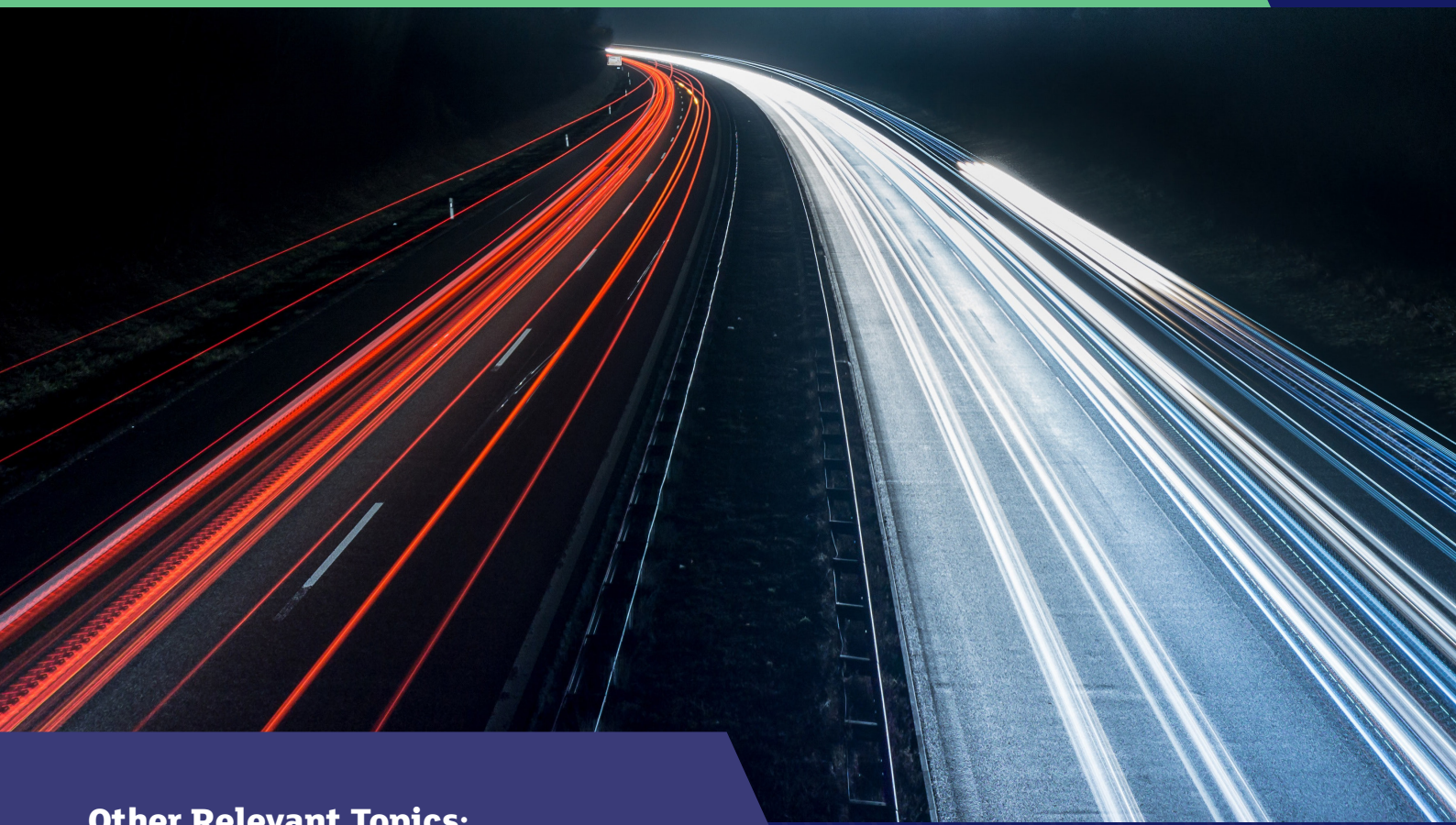


Synthesis title:

Urban Roads

Category: Roads



Other Relevant Topics:

- ▶ Cycling Infrastructure
- ▶ Pedal Cyclists
- ▶ Motorcyclists
- ▶ Adults
- ▶ Children
- ▶ Teenagers
- ▶ Signing and Marking
- ▶ Street Lighting
- ▶ Speed
- ▶ Speed Limits
- ▶ Traffic Calming
- ▶ Surfaces

About the Road Safety Observatory

The Road Safety Observatory aims to provide free and easy access to independent road safety research and information for anyone working in road safety and for members of the public. It provides summaries and reviews of research on a wide range of road safety issues, along with links to original road safety research reports.

The Road Safety Observatory was created as consultations with relevant parties uncovered a strong demand for easier access to road safety research and information in a format that can be understood by both the public and professionals. This is important for identifying the casualty reduction benefits of different interventions, covering engineering programmes on infrastructure and vehicles, educational material, enforcement and the development of new policy measures.

The Road Safety Observatory was designed and developed by an Independent Programme Board consisting of key road safety organisations, including:

- ▶ Department for Transport
- ▶ The Royal Society for the Prevention of Accidents (RoSPA)
- ▶ Road Safety GB
- ▶ Parliamentary Advisory Council for Transport Safety (PACTS)
- ▶ RoadSafe
- ▶ RAC Foundation

By bringing together many of the key road safety governmental and non-governmental organisations, the Observatory hopes to provide one coherent view of key road safety evidence.

The Observatory originally existed as a standalone website, but is now an information hub on the RoSPA website which we hope makes it easy for anyone to access comprehensive reviews of road safety topics.

All of the research reviews produced for the original Road Safety Observatory were submitted to an Evidence Review Panel (which was independent of the programme Board), which reviewed and approved all the research material before it was published to ensure that the Key Facts, Summaries and Research Findings truly reflected the messages in underlying research, including where there may have been contradictions. The Panel also ensured that the papers were free from bias and independent of Government policies or the policies of the individual organisations on the Programme Board.

The Programme Board is not liable for the content of these reviews. The reviews are intended to be free from bias and independent of Government policies and the policies of the individual organisations on the Programme Board. Therefore, they may not always represent the views of all the individual organisations that comprise the Programme Board.

Please be aware that the Road Safety Observatory is not currently being updated; the research and information you will read throughout this paper has not been updated since 2017. If you have any enquiries about the Road Safety Observatory or road safety in general, please contact help@rospa.com or call **0121 248 2000**.

How do I use this paper?

This paper consists of an extensive evidence review of key research and information around a key road safety topic. The paper is split into sections to make it easy to find the level of detail you require. The sections are as follows:

Key Facts	A small number of bullet points providing the key facts about the topic, extracted from the findings of the full research review.
Summary	A short discussion of the key aspects of the topic to be aware of, research findings from the review, and how any pertinent issues can be tackled.
Methodology	A description of how the review was put together, including the dates during which the research was compiled, the search terms used to find relevant research papers, and the selection criteria used.
Key Statistics	A range of the most important figures surrounding the topic.
Research Findings	A large number of summaries of key research findings, split into relevant subtopics.
References	A list of all the research reports on which the review has been based. It includes the title, author(s), date, methodology, objectives and key findings of each report, plus a hyperlink to the report itself on its external website.

The programme board would like to extend its warm thanks and appreciation to the many people who contributed to the development of the project, including the individuals and organisations who participated in the initial consultations in 2010.

Key Findings

- The definition of urban roads used for national statistics is all major and minor roads within an urban area with a population of 10,000 or more (based on the 2001 Communities and Local Government definition of Urban Settlements). Rural roads are major and minor roads outside urban areas (DfT, 2013a). In 2016, 61% of all road accident casualties occurred on urban roads (RRCGB, DfT, 2017).
- In 2016, 598 fatal and 12,417 serious road accidents were reported on urban roads. In terms of accident causation factors on urban roads, “failed to look properly” was reported as a contributory factor for 47% of accidents, compared with 34% of accidents on rural roads and 35% of accidents on motorways. Twenty two percent of fatal accidents on urban roads involved a pedestrian that failed to look properly and a further 14% involved a pedestrian that failed to judge a vehicle’s path or speed (RRCGB, DfT, 2017).
- There is a wealth of literature covering the myriad issues that fall into the category of road safety on urban roads. There are a number of publications that are of particular relevance and provide a useful overview including the Department for Transport’s Manual for Streets (DfT, 2007) and the subsequent Manual for Streets 2 Wider Application of the Principles (CIHT, 2010). More recent publications have been produced by the CIHT to assist professionals in implementing the Manual for Streets guidance including: ‘Planning for Cycling’ (CIHT, 2014), ‘Involving the Public and Other Stakeholders’ (CIHT, 2015a), ‘Planning for Walking’ (CIHT, 2015b) and ‘Designing for Walking’ (2015c).
- Previously, traditional approaches were focussed on segregation of road users to minimise interactions. New towns built in the 1950s and 60s typify this style of urban planning. An alternative approach, originating in the Netherlands, aims to achieve the complete opposite. The safety problems on urban roads stem from too many people trying to use the same space, causing problems for vulnerable road users; rather than segregating users, the concept of “shared space” aims to minimise demarcations between users, finding ways to reduce the dominance of motor vehicles and changing the way that the space operates. It is important to note however that poorly implemented shared space schemes can have adverse effects.

