

Planning for Cycling

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1. Introduction

Cycling is an important part of urban transport. However, for many years its role has been neglected in the UK, with the focus mainly on the needs of motor traffic. Cycling is one of the most sustainable forms of transport, and increasing its use has great potential. To release this potential, highways, public spaces and other rights-of-way need to be organised accordingly. Planning for cycling is discussed in these guidelines; detailed design of infrastructure and facilities for cycle users will be examined elsewhere.

These guidelines are organised in the following sections:

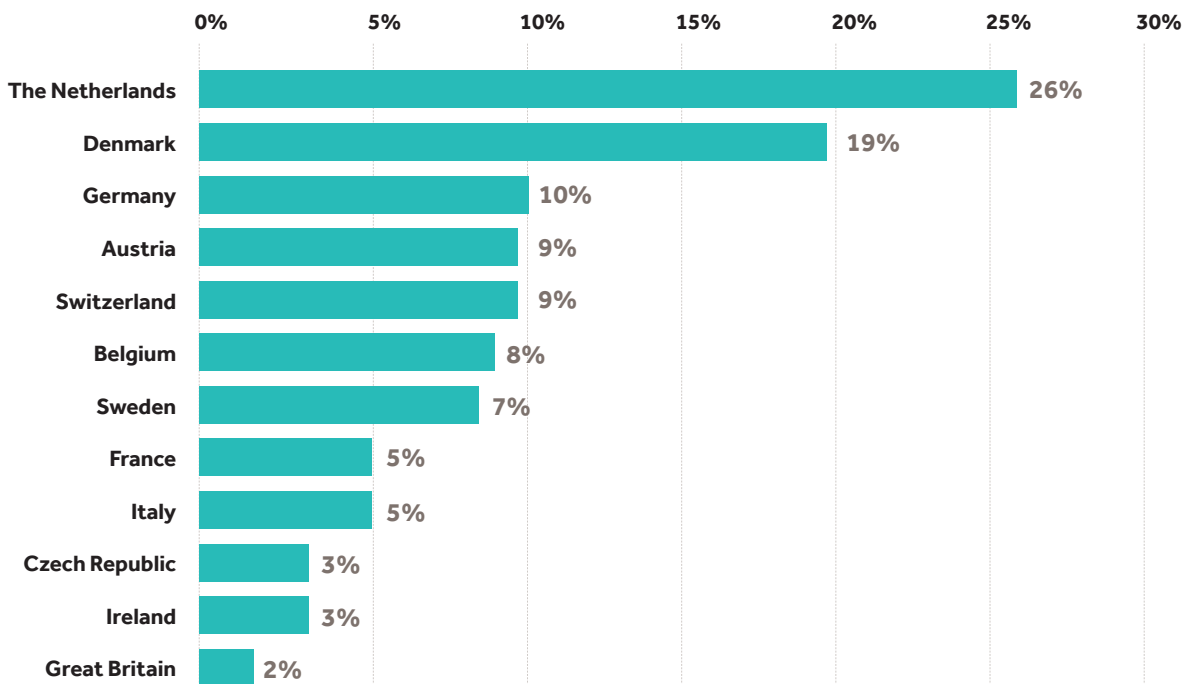
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2. Cycling Characteristics, Behaviour and Trends in the UK

Cycling was once widely undertaken in the UK, but the level of use declined from the 1950s as car ownership grew. It reached its lowest point in the 1990s and then stabilised, though at a generally lower level than in some Northern European countries. Since the new millennium, however, significant growth has been observed in some places.

Around 23 million bicycles can be found in the UK. These bicycles are owned by nearly half the population. However, only 15% of the population cycle once a week or more, and around 65% do not cycle at all (DfT, 2014). Figure 1 compares cycle use in twelve European countries.

Figure 1: Cycling as a percentage of all trips in the mid-2000s in twelve European countries



Source: DfT (2010)

In the UK, the highest proportions are seen in the cities of Cambridge (18% of all trips), Oxford (14%) and York (10%). Across Greater London, approximately 2% of all trips are made by bicycle. In Scotland, Edinburgh has one of the highest levels of cycling (around 5% of journeys to work), but most other Scottish towns and cities are below 2%.

Significant variations can occur within a county or city. For example, in the Somerset towns of Yeovil, Taunton and Bridgwater, cycling accounts for 6%–10% of all trips; yet in other towns in the county such as Crewkerne, Chard and Glastonbury, it accounts for only 1%–3% of all trips. Wide variations also occur within cities like London and Bristol, with significantly higher proportions in central and inner areas. For example, in 2011 in the London Borough of Hackney, 15% of journeys to work were by bicycle; but in most outer London boroughs, only 1%–2% of the working population cycled to work.

The variations reflect differences in topography, town size, urban function, demography (for example, the presence of a university), street layout, congestion and the availability of public transport. A further important factor is the influence of central and local government: research in the Netherlands identified government support as a major reason why Dutch cycling levels recovered in the 1970s after years of decline (Ministrie van Verkeer en Waterstraat, 2009).

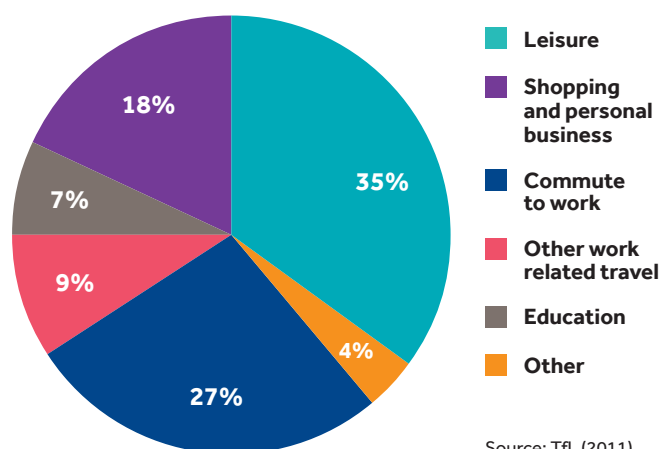
Who Cycles and Why?

People of all ages cycle, but in the UK, the proportion of young and elderly cyclists is much lower than in European countries with high levels of cycling. Similarly, the proportion of female cyclists in the UK, at 30%, is significantly lower than the 45%–55% in Denmark, Germany and the Netherlands (Pucher and Buehler, 2008). UK towns and cities with high levels of cycling also have the highest proportions of female cyclists, and London's recent growth in cycle use has seen the proportion of female cyclists increase.

Bicycle mode shares in the UK tend to be lower for people from non-white ethnic backgrounds, particularly those from Bangladeshi, Chinese and black African backgrounds; and higher-income households generally cycle more than lower-income households.

Cycle use is more seasonal than for other modes, with up to twice as many cyclists in summer compared with winter. The majority of cycling trips are for short distances, with 80% being less than five miles and with 40% being less than two miles. However, the majority of trips by all modes are also short distances (67% are less than five miles, and 38% are less than two miles); therefore, the bicycle is a potential mode for many of these trips (DfT, 2014a). Electric bicycles extend the range that can be cycled comfortably, and combined cycle-rail or cycle-bus journeys offer an alternative to car travel for many longer trips.

Figure 2: Cycle journeys in London, by purpose (2010/11)



Source: TfL (2011)

Cycle trip purposes vary according to location. Nationally, commuting trips are the most common (37% of all cycling trips) followed by leisure trips (34%) and shopping (10%). The low proportion of education trips (8% nationally and 7% in London) is in marked contrast with some European countries: in Germany, for example, cycling to school accounts for 27% of all cycle trips.

3. Benefits of Cycling

The bicycle has many advantages over other modes and is one of the most sustainable forms of transport. It requires only one-fifth the energy of walking and causes negligible climate change, air pollution and noise. Compared with motor vehicles, it causes less severance, requires less space for parking and in congested urban traffic conditions can support higher passenger flows per metre of road width than cars.

This considerable operational advantage is frequently overlooked in discussions concerning road space allocation. It is not only energy and space efficient but in urban areas is also often the quickest means of travel for short distances. It is also widely accessible because of its low cost and potential use by people across the age spectrum, from children from as young as four years to very elderly people.

The bicycle's many advantages mean that schemes to promote cycling support a wide range of government objectives and achieve high benefit-to-cost ratios in economic appraisal. In fact, cycling schemes, along with walking schemes, often have the highest rates of return on investment; and much of this is because of the estimated health benefits. Evaluation is discussed further in Section 9, and Figure 3 summarises the main benefits.



Figure 3: Summary of Benefits of Cycling

Efficient

- **Speed:** Cycling is often the quickest mode over short distances in urban areas.
- **Cost:** Only walking is cheaper, per person kilometre.
- **Space:** It transports more passengers per metre width of road than cars, and one-car parking space can accommodate 8–10 bicycles.
- **Versatile:** It carries children and luggage and can pull trailers of up to half a tonne.

Healthy

- Cycling encourages and enables people to take regular exercise.
- Research has found that regular exercise can reduce the risk of heart disease, diabetes and obesity by 50% and the risk of high blood pressure by 30%.
- Fifty thousand die annually in the UK from heart disease, compared with just over 100 in cycling incidents.
- Research has also found increases in productivity and general well-being amongst people who exercise regularly.



Sustainable

- **Clean and quiet:** It has no fumes and causes minimal noise.
- **Greenhouse gases:** It produces very little carbon dioxide (only in manufacture and disposal).
- **Severance:** Unlike motor traffic, bicycles can coexist well with other users in residential streets and town centres.
- **Energy security:** It reduces oil dependency and increases transport resilience in the event of oil price increases.

