recommended the use of white lines on the approaches to pedestrian refuges and similar obstacles in the road, and also as lane lines and as edge lines where the kerb line was interrupted. The Committee recommended that the use of the word "SLOW" should be restricted to the approaches to junctions, and recommended against the use of other worded markings such as "STOP", "NO PARKING" or destinations. The recommendations of the Committee were implemented by the Regulations, dated December 1933, which permitted the lines and other markings to be coloured white or yellow, and either be painted or made of metal or other suitable material.

The 1933 Regulations did not include lane or centre lines, but in 1935 experiments were carried out with these markings on the A30 and A38 in Devon. After the passing of the Trunk Road Act in 1936, the use of this form of marking spread slowly until the Second World War, when it was adopted on all main roads as an emergency measure. By the 1940s, the use of white lines had been extended to include the definition of traffic lanes on open lengths of road, edge lines at entrances to side roads and lay-bys etc., and transverse lines for use in conjunction with "HALT" signs.

The 1944 Report of the Departmental Committee on Traffic Signs generally endorsed the existing uses of road markings, but recommended discontinuing the option for markings to be coloured yellow. The Committee recommended the continued use of the existing worded road markings with the addition "BUS STOP" (surrounded by broken white lines) supplemented by 'NO WAITING?' where other vehicles were prohibited from waiting in the bus stop. Limited use of lane destination markings was also suggested. The 1944 Report recommended that the practice of marking three traffic lanes on single two-way carriageways should be discontinued, as it was potentially dangerous and could lead to head-on collisions. In fact this road layout continued in use for many years to come!

In spite of the recommendations of the 1944 Report, the 1950 Regulations merely re-enacted the provisions of the 1933 Regulations with regard to road markings, but with the addition of the use of studs or plates as lane lines. However, the 1957 Regulations included a series of diagrams for road markings based on the 1944 Report, with some additions and amendments.

In 1957 the United Kingdom signed the European Agreement on Road Markings which aimed at international uniformity in this field. As part of the moves to bring the United Kingdom into line with this Agreement, it was decided to experiment with double white lines to prevent overtaking. This was tried out first on two roads in the south of England (the A3 and the A20). A press notice issued by the Ministry of Transport and Civil Aviation in November 1957 explained the new system to the public, and during 1958 a further 500 miles of trunk roads (for which the Ministry was responsible) were laid with double white lines. Warning lines were also introduced in the form of closely spaced broken lines, and the existing single continuous lines were converted to the new patterns over a 3-year period. In May 1959 regulations came into effect giving legal force to the double white line system.

The Worboys Committee Report of 1963 recommended the use of a double broken transverse white line across the minor road at junctions that were not controlled by the police, traffic light signals or stop/halt signs. It was intended that the markings should be advisory, rather than enforceable. The Committee endorsed the use of double white lines on bends and hills, but warned against devaluing them by over-use. Generally the continued use of the other existing markings was endorsed by the

Worboys Committee, but they recommended that the "GIVE WAY" and "STOP" signs should be supplemented by road markings (an inverted triangle and the word "STOP" respectively). The 1964 Regulations implemented the Worboys Report recommendations and also included solid edge lines for use on bends or similar hazards and broken edge lines for use at other locations.

In 1975 the school entrance marking was changed to its present yellow zigzag form. (A white zigzag had been tried out previously as an alternative to the white "box" marking prescribed in the 1964 Regulations but the yellow version had proved to be the most effective marking.) Hatching, chevron markings, a solid edge line for motorways (and other roads with a hard shoulder or strip), bus lanes, bus stop clearways (with a broad yellow line alongside the kerb) and yellow box markings to keep junctions clear were also introduced in the 1975 Regulations.

The 1981 Regulations changed the double continuous transverse stop line to a single line. Amendments which came into force in 1983 prescribed road markings for cycle lanes and tracks. Road hump markings were first prescribed in the 1990 Amendment Regulations.

The 1994 Regulations rationalised the patterns of broken white lines used for lane lines, hazard lines and centre lines. In each case a longer mark and gap was used on roads with a speed limit of more than 40mph. Previously the speed limits had not been specified in the Regulations. Edge lines with raised ribs which gave an audible warning and a rumble effect when a vehicle ran over them, as well as giving improved visual performance at night in wet conditions, were introduced for use on motorways and all-purpose roads with hard shoulders or strips. Road markings to guide high vehicles through arched bridges were also introduced following experiments with their use. The colour of bus stop and taxi rank markings was changed to yellow to discourage other drivers from parking there, whether or not waiting restrictions were in force.