- For shared space schemes, the aim is usually to achieve vehicle speeds of under 20mph, and preferably less than 15mph. Vehicle speed and flow have a significant impact on pedestrians' willingness to share space and also drivers' willingness to give way to other users. Available evidence shows comparable casualty levels for shared space versus conventional streets, despite shared space streets showing increased use by pedestrians and cyclists (DfT, 2011). However not all user groups are in favour of the shared space concept, and it is frequently opposed by organisations representing the blind, partially sighted and deaf. These users often express a strong preference for clear demarcation and separation, and can have difficulties resulting from the removal of familiar features such as kerbs and railings. Other studies (Moody & Melia, 2014) suggest that the claims made by shared space advocates have overstated the available evidence. They have concluded that some pedestrians, particularly the elderly, can feel intimidated by shared space and prefer conventional crossings, and that most pedestrians still give way to vehicles and feel less safe. Therefore, caution is required when proposing and implementing such schemes, particularly in environments of high traffic flows.
- In recent years there has been considerable momentum towards the introduction of 20mph zones in urban environments. 20mph zones differ from shared space schemes in that they do not typically require extensive re-engineering of the road environment. For example, research has been conducted into the effectiveness of 'sign-only' 20mph schemes (e.g. Tapp & Toy, 2015a) in combination with materials produced to aid those interested in their implementation. The overall effect of 20mph zones on casualty reduction has been positive. For example, in London, it has been estimated that a reduction of 42% in killed or seriously injured casualties has been achieved in areas where 20mph zones have been implemented (Grundy et al., 2008).
- The most vulnerable user group in the urban setting is pedestrians. On urban roads, pedestrians account for over a third of KSIs, with car occupants, motorcyclists and pedal cyclists each comprising roughly a fifth (RRCGB, DfT, 2017). Pedestrians and cyclists together account for a disproportionately high number of casualties in urban areas, whilst accounting for only a small percentage of the overall traffic. These figures serve to demonstrate that not only are pedestrians (and to a lesser extent cyclists) more at risk of an accident, they are also far more vulnerable to physical injury when accidents do occur. However these modes have health benefits that can outweigh this risk.
- Innovation in cycling provision is a growth area and many road operators and authorities are looking to European best practice for inspiration. One example is hybrid cycle tracks which reallocate carriageway space for a cycle lane raised above carriageway surface, but below the footway. These are common in Copenhagen and other places on the continent (DfT, 2012). Transport for London carried out a major cycle safety research project looking at a range of junction layouts and traffic technology that are used in other countries, such as the use of 'Dutch-style' roundabouts and low-level cycle signals (TfL, 2013).

- Even in situations where formal signal controlled crossings are required, there are measures that can be taken to improve facilities for pedestrians. For example, if there is an all-red phase during the signal cycle then diagonal crossing facilities can be provided, which are much quicker and more convenient for pedestrians (CIHT, 2010).
- A great deal of information is available on the principles of traffic signal control (DfT, 2006) and the physical design of junctions and crossings to optimise safety (DfT, 2005a; DfT, 2005b).
- Roundabouts have the lowest rate and lowest severity for motor vehicle collisions, but they have a poor record for cyclist safety and can also be a barrier to pedestrian movement. Slower speeds for vehicles, and hence increased safety for cyclists, can be encouraged through use of narrow exits and entries and small corner radii, resulting in more 'continental-style' compact roundabouts. Tight corner radii are also being used more and more at all junctions; this increases pedestrian and cyclist safety by reducing driver speed and increasing awareness (CIHT, 2010).
- Keeping speeds low has been demonstrated to have significant safety benefits, particularly where space is shared between different user groups (CIHT, 2010).
- Further information on all aspects of carriageway design and road geometry can be found in Design Manual for Roads and Bridges (DMRB, Highways Agency, 1993). (Note that all sections of DMRB are written specifically for trunk roads, and whilst relevant to urban roads, should not be applied uncritically.)

Summary

- The definition of urban roads used for national statistics is all major and minor roads within an urban area with a population of 10,000 or more (based on the 2001 Communities and Local Government definition of Urban Settlements). Rural roads are major and minor roads outside urban areas (DfT, 2013a). In 2016, 61% of all road accident casualties occurred on urban roads (RRCGB, DfT, 2017).
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- There is a wealth of literature covering the myriad issues that fall into the category of road safety on urban roads. There are a number of publications that are of particular relevance and provide a useful overview including the Department for Transport’s Manual for Streets (DfT, 2007) and the subsequent Manual for Streets 2 Wider Application of the Principles (CIHT, 2010). More recent publications have been produced by the CIHT to assist professionals in implementing the Manual for Streets guidance including: ‘Planning for Cycling’ (CIHT, 2014), ‘Involving the Public and Other Stakeholders’ (CIHT, 2015a), ‘Planning for Walking’ (CIHT, 2015b) and ‘Designing for Walking’ (2015c).
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- In recent years there has been considerable momentum towards the introduction of 20mph zones in urban environments. 20mph zones differ from shared space schemes in that they do not typically require extensive re-engineering of the road environment. For example, research has been conducted into the effectiveness of 'sign-only' 20mph schemes (e.g. Tapp & Toy, 2015a) in combination with materials produced to aid those interested in their implementation. The overall effect of 20mph zones on casualty reduction has been positive. For example, in London, it has been estimated that a reduction of 42% in killed or seriously injured casualties has been achieved in areas where 20mph zones have been implemented (Grundy et al., 2008).
- The most vulnerable user group in the urban setting is pedestrians. On urban roads, pedestrians account for 34% of KSIs, with car occupants accounting for 22%. Motorcyclists and pedal cyclists each comprise roughly a fifth (RRCGB, DfT, 2016). Pedestrians and cyclists together account for a disproportionately high number of casualties in urban areas, whilst accounting for only a small percentage of the overall traffic. These figures serve to demonstrate that not only are pedestrians (and to a lesser extent cyclists) more at risk of an accident, they are also far more vulnerable to physical injury when accidents do occur. However these modes have health benefits that can outweigh this risk.
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Methodology

The mixed use nature of ‘urban roads’ means that relevant road safety issues are diverse and wide-ranging. As such, it has not been possible to cover all relevant areas in this synthesis. Correspondingly, there is a wealth of literature covering the myriad issues that fall into the category of road safety on urban roads, and a literature search of all relevant research would be unmanageable.

The methodology used for the other syntheses (see the Methodology section of the Observatory website <http://www.roadsafetyobservatory.com/Introduction/Methods>) was felt not to be appropriate for this synthesis, which aims to provide a general overview of this topic and to provide direction to further information (often to other syntheses on more specific topics within the urban road domain).

Two publications that are of particular relevance and provide a useful overview are the Department for Transport’s Manual for Streets (DfT, 2007) and the subsequent Manual for Streets 2 Wider Application of the Principles (CIHT, 2010), both of which were major publications that brought together research from a wide range of sources. The method used was therefore to use these documents as a basis for this review and restrict further searches to research published after 2010. The aim was not to include details of all research since the publication of Manual for Streets 2; instead the literature was searched to confirm that the information contained in those publications (and references therein) represented the latest thinking on the subject.