Accessible

- **People of all ages cycle** – from children as young as four years to elderly people. The age range is much wider than that for motor vehicles.
- **Affordable:** Its low cost makes the bicycle affordable to most income groups.
- **Inclusive:** Cycling widens people's access to activities such as work, education, shops, health care, public transport and recreation, especially when other modes are unavailable.

4. Current Conditions and Challenges

Despite the benefits of cycling, many barriers, both real and perceived, also exist. Surveys in London identified seven major factors that discourage people from cycling: (i) danger, (ii) effort, (iii) poor cycling environment, (iv) weather, (v) cycle theft, (vi) lack of information and skills and (vii) culture/attitude/credibility; and of these, the first three were most frequently mentioned (TfL, 2004). Research in the Cycling Demonstration Towns has shown a complex interplay between the different factors; and the behavioural changes that prompt people to take up cycling are often linked to important life events such as changing schools or jobs or moving to a new location (Cycling England, 2010).

Road Safety

Fear of traffic is one of the main factors that discourage people from cycling, and cyclists (along with pedestrians) experience proportionately higher rates of road casualties than any other road users except motorcyclists. In 2013, 109 cyclists were killed in Great Britain, representing 6% of road deaths that year, a higher proportion than their modal share of 2%. Cyclists also accounted for 14.5% of seriously injured road casualties in 2013, with the great majority occurring in built-up areas, particularly at or near road junctions.

Cycling casualties are generally underreported. Europe-wide, it is estimated that less than half of

hospital admissions for traffic-related cycling injuries are reported in police statistics. Non-traffic-related cycling injuries are also significantly underreported – only 4% appeared in police records in England, though they are numerically much more common than vehicle-related collisions. The main causes of these non-collision injuries were (i) slipping on ice, (ii) slipping on wet or loose surfaces and (iii) losing control at potholes or kerbs or rail or tramlines (Benington, 2012).

The large number of non-collision injuries means that cyclists account for more hospital admissions than any other transport mode, including cars and motorcycles. The majority of these non-collision admissions (70%) are minor and require no treatment, but their prevalence highlights the need for maintaining good road and path surfaces as well as raising cyclist awareness and competence (Benington, 2012).

Overall, however, the risk of a cyclist being a road casualty is low compared with many other activities. In the UK there is, on average, one cyclist death per 33 million kilometres of cycling, whereas lack of exercise presents a much greater risk. Over 50,000 people die in the UK each year because of coronary heart disease related to insufficient physical activity; and research suggests that the health benefits of cycling outweigh the safety risks by a factor of around twenty-to-one (DfT, 2010), a figure mirrored in European cities, as shown in Figure 5.

Figure 4: Number of killed and seriously injured pedal cyclists, GB 2000–2013

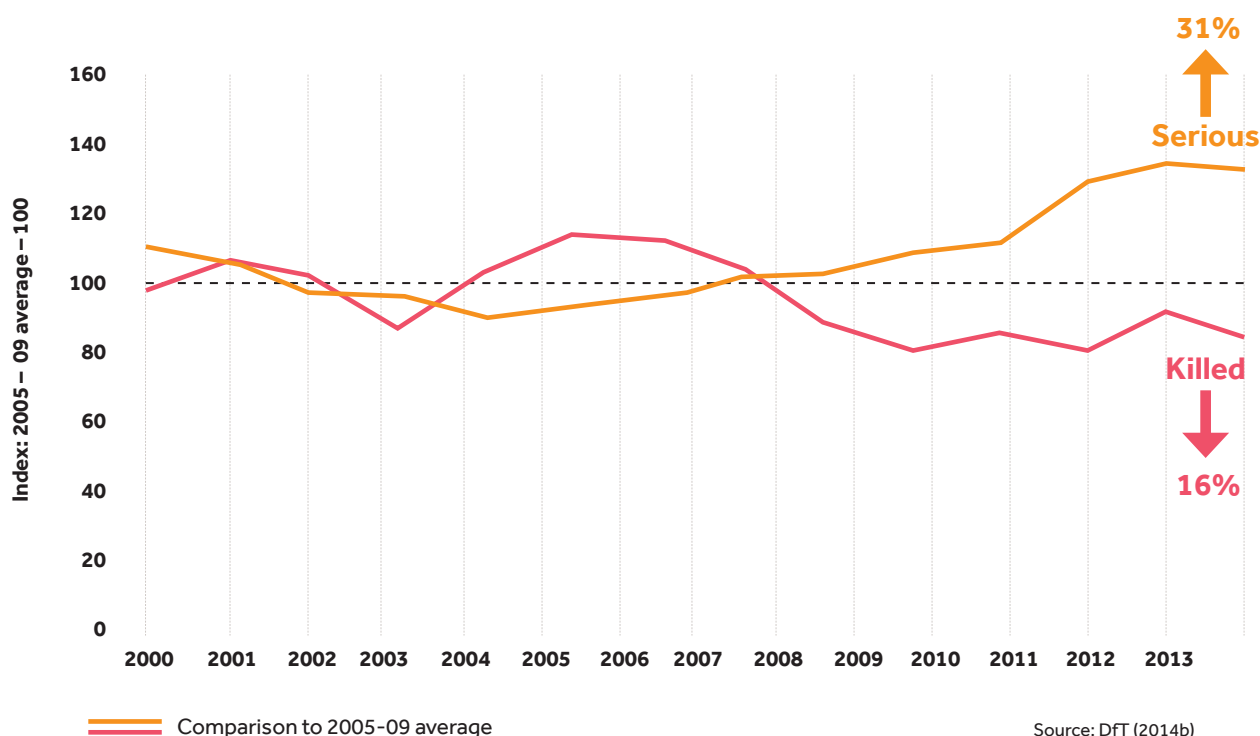
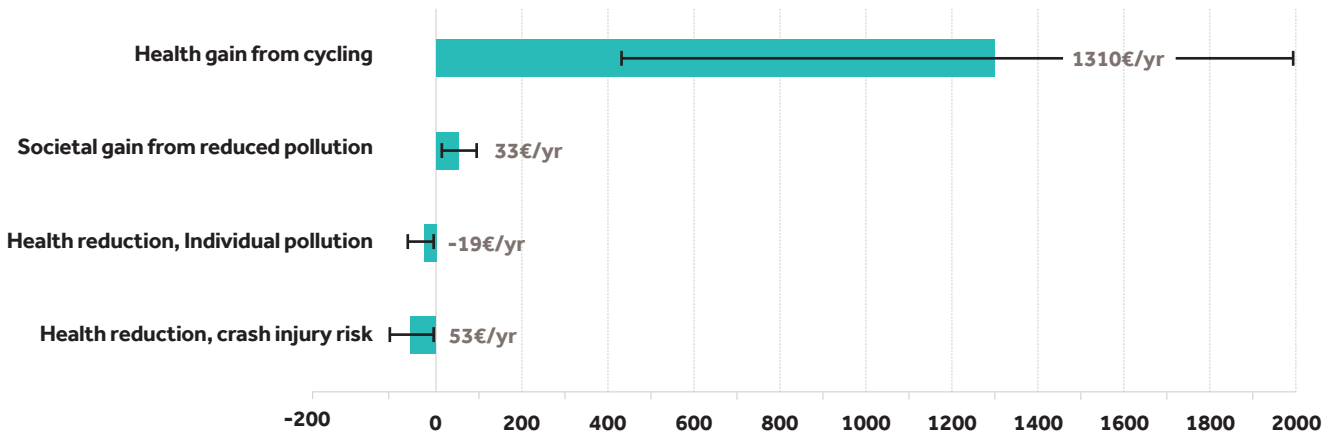


Figure 5: Health gains and reductions for individuals switching from car to bicycle for work trips**
(Average for large European cities, in Euros per person per year)



** 2x5 kilometres daily round trip, 5 days per week, 46 weeks per year. Error bars represent upper and lower % confidence intervals. Source: International Transport Forum (2012)

Figure 6: Distance cycled per day per capita in fourteen European countries against fatalities per 100 million kilometres cycled