In the early 1990s, trials were carried out on two lengths of the M1 motorway with chevron markings in the left hand and centre lanes to encourage drivers to keep the appropriate distance from the vehicle in front. The markings were accompanied by explanatory roadside signs mounted on poles. This was developed from an idea first tried out in France. An assessment of the results indicated that the markings had a beneficial effect on driver behaviour and reduced collisions.

The system of marking hazardous sections of the road was introduced in 1959 by the Ministry of Transport. The innovation consisted of two parallel white lines, one for each direction of travel, laid longitudinally along the centre of the carriageway. The driver was not allowed to cross the lines if the line nearest to his vehicle was continuous. If the line was broken, he was allowed to cross for overtaking purposes, provided that it was safe to do so.

However, it is noteworthy that despite the widespread use of white lines, very little evidence exists as to how centre and edge of carriageway markings 'work' and what would be the result of their widespread removal – in both the short and long-term. It is clear that in general they serve to improve guidance 'clues' (especially in certain traffic situations - and at night) to thus help the driver by reducing uncertainty. There is limited evidence that simply removing such clues would either improve safety or reduce congestion in the majority of circumstances – especially for a road user population that has become used to their presence. The argument that we need to remove unnecessary 'clutter' is only relevant when there is unnecessary and confusing signage and that visual amenity is compromised. Accordingly, *By Design: Urban Design in the Planning System* (DTLR, 2001b) states that the co-ordination of the design of the streetscape avoids clutter and confusion. This includes all elements of the street scene including signage, lighting, railings, litter bins, paving, seating, bus shelters, bollards and so on. Co-ordination is crucial, the guide also argues that there is no need for signage to be purely functional, but rather that it can also be aesthetically pleasing in its own right - it also argues that with signage, less can sometimes be more. A 'companion' document *Safer Places* looks at the placing of street furniture. It should be carefully considered, especially by utility companies, so as to minimise the likelihood of anti-social behaviour such as vandalism. Each element of the streetscape needs to be considered as part of a total whole. Insensitively placed additions are a problem in many streetscapes and needed to be tackled on a coordinated basis. In fact often 'shared space' schemes recognise the value of amenity – and visual appearance - as being paramount, but

importantly recognise the need for 'softened' signage and the need to replace what is taken out with new additions to the 'place'.

Within this context the situation regarding road signs has also received considerable urban design and research attention. For example, Noordzij and Hagenzieker (1996) investigate the effects that traffic signs (and road markings) have on road safety, focusing on the inadequacy or absence of either. They comment that "the road environment is of major influence in a road user's ability to register traffic signs quickly. Environmental factors include the volume of traffic, the number of traffic signs or markings on a particular stretch of road, the presence of distracting images in the background or other indicators in the immediate vicinity which may reinforce or detract from the message on the sign. These distracting influences can be reduced by following a few general pointers on the design and placement of traffic signs and on the planning of the general road environment in relation to both day and night-time use".

The following measures to improve the contribution of traffic signs to road safety were identified:

- Making a distinction between important and less important traffic signs
- Improving the design of these signs to make them more noticeable, recognisable and understandable (for example, introducing new signs to indicate what type of road a user is on)
- Placing speed limit signs everywhere at the entrance to a (section of) carriageway or to an area, and repeating them where necessary
- Reinforcing the message on the signs of other, more natural indicators
- Replacing some of the road markings whose message is intended to be read at different times of the day or night.

Noordzij and Hagenzieker also state that road markings are an important feature in relation to road safety, provided that they are restricted to special situations and integrated into a package of various local measures.

Public Realm contains many different elements which need careful consideration. *The Urban Design Compendium* (English Partnerships/Housing Corporation/Llewelyn Davis, 2000) argues that this is not often achieved well with too many organisations putting in too many different elements to the public realm in an uncoordinated manner. This can lead to excessive clutter which can have negative effects on non-car users. The example of "sheep-pen" style traffic crossings which provide free flow for traffic, while impeding pedestrian movement is cited.