Searches were carried out using the TRID (Transport Research International Documentation) database. TRID is a new database that combines ITRD (OECD’s International Transport Research Documentation database) and the US-based database TRIS (Transport Research Information Service). Three searches were carried out using the following search terms:

- Search 1: “manual for streets”
- Search 2: “Shared space” OR “shared use” OR “living streets”
- Search 3: “road safety” AND “urban area”

The search terms used were purposefully broad in order to identify overarching research. Search terms related to the individual issues within this area (e.g. pedal cyclists, traffic calming, children) were not used, as specific research focusing on these topics will have been identified and reviewed as part of the methodology for the other syntheses.

The results were reviewed to identify any research that builds upon, expands or challenges the general concepts presented within Manual for Streets 2 and to ensure that the overview provided represents the accepted best practice. One document was judged to contain important counterarguments and was therefore included (Moody & Melia, 2014).

A separate search was conducted of Department for Transport publications (and references therein) to provide further detail where useful within the review.

This synthesis was reviewed and updated in 2016 to ensure it still represents the latest thinking in this field. The methodology used involved a search for recent updates of the key documents cited in the synthesis. A further search of the literature was conducted to identify pertinent developments relevant to the urban roads environment.

Manual for Streets 2 remains the most recent guidance from CIHT in this field. However subsequent publications providing advice on implementation of this guidance have been produced, including; 'Planning for Cycling' (CIHT, 2014), 'Involving the Public and Other Stakeholders' (CIHT, 2015a), 'Designing for Walking' (CIHT, 2015b) and 'Planning for Walking' (2015c).

Note

This review includes statistics from Reported Road Casualties Great Britain 2014, which were the latest available data when the review was written. In December 2017, statistics from Reported Road Casualties Great Britain were updated to [Reported Road Casualties Great Britain 2016](#).

Research Findings

The definition of urban roads is based on the 1991 Office of the Deputy Prime Minister definition of urban settlements. The urban areas used for tables in bulletins from 2013 are based on 2011 census data. Earlier bulletins are based on 2001 census data. In 2014, 65.1% of all road accident casualties occurred in urban areas (DfT, 2015a). The term 'urban roads' covers everything from quiet lightly-trafficked residential streets to heavily-trafficked urban motorways or busy city centres. The mixed use nature of these roads means that road safety issues are similarly diverse and wide-ranging, and as such it is impossible to cover all relevant areas. This document aims to act as a starting point for this topic and to provide direction to further information.

On urban roads, pedestrians account for around a third of KSIs, with car occupants, motorcyclists and pedal cyclists each comprising roughly a fifth (DfT, 2015a). In 2014, 591 fatal and 11,892 serious road accidents were reported on urban roads (DfT, 2015a). In terms of accident causation factors on urban roads, "failed to look properly" was reported as a contributory factor for 49% of accidents, compared with 34% of accidents on rural roads and 33% of accidents on motorways (DfT, 2015a). Twenty five percent of fatal accidents on urban roads involved a pedestrian that failed to look properly and a further 12% involved a pedestrian that failed to judge a vehicle's path or speed (DfT, 2015a).

There is a wealth of literature covering the myriad issues that fall into the category of road safety on urban roads. Two publications that are of particular relevance and provide a useful overview are the Department for Transport's Manual for Streets (DfT, 2007) and the subsequent Manual for Streets 2 Wider Application of the Principles (CIHT, 2010). Manual for Streets (MfS) provides advice for the design of residential streets in England and Wales and presents a new approach to the creation of sustainable and inclusive public spaces. For the purposes of this topic, the Manual for Streets 2 (MfS2) is of more direct relevance as it expands the remit from lightly-trafficked residential streets by applying the MfS principles more widely to, amongst others, town and city centres, urban and suburban areas, urban extensions, and interchanges. The original Manual for Streets was developed from an extensive evidence base, including primary research, reviews of existing research, case studies, good practice guidance and consultation with a wide range of stakeholders and practitioners (York et al., 2007). Manual for Streets 2 extended this to include subsequent research, in particular studies from the Department for Transport on mixed priority routes and shared space, detailed research and case studies by the Commission for Architecture and the Built Environment (CABE) and additional primary research (CIHT, 2010). The CIHT has recently released a range of guidance documents that deal with different types of urban road users e.g. those who cycle (see CIHT, 2014) and those who walk (see CIHT, 2015b and 2015c).

For those interested in engaging the public and other stakeholders a guidance document has been produced for this purpose (see CIHT, 2015a). This document states that "it is now considered best practice for transport professionals to act as facilitators of engagement –providing technical guidance, knowledge and advice on

schemes – and not simply to ‘ask for your view’. While involving the public as little as possible may make professional life easier in the short term, the reason that more proactive participation is considered best practice is because it is likely to deliver better outcomes in the long term”.

The Manual for Streets documents were developed from a new way of thinking about urban road safety. The typical perception of urban roads, and arguably the most relevant to road safety, is that of a highly-trafficked road with many interactions between road users, be they cars, buses, lorries, cyclists or pedestrians. Previously, traditional approaches were focussed on segregation of road users to minimise these interactions. New towns built in the 1950s and 60s typify this style of urban planning. Urban areas were designed to keep pedestrians and cyclists entirely separate from motor traffic, often including large residential areas where cars were banned altogether, and using infrastructure such as subways and bridges when interactions were unavoidable.

An alternative approach, originating in the Netherlands, aims to achieve the complete opposite. The safety problems on urban roads stem from too many people trying to use the same space, causing problems for vulnerable road users; rather than segregating users, the concept of “shared space” aims to minimise demarcations between users, finding ways to reduce the dominance of motor vehicles and changing the way that the space operates.

The ratio between the ‘movement’ function of a street (throughput and access) and the ‘place’ function (sense of a place to spend time in) depends on the type of road. For example a motorway is entirely weighted towards the movement function, whereas a residential cul-de-sac is weighted towards place. The shared space concept is most often applied to a high street environment where both elements are important and a careful balance must be achieved. The aim is to enhance place without restricting movement too much; a well-designed street can increase social cohesion, encourage walking and cycling with associated health benefits, and improve local economic performance (DfT, 2011).

It is important to note, however, that poorly implemented shared space schemes can have adverse effects – for example, removing street furniture without fully understanding the impact. For most roads, the traditional format is likely to remain in place for many years, and therefore the road safety requirement will need to be focused on finding ways to implement affordable measures on existing elements as well as more substantive changes on individual isolated elements.

Often many local authority objectives can be addressed through the use of pedestrianisation, such as reducing casualties, improving accessibility and improving air quality. It is important to note however that local authorities face a potential conflict between the duties of the Road Traffic Act (reducing and preventing casualties) and the Network Management Act (keeping traffic moving). Therefore, in many situations shared space may be better than pedestrianisation as it maintains access for public transport, cyclists, delivery vehicles etc. and reduces the network impacts that may be caused by totally closing a link to traffic. It can also avoid causing areas to be deserted at night with associated personal security issues, which can be an unwanted side effect of full pedestrianisation (CIHT, 2010).

Shared space is a concept or set of design principles and recommendations rather than a definitive design; it is about the individual characteristics and how they work in combination. A characteristic of many schemes is the reduced use of signs and markings, which has a twofold effect – both making drivers aware that this is not a ‘normal road’ and should not be treated as such, and also increasing uncertainty as to priorities, to which they respond with reduced speeds and more cautious behaviour.

Usually road user behaviour, particularly that of car drivers, is largely governed by the physical highway infrastructure around them; in shared space the environment provides less indication of how drivers should behave, which requires them to interpret the behaviour of other users and respond accordingly (DfT, 2011). The unpredictability causes their perception of risk to increase, making drivers more attentive, engaged and careful. Shared space is about users responding to each other, rather than both responding to traffic signals (as with a conventional pedestrian crossing for example), thus encouraging personal responsibility and socially responsible behaviour.

For shared space schemes, the aim is usually to achieve vehicle speeds of under 20mph, and preferably less than 15mph. Vehicle speed and flow have a significant impact on pedestrians’ willingness to share space and also drivers’ willingness to give way to other users. At flows of above 100 vehicles per hour, pedestrians tend to treat the path taken by vehicles as a ‘road to be crossed’ rather than a ‘space to share’ although a well-designed shared space can increase this threshold. As traffic flow increases, there is reduced willingness of pedestrians to use all of the street space (DfT, 2007). Additionally as vehicle speeds decrease, the proportion of drivers giving way increases, particularly once the speed drops below 15mph (DfT, 2011).