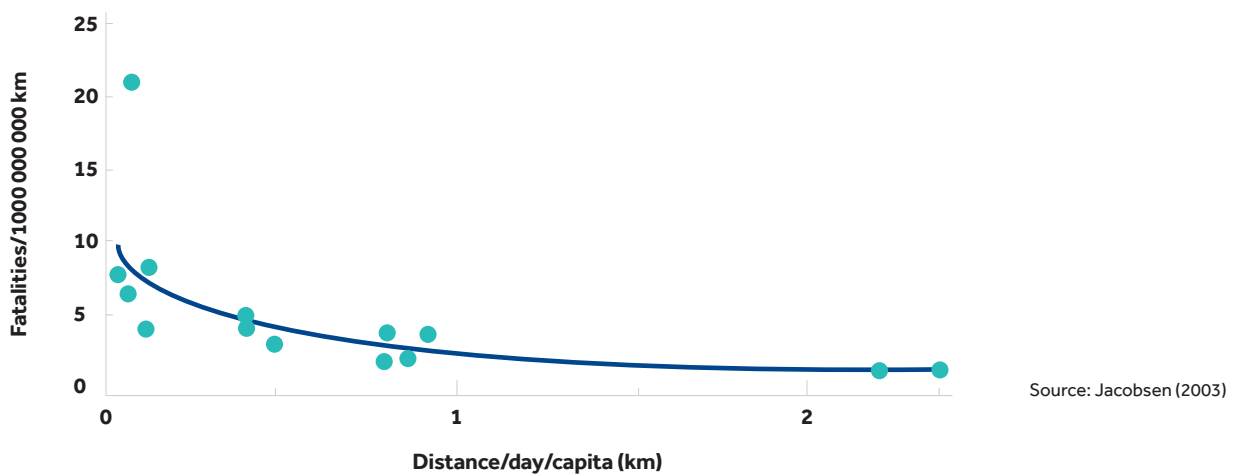
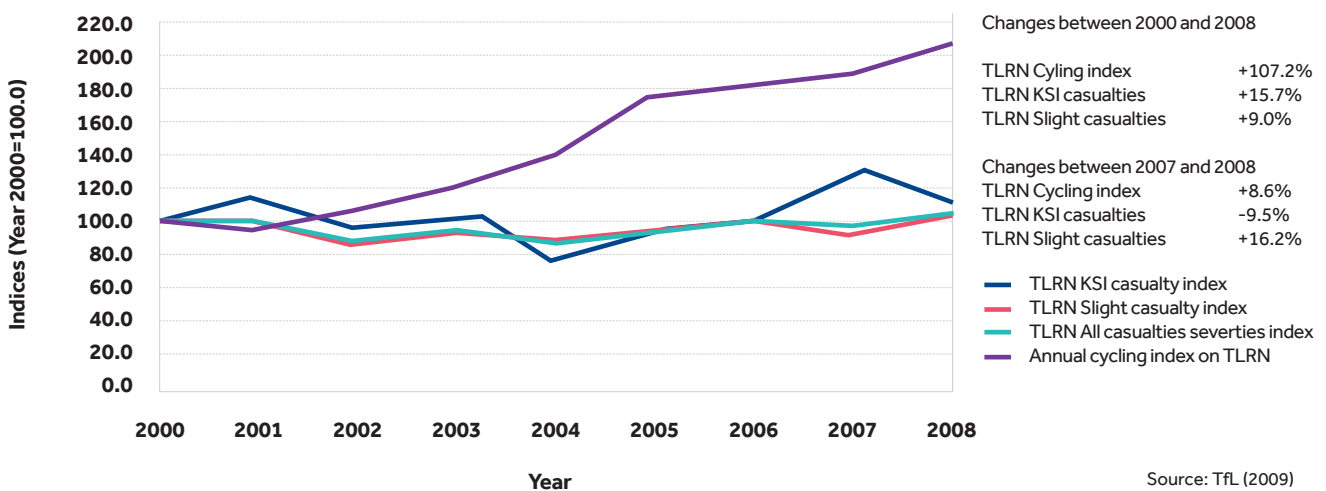


Figure 7: Indices of cycling flows and casualties on the Transport for London Road Network, 2000 – 2008





The challenge is to improve the environment for cycling.

Photo: Chandra Prasad/Sustrans

The number of cycling fatalities in the UK has declined steadily since the 1950s. Nonetheless, cycling casualty rates are significantly higher in the UK compared with other countries with higher levels of cycling, both for fatal and nonfatal collisions. The experience from other countries with higher levels of cycling suggests a 'safety in numbers' effect, that is, the more people cycle, the lower the relative risk, as illustrated in Figure 6. This phenomenon is consistent with other considerable evidence about nonlinear relations between risk and exposure, but discussion continues concerning the underlying causal mechanisms (Bhatia and Weir, 2011).

London's recent experience supports the notion of 'safety in numbers': between 2000 and 2008, cycling

levels on London's major roads increased by 107%, but the number of cyclists killed or seriously injured increased by only 16% and slight casualties by 9%; hence, the relative risk decreased by almost half (TfL, 2009) – see Figure 7. However, while the rate of collisions may decrease with increased cycle volume, an absolute increase in collisions may still happen.

The barriers to cycling are thus more in people's perceptions and habits than in actual levels of risk. The challenge is how to respond to these barriers, especially by improving the environment for cycling by making it more attractive and comfortable and thus encouraging more people to cycle.

Recent Growth Trends

There has been limited growth in cycling at a national level during the past decade; but substantial growth in some places, for example, more than doubling in central and inner London during the 2000s, and increasing by between 20% and 50% in Bristol, Leicester, Sheffield and Hull in the latter half of the 2000s. In the first six Cycling Demonstration Towns supported by Cycling England, an overall 27% increase in cycling levels was achieved in three years (2005-08); see box.

It appears that the growth has taken place mainly in congested inner urban areas and in leisure cycling. On-road cycling in suburbs and rural areas has changed little from the low levels of the 1990s. In outer London, for example, which accounts for about half of all cycling trips in the capital, there was only a 0.2% increase in cycling between 2001 and 2009, while Wiltshire experienced no increase between 2004 and 2008. In Scotland, there have been small annual increases since 2008 in the total distance cycled and the number of people cycling to work and school.

There is other evidence of cycling growth at a national level, including the following:

- **Record cycling levels in London in 2014 (up 173% on the TfL Road Network since 2001)**
- **Annual increases of 9% – 13% on the National Cycle Network in the late 2000s**
- **The appearance of large-scale commercial sponsorship (for example, the sponsored Cycle Hire scheme in London and 'Sky Ride' events around the country)**

A wide range of factors has contributed to this growth in cycling, including the following:

- **Infrastructure to improve the attractiveness and comfort of cycling**
- **Promotional programmes and growing public awareness**
- **Rising costs and crowding on public transport**
- **Increased car parking costs and reduced availability**
- **Other factors such as congestion charging in London**

Growth Potential

Undoubtedly, a great potential demand for cycling exists in the UK. A survey by Sport England in 2009/10 identified 2.2 million 'latent' cyclists in England (LSE, 2011), and Sustrans (the sustainable transport charity) has found that nearly half of children at school would like to cycle to school, given the right conditions (Sustrans, 2008).

The Cycling Demonstration Towns



Cycling England was established by the government in 2005 as a non-departmental public body to promote cycling. It existed for six years before being disbanded in 2011.

Cycling England initially granted 'Cycling Demonstration Town' (CDT) status to six towns, with funding for three years to boost cycling through a combination of infrastructure and promotional measures. Later, the funding for the six towns was extended, and an additional eleven towns and one city (Bristol) were designated as 'Cycling Cities and Towns' (CCTs).

The funding increased cycling investment in the towns to around £10–20 per capita per year, nearly three times the previous average. Half of this was 'match funding' from the local authority.

However, local authorities seeking to improve the environment for cycling face a dilemma: low numbers of cyclists mean that cycling projects tend to receive less priority and funding compared with other transport projects, yet the limited investment in improving conditions for cycle users discourages many would-be cyclists from taking up cycling. For local authorities, the challenge is to transform this 'vicious' circle into a 'virtuous' circle.

5. Legal and Regulatory Context for Cycling

There is a wide range of legislations and regulations relevant to cycling, which for convenience can be considered under two broad categories: (i) those relating to cyclists' use of roads and paths and (ii) those relating to the provision of specific infrastructure for cycle traffic.

The Cyclist as Road User

The term 'cycling' covers a range of different types of vehicle. The Traffic Signs Regulations and General Directions 2002 define a pedal cycle as a 'unicycle, bicycle, tricycle, or cycle having four or more wheels', while bicycles, tricycles, velocipedes, and other similar machines are defined by Section 85 of the Local

Government Act 1888 as 'carriages' within the meaning of the Highway Acts.

Electrically assisted bicycles are also regarded as pedal cycles under the Electrically Assisted Pedal Cycles Regulations 1983, provided they do not exceed 40 kilograms and 200 watts in power (or 250 watts in the case of tricycles and tandems) and are not electrically assisted above fifteen miles per hour. They cannot be ridden on the highway by children under fourteen.

Bicycles are treated as carriages under the various highways and traffic acts, except when the cyclist is dismounted (and they are treated as pedestrians). Cycles are permitted on all roads other than motorways, unless specifically prohibited. Cyclists are also permitted by the Countryside Act 1968 to use bridleways, though they must give way to pedestrians. Cyclists have no right to cycle on footpaths away from the road (except in Scotland; see below), but they only commit an offence where local bylaws or traffic regulation orders create such an offence. Footpath landowners can undertake a civil action if property is damaged, but this applies also to walkers. Cycling on footways, however, is illegal unless specifically marked as a shared use cycle path (Highways Act 1835, S.72).

It is not compulsory for cyclists to use dedicated facilities such as cycle lanes and off-road cycle paths (shared or otherwise) – the cyclist has discretion as to whether or not to use such facilities, depending on their experience and skills (Highway Code, Rule 140).



Cyclists are permitted on all roads (except motorways and where specifically prohibited).

Photo: John Parkin

Regarding liability in the case of road collisions, the UK's laws are currently different to those in most Western European countries, where civil liability in any collision involving a motor vehicle and a cycle (or a pedestrian) always lies with the vehicle driver, unless proven otherwise. In the UK, the vehicle driver's liability has to be proven, which can sometimes be difficult. UK liability laws have been the subject of discussion for some years and were re-examined in an official consultation in Scotland (see Scottish Government, 2010).