Four specific recommendations in relation to street clutter have been made:

1. Remove superfluous and obsolete elements - establish visual logic with clear messages for drivers, cyclists & pedestrians
2. Design space so functions are clear and so need for signs is minimised
3. Hide it or flaunt it - some elements are necessary evils - where they cannot be hidden they should be treated as a form of public art and highlighted tailored to the specific context
4. Producing a comprehensive and coordinated strategy of elements for each space - again context driven.

In relation to signage, the Compendium suggests that signage for pedestrians and cyclists is as important as that for motorists. Four considerations are suggested:

1. Consistent and co-ordinated design

2. Making the structure of the place legible so as to minimise the need for signs
3. Concentrating pedestrian signage at key nodal points, and
4. Implicit routing defined by the paving type and other methods to ease orientation.

The *Urban Design Compendium* (English Partnerships/Housing Corporation/Llewelyn Davis, 2000) makes similar statements to those made regarding signage and street clutter. It argues that minimising pedestrian barriers can help to create a more walking friendly environment. Guard Railing in particular though sometimes billed as "pedestrian improvements" can actually end up impeding movement on foot and rather reinforce vehicular movement. The guide also offers an example of Canning Street in Liverpool where selective street closure in a historical layout has been used to achieve a better balance between vehicles and other users.

4.10 Psychological issues relevant to simplification

Advocates of reducing road sign clutter and supporters of shared space schemes (which typically advocate the removal or reduction of signs and priorities) have proposed a number of reasons why they are to be encouraged and why they work.

The limited channel capacity theory of perception (Broadbent, 1987) proposes that not all information can be processed so that the brain samples information (based on what is perceived as most relevant); the more information (or clutter) the greater the probability that important information is ignored or missed to the extent of interfering with the primary task, which in driving involves steering the correct path at an appropriate speed.

More recent arousal theories of attention consider the problem of reducing driver distraction (Wallace, 2003). Signs and markings can cause visual clutter that can both distract the driver and even obscure traffic lights. Such problems are likely to be greatest at busy junctions where the driver has a high cognitive load and level of arousal, but can also occur when arousal is low when driving on long monotonous ('boring') stretches of road.

In addition to such *input* models more recent *internal* cognitive models of behaviour consider the driver to be continuously monitoring perceived risk and adjusting behaviour accordingly. One such theory (and one proposed by Monderman) would be to "make the road (*appear*) dangerous to make it safe" i.e. increasing perceived risk, but not actual risk because of compensation behaviour by the driver. The extension of this to 'shared space' design advocates removing priorities so that people may have to make eye contact to determine who has right of way and how they are going to interact. However, the information conveyed by initial eye contact – and over larger distances by a pedestrian's accompanying body movements (e.g. head turning and slowing at the kerb before crossing) – only informs road users that others are aware (or should be) of their presence and initiates the negotiation of priority, a process that different road users may not interpret in the same way. In any case such a reliance on direct eye contact will lead to problems in the dark or adverse weather conditions and there are also likely to be issues of such interactions between certain social and ethnic groupings. Supporters also argue that by treating people as sensible/intelligent human beings they will behave accordingly. While this may be true for the vast majority of people there are likely to be some individuals who will seek to gain an advantage if the priority 'rule' is flexible. They also claim that the risk homeostasis model initially proposed by Wilde (1982) and similarly applied to driving by Adams (1985) provides a sound theoretical basis for why simplified and shared space schemes appear to operate successfully – on the assumption that road users (subjective) *perceived* risk is generally the same as (objective) *real* risk.

In fact there are other socio-psychological frameworks that are relevant to the idea. For example, in Australia David Engwicht (see website in references) uses the concept of "intrigue" (which may act in a similar way to concepts such as complexity, ambiguity or uncertainty). Residents are encouraged to reclaim their roads by treating them as part of their own social space (as opposed to existing for the

sole use of cars) by holding parties and public meetings in the road and changing the visual appearance by painting patterns on the surface. However, it is difficult to see how this might be maintained over time, especially in countries with wetter and colder climates, and such ideas are not relevant to more heavily trafficked through roads that are not flanked by (residential) communities – the case for many arterial roads in London.