Another characteristic is that of ‘level surface’ and removal of kerbs, which reduces the definition of ‘pedestrian areas’ and implicitly indicates that the road is shared. Level surface aims to remove the physical and psychological barrier to pedestrian movement, encourages drivers to expect pedestrians not to be confined, and removes the implied priority of vehicles.

Available evidence shows comparable casualty levels for shared space versus conventional streets, despite shared space streets showing increased use by pedestrians and cyclists (DfT, 2011). However not all user groups are in favour of the shared space concept, and it is frequently opposed by organisations representing the blind, partially sighted and deaf. These users often express a strong preference for clear demarcation and separation, and can have difficulties resulting from the removal of familiar features such as kerbs and railings.

Other studies (Moody & Melia, 2014) suggest that the claims made by shared space advocates have overstated the available evidence. They have concluded that some pedestrians, particularly the elderly, can feel intimidated by the shared space and prefer conventional crossings, and that most pedestrians still give way to vehicles and feel less safe. Therefore, caution is required when proposing and implementing such schemes, particularly in environments of high traffic flows.

The effect on cycling and cyclists can be both positive and negative – in many pedestrianised areas there are restrictions on cycling, which are not usually present in shared space schemes. This factor together with the reduced impact of vehicles can encourage cycling, however this can in turn increase interactions (and potential conflicts) between pedestrians and cyclists.

In recent years there has been considerable momentum towards the introduction of 20mph zones in urban environments. 20mph zones differ from shared space schemes in that they do not typically require extensive reengineering of the road environment. In Great Britain, approximately 20% of residential streets have signed 20mph limits, and many more schemes are planned (Tapp et al., 2015b). The effect of 20mph zones in London has been approximately estimated to be a reduction in killed or seriously injured casualties of 42% (Grundy et al., 2008). DfT has produced guidance on setting local speed limits which includes 20mph zones (2013d). For those considering the introduction of 20mph schemes, there are a range of useful materials available in the public domain. For example Tapp & Toy (2015a) have produced a step-by-step toolkit in addition to a range of informational materials and guidance to make the introduction of 20mph schemes successful. Similarly, Transport Scotland produced a 'Good Practice Guide' on 20mph schemes. Research by Tapp et al. (2015b) found that there are a number of behaviours that may negatively affect compliance with 20mph speed zones. A summary is provided below (some titles have been paraphrased from the original source):

- **Contested link between speed and accidents:** the lack of awareness of or disagreement with the link between speed and accidents
- **Speed limit attitude–behaviour incongruence:** the approval of speed limits but lack of personal adherence to limits
- **Personalising speed limits:** the tendency to drive above the speed limit but to regard this behaviour as law abiding
- **Self enhancement bias:** the tendency to regard one's own driving skills as superior to others; or to regard one's own speeding as less than or safer than others
- **Social contagion effect:** the tendency to drive at the perceived average speed of other traffic
- **False consensus effect:** the general belief that other drivers travel at higher speeds than the reality
- **Automaticity:** inattentive and / or habitual driving that results in the lack of awareness of one's own speed
- **JIMBY effect:** 'Just in my back yard' – the tendency to drive slowly in one's own neighbourhood but more quickly elsewhere.

Urban road safety measures have traditionally focused on traffic engineering and the reduction of speed. Whilst these areas are still of critical importance, many other design issues are now also considered. In the remainder of this document, some of these issues are discussed in brief, with links to further information provided where appropriate.

This document does not claim to cover all relevant areas, nor should these issues and measures be considered in isolation. Urban areas will only continue to grow, and safety must be built in at the planning stage. Using a network management approach can be of benefit - classifying network elements by their primary purpose (notably the balance between the 'movement' and 'place' functions) and ensuring design is consistent with that purpose. A successful approach to urban road safety relies on taking an holistic view and finding workable solutions that optimise the benefit for all users.

Vulnerable road users

Other related syntheses:

- *Cycling infrastructure*
- *Pedal cyclists*
- *Motorcyclists*

Pedestrians

The most vulnerable user group in the urban setting is pedestrians. On urban roads, pedestrians account for around a third of KSIs, with car occupants, motorcyclists and pedal cyclists each comprising a roughly a fifth (DfT, 2016). Pedestrians and cyclists account for a disproportionate number of casualties in urban areas, whilst accounting for only a small percentage of the overall traffic. These figures serve to demonstrate that not only are pedestrians (and to a lesser extent cyclists) more at risk of an accident, they are also far more vulnerable when accidents do occur. However these modes have health benefits that can outweigh this risk.

Highway authorities have a public health duty to make so-called 'active travel' low risk and to make these road users safer. Also, perception of risk is arguably as important as absolute risk; if users do not feel safe when cycling or walking then they will do so less often and the benefits will be diminished.

In general, cyclists should only be removed from the road where there is an overriding safety requirement that cannot be met by on-carriageway improvements such as:

- traffic speed / volume reduction,
- reduction in HGV,
- junction / hazard site treatment,
- reallocation of carriageway space (DfT, 2012).

The perception is that taking cyclists off the carriageway will increase safety, but in fact it can be less safe, particularly where such cycle routes cross roads, private access and bus stops etc., where there is significant potential for conflict. Additionally these routes are typically much slower for cyclists as side roads and access can lead to 'stop-start' riding, which can tempt cyclists back onto the main carriageway or deter them from cycling altogether. Similarly, absence of pedestrian provision alongside the main carriageway tends to cause drivers to travel faster, thus negatively impacting road safety.

The ideal aim is therefore that pedestrians and cyclists should be catered for in multifunctional streets rather than segregated from motor traffic (CIHT, 2010). However despite this aim and the rise of shared spaces, in many environments separation of pedestrians and cyclists from motor traffic is still necessary and forms the most appropriate approach. Shared use routes are designed to accommodate the movement of pedestrians and cyclists and can be segregated or unsegregated – by line, barrier, kerb level difference etc. (DfT, 2012). They can be very controversial, particularly when converting an existing footpath which can be seen as a reduction in pedestrian provision. Inappropriate implementation can make things worse for both user groups.

There are advantages and disadvantages to segregation (Phil Jones Associates, 2011); previously it has been considered good practice to segregate where possible, seemingly based on the presumption there is considerable potential for conflict on unsegregated routes. However designers are increasingly being encouraged to make decisions appropriate to the scheme context (DfT, 2012). Research carried out to compare conflicts between routes that were unsegregated and segregated (by a white line) concluded that there was no evidence that segregation materially reduces the potential for conflict (Atkins, 2012).

Innovation in cycling provision is a growth area and many road operators and authorities are looking to European best practice for inspiration. One example is hybrid cycle tracks which reallocate carriageway space for a cycle lane raised above carriageway surface, but below the footway. These are common in Copenhagen and other places on the continent (DfT, 2012). Transport for London are currently carrying out a major cycle safety research project looking at a range of junction layouts and traffic technology that are used in other countries, such as the use of 'Dutch-style' roundabouts and low-level cycle signals (TfL, 2013).

There is a good deal of further information in various guidance documents regarding design principles for pedestrian and cycling infrastructure e.g. (DfT, 2005a; DfT, 2005b; DfT, 2008b). This section has focused on built-up areas where road use by pedestrians and cyclists is likely to be frequent. Information on accommodating cyclists and other non-motorised users on trunk roads can be found in DMRB (Highways Agency, 2005).

DfT has produced a paper entitled 'Investing in Cycling and Walking: The Economic Case for Action' (DfT, 2015b). The paper seeks to "summarise recent changes in the evidence base as well as the key legacy studies that should help not only to quantify the impacts resulting from investment in cycling and walking, but also to make the case for investing in cycling and walking above other demands on budgets". The paper also aims to point towards a number of relevant studies for the UK context and cover the main issues for the practitioners (i.e. local authorities). It also provides a brief overview of how to demonstrate the economic case for a new cycling and walking proposal.

Junctions and crossings

Other related syntheses:

- *Pedestrians*
- *Pedal cyclists*

Junctions and crossings are critical to safety as this is where most interactions between users and thus most collisions tend to occur; these interactions are usually between vehicles and vulnerable road users and as such there is significant overlap with the previous section.