Provision of Infrastructure for Cycle Traffic

The legal framework for planning for cycling in the UK is constantly evolving. The main areas of legislation and regulation include the following:

- **National policies, for example, national planning frameworks and sustainable development legislation**
- **The local planning system and development plans**
- **The development control system**
- **Local transport plans**
- **Various highways, road traffic and traffic management acts**
- **Laws relating to countryside access**
- **Laws against disability discrimination**
- **Duties regarding the promotion of public health**

National Planning (Policy) Frameworks (Scottish Government, 2012; Welsh Government, 2012; and DCLG, 2012) set out in broad terms the approach that local authorities should follow in preparing land use and transport plans. For example, the NPPF for England states (para 17) that a core principle is that planning should actively manage patterns of growth to make the fullest possible use of public transport, walking and cycling. Developments should be located where the need to travel will be minimised (para 34) and designed so that 'priority is given to pedestrian and cycle movements', with 'safe and secure layouts which minimise conflicts between traffic and cyclists or pedestrians'. The planning process should also 'consider the needs of people with disabilities by all modes of transport' (para 35).

There is currently no legal requirement for local highway authorities to prepare cycling strategies or provide urban cycle networks, though various laws create a duty to manage traffic expeditiously and provide a safe local road network (giving powers for traffic calming, setting speed limits, providing facilities for cyclists and pedestrians, road safety education and so on). (See, for example, Section 16 of the Traffic Management Act 2004 for England and Wales; and in Scotland, the Roads [Scotland] Act 1984 [Part 1], Road Traffic Regulation Act 1984 [Section 122] and Road Traffic Act 1988 [Section 39]).

Recently, the Welsh Government has sought to strengthen the legal requirements for providing safe routes for cyclists and pedestrians. The Active Travel (Wales) Act (2013) requires Welsh councils to identify and map a network of safe routes for walking and cycling, comprising both traffic-free routes and on-road provision. The councils will then be required to draw up a prioritised list of schemes to tackle gaps in the network for inclusion in the regional transport plans. The aim is to promote greater provision for cycling and walking.

Other existing legislation supports the provision of cycling facilities, particularly in rural areas. Section 60 of the Countryside and Rights of Way Act 2000 (for England and Wales) requires local highway authorities to prepare Rights of Way Improvement Plans (ROWIPs), which assess the extent that existing rights-of-way meet present and future needs. There is considerable scope for using these ROWIPs to improve the rights-of-way network for cycle traffic, but to date, this mechanism has been relatively underused.



Cyclists climbing to Blanchland Moor, Northumberland. There is considerable scope to improve the rights-of-way network for cycling in all areas.

Photo: Oliver Dixon

There is considerable scope to improve the rights-of-way network for cycling in all areas.

In Scotland, the Land Reform (Scotland) Act 2003 is a highly innovative piece of access legislation that establishes the right of responsible access by all non-motorised users (including cyclists) to most land and inland waters, and not merely to paths and rights-of-way. The act requires the planning of Core Path networks by access authorities across Scotland. Where appropriate, these core paths will link up with other path networks and be adopted in the existing cycle network.

Development Control Standards and Planning Obligations

When sites are developed, planning laws enable development standards to be specified (for example, relating to cycle parking) and planning obligations to be imposed. For example, Section 106 agreements under the Town and Country Planning Act 1990 can require developers to provide cycle network improvements that support both the development and the wider locality. Monies derived from the Community Infrastructure Levy, a per square metre levy on new development that a planning authority may charge to a developer, can also be used to promote a cycle network. In Scotland, the Planning etc. (Scotland) Act 2006 allows Scottish ministers and local authorities to be prescriptive regarding planning obligations to improve facilities for cycle traffic.

6. Cycling Strategies and Plans

Cycling strategies and plans may be prepared by central and local governments and also by organisations with an interest in cycling: for example, health authorities, tourism bodies and Sustrans. In addition, wider transport strategies and plans should normally contain sections on cycling.

This section considers higher level strategies and plans for cycling, first, at the national and regional level and, second, at the metropolitan and county level. Section 7 considers the detailed planning of cycle networks and routes.

In general, the scope and content of a cycling plan changes with the different spatial level. At the national level, the emphasis is on broad policies and programmes (for example, laws, institutional measures, budgetary allocations and so on). At the network or route level, the emphasis is on technical design and site-specific issues. At intermediate levels, the plan is likely to contain both policies and location-specific proposals.

National and Regional Cycling Strategies

The number of cycling strategies has grown considerably at all levels during the past decade. National cycling strategies are now quite common — for example, Germany (2002 and 2012), Ireland (2009), Australia (2011), France (2012), Slovak Republic (2013). Regional cycling strategies are also emerging, particularly for metropolitan regions—for example, Metro-Vancouver (2011), San Diego Regional Bicycle Plan (2012) and Western Australia Bicycle Network Plan (2012). Examples of various strategies internationally can be seen at the Australian Cycling Resource Centre website (2014).

The UK's first National Cycling Strategy was produced in 1996 by the Department of Transport. Later, separate plans were prepared for each of the four home nations, as follows:

N. Ireland:	Cycling Strategy, 2000 and 2014
Wales:	Walking and Cycling Strategy, 2003 Walking and Cycling Action Plan, 2009
England:	Walking and Cycling Action Plan, 2004 Active Travel Strategy, 2010 for walking and cycling)
Scotland:	Cycling Action Plan, 2010

The purpose of a national or regional cycling strategy is to provide an overall framework for developing cycling by setting objectives and identifying the means to achieve them. The strategies help to coordinate the activities of a wide range of agencies and can significantly influence policies and plans at the lower levels. Their style and content varies considerably, so it is difficult to suggest a single 'template' that serves all. However, some features of good practice can be proposed.

First, the time period for a strategy is often around ten years, with action plans of three to five years to implement the strategy. Building infrastructure and changing people's travel patterns can be a lengthy process, so this allows enough time for a strategic view, yet not so long as to be unrealistic.

Second, the setting of clear targets and objectives is important. Neither the 2004 nor the 2010 action plans for England contained targets, unlike the plans for Ireland (Eire) and Scotland, which both set targets of 10% modal share for cycling by 2020. Targets are important, not just because they provide a benchmark against which performance can be measured but also because they influence strategies and plans at the lower levels.

Third, the content of the cycling strategy is crucial. Many strategies in the past have been lengthy documents, full of generalisations and broad principles, but saying little about actual delivery. A 'good' strategy should focus on the actions and responsibilities of different organisations to implement the plan and the resources needed to deliver it, particularly institutional arrangements and funding.

Fourth, while stand-alone cycling strategies are desirable at the national level (and also regional level, where appropriate), the role of cycling in other high-level transport plans and strategies should not be forgotten. Multimodal transport studies at the regional and corridor level often omit cycling (and walking) or at best pay them lip service, as they are seen as 'local' transport and therefore not relevant to the larger-scale study. However, cycling has a strategic role in several ways: (i) as a transport mode on main corridors (and also long-distance cycle routes such as the European Cycle Network), (ii) as a feeder mode for public transport, (iii) as an important contributor to national targets on broader issues such as climate change and health and (iv) in claiming a dedicated share of transport funds and budgets (the San Diego Regional Bicycle Plan 2012, for example, estimated the cost of completing the regional bicycle network at \$419 million). Therefore, 'high-level' transport studies should also include cycling development and the resources needed to support this.

Metropolitan and County-Level Cycling Strategies and Plans

The introduction of the Local Transport Plan (LTP) system in England and Wales in 1999 gave cycling planning some additional impetus, and this was replicated in London with Local Implementation Plans (LIPs) prepared by each borough. As part of the process, local highway authorities were expected to prepare cycling strategies for their area, and government guidance listed the requirements of a cycle-friendly LTP (DfT, 2000). Although the rules have since changed (for example, LTPs are no longer mandatory), the original guidance for preparing local cycling strategies remains relevant and is summarised below. The local cycling strategies should contain the following:

- **A discrete strategy for encouraging cycling**
- **Clear cycling targets**
- **Evidence that cycling is given a high priority and reflected in all transport policies**
- **Interaction with the local planning authority to ensure that land use and development planning encourage people to cycle**
- **Partnerships for action with health, education, commercial and voluntary bodies**

- Evidence that the road network (including existing cycle networks) has been reviewed to establish where improvements for cyclists are needed
- Cycle audits of all road and traffic schemes (including those delivered by private developers)
- Increased opportunities for combined cycle and public transport journeys
- Encouragement for cycling through various promotional programmes such as travel plans, school transport plans and so on

More recent practical guidance on the planning and delivery of cycling programmes was given by Cycling England in its 'top ten tips', based on the experience of the Cycling Demonstration Towns programme (Cycling England, 2010):

1. **Senior political and executive commitment to cycling programmes is critical for success.**
2. **Investment must be substantial and maintained over a long period.**
3. **A skilled and motivated delivery team is critical.**
4. **Engagement and support of colleagues in other teams across the local authority is vital.**
5. **Local stakeholder engagement and support is also vital.**
6. **Cycling development needs BOTH infrastructure and encouragement measures.**
7. **Programmes need to be adapted to the local context, priorities and opportunities.**
8. **Programmes need to focus on clearly defined target groups.**
9. **Programmes need to cater for different types of cycle user.**
10. **Programmes need to promote both new and improved cycle routes.**

Today, most local highway authorities in the UK have a 'cycling strategy', though their form, content and quality vary considerably. One innovative example of a city-wide cycling strategy is that prepared for Greater Bristol Cycling City in 2010. More recently, the London Mayor published his vision for cycling in London, which made a strong commitment to the provision of good-quality infrastructure across Central London and beyond (see boxes).