Similarly research conducted in the Netherlands on “self-explaining roads” (Theeuwes, 1998) suggests that a well-designed and distinctive visual environment can play a significant role in changing drivers’ behaviour and reducing traffic speed, while the underlying principles behind the use of non-physical (psychological) traffic calming to reduce speeds (Elliott *et al*, 2003; Kennedy *et al*, 2005) includes related ideas such as increasing complexity to increase cognitive load and perceived risk. However, Elliott comments that “many of the applications in this field rely on intuition rather than being theory driven”, and typically involve introducing design elements (e.g. gateways, extended edge markings, road narrowing or ‘pinch points’ using bollards (or tree planting). In addition to either changing the visual complexity, increasing perceived risk, identifying a ‘low speed’ place they can also serve to reduce forward visibility. It is likely that such schemes, that have been extensively trialled both in a driving simulator and on real roads, may ‘work’ for a number of reasons, and it is also not known about how they will work in the longer terms and if enforcement is reduced as a result of providing ‘psychological’ measures. One concern is that once the novelty (and uncertainty) of such schemes is removed so might their effectiveness.

In any case, the real value, or correctness, of any theoretical justification for simplification (whether psycho-social or otherwise) is likely to be determined by the framework in which it is being applied - and the reason why the scheme is being introduced. Schemes aimed at improving amenity, encouraging regeneration, improving the environment or reducing the numbers of traffic collisions will all require being critically judged or evaluated within a different frame of reference. It is also likely that schemes will finally be judged within a strict economic model - even though it is sometimes difficult to put a monetary value on some of the social costs included.

4.11 Road user interactions in simplified schemes

While it is uncertain how UK, or London, road users might behave in unusual traffic environments such as simplified streetscapes or shared space schemes – especially when normal formal priorities are removed or ‘confused’ – there have been a small number of research studies that have examined how pedestrian and drivers interact in similar situations typically introduced as part of traffic calming schemes. In a number of these schemes ‘informal’ pedestrian crossing facilities have been introduced at locations where pedestrian crossing movements tend to concentrate - for example strips surfaced in a different colour material from the rest of the street, or flat-top road humps (see Figures 28 and 29).



Figure 29 - Alton (High Street), Hampshire

Although the interactions of drivers and pedestrians at these informal crossings is not well understood, they may give some indications of how road users in less regulated areas might behave with respect to taking or ceding priorities. Early unpublished studies conducted by TRL at three sites (Crawley, Shrewsbury and the London Borough of Hillingdon) featuring flat-top humps or crossing places laid in contrasting surfacing found there was a correlation between pedestrian crossing flow and the proportion of drivers giving way. A more recent, again unpublished, comprehensive study, using video observation and public surveys, examined give way behaviours at over 30 crossing places in 18 schemes concentrated on crossing places utilising flat-top humps the majority of which were located in town centre shopping streets, with the remainder in or close to neighbourhood shopping areas. They included one or more features at the hump to suggest that this was an appropriate place to cross the road e.g. carriageway narrowing, tactile paving, bollards, guardrails and/or a continuation of footway paving material across the hump.



Figure 30 - Chelmsford (Market Road), Essex

To put this latest study into context, the mean hourly vehicle flows on the crossing places ranged from 200/h to 700/h, and pedestrian flows from under 50 to nearly 800/h.

For the analysis of give-way behaviour, only pedestrians approached by drivers who could give way to them were considered. The give-way rate of drivers approaching pedestrians about to cross varied considerably between crossing places, ranging from 0% to 70%. The reasons for this variation are not known, but were thought to be site specific.

The public attitude surveys, broadly supported by the video analyses, found that about three-quarters of all respondents, whether drivers or pedestrians, thought that motorists have priority at informal raised crossings, but that most pedestrians were prepared to cross at informal raised crossings as they considered them to be safer than crossing at unmarked locations (because the cars were forced to slow down) although they were not as safe as formal crossings. The surveys also found that pedestrians were more likely to use the informal crossing if the road was narrowed or if there was a central refuge and that motorists were more likely to stop for pedestrians who had an obvious disability, were accompanied by young children, were elderly, or if the weather was bad, but less likely to do so if they were in a hurry. Very few drivers said they would stop automatically. Again the responses of pedestrians reporting drivers' give way behaviour were site specific.