There is a great deal of information and advice available on the most appropriate type of crossing for various situations, for example uncontrolled junctions can be particularly relevant for certain urban centres as they have been shown to increase driver uncertainty and thereby reduce speeds (CIHT, 2010). This concept can be taken even further - crossings in shared space areas are often 'courtesy crossings'. These are crossings, marked by change in surface texture, tonal contrast, surface level or similar, where there is no statutory requirement for drivers to give way to pedestrians at all, but in practice it appears that drivers tend to treat courtesy crossings as they would a zebra crossing (DfT, 2011). Pedestrian crossings should be placed on pedestrian desire lines, otherwise there is a high likelihood of crossings (formal or informal) not being used, potentially increasing the risk of conflict.

Even in situations where formal signal controlled crossings are required, there are measures that can be taken to improve facilities for pedestrians. For example, if there is an all-red phase during the signal cycle then diagonal crossing facilities can be provided, which are much quicker and more convenient for pedestrians (although it is worth noting that the typical shorter crossings will still be required for visually- or mobility-impaired pedestrians) (CIHT, 2010). A great deal of information is available on the principles of traffic signal control (DfT, 2006) and the physical design of junctions and crossings to optimise safety (DfT, 2005b). As discussed earlier, segregation of different road user types should be avoided where possible, for example the use of grade separation (subways and bridges) is discouraged.

Roundabouts have the lowest rate and lowest severity for motor vehicle collisions, but they have a poor record for cyclist safety and can also be a barrier to pedestrian movement. Slower speeds for vehicles, and hence increased safety for cyclists, can be encouraged through use of narrow exits and entries and small corner radii, resulting in more 'continental-style' compact roundabouts. Tight corner radii are also being used more and more at all junctions; this increases pedestrian and cyclist safety by reducing driver speed and increasing awareness (CIHT, 2010).

Signing, marking, street furniture and lighting

Other related syntheses:

- *Signing and Marking*
- *Street lighting*

As discussed above, a characteristic of many shared space schemes is reduced use of signs and markings in order to increase uncertainty and caution and thus to reduce vehicle speeds. This aligns with a wider initiative to reduce the use of signing and marking on all roads. The Traffic Signs Manual and Traffic Signs Regulations and General Directions (TSRGD) - and subsequent amendments - detail all authorised traffic signs and road markings in the UK; the amendments have, in some cases, reduced the minimum required, giving designers more flexibility (TSRGD, 2011). Rather than following standard signing layouts, it is often possible for practitioners to take a more sensitive approach to suit local circumstances – reducing the use of signing reflects general good practice (DfT, 2011). Signs should only be provided where there is a clear need; ways in which to reduce the number of signs are detailed in various guidance documents (DfT, 2008a; DfT, 2013b; 2013c). An example is provided in the Manual for Streets which notes that centre lines are not a requirement, and reductions in traffic speed have resulted from omitting centre lines, on busy urban routes as well as residential streets.

Excessive signing and marking can reduce users' understanding of the street environment and reduce feelings of personal responsibility for safe and appropriate behaviour (CIHT, 2010). Research has shown that the more signs presented simultaneously, the greater the difficulty for drivers to assimilate all the information (DfT, 2008c). Over-provision of signs can also dilute more important messages by causing information overload, (as well as being aesthetically detrimental to the environment) (DfT, 2013b).

Similar principles apply to over-provision of street furniture such as bollards, seats and litter bins. Reducing and/or repositioning street furniture can keep footways clearer and allow better pedestrian flows, removing unnecessary obstacles. All furniture should have a clear function and if possible should perform more than one function; for example using trees or cycle racks, rather than bollards or guardrails to provide delineation. Street furniture and trees in unconventional positions (such as the middle of the street) can also be effective in reducing vehicle speeds but this should always be done as part of a well-planned and managed approach, not an isolated change.

Lighting should be appropriate to the situation and integral to the streetscape. Well-designed lighting can be incorporated into street furniture thus further reducing clutter. An example is the use of lighting columns to mount traffic signal heads, or combined lighting columns and striped zebra beacon poles. In shared space areas, lighting must be fairly even and adequate to observe pedestrian behaviour at any time of day. The type of lantern is important – for example to render pedestrian and cyclist movement visible to drivers as well as rendering colour which is important for user confidence, which in turn encourages pedestrian and cyclist activity in the hours of darkness.

Carriageway design, speed, speed limits and traffic calming

Other related syntheses:

- *Speed*
- *Speed Limits*
- *Traffic calming*
- *Surfaces*

As previously mentioned, traditional road safety measures tend to revolve around the physical design of the carriageway and speed reduction techniques. These methods are still extremely relevant, and indeed many of the measures discussed so far consist of one or both of these elements. For example, much of the shared space concept aims to reduce vehicle speeds.

Keeping speeds low has been demonstrated to have significant safety benefits, particularly where space is shared between different user groups (CIHT, 2010). The Design Manual for Roads and Bridges confirms that designing for higher speeds is self-fulfilling, i.e. designing a scheme such that higher speeds are safer actually causes drivers to travel faster.

Design of a carriageway is generally based on a ‘design speed’, which in the past has tended to be based (in urban areas) on the existing speed limit but with allowance for vehicles travelling at higher speeds. Now it is considered inappropriate for the design speed to be more than the speed limit (except in rare individual cases) particularly in built-up urban areas; the design speed can be (and often is) lower than the speed limit. In addition, speed limits of 20mph are becoming more and more commonplace (as discussed elsewhere in this synthesis).

Streets can be designed to encourage lower speeds in several ways, notably (DfT, 2011):

- Making the street look and feel different
- Creating ambiguity for drivers
- Making it physically difficult to drive through quickly

A change in surfacing can be effective for achieving the first principle – for example, block paving has been found to reduce traffic speeds by between 2.5 and 4.5mph, compared with speeds on asphalt surfaces (York et al., 2007). Other examples are visual narrowing and reducing forward visibility to change a street’s character. Speeds can vary according to the impression of constraint that the layout and alignment impart to the driver (Highways Agency, 1993). Much of the shared space concept is aimed at achieving this impression of a different kind of road, as well as increasing ambiguity as mentioned in the second principle. The third principle covers physical design features such as tightening up road geometry with small corner radii at junctions and other forms of traffic calming. Varying carriageway width through non-parallel kerb lines or other physical limits can be effective at reducing traffic speeds.

Although in urban areas, half-batter kerbs are often already used, even lower kerb heights can be easier for pedestrians, particularly mobility-impaired. This aligns with the shared space concept of removing segregation to reduce vehicle dominance, since shared space often has zero kerb height.

Tactile blister paving can be (and often is) used as a delineator strip between the carriageway and footway, particularly in shared spaces where other features such as the kerb are absent. The purpose of tactile paving is to enable visually impaired pedestrians to avoid entering the carriageway by mistake. Trials were carried out as part of the redevelopment of Exhibition Road in London which demonstrated that an 800mm wide strip of corduroy tactile paving could be reliably detected by blind and partially-sighted people, and did not represent a barrier to mobility-impaired people (MVA, 2011).

Further information on all aspects of carriageway design and road geometry can be found in DMRB. (Note that all sections of DMRB are written specifically for trunk roads, and whilst relevant to urban roads, should not be applied uncritically.)