Assessing Cycling Strategies

Various approaches have been developed to assess the effectiveness of cycling strategies and programmes. One is the 'Bicycle Policy Audit' (BYPAD, 2008), which allows cities, regions and provinces to self-evaluate and benchmark their cycling policies, facilitated by a trained auditor. One hundred cities in Europe have done BYPAD audits, including Birmingham, Liverpool and Southwark.

The Greater Bristol Cycling Strategy 2011 – 2026



(Bristol City Council, 2010) was prepared by consultants for the Bristol Cycling City project under the guidance of the Stakeholder Advisory Panel. It was not formally adopted by Bristol City Council but has helped to shape the Council's policies.

The strategy adopted ambitious but achievable targets (20% mode share for cycling by 2026, from a base of 4% in 2008). It also adopted a 'targeted approach', concentrating first on inner areas and then on outer areas. It proposed a substantial budget of nearly £100 million over fifteen years, equivalent to £11 per person per year (roughly the level seen in the Cycling Demonstration Towns, and nearly treble the average per capita expenditure on cycling in the first round of LTPs).

The strategy emphasised encouragement measures that were allocated 40% of the proposed budget, nearly half of which was for cycling training. Key infrastructure proposals included (i) the development of a strategic cycle network, (ii) an asset management plan, (iii) a good route signage and (iv) an integration with other transport modes at hubs.

What distinguished the Greater Bristol Cycling Strategy from most other cycling strategies prepared under the LTP programmes was first, the focus on delivery (with a programme-wide budget and institutional proposals); second, the targeted approach (identifying priority areas and groups); and third, the level of *stakeholder involvement* in developing the strategy.

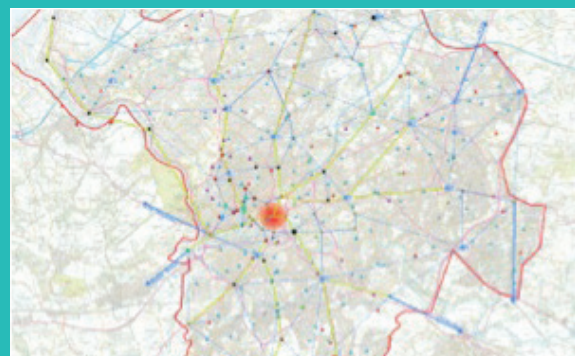


Figure 8 The Greater Bristol Cycling Strategy contained specific proposals for a phased programme of cycling development

The Mayor's Vision for Cycling in London, 2013

The Greater London Authority published the Mayor's Vision for Cycling in London in March 2013. It looks forward ten years and aims to double cycling levels through transformative change and truly mass participation in cycling. It is the most ambitious cycling strategy yet developed in the UK and is expected to be highly influential.

The vision proposes a trebling of cycling investment in Greater London, with £0.9bn over the next ten years. In the first two years, spending will rise to roughly £18 per head per year, equivalent to levels in Germany and almost equal to The Netherlands. Cycling investment in outer London will increase dramatically over the current low levels.

The vision is largely a statement of aims and the main measures to achieve them. Its coverage is comprehensive and strategic rather than detailed. This is to be expected, as 95% of London's road network is controlled by the thirty-three boroughs, with TfL responsible only for the main roads. The vision's success therefore depends on cooperation between the various stakeholders, particularly the London boroughs, the railways, the royal parks and central government.

The vision's key strategies include:

- Developing a 'tube network for the bike' - direct, high capacity routes, signed and branded based on existing public transport lines, such as the 'Bakerloo Superhighway'.
- On busier streets, better segregation from motorised traffic, including innovative (to the UK) techniques such as 'light segregation' using intermittent physical features.
- New 'Quietways' where cyclists use direct but less busy streets. These routes will form a comprehensive grid in central London, and a



(TfL) London's Embankment, as visualised in the Mayor's Vision for Cycling.

number of outer boroughs have been selected to be made into 'mini-Hollands'.

- A focus on improving conditions for cycling at major junctions, such as large gyratories, which are currently hostile for cycling and account for the majority of cycle collisions.

The vision gives less emphasis to encouragement measures (compared with physical and traffic measures); but cycle training in schools, communication strategies and targeted marketing, partnership working with stakeholders and regulatory improvements are all included.

In conclusion, the test of a good strategy lies in its subsequent implementation. However, the above examples suggest that a 'good' cycling strategy will

- have or obtain senior political and institutional 'buy-in' to the objectives,
- be specific to cycling (as opposed to combining 'walking and cycling'),

- focus on specific policies and actions rather than generalities,
- set clear and challenging targets,
- provide a framework that integrates and co-ordinates the efforts of diverse organisations, and
- include specific information about the resources (financial and human) needed to implement the strategy.

7. Planning Cycle Networks and Routes

Cycle routes and networks are elements of the wider cycling strategy; and, as with any transport network, their planning requires a high level of transport and traffic planning and engineering design. If the UK's potential for cycling is to be realised, this level of planning should become the norm. This section focuses first on overall principles and then examines the different stages in planning networks for cycle traffic.

Overall Principles

The development of cycle networks is mainly concerned with appropriately managing existing highway, right-of-way and permissive routes and creating new links within the existing network to close gaps, with the overall aim of creating a coherent and complete network with a consistent and adequate level of service for cycle traffic. Consideration needs to be given to the management of routes in terms of their attractiveness and comfort for cycle users, and this

will extend to undertaking measures to manage motor traffic volumes and speeds.

As with any form of planning, the first step is to set the objectives for what the cycle network should achieve. A bicycle is a vehicle capable of speed, and guidance recommends design speeds of twenty miles per hour for both on- and off-road cycle routes, with consideration being given to higher speeds where these are likely to occur (DfT, 2008a and CROW, 2007). Hence, the needs of cycle traffic are similar to those of motor traffic, and planning and design for cycle users should therefore follow similar pathways as for other types of vehicle. However, in much recent planning for cycling, there has been a tendency to treat cyclists as though they have similar requirements to pedestrians and to provide 'facilities' shared with pedestrians. While this may be acceptable in certain situations, in general, their needs are different and should be planned accordingly.



A comprehensive approach to cycle network planning is required.

Photo: Oliver Dixon

Designs for cycle traffic have usually assumed that a cyclist has the knowledge and skill to be able to handle the bicycle at up to the appropriate design speed and in mixed traffic, according to national training standards (Franklin, 1997). Efforts should continue to ensure that cycle users are offered suitable training (see Section 8 for cycle training). However, whatever level of training they may have, it is unrealistic to expect many existing and potential cycle users to find high volume or fast-moving mixed traffic conditions either attractive or comfortable. Network planning should therefore be concerned with creating direct cycle routes that provide comfortable passage for all types and ages of cycle user. This will usually be via a combination of:

- **routes dedicated to cycle traffic that are free from motorised traffic;**
- **routes with mixed traffic of appropriate speed and volume;**
- **routes with higher volumes and speeds of motor traffic, which have well-designed segregated space for cycle traffic.**

Local Transport Note 02/08 advises that at speeds of twenty miles per hour and below, cycle traffic and motor traffic readily mixes. At speeds up to thirty miles per hour, it may be appropriate to manage traffic within the carriageway by providing separate lanes for cycle traffic. At speeds greater than thirty miles per hour and for volumes of more than 10,000 vehicles per day, it may be appropriate to provide infrastructure for cycle traffic separate from motor traffic.

In the UK, cycle users have commonly been categorised by type, for example, 'fast commuter' or 'inexperienced leisure cyclist' (DfT, 2008a). While these categories may be helpful in identifying market segments for promotional measures, they are not sufficient for determining design requirements; and a better approach, particularly if the interest is to allow for large growth in cycle use, is to focus on the cycle users' needs, as follows (CROW, 2007):

- **Keeping energy use to a minimum;**
- **Providing smooth surfaces;**
- **Ensuring sufficient space around a bicycle to separate it from threats;**
- **Avoiding involuntary low speeds;**
- **Providing shelter from wind and rain, as far as possible;**
- **Allowing cyclists to ride side by side, hence allowing cycling to be sociable;**
- **Minimising the number and complexity of tasks that cyclists have to perform.**

When the UK motorway network was being planned, appropriate design criteria were established at the

outset. In a similar manner, cycle infrastructure planning should ensure appropriateness in all details and adhere to the following five principles, originally expounded by the Dutch (CROW, 2007) and repeated in much guidance around the world:

- **Coherence: Infrastructure for cycle traffic needs to form a coherent whole and provide connections that link origins and destinations; key elements include way-finding and consistency of quality of route.**
- **Directness: A cycle user needs to be offered the most direct route possible and particularly routes which are shorter and quicker than by car.**
- **Attractiveness: Cycling infrastructure should be well designed to fit in with the surroundings and engender feelings of personal security.**
- **Safety: Infrastructure should be designed to offer space to cycle users to reduce their feelings of vulnerability from all potential threats.**
- **Comfort: Infrastructure should reduce delay at particular locations and the consequential additional effort required to recover normal cycle speed; similarly, infrastructure should provide smooth surfaces with no discrete discontinuities such as kerb edges.**

Local Transport Note 2/08 (DfT, 2008a) advises that provision should be according to a hierarchy in which the designer attempts first to (i) reduce motor traffic volume, (ii) reduce motor traffic speed, (iii) treat junctions and hazard sites, (iv) reallocate road space in favour of cycling, (v) provide cycle tracks away from the road and, only lastly, (vi) convert footways for cycle use. A similar approach is advocated in Local Transport Note 1/12 (DfT, 2012).

