

Disabled cyclists in England: imagery in policy and design



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UK policy has long sought to promote cycling as a healthy and sustainable form of transport. A desire to generate an 'Olympic legacy' following the 2012 games along with pressure from campaign groups for safer infrastructure has led to more inclusive policies, with an emphasis on promoting cycling for everyone, along with new design guidance to enable it. What does that mean for disabled people and a paralympic legacy? This paper discusses how disabled people can be represented in the cycling environment, the types of cycle they use (from bicycles to quadricycles, through handcycles and tricycles) and the requirements they have. A snapshot of cycling policy and design guidance in the period 2013–2014 is analysed to see how disabled cyclists are illustrated by comparing the frequency of bicycles to other types of cycle. It concludes by recommending ways to ensure disabled people are included in the cycling mainstream.

1. Introduction

Between March 2013 and February 2014 three new cycling policy documents were published in England, one specific to Greater London and two with a national focus (also covering Wales, Scotland and Northern Ireland). All seek to expand the population of cyclists in London and England to include under-represented groups.

We will 'normalise' cycling, making it something anyone feels comfortable doing. Hundreds of thousands more people, of all ages, races and backgrounds, and in all parts of London, will discover that the bike has changed their lives. (Greater London Authority (GLA, 2013))

Our vision is for a dramatic increase in the number and diversity of people who cycle, because they see it as a safe and normal activity. (APPCG, 2013)

If we want more people to choose cycling, and for cycling to be open to everyone not just those who are already fit and confident, then we need to remodel our towns and cities and we need to transform our transport networks so that they are more welcoming places for people who would like to travel by bike. (British Cycling (BC, 2014))

In April and June 2014 two new design guidance documents relevant to England were published. One a draft for consultation specific to Greater London – the next step in putting the policy quoted above into practice. The other a national

document, also covering Wales and Scotland, which sets out similar aims.

The key to success is to ensure that our streets and public spaces are suitable for people of all ages and all abilities to get around without a car. We need to focus on those not yet walking and cycling as well as those that already are. (Sustrans, 2014)

These statements signal a desire for a step change towards an inclusive cycle network while implicitly recognising that cycling policy and practice have not been inclusive in the past. Disabled people are not mentioned explicitly in these extracts and perhaps they do not need to be because they are a subgroup within 'all ages', 'everyone', 'all abilities' and 'diversity'. However, it is probably necessary to emphasise that, while disabled people are an under-represented group, most can cycle. In London, 70% of disabled adults say that they can cycle, although only 6% do on a regular or occasional basis, while rates for non-disabled adults able to cycle are much higher (TfL, 2012). To put that in a national context, in the UK population almost one in five people (19%) has a disability and over half of disabled people (57%) a mobility impairment (PT, 2014).

Rather than just telling planners, designers, policymakers and disabled people themselves that disability in itself is not a barrier to cycling and that cycling can in fact be an enabler, it is arguably better to show them. Evidence from marketing research suggests that messages conveyed with images prove

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more memorable than those conveyed verbally (Childers and Houston, 1984). Many types of disability are hidden and many disabled people who cycle are hidden among the cycling population because they use the most common form of cycle, the bicycle. Reliably recognising disability among these cyclists visually is not possible. However, it is possible to recognise the types of cycle that some disabled people use, and this is really the only way to signal clearly the inclusion of disability when illustrating it in the cycling environment – that is, by employing