The proportion of drivers giving way voluntarily at the informal crossings was higher when there were more pedestrians waiting to cross or the site had higher vehicle flows, a higher proportion of pedestrians were accompanied by young children, while drivers were less likely to give way if the scheme included a formal crossing. The authors concluded that drivers are more likely to be forced to give way as a result of pedestrian attitudes rather than traffic flow or geometric layout.

These results are very varied and suggest there is no simple 'model' of driver-pedestrian interaction. The numbers of drivers giving way to pedestrians and the numbers of pedestrians forcing priority varies considerably from site to site and varies depending on the proximity of formal crossings, vehicle and pedestrian flows, the weather and the presence of children. The findings do indicate that road users can interact safely when placed in less regulated spaces and that in general both pedestrians and drivers generally take each others movements into account and behave safely. However, there are frequent examples of 'confused' priority which may be caused (in part) by road users not being aware of who has formal priority in such situations. There is a need to clearly identify 'spaces' where such interactions are proposed and to inform road users of what rules (if any) apply and what is to be the accepted and normal behaviour. However, how this might be regulated, reinforced or even enforced is far from clear.

5 Discussion and conclusions

This review has examine some of the issues relevant to 'simplified streetscape scenes' that would result from removing, or reducing, certain elements of street design such as road signs, white lines, pedestrian barriers and footway kerbs. Such changes would serve to 'de-clutter' the environment but also serve to reduce costs. However, the consequences for safety of such removals are generally uncertain. A number of studies have reported that such simplification of the driver's visual scene can bring about safety improvements – or at least not make the situation more dangerous. The review includes a compendium of such schemes that have been constructed, mostly within Europe, and reports on any evaluations conducted in terms of safety, access and public attitudes. Although some schemes conducted in a more rural environment are included, the main focus was the applicability of such design ideas to more urban areas – and London in particular.

While the removal of visual clutter can be supported by the desire not to overload the driver's cognitive capacity (and perhaps reduce costs) such markings are typically used to provide the driver with relevant and timely information to simplify the driving task such that its removal would (presumably) increased 'uncertainty' and would make the driver's task more difficult and risky. However, some safety practitioners suggest increasing the drivers uncertainty and *perception* of danger will result in safer behaviour (as a result of risk 'compensation') and fewer collisions.

Therefore this review also considered a number of schemes designed with the aim of removing existing road user 'priorities' as well as physical features. These schemes aimed to improve public 'shared spaces' by reducing the dominant role often given to (or taken by) the vehicle and thus improving amenity - while at the same time improving (or at least not reducing) safety. While often these shared space schemes involve removing street signage and priorities, they frequently involve radical redesign of such locations that can involve *adding* a significant amount of structural guidance to the road user – other than by using signs road signs and white lines – by way of, for example, coloured and textured road surfaces.

While street de-cluttering and shared space schemes have many elements in common they do have very different motivations for their introduction – although safety is something that both design philosophies need to consider. This means that often urban safety developments, such as traffic calming, sometimes share similar attributes. However, it is worth pointing out that this review does not directly cover traffic calming schemes even though these sometimes involve elements of both simplification and shared space – as well as other considerations such as access and amenity.

The sizeable number and types of different simplification schemes and shared space schemes identified, seemingly each with its own particular design features, meant that it was not possible to come up with a single, simple classification of schemes. Some were designed for sizeable areas such as the centres of a city or village, some involved lengthy stretches of road while some involved a single junction. The marked differences and make-up of traffic flows also made the schemes very individualistic. However, what also helped to make the different schemes so distinctive was not what was removed but what was added. The designs often included adding in features such as gateways, differently textured and coloured surfaces and sometimes involved replacing traffic signals with an open space containing a physically raised or differently coloured/textured roundabout. Additionally such new 'physical' features were often supplemented with reduced speed limits and traffic diversions.

With hindsight it is perhaps not surprising that such an enormous range of schemes were identified, as the practical process followed was that each scheme was designed specifically for each location (and indeed for shared space schemes designed to provide a feeling of 'place' based on the local situation). Only a few of the schemes first developed the design concept and then identified locations where it could be introduced (Kennedy *et al*, 2005).