However, if a large-scale increase in cycle volumes is the desired aim, a more comprehensive approach to planning for cycle traffic is required than this simple 'hierarchy of provision', as the following pages explain.

Planning of Networks and Routes

Several approaches can be used in selecting the most suitable routes for cycle traffic. One approach is to compare cycle users' desired lines with existing networks; and increasingly, this is being done electronically, using apps on mobile phones. Another approach is to consult local cycle users and carry out 'saddle surveys'. The Dutch guidance (CROW, 2006) suggests specific dimensions for the size of the 'mesh'. A more extensive approach suggested in Danish guidance (Danish Road Directorate, 2012) considers numerous factors, including cyclists' choice of corridor, desired speed, standard of the route, number and type of junctions, type of surfacing to be provided, whether the route will be lit and the level of maintenance to

be provided. The Danish guidance emphasises the importance of developing a network which is 'fit for purpose'. It has similarities with planning for motor traffic: in some cases, high capacity and high speed routes are called for; in other cases, shared use with pedestrians may be appropriate.

Transport modelling is widely used in planning for motor traffic. Given the benefits of increasing cycling use, it should be more generally applied to cycling and future land use / transport models, and traffic assignment models should include cycling as a distinct mode at every stage. The analysis of cycling data collected through mobile phone apps also provides a powerful tool for modelling cycling networks.

With or without modelling, the following stages should be undertaken in planning the cycle route network (Godefrooij et al., 2009):

1. **Define objectives**
2. **Map land use and assess cycling demand**
3. **Map existing routes, facilities, cycle volumes and cycling-related collisions**
4. **Identify priority locations and constraints, which need to be treated**
5. **Identify improvements to the network (option development)**
6. **Predict potential demand**
7. **Prioritise and select schemes**
8. **Implement schemes**
9. **Monitor and assess operation against business case**

1. Define objectives

Objectives may be related to the local authority's wider social and economic development objectives; though they are more likely to reflect specific transport needs, such as connecting geographical areas with high quality cycle routes. A good example is the Scottish Government's desire to connect residential areas and rural settlements to town centres (Scottish Government, 2010).

2. Map land use and assess cycling demand

The second stage is to consider land uses, both existing and proposed, and especially those with potential to generate significant volumes of cycle traffic; for example, residential areas (especially those with demographics more conducive to cycling), major employment areas, educational establishments, shopping areas, public transport nodes and leisure and tourist attractions. Data relating specifically to cycle use may be limited, but proxy data such as population or households or numbers of people employed can sometimes be used to estimate total transport demand to or from an area. Significant barriers such as rivers, railways and steep gradients should also be identified.

3. Map existing routes and relevant information

The third stage is to consider the existing network, including any additional links that are not part of the highway but that could potentially be used by cycle traffic. Traffic data should be collected (cycle flows and motor traffic volume and composition). This may already be available or imputed from other data, but it may be necessary to collect additional data. Link speed data for motor vehicles and journey speeds for cycle traffic may also be collected if relevant, the latter highlighting sections that are unnecessarily slow for cycle traffic, particularly junctions or congested traffic conditions. Cycling-related collisions and casualties may also be analysed, if relevant. Stakeholder feedback and local knowledge is an important supplement to the factual data (and sometimes may be the only information available).

4. Identify priority locations

The fourth stage is to synthesise the data to identify priority locations, especially (i) junctions that cause problems for cycle traffic in either speed or collision terms, (ii) corridors with high traffic speeds and volumes and (iii) potential missing links in a cycle network.

5. Identify improvements (option development)

The fifth and creative stage is to develop options for improving the highway network and other possible non-highway routes. This stage includes consideration of possible engineering solutions and also traffic management measures that may take an area-wide approach to managing the overall demand for traffic on the highway. The latter will include consideration of speed limits, such as twenty-mile-per-hour zones, and the wholesale reappraisal of existing traffic management schemes such as one-way streets, banned turns and provision at junctions. The aim would be to adjust the patterns of flow on the highway network in order to reduce the impact of motor traffic on cycle traffic. This approach is more ambitious than the often quoted 'hierarchy of provision' for cycle traffic discussed above (Department for Transport, 2008). In some cases, it may require substantial changes in patterns of movement for motor traffic, which in turn could require significant assignment and junction remodelling.

Other crucial planning considerations include land ownership and route or path status, as these may determine whether or not a cycle route can be successfully developed. For example, pedestrian stakeholders often oppose conversion of footpaths to cycle tracks, which can prevent a scheme from progressing. While stakeholders should be engaged from the start of the planning process, this fifth stage

(option development) is an important time for utilising local cycle users' knowledge. A well-tried approach has been the Cycle Route Implementation and Stakeholder Plan (CRISP) approach adopted by Transport for London (see Deegan & Parkin, 2011), which involves significant stakeholder inputs at all stages of the route planning process. This has now developed into the level of service assessment tool in the draft version of the London Cycle Design Standards (TfL, 2014).

6. Predict potential demand

The sixth stage involves predicting the potential demand for cycling resulting from the proposed changes, which helps in comparing alternative schemes. Cycling demand forecasting techniques are summarised in WebTAG Unit A5.1 S2.3 'Guidance on the Appraisal of Walking and Cycling Schemes' (DfT, 2014c) and include the following:

- **Comparing the proposed scheme with other similar existing schemes (though caution is needed as underlying conditions may be different)**
- **Using a disaggregate mode choice model, with coefficients that predict increased levels of use when higher-quality facilities are provided**
- **Using census data (for example, journey to work matrices) or TEMPRO forecasts of trip ends by mode, and multiplying this by an elasticity coefficient¹ representing the increase in cycling demand associated with an increase in cycling facilities**

Transport for London, in planning the Cycle Superhighways, placed each residential area along the route within a 'lifestyle' category, which was then assigned a 'propensity to cycle' index based on empirical data. The index was applied to the population of the area to provide an estimate of potential cycle trips.

Whichever method is used, the cycling demand forecasts are only as good as the available data and assumptions, and WebTAG emphasises that the amount of effort devoted to analysis should be proportional to the scale of the project and its impact on cycling. In practice, local authorities often do not carry out formal cycling demand assessments, partly because of the limited accuracy of traffic forecasting and partly because of limited resources.

¹For example, if a 20% increase in cycling facilities produces a 1% increase in cycling levels, this would reflect an elasticity coefficient of +0.05.



7. Prioritise and select schemes

After demand has been assessed, it will be necessary to prioritise and programme portfolios of schemes of investment. The prioritisation process should be based on comparing costs and benefits using common criteria, which may include network continuity, journey time savings, regeneration objectives and casualty reduction. Other important prioritisation criteria include the following:

- **How many LTP objectives a scheme is likely to meet**
- **The stage that a scheme has reached in its development (for example, priority given to part-completed schemes)**
- **Opportunities for funding from non-cycling programmes or third parties**

Whatever schemes are chosen (whether large-scale or a series of smaller schemes), it is important to present them as a coherent package that will generate political and public support. It is also important to schedule schemes based on feasibility: for example, where land negotiations are involved it is important to start these early, probably before funding is in place for delivery.

8. Implement schemes

The execution of the schemes may require construction work or traffic engineering works to adjust the management of the highway. There may also be legal procedures to acquire land for new links or implement traffic regulation orders, or convert footpaths to cycle tracks, or create shared use paths, or change by-laws to allow cycling, for example, through parks. Consultations, both statutory and nonstatutory, may also be required.

The schemes, crucially, should also incorporate

appropriate elements of a comprehensive way-finding strategy, including direction signs and road markings that are consistent with prejourney planning materials such as maps and web-based tools.

9. Monitoring and evaluation

Monitoring and evaluation is an important part of the transport planning process and is discussed further in Section 9. So far as cycling is concerned, there are particular issues relating to the current low level of usage. Usual methods of automatic cycle counters and manual traffic counts on cordons and screen lines should be adopted, but manual counts may need to be repeated on a quarterly basis to ensure that seasonal effects do not swamp any year-on-year change that may be present. Day to day variability of cycling levels because of weather will also affect the robustness of manual count data. In addition, data may be available from counts of parked bicycles and workplace and school surveys. Funding is not usually available for repeated household panel surveys; but such surveys may be taking place, particularly in larger conurbations, for other transport purposes. Appropriate questions relating to cycle journeys should always be included in such surveys and appropriate sample sizes should be adopted to identify changes in cycle journey patterns.

Concluding Comment (Cycle Network and Route Planning)

The above stages describe the technical process for identifying, analysing and selecting appropriate cycle routes and networks. However, it is important to remember that underlying this process is political choice exercised by local authorities and other stakeholders, which is also a major factor (and sometimes the most important) in determining cycling outcomes (see box).



Cycle Network and Route Planning in Practice

– Lessons from the London Cycle Network+

There are many practical constraints – physical, financial and political – to achieving optimum or even preferred cycle routes in urban areas, which planners should be aware of.

Busy Roads or Quieter Routes?

One key issue has been how best to cater for different types of cycle user. Should strategic cycle routes, for example, follow busy main roads or quieter roads through residential areas and parks? Both have advantages and disadvantages. On the one hand, the largest numbers of cyclists are found on busy arterial roads because these are direct and contain many origins and destinations (shops, employment, etc.). But traffic conditions on these busy roads may be difficult for less experienced cyclists. On the other hand, quieter routes through residential areas, parks and shared footways tend to be slower and less direct, making them less attractive for experienced cyclists. Experience from the London Cycle Network+ suggests that the best approach may be to cater for ALL users by developing BOTH types of route; and London's experience has confirmed the viability of using suitable main roads for strategic cycle routes, with suitable investment in appropriate facilities.