References

References are provided in alphabetical order

	Shared Use Operational Review
Published:	Atkins, 2012 Published on DfT website
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/9181/atkins-shared-use-operational-review.pdf Free
Objectives:	Research into factors influencing design and operation of pedestrian and cyclists shared use facilities.
Methodology:	Behavioural studies.
Key Findings:	Very few conflicts between cyclists and pedestrians observed on segregated or unsegregated routes.
Keywords:	Segregation, cyclists, pedestrians, conflict
Comments:	Guidance document

Title:	Manual for Streets 2: Wider Application of the Principles
Published:	Chartered Institution of Highways and Transportation, 2010
Link: Free/priced:	http://www.ciht.org.uk/en/publications/index.cfm/manual-for-streets-2--wider-application-of-the-principles-2010 £24 to £150 depending on format
Objectives:	"To extend the advantages of good design to streets and roads outside residential areas and to provide an environment that improves the quality of life." (CIHT)
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	Guidance document

Title:	Planning for Cycling
Published:	Chartered Institution of Highways and Transportation, 2014
Link:	http://www.ciht.org.uk/en/document-summary/index.cfm/docid/A462E2ED-886F-491E-BDCAD6B7B4DB7E6E
Free/priced:	Free
Objectives:	<p>Planning for cycling is discussed in these guidelines. The guidance includes sections on:</p> <ul style="list-style-type: none"> • Cycling Characteristics, Behaviour and Trends in the UK • Benefits of Cycling • Current Conditions and Challenges • Legal and Regulatory Context for Cycling • Cycling Strategies and Plans • Planning Cycle Networks and Routes • Promoting Cycling • Monitoring and Evaluation of Cycling Schemes • Further Information on Planning for Cycling
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	Cycling, planning, UK trends, benefits, legal and regulatory context, networks and routes, monitoring and evaluation
Comments:	Guidance document

Title:	Involving the Public and Other Stakeholders
Published:	Chartered Institution of Highways and Transportation, 2015(a)
Link: Free/priced:	http://www.ciht.org.uk/en/document-summary/index.cfm/docid/8BC0682B-958E-435E-BD5E44ED67E01964 Free
Objectives:	Guidelines to encourage and enable transport planning practitioners to engage more effectively with those who stand to be most directly affected by the work they undertake
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	Stakeholder engagement, policy, strategy, scheme design, consultation, public consultation
Comments:	Guidance document

Title:	Planning for Walking
Published:	Chartered Institution of Highways and Transportation, 2015(b)
Link: Free/priced:	http://www.ciht.org.uk/en/document-summary/index.cfm/docid/859203EA-CFA1-4BE7-A136D943E93D4904 Free
Objectives:	This Chartered Institution of Highways and Transportation (CIHT) guideline - Planning for Walking: <ul style="list-style-type: none"> • describes the characteristics of pedestrian journeys • lists the benefits of walking, • identifies factors that discourage walking and how they can be overcome, • summarises the legal framework that applies to pedestrians, • outlines the way that plans and strategies for pedestrian travel are developed.
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	Walking, pedestrian travel
Comments:	This is a summary document. The full document is also available on the CIHT website. These guidelines are complemented by another CIHT document, Designing for Walking (see below).

Title:	Designing for Walking (follow-up to Planning for Walking)
Published:	Chartered Institution of Highways and Transportation, 2015(c)
Link: Free/priced:	http://www.ciht.org.uk/en/document-summary/index.cfm/docid/E4B48D37-9FE7-4C30-92ED822524C777CC Free
Objectives:	This document explains how facilities for walking should be designed, following on from how they are planned, which is covered in Planning for Walking (2015b above).
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	Walking, pedestrians
Comments:	Guidance document

Title:	Inclusive mobility – a guide to best practice on access to pedestrian and transport infrastructure
Published:	DfT, 2005(a)
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3695/inclusive-mobility.pdf Free
Objectives:	To provide guidance on access for those with disabilities and those without disabilities to pedestrian and transport infrastructure.
Methodology:	Guidance document
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Traffic Advisory Leaflet 05/05 Pedestrian facilities at signals
Published:	DfT, 2005(b)
Link: Free/priced:	http://www.ukroads.org/webfiles/tal05-05p1.pdf (Part 1, with extra links to Parts 2, 3 and 4) Free
Objectives:	To provide guidance on various aspects of pedestrian crossings.
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Traffic Advisory Leaflet 01/06 Traffic Signal Control Principles
Published:	DfT, 2006
Link: Free/priced:	http://webarchive.nationalarchives.gov.uk/20120606202850/http://assets.dft.gov.uk/publications/tal-1-06/1-06_1.pdf (Part 1, with extra links to Parts 2, 3 and 4) Free
Objectives:	To provide guidance on various aspects of traffic lights for controlling traffic.
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Manual for Streets
Published:	DfT, 2007 Thomas Telford
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3891/pdfmanforstreets.pdf Free
Objectives:	To provide guidance on residential street design.
Methodology:	Guidance document.
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Local Transport Note 1/08 Traffic management and streetscape
Published:	DfT, 2008(a) The Stationary Office
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3810/ltn-1-08.pdf Free
Objectives:	“To help all those involved in the design of traffic management measures to prepare schemes that consider and care for the streetscape. It assists hands-on designers, project enablers and decision-makers alike. Specifically, it aims to enhance streetscape appearance by encouraging design teams to minimise the various traffic signs, road markings and street furniture associated with traffic management schemes.” (p7)
Methodology:	Guidance and case studies.
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Local Transport Note 2/08 Cycle Infrastructure Design. Underlying principles of designing for pedestrians and cyclists
Published:	DfT, 2008(b) The Stationary Office
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3808/ltn-2-08.pdf Free
Objectives:	“This design guide brings together and updates guidance previously available in a number of draft Local Transport Notes and other documents. Although its focus is the design of cycle infrastructure, parts of its advice are equally appropriate to improving conditions for pedestrians.” (p9)
Methodology:	Design guidance
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Traffic Signs Manual, Chapter 3
Published:	DfT, 2008(c) The Stationary Office
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223943/traffic-signs-manual-chapter-03.pdf Free (pdf) / £40 (hardcopy)
Objectives:	The Traffic Signs Manual is intended to give advice to traffic authorities and their agents on the correct use of signs and road markings. Chapter 3 deals with regulatory signs, which indicate requirements, restrictions and prohibitions.
Methodology:	Guidance document
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Local Transport Note 1/11 Shared Space
Published:	DfT, 2011 The Stationary Office
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3873/ltn-1-11.pdf Free
Objectives:	“This Local Transport Note (LTN) is mainly concerned with the use of shared space on links. While it focuses on High Street environments, many of its principles will apply to other types of shared space. It is intended to assist those designing and preparing street improvement and management schemes. It explains how the scheme development process introduced in LTN 1/08 <i>Traffic Management and Streetscape</i> (DfT, 2008a) can be applied to shared space projects, and presents a series of design considerations and recommendations to inform that process.” (p.5)
Methodology:	Guidance and design considerations
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Local Transport Note 1/12 Shared Use Routes for Pedestrians and Cyclists
Published:	DfT, 2012 The Stationary Office
Link: Free/priced:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/9179/shared-use-routes-for-pedestrians-and-cyclists.pdf Free
Objectives:	This LTN provides guidance on the concepts and design principles for shared use routes. It complements LTN 2/08 Cycle Infrastructure Design and draws on the underlying principles introduced in that document.
Methodology:	Guidance and design principles
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Road lengths statistics: Notes and definitions
Published:	DfT, 2013(a)
Link:	http://assets.dft.gov.uk/statistics/series/road-lengths/road-lengths-methodology.pdf
Free/priced:	Free
Objectives:	Definitions for the terms used in the road lengths statistics used and published by the Department for Transport.
Methodology:	Notes and definitions relating to road lengths statistics published by the DfT www.dft.gov.uk/statistics/series/road-lengths/
Key Findings:	Not a research report.
Keywords:	
Comments:	

Title:	Traffic Advisory Leaflet 01/13 Reducing Sign Clutter
Published:	DfT, 2013(b)
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43525/tal-reducing-sign-clutter.pdf
Free/priced:	Free
Objectives:	This leaflet provide practical advice on reducing sign clutter, as part of 'Signing the Way' – the outcome of the Department's major review of traffic signs policy.
Methodology:	Guidance document
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Setting Local Speed Limits. 20mph Speed Limits and Zones
Published:	DfT, 2013(c) (Department for Transport Circular 01/2013)
Link:	https://www.gov.uk/government/publications/setting-local-speed-limits
Free/priced:	Free
Objectives:	This revised guidance is aimed mainly at local traffic authorities who are responsible for setting speed limits on local roads. It has also been designed to help explain to everyone why and how local speed limits are determined.
Methodology:	DfT Guidance
Key Findings:	Contains guidance on setting local speed limits and explains how local speed limits are set
Keywords:	Speed, guidance, local roads, speed limits
Comments:	This circular has been revised following full public consultation in summer 2012. Further speed-related policy documents can be found on the link above.