In general the review identified a surprisingly small number of schemes that had attempted (or at least published) proper evaluations of the schemes in terms of collisions and public attitudes. In part this often resulted from schemes being designed and built by urban designers or transport planners rather than safety practitioners. This may have resulted in no suitable evaluation data being collected, and schemes designed to improve access and regeneration did not consider that collisions were a critical issue. One surprising finding was that while a sizeable number of people expressed a keen interest in such radical design ideas (and claimed to be personally involved in relevant schemes) very few were able, or willing, to provide any information that would have been of value to this review. A number indicated that the interest now being expressed in such schemes meant that reportable evaluation information would become available in the near future.

For a number of the schemes for which collision data was available the data was limited in scope, especially for the after period, even though many of the schemes had been in place for over 5 years. The review was also limited because no control data was available from similar sites – needed to check whether collisions had gone up or down over the measurement period in locations where no scheme had been introduced. Similarly no monitoring of local areas had been undertaken to see if collisions might have 'migrated' – along with traffic – to roads that drivers switched to in order to avoid the scheme itself.

Although disappointing, the collision data identified for this review did not provide a safety case for simplified streetscapes or shared spaces one way or the other, especially for locations with high traffic flows. While some of the schemes in the Netherlands showed safety gains, others clearly did not. However, most of the changes identified in such schemes were for damage only collisions suggesting that many of the schemes were in low flow, low speed areas. In fact in the many years of monitoring

only one fatal and one injury collision had ever been recorded before a shared space scheme was introduced. While ‘supporters’ can claim that there had never been a serious collision after a scheme had been introduced – this was also typically the case before any of the schemes were introduced. In any case the sparseness of data means that it was impossible to draw any firm statistically sound conclusions. Differences in collision numbers (e.g. compare the collision numbers in Oosterwolde with those in Kensington) and traffic flows also means that extrapolating the Dutch findings to the UK and London in particular is not strictly relevant. It is also a concern that Dutch road users may have a different driving culture compared to typical London road users so that findings from other counties may not be directly relevant to any schemes introduced in London.

One study that was identified that could be interpreted to assess the effect of simplified streetscapes/shared space in London was the study of public transport in London Borough Pedestrian Priority Areas (PPAs) undertaken by TRL for the Bus Priority Team of TfL. The study (unpublished) appears to indicate that in PPAs there is a self limiting factor on pedestrians using the area also provided for vehicles (i.e. shared space) at around 100 vehicles per hour. Speed of vehicles also had a very strong influence on how pedestrians used the shared area. It would be reasonable to assume that these factors would also apply in other simplified/shared space schemes. Therefore in the London context shared space designs would be appropriate where vehicle speeds could be kept as low as possible and volumes were less than 100 vehicles per hour. However, it is not possible to draw hard and fast rules from a single scheme.

One concern about the new signing and traffic schemes reported here is that road users would, over time, adapt to any new environment and either respect it - or abuse it. Many drivers will tend to speed if they think they can get away with it. An uncontrolled simplified space (unless at least some enforcement is taking place) may encourage some drivers to resort to bullying tactics to take priority; it is interesting to consider hearsay evidence of what London drivers think of cyclists, and what London cyclists think of drivers - in contrast to the apparent tolerance that Dutch road users show to each other. It is perhaps worth commenting that when mini-roundabouts were first introduced in the UK they were initially treated with very great care and circumspection by drivers (“Does the other driver know what to do?”) but now many drivers have adapted and use aggressive tactics (e.g. high approach speeds) to take priority and force more considerate drivers to give way to them. A similar long-term behaviour pattern might take place on simplified/shared space road schemes – especially if congestion continues to get worse and encourages aggressive driving. In any case the psychological Hawthorne effect (of any novelty initially producing measurable improvements) would predict that any change will bring about an initial marked improvement that will be likely to dissipate over time.

However, none of these concerns apply to the scheme introduced in Kensington High Street. While this scheme did remove certain elements it also introduced new features and a holistic redesign of the area. The scheme introduced ‘enhanced’ pedestrian crossings, changes to road layout, footway widening, new paving trees and cycle parking, at the same time as removing street clutter and guard railings. Whether this qualifies as a true simplified streetscape is debatable, but its success emphasises the need to engage in holistic design to suit the ‘space’ being developed.

This means that applying the simplified streetscape philosophy to the London situation could be successful as long as it is not taken to extremes and does not simply involve removing everything – streetscape simplification and shared space schemes have moved on from such a simplistic approach.