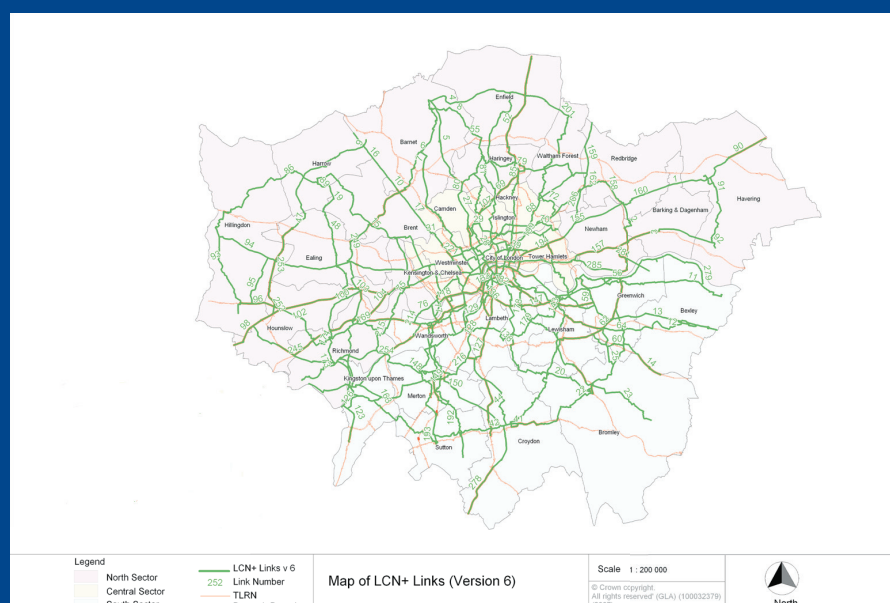
Dealing with Busy Intersections and On-Street Parking: Two of the most significant obstacles encountered in cycle route studies for the London

Cycle Network+ were (i) busy intersections and (ii) dealing with on-street car parking. Most cycling collisions occur at intersections, and they are often the biggest barrier along a particular route. However, reorganising them can be physically difficult because of limited road width and expensive, particularly if utilities and services have to be relocated. Furthermore, many junctions are at capacity at peak periods; and reorganising them for the benefit of cyclists, pedestrians and bus users can increase delays for other motor traffic, at least in the short term. Because of these issues of complexity, cost and political sensitivity, cycling and pedestrian improvements to major junctions on the London Cycle Network+ tended to lag behind, while easier (but less critical) sections of the network tended to be implemented first (TfL, 2006).

On-street car parking was another significant obstacle to providing uninterrupted on-road cycle lanes, and here too, political support was often not forthcoming because of the public and political sensitivities of limiting on-street parking provision.

Key Lessons: Implementing cycle networks on existing heavily trafficked roads is a challenge, which requires a long-term approach, strong political leadership and adequate resources (both funds and staff).

Figure 9 The London Cycle Network+ in 2009: 900km of strategic cycle routes, mainly on busy main roads



8. Promoting Cycling

Increasing the level of cycling is a major policy aim in most UK transport plans. But simply improving the infrastructure is not enough: there are also perceptual and social barriers that discourage people from cycling, and positive encouragement is needed to overcome these. This section highlights some of the main promotional measures for cycling and gives references to other sources.

Coordination of Human Resources the Main Priority

For a local authority seeking to increase cycling in its area, the first priority for 'encouragement' is to engender a cycle-friendly culture within the authority itself. There are several ways of doing this, including appointing 'cycling champions' among elected members and senior officers, making sure cycling policies and benefits are well understood throughout the organisation and providing appropriate training and awareness-raising for staff (Cycling England, 2009).

The second priority is to mobilise and coordinate the efforts of many organisations—public, private and community-based—which have an interest in promoting cycling. In the public sector, this includes organisations responsible for health, education, tourism, business and economic development, parks and recreation, sports, police and community safety. In the private sector, this includes transport operators, the bicycle industry, the tourism industry and employers generally. For the latter, the benefits of commuter time savings, productivity improvements, reduced demand for car parking, increasing employee catchment area and promoting a 'green' image may be good reasons for wishing to encourage cycling.

Third-sector organisations include national and local cycling clubs, campaigning groups, charities and community interest companies providing cycle training, cycle purchase schemes, promotional events and so on. Many individuals volunteer their time at schools and workplaces and look after cycling facilities. The overall value of the third sector's contribution is hard to measure but is potentially a major resource for cycling encouragement.

Mobilising and coordinating the various organisations is a labour-intensive work, for which staff and budgets are required. Most local authorities already have individuals or teams working on influencing travel behaviour, and those that have made cycling a priority usually have a dedicated team or teams for cycling, as in London and the Cycling Demonstration Towns.

Targeting Encouragement Efforts

Cycling resources are best focused on particular groups and locations. There are various ways of segmenting the market, for example, by age, frequency of cycling, trip purpose and so on. For non-cyclists (who are by far the largest group), the encouragement measures include cycle training, guided rides and cycle loan/purchase schemes. It may also be appropriate to target particular ethnic groups, as has been done in Leicester, Tower Hamlets, Southall, Blackburn and Darwen (Cycling England, 2009).

Most local authorities target their encouragement measures at education and employment establishments because these have many younger people (who may develop the habit of cycling) and also involve repeated journeys. These establishments also fit well with existing local authority programmes (for example, safe routes to schools and workplace travel plans) and are able to provide facilities and encouragement at the travel destination.

Cycle Training

Cycle training and supporting initiatives for schools have been the most important cycling encouragement measure during the past decade and accounted for over half of Cycling England's total budget for 2009–2012. In the Netherlands, young people are by far the largest group of cycle users, and in the UK, it has been estimated that young people (ages 7–17) represent two-thirds of the potential 'market' for new cyclists (National Cycling Strategy Board, 2005).

Cycle training is now promoted under the title 'Bikeability', with national standards at three levels, delivered by qualified cycling instructors:

- | | |
|---------------------|--|
| Level One: | Basic skills and bike handling in a traffic-free environment; |
| Level Two: | Skills for quieter roads; |
| Level Three: | Skills for busy roads (including complex junctions). |

Cycle training is usually part of a wider package of measures for young people at schools that includes cycle parking, safer or otherwise improved routes to school and cycling events for children and their parents. Sustrans has led the way with its 'Bike-it' programme, involving full-time facilitators working with a group of schools. Sustrans reckoned that the programme has increased the proportion of children cycling daily to school from 3% to 10% on average at participating schools (Sustrans, 2010).

Workplace Encouragement

Encouraging cycling at the workplace is part of the overall workplace travel planning process. However, there are a number of measures specific to cycling, which are summarised in the 'Cycle to Work Guarantee' supported by DfT. Organisations are encouraged to sign the guarantee, which has five main components:

Storing	good cycle parking facilities
Changing	showers and lockers
Buying	assistance in purchasing bikes and equipment
Repairing	facilitating cycle repairs through information and links with local repairers
Inspiring	through measures such as cycle training, targets, bike 'buddies', bicycle user groups (BUGs), cycle 'trains' to work, cycle mileage allowance for business use and collecting commuter 'bike miles' to be exchanged for rewards

Many organisations have signed the Cycle to Work Guarantee, some with outstanding results. Another important initiative is the 'Workplace Cycle Challenge' supported by the Cyclists' Touring Club (CTC). This involves a competition between organisations or individual departments to see who can get the most staff to cycle for at least ten minutes during a three-week period. Over 70,000 people took part in 'cycle challenges' in the four years to 2012, with significant increases in cycling levels (Challenge for Change, 2013).

Residential Travel Plans

Residential travel plans are also helpful in encouraging more people to cycle; and as mentioned above, people are mostly likely to change their travel choices when they experience a life-changing event, such as moving house. Useful guidance is contained in Making Residential Travel Plans Work, published by the Department for Transport (2005).

Public Bicycle Hire Schemes

Public bicycle hire schemes have become very popular, and their numbers have increased rapidly around the world. The scale of schemes has also increased dramatically: Hangzhou, with 40,000 bicycles, is the world's largest; Paris had 24,000 and London 8,000 in 2012. Elsewhere in the UK, at least fourteen towns and cities have started schemes or experimented with them, though most were very small scale, in contrast with Europe and elsewhere. Research suggests that public use increases disproportionately with scheme size (London Analytics, 2007); thus, larger schemes tend

to have an advantage over smaller schemes, which may partly explain why many UK schemes have foundered. Public bike hire schemes can be distinguished from bike-hire based at shops or rail stations (the latter being very common in the Netherlands, Germany and Switzerland), because the docking stations are in the public domain and users can leave the bikes in many different locations. The use of electronic payment and communication technologies has reduced running costs and risks of theft. However, the schemes are expensive to establish: Phase 1 of the London bike hire scheme, for example, cost £79 million, plus £18 million annually in management costs. Only a small proportion of the cost was covered by private sponsorship, though Transport for London hoped to recover operating costs from user charges within a few years (London Assembly Transport Committee, 2010).