Title:	Reported Road Casualties Great Britain 2014
Published:	DfT, 2015(a)
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/463797/rrcgb-2014.pdf
Free/priced:	Free
Objectives:	To present detailed statistics about the circumstances of personal injury accidents in 2014, including the types of vehicles involved, the resulting casualties and factors which may contribute to accidents.
Methodology:	National statistics
Key Findings:	<ul style="list-style-type: none"> • In recent years, non-motorway traffic has been split roughly 50-50 between rural and urban roads. However, the two road types show markedly different casualty patterns • Deaths are disproportionately likely to occur on rural roads, due to the higher speeds on these roads, but serious and slight injuries are more likely to occur on urban roads • In 2014, 591 fatal and 11,892 serious road accidents were reported on urban roads. • On urban roads, pedestrians account for around a third of KSIs, with car occupants, motorcyclists and pedal cyclists each comprising a roughly a fifth

	<ul style="list-style-type: none"> • Across all road and road user types, pedestrians accounted for 25% of fatalities (an increase of 12% on 2013 - 2014) and pedal cyclists accounted for 6% (an increase in 4% on 2013 – 2014). Car occupants accounted for 19% (an increase of 2% on 2013 - 2014), Motorcyclists, 19% (an increase of 2% on 2013 - 2014), and other 5% (a decrease of 11% on 2013 - 2014) • 44% of <i>fatalities</i> occurred in 'built up' areas (40 mph or less) in comparison to 50% in 'non-built-up' areas (40 mph +) and 5% on motorways • 73% of <i>slight</i> injuries occurred in 'built up' areas (40 mph or less) in comparison to 22% in 'non-built-up' areas (40 mph +) and 5% on motorways • 66% of <i>serious</i> injuries occurred in 'built up' areas (40 mph or less) in comparison to 31% in 'non-built-up' areas (40 mph +) and 5% on motorways. Mile-for-mile, the risk of death on rural roads is around 1.7 times that on urban roads • Failed to look properly was reported as a contributory factor for 49% of accidents on urban roads, compared with 34% of accidents on rural roads and 33% of accidents on motorways • 25% of fatal accidents on urban roads involved a pedestrian that failed to look properly and a further 12% a pedestrian that failed to judge a vehicle's path or speed • In summary: whilst personal injury accidents are more likely to occur on urban roads, where they do occur on rural roads, they are more likely to have fatal outcomes
Keywords:	Urban roads
Comments:	

Title:	Investing in Cycling and Walking The Economic Case for Action
Published:	DfT, 2015(b)
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416826/cycling-and-walking-business-case-summary.pdf
Free/priced:	Free
Objectives:	<ul style="list-style-type: none"> • To point to relevant studies / evidence in a UK context; • To help practitioners quantify the impacts resulting from investment in cycling and walking; • Provides a step by step illustration based on a hypothetical example; • Contains a spreadsheet that can be used to calculate the cost / benefit ratio for existing or planned schemes
Methodology:	DfT Guidance
Key Findings:	N/A
Keywords:	Cycling, walking, economic benefit, economic case, investment in cycling and walking, return on investment
Comments:	

Title:	20mph zones and Road Safety in London
Published:	Grundy, C., Steinbach, R., Edwards, P., Wilkinson, P. and Green, J. (2008). 20mph zones and Road Safety in London: A report to the London Road Safety Unit
Link:	http://content.tfl.gov.uk/20-mph-zones-and-road-safety-in-london.pdf
Free/priced:	Free
Objectives:	The study aimed to provide robust evidence on the effects of 20mph zones in London
Methodology:	<ul style="list-style-type: none"> • Describing 20mph zones in London using Geographic Information Systems; • Quantifying the effects of 20mph zones on collision and casualty risk; • Assessing whether 20mph zones change the pattern of injuries for local residents compared with non-local travellers; • Quantifying the cost-effectiveness of 20mph zones in terms of the number of casualties prevented against the cost of implementation; • Assessing the potential casualty reductions in London from future expansion of the number/size of 20mph zones
Key Findings / outputs:	The study provides robust evidence for the beneficial effects of 20mph zones on road safety in London, with the best estimate of the overall effect being a reduction in all casualties of 42% compared with outside areas
Keywords:	London, 20mph schemes, policy and practice, effect of 20mph zones
Comments:	Access the full report via the link above

Title:	Design Manual for Roads and Bridges, Highway Link Design Volume 6, Section 1, Part 1, TD9/93
Published:	Highways Agency, 1993
Link:	http://www.dft.gov.uk/ha/standards/dmrb/vol6/section1/td993.pdf
Free/priced:	Free
Objectives:	“The Standards sets out the elements of design and principles for their co-ordination, for geometric design of an existing carriageway or new build situation.”
Methodology:	National standards and guidance
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Design Manual for Roads and Bridges, Provision for Non-Motorised Users Volume 5, Section 2, Part 4, TA91
Published:	Highways Agency, 2005
Link:	http://www.dft.gov.uk/ha/standards/dmrb/vol5/section2/ta9105.pdf
Free/priced:	Free
Objectives:	“This Advice Note provides guidance in relation to provision for non-motorised users, through the design and implementation of both on- and off- carriageway provision including crossings, junctions and general design considerations.”
Methodology:	National standards and guidance
Key Findings:	Guidance document, not a research report.
Keywords:	
Comments:	

Title:	Shared space: Research, policy and problems
Published:	Moody, S. and Melia, S. (2014) Shared space: Research, policy and problems. <i>Proceedings of the Institution of Civil Engineers - Transport</i> , 167 (6). pp. 384-392. ISSN 0965-092X Available from: http://eprints.uwe.ac.uk/17937
Link:	http://eprints.uwe.ac.uk/17937/
Free/priced:	Free
Objectives:	To critically examine the claims made in national guidance to local highway authorities on shared space schemes.
Methodology:	Primary research reported in the paper examines one of the sites in the 'official study' in Ashford, Kent, in greater depth, using video observation and a street survey of pedestrians.
Key Findings:	<ul style="list-style-type: none"> • Most pedestrians divert away from their desire lines, give way to vehicles and felt safer under the original layout • Some of the claims made on behalf of shared space have overstated the available evidence.
Keywords:	Shared space; pedestrians; conflict; priority; safety
Comments:	

Title:	Exhibition Road Corduroy Delineator Testing
Published:	MVA Consultancy, 2011
Link: Free/priced:	http://www.rbkc.gov.uk/PDF/20110616%20MVA%20Exhibition%20Road%20Delineator%20Testing_Final%20Report%20%20Appendices.pdf Free
Objectives:	<p>“To undertake testing to determine whether, in an on-street environment, the corduroy delineator paving introduced as part of the Exhibition Road single-surface scheme:</p> <ul style="list-style-type: none"> • Can be detected by blind or partially sighted people when approached from an acute angle; and • Is overpassable by people with mobility impairment.” (p5)
Methodology:	<p>Two groups of participants were recruited to take part in the study – Visually impaired and Mobility impaired.</p> <p>The testing comprised three parts: Pre-test questionnaire, Testing if and where the delineator paving was detected (for visually impaired) and if the delineator paving was overpassable (for mobility impaired), Post-test interview.</p> <p>Corduroy tests were carried out at different angles and control tests were also used.</p>
Key Findings:	The overall conclusion was that 800mm wide corduroy delineator paving was reliably detected by blind or partially sighted participants in these tests when approached from an acute angle (of between 1 and 35 degrees) and was overpassable by participants with mobility impairments.
Keywords:	Delineator; visually impaired; mobility impaired; corduroy paving;
Comments:	

Title:	The Merits of Segregated and Non-segregated Traffic-free Paths
Published:	Phil Jones Associates, 2011 Sustrans
Link: Free/priced:	http://www.sustrans.org.uk/sites/default/files/images/files/migrated-pdfs/Phil%20Jones%20Associates%20report%20-%20September%202011.pdf Free
Objectives:	“Phil Jones Associates was commissioned by Sustrans in 2008 to carry out a literature based research study into segregated and non-segregated traffic-free paths. This was needed to provide an evidence base in connection with Sustrans’ proposal to the Welsh Assembly, which would place a duty on Highway Authorities to develop and maintain a network of traffic free paths for walkers, cyclists and disabled people across Wales. PJA was instructed in May 2011 to produce this updated version of the report, reflecting new documentation and research that has been published in the intervening period.” (p3)
Methodology:	Literature review of: <ul style="list-style-type: none"> • Policy statements and produced by Sustrans, Guide Dogs for the Blind Association and the Joint Committee for Blind and Partially-Sighted People • Guidance and standards from the UK • Guidance and standards from overseas • Primary research, case studies and academic papers from various sources
Key Findings:	<ul style="list-style-type: none"> • Traffic-free routes are vitally important if cycling and walking are to be encouraged • Both segregated and non-segregated paths have their advantages and disadvantages • Actual levels on shared paths are low, and perceptions of conflict are often lower than focus groups may suggest • Further research is advisable into the response of vulnerable groups to shared paths (e.g. blind and partially-sighted people)
Keywords:	Pedestrians; cyclists; conflict; shared use; segregation
Comments:	