Urban design is concerned with more than road safety. Many schemes are conceived as a way of improving the appearance and aesthetics of public space, some strive to improve access, amenity and regenerate streets that have become dominated by motorised vehicle so that pedestrians and cyclists avoid them whenever possible.

Very few schemes are designed primarily for safety – often amenity and regeneration are prime objectives (perhaps this is why so little collision data is collected to evaluate them). However, irrespective of the initial rationale for each scheme they can have safety and congestion benefits as well as creating a space with improved access and amenity for the community. Where there has been a history of injury collisions more traditional traffic calming or safety engineering techniques tend to have been used.

In conclusion, it is clear that many urban (and rural) roads are presently suffering from over conservative and ‘enthusiastic’ transport planning. One of the reasons for this is that training typically involved doing things comprehensively according to accepted simple prescriptive design principals and ‘by the book’. One problem with this is that there may be too many books – but perhaps the major reason is that, in an increasingly litigious culture, designers have to encompass all eventualities and be aware of how safety audits can identify potentially hazardous circumstances in seemingly safe situations. Perhaps the publication of new design guidelines (such as *Manual for Streets* currently being written for DfT to replace the 1992 *Design Bulletin 32*) will provide opportunities for more innovation in street design – although the innovation will probably still (in London at least) be some way from the ‘naked streets’ concept that some practitioners use to refer to more extreme examples of shared space design.

From the schemes that have been studied for this report there are a few key elements that govern the success of the scheme. They include the following:

- The design of the scheme must be considered in a holistic manner and the scheme must be context specific, i.e. it should be suitable for the surrounding area and address the needs of the all user groups.
- Some physical changes to slow traffic are desirable and traffic speeds should be kept as low as possible
- Vehicle flows should not exceed 90 vehicles per hour
- The use of contrasting textures can help identify specific areas; however textures need to be used carefully as they can be unpleasant for some users, i.e. cyclists and the disabled.
- Allowances need to be made for the visually impaired.
- Consideration needs to be given to how the scheme will operate at night e.g. if the scheme uses colours to identify different areas, are the colour differences apparent at night and are they altered by street lighting.

In summary, successful and holistic design aimed at promoting the idea of ‘space’ needs to be tailored to the specific location in each case, as such it cannot necessarily follow the principles of design guidelines used in the past. Each scheme needs to be considered on its own merits and consulted upon accordingly. This may be an expensive initial approach to take, but it will provide successful outcomes in the future.

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Useful websites

www.transport2000.org.uk

www.shared-space.org

www.lesstraffic.com

www.dptac.gov.uk

www.shared-space.org

www.rbkc.gov.uk/EnvironmentalServices/general/ex_roadintro.asp

www.newlifeformainroads.org.uk

www.dft.gov.uk/stellent/groups/dft_susttravel/documents/page/dft_susttravel_037635.hcsp

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Abstract

The report considers the likely safety implications of simplifying the drivers' visual environment by removing or reducing the use of traffic signs and road markings; and the possible consequences for other more vulnerable road users. It has been argued that giving the driver more responsibility for the way he interacts with other road users, by for example encouraging eye contact' will not compromise safety and allow for roadside 'clutter' to be reduced. The applicability of ideas such as 'shared space' (and 'naked streets'), that were originally conceived in a number of other countries (notably the Netherlands), to more urban environments in the UK was the main consideration in the review. In addition to a literature search and surveys of practitioners, both collision data and the design features of a number of existing schemes were considered, including a small number of schemes in the UK. It was found difficult to provide a simple categorisation of the very wide variety of different schemes that were identified, and that while many of them did simplify the environment by removing design elements, others added a variety of 'hard' features that defined the space as being atypical of normal driving environment. While the design concept may be appropriate in some situations, and some countries more used to a 'sharing' and less competitive driving environment, following an analysis of the limited crash data available to date it was concluded that the case for widespread implementation in more urban areas in the UK has not yet been convincingly made. However, there remains considerable scope for a change in the design of public space, shared by vulnerable road users and vehicles, that takes account of both safety and amenity. Applying the simplified streetscape philosophy to the London situation, for example, could be successful as long as it is not taken to extremes and is considered on a case by case basis.