Funding arrangements vary greatly from scheme to scheme. Many are funded through contracts let to advertising companies (for example, Lyon, Paris, Dublin). Others are publicly funded (sometimes with commercial sponsorship), with a private firm contracted to operate the scheme (for example, London, Barcelona, Blackpool). In either case, securing a good deal for the public purse can be challenging.

Most schemes adopt a graduated system of hire charges, with the initial period free (typically half an hour). This encourages use for specific journeys rather than for a whole day. On the other hand, many users take advantage of the 'free' period (for example, over 95% of bike hires in London, Paris and Dublin), reducing revenues as a result.

Most of the recent large schemes have been well-received: London's scheme generated 21,000–24,000 trips per weekday in 2010 or roughly 4.5% of the city-wide cycling total, with a significant impact on encouraging people to cycle (TfL, 2010). However, the impact on reducing car use has been limited. The main impact on modal shift has been to substitute cycling for public transport (bus and tube) and walking trips; and similar results are seen in Lyon, Paris, Barcelona and Montreal. The main benefits of public bicycle schemes have therefore been (i) to get people onto bicycles who might otherwise not have used them; (ii) to free space on crowded public transport; (iii) to offer users quicker, cheaper and pleasanter journeys; and (iv) to demonstrate that the city authority supports the bicycle as a mode of transport.

Key lessons from previous public bike hire schemes are summarised in the box on the next page.

²UK bicycle hire schemes include Blackpool, Cardiff, Southport, Oxford, Bristol, Cheltenham, Reading, Bath, Farnborough, Hammersmith & Fulham (London), Dumfries and Inverness. New schemes were also planned in 2012 for Liverpool, Nottingham and Reading using the government's Local Sustainable Transport Fund.

Key Lessons for Public Bike Hire Schemes



Commitment and caution is needed in planning a public bicycle hire scheme, and key lessons include:

- Important to choose the right scale of scheme: In the UK, several small schemes have faltered because of low take-up. Being sufficiently ambitious with the scale for the scheme is important, together with strong political support to make the scheme a success.
- The financial aspects need careful consideration: Even 'successful' schemes such as Paris have led to significant costs on the public purse, and getting sufficient value from the sponsorship or advertising deal is a critical issue. There is also the 'opportunity cost' of investing in public bicycle schemes and whether it represents the best use of cycling development funds.
- The timing is important, especially whether a town or city is ready for a scheme. In both Paris and London, cycling levels had increased rapidly in the years before the introduction of the schemes, and both cities had invested substantially in cycling infrastructure in preceding years.
- Public bicycle schemes need to be accompanied by greater investment in cycling, both in infrastructure and wider promotional measures.

Other Encouragement Measures

There are many other ways of encouraging cycling, and extensive literature is available on these: see, for example, the Chartered Institute for Logistics and Transport's The Hub online cycling resources pages (CILT, 2013). Some of the most important measures include the following:

- Bicycle purchase schemes, 'pool' bicycles and recycling schemes. The UK's 'Cycle to Work' scheme, for example, resulted in over 400,000 bicycles being purchased by employees up to 2011, through their employing organisations (LSE, 2011). The employees pay for the bicycles in regular instalments and benefit from tax and national insurance concessions, which reduce the bicycle's cost by up to 50%.
- Cycle route maps and mapping, both paper-based and electronic, including smartphone apps which can act as a cycle-mounted satnav. A good UK-wide example of the latter is operated by Cycle Streets (Cycle Streets, 2013).
- A range of marketing techniques, including personalised travel planning, advertising, events, festivals and so on.
- Sports and recreational cycling, including racing and mountain bike trials.
- Reduction of cycle theft; see below.
- Integration with public transport (railways, buses, trams and taxis). Integration is mutually beneficial and increases the overall potential for replacing car

trips. The main integration measures are described by Pucher and Buehler (2009) and include the following:

1. Bike parking at stations and bus stops (with varying degrees of shelter, security and scale)
2. Bike racks on buses and taxis (usually external) and dedicated spaces or compartments on trains
3. Bike hire at stations and interchanges (commonplace in the Netherlands and Germany)
4. Bike service centres with facilities such as repair and accessory shops, lockers, changing rooms and showers
5. Maps, cycle route and touring information
6. Improved infrastructure (including direction signage) on cycle routes leading to stations and bus stops

Further information on bike-rail integration is available in a toolkit published by the Association of Train Operating Companies (ATOC, 2012).

Cycle Theft

Cycle theft is widespread in the UK, with over half a million bicycles stolen annually and 100,000 stolen in London alone in 2010. Typically, only 20% of thefts are reported to the police, and possibly only 1% of stolen bicycles are reunited with their owners. Many of the victims stop cycling or cycle less as a result. The problem is not confined to the UK: in the Netherlands, some 750,000 bicycles are stolen every year (Ministrie van Verkeer en Waterstraat, 2009).

Tackling cycle theft is therefore an important part of encouraging cycling, and remedial measures include the following: (i) well-located, high quality cycle stands; (ii) 'cycle passports' prepared by bicycle owners with a photograph and specification details; (iii) electronic tagging; (iv) online registering, so recovered bicycles can be returned; and (v) reporting all thefts.

9. Monitoring and Evaluation

Planning is a continuous process and involves choosing among alternatives, monitoring progress and amending actions (or objectives) accordingly. This section considers aspects of monitoring and evaluation that apply specifically to cycling.

Monitoring Cycling

Issues connected with monitoring were discussed in Section 7 (point 9). Data on cycling are generally limited, and in the first round of Local Transport Plans (LTPs), local changes in cycling levels could not be accurately determined because of inconsistencies in data. Local highway authorities made significant efforts to improve cycle monitoring, and this became mandatory for the second round of LTPs (together with the setting of local cycling targets). However, in the LTP3 guidance, this became optional and in 2010 was dropped altogether as a national indicator, though many local authorities have continued the process.

Cycling monitoring thus remains underdeveloped, and the quality of data varies greatly from place to place. Local authorities need to devote more resources and attention to strengthening their cycling monitoring systems in order to (i) provide better information for planning purposes and (ii) measure progress against targets.

In both Paris and London, cycling levels had increased rapidly in the years before the introduction of the schemes, and both cities had invested substantially in cycling infrastructure in preceding years.



Evaluating Cycling Projects

The evaluation of cycling projects has similarly been limited. This partly reflects local authority resource constraints and also difficulties in isolating changes attributed solely to cycling investment. However, it also reflects the low priority generally given to cycling (SQW Consulting, 2008).

The approach to evaluating cycling projects is similar to that for other types of transport project and suffers from the same limitations—for example, in estimating and evaluating changes in air quality, noise, climate change, journey ambience and so on. Moreover, cycling schemes tend to be small in value and unlikely to justify elaborate evaluations. A variety of approaches can be used in evaluating small schemes (see, for example, DfT, 2008; and DfT, 2012), and the most suitable approach will depend on local circumstances. In general, the evaluation process should support decision making rather than trying to supplant it, and a degree of ‘professional judgement’ is acceptable provided the assumptions and methodology are transparent.

Many local authorities use ranking systems to prioritise cycling schemes, for example, ranking them according to how well they meet certain LTP objectives (such as modal shift, accident reduction, cost, integration with other modes, local support and so on). Adjustments can be made to ensure a geographical balance across the local authority area (Hereford, for example, prepares two priority lists; one for the city of Hereford and another for the rest of the county). One limitation of the ranking approach is that one particular factor may be a crucial reason for having the scheme, but this will not be reflected in the overall scoring.

Economic Benefits and Returns on Investment

Cycling benefits are difficult to measure and frequently underappreciated; consequently, cycling tends to be undervalued in transport decision making, leading to underinvestment in cycling programmes.

A study for Cycling England found that by far the largest benefit from cycling investment was the health benefits of generating additional cyclists. Other important benefits included reduced congestion, productivity gains, pollution reduction, NHS savings and improved journey ambience. The benefits vary from place to place, depending on local circumstances, but the health benefits are gained in both urban and rural cycling schemes (SQW, 2007).

Benefit-cost ratios vary considerably from scheme to scheme, but overall, investment in cycling produces very substantial returns. An evaluation of the first six Cycling Demonstration Towns estimated that reduced child mortality (because of the programmes) was alone worth £2.59 for every £1.00 invested in the programmes (Cycling England, 2009). Cycle training in London (all ages) gave an overall benefit-cost ratio of 7.44 (SQW, 2007). These figures can be compared with government guidance on the evaluation of major projects, which states that a ‘medium’ value-for-money project will have a BCR between 1.5 and 2, and a ‘high’ value-for-money project a BCR of at least 2.

To conclude, cycling investment – if done properly – is one of the most cost-effective forms of transport investment available.

5. Further Information on Planning for Cycling

A wealth of information on planning for cycling is available nationally and internationally. For quick access to further information, the following six websites are useful:

1. **Cycling Hub, CILT (UK) – this includes the Cycling England archive:**
www.ciltuk.org.uk/AboutUs/ProfessionalSectorsForums/Forums/Cycling/TheHub.aspx
2. **Cycling Scotland:** www.cyclingscotland.org/about
3. **Sustrans:** www.sustrans.org.uk/
4. **CTC, the National Cycling Charity:** www.ctc.org.uk/
5. **European Cyclists’ Federation:**
www.ecf.com/resources/library/
6. **Cycling Resource Centre (Australia):**
www.bicycles.net.au/directory/cycling-resource-centre-crc/



³ The study did not include benefits of climate change impacts, reductions in obesity, reduced severance or reduced cycle accidents (the latter because the impact on accident levels was difficult to predict).

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