Title:	20's Plenty
Published:	Tapp, A. (Bristol Social Marketing Centre) and Toy, S., (Sustrans), 2015(a)
Link:	http://www2.uwe.ac.uk/faculties/BBS/BUS/Research/BSMC/PDF%20Project%20Docs/20s%20Plenty.pdf
Free/priced:	Free
Objectives:	To explore the effectiveness of social marketing interventions to support the implementation of signs-only 20mph limits
Methodology:	<p>The action-research (i.e. the study was carried out during the implementation of 20mph limit pilot schemes) project had a number of parallel and overlapping workstreams:</p> <ul style="list-style-type: none"> • A literature review to research driver attitudes and behaviour towards speed and best practice in influencing driving behaviour and speed choice; • Research to learn from Bristol's 20mph limit pilots through analysis of monitoring data and in-depth interviews with stakeholders; • Study visits to learn from other 20mph limit initiatives through site visits and in-depth interviews with stakeholders; • Active engagement with community groups in Bristol to identify and potentially support local initiatives promoting 20mph limit compliance; • Qualitative research with Bristol residents to gain insights into attitudes and stated behaviour with regard to 20mph limits; • Observations on actual driving behaviour in the 20mph limit pilot areas.
Key Findings / outputs:	<p>The research project resulted in a range of informational material and guidance to make the introduction of 20mph limits successful including:</p> <ul style="list-style-type: none"> • The 8-page booklet Making 20mph stick offers a brief overview of the vision, with ideas and inspiration for putting it into action. • The 20mph Research Findings document is an in-depth report including a full review of evidence, case studies from other cities piloting 20mph limits and analysis of the qualitative data including transcripts of the focus groups and in-depth interviews. • The 20mph Practical Guide is a step-by-step toolkit aimed at those interested in implementing a signs-only 20mph scheme. • A presentation given to delegates at the 20's Plenty envisioning workshop held on 13 March 2012.
Keywords:	20's Plenty, 20mph schemes, action research
Comments:	The link above contains links to the project outputs

Title:	Support and compliance with 20mph speed limits in Great Britain
Published:	Tapp, A., Nancarrow, C., and Davis A. 2015(b). Support and compliance with 20mph speed limits in Great Britain. Transportation Research Part F: Traffic Psychology and Behaviour. Vol. 31 pp. 36 – 53.
Link:	http://www.sciencedirect.com/science/article/pii/S136984781500042X
Free/priced:	£20.00 approx. (\$27.95)
Objectives:	To determine: <ul style="list-style-type: none"> • Levels of support and opposition to 20mph speed limits by drivers. • The reasons for support or opposition. • The extent to which drivers claim they may or may not comply with 20mph limits. • The nature of the interactions between support/opposition and compliance/non-compliance. • The effect of other motorists on a driver's speed. • Attitudes to driving and speed limits, and how these might affect behaviour.
Methodology:	Survey (administered by YouGov)
Key Findings:	The following behaviours were identified as potentially negatively impacting compliance with 20mph limits: <ul style="list-style-type: none"> • Contested link between speed and accidents: the lack of awareness of or disagreement with the link between speed and accidents • Speed limit attitude–behaviour incongruence: the approval of speed limits but lack of personal adherence to limits • Personalising speed limits: the tendency to drive above the speed limit but to regard this behaviour as law abiding • Self enhancement bias: the tendency to regard one's own driving skills as superior to others; or to regard one's own speeding as less than or safer than others • Social contagion effect: the tendency to drive at the perceived average speed of other traffic • False consensus effect: the general belief that other drivers travel at higher speeds than the reality • Automaticity: inattentive and / or habitual driving that results in the lack of awareness of one's own speed • JIMBY effect: 'Just in my back yard' – the tendency to drive slowly in one's own neighbourhood but more quickly elsewhere.
Keywords:	20mph zones, social marketing, compliance
Comments:	Research paper. The key findings have been paraphrased from the original source for simplicity.

Title:	Traffic Signs Regulations and General Directions (TSRGD) 2002, SI 3113
Published:	The Stationary Office, 2002
Link: Free/priced	http://www.legislation.gov.uk/uksi/2002/3113/contents/made http://www.legislation.gov.uk/uksi/2002/3113/pdfs/uksi_20023113_en.pdf
Objectives:	Legislation that sets out the design and conditions of use of official traffic signs on or near roads in the UK
Methodology:	UK legislation (Statutory instrument)
Key Findings:	Legislation, not a research report.
Keywords:	
Comments:	

Title:	Traffic Signs Regulations (Amendment) (No 2) and General Directions (TSRGD) 2011, SI 3041
Published:	The Stationary Office, 2011
Link: Free/priced:	http://www.legislation.gov.uk/uksi/2011/3041/contents/made http://www.legislation.gov.uk/uksi/2011/3041/pdfs/uksi_20113041_en.pdf
Objectives:	This amendment makes minor changes to SI 3113, including changes to cycleway signage requirements.
Methodology:	UK legislation (Statutory instrument)
Key Findings:	Legislation, not a research report.
Keywords:	
Comments:	An TSRGD web-app has also been released to support the traffic signs industry (available to download from www.tsrgd.co.uk).

Title:	Transport for London Press Release ‘Cycle Safety trial under way’
Published:	TfL, 2013
Link:	https://tfl.gov.uk/info-for/media/news-articles/cycle-safety-trial-under-way
Free/priced:	Free
Objectives:	
Methodology:	Press release
Key Findings:	Press release
Keywords:	
Comments:	

Title:	Good Practice Guide On 20mph Speed Restrictions
Published:	Transport Scotland, 2015
Link:	http://www.transportscotland.gov.uk/system/files/documents/guides/20%20mph%20Good%20Practice%20Guide%20-%202019%20December%202014%20-%20Version%20to%20be%20published.pdf
Free/priced:	Free
Objectives:	<ul style="list-style-type: none"> • To provide a ‘Good Practice Guide’ for 20mph speed restrictions
Methodology:	<ul style="list-style-type: none"> • A ‘Good Practice Guide’
Key Findings / outputs:	<ul style="list-style-type: none"> • The Guide contains: <ul style="list-style-type: none"> - Background - Factors to be considered when setting 20mph speed restrictions - Speed measurement - Enforcement - Legislative requirements - 20mph speed restriction options
Keywords:	20mph schemes, good practice, speed measurement, enforcement
Comments:	Access the full report via the link above

Title:	The Manual for Streets: Evidence and research
Published:	York, I., Bradbury, A., Reid, S., Ewings, T. and Paradise, R. (2007) TRL Report 661, Transport Research Laboratory
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3893/manualforstreetsevidence.pdf
Free/priced:	Free
Objectives:	<p>“This research undertaken by TRL provides the evidence base upon which the revised geometric guidelines in the Manual for Streets are based, including:</p> <ul style="list-style-type: none"> • Link widths • Forward visibility • Visibility splays • Junction spacing” (p.4)
Methodology:	<p>Twenty sites were selected throughout the UK for site surveys to obtain primary data for examining relationships between geometry, the environment, speed and casualties.</p> <p>At each case study site, a household survey was also undertaken to obtain the residents’ opinions of their streets. Three hundred household questionnaires were returned for analysis.</p>
Key Findings:	<ul style="list-style-type: none"> • Lower vehicle speeds are associated with reduced road width and reduced visibility, both on links and at junctions • Site type is not a significant determinant of speed • Geometry can lower speeds reducing both the likelihood and severity of accidents due to conflicting movements at junctions • Stopping distances on links and at junctions have a margin of safety down to a visibility of around 20 metres, in the environments studied, unless other speed reduction features are incorporated • Parking was found to reduce speeds on links and at junctions by 2 to 5mph, due to perceived danger causing reduced speed. The effect of this on safety is unclear. • The largest effect on speeds was found to be associated with reducing lines of sight.
Keywords:	Speed reduction; road geometry; stopping distances; lines of sight
Comments:	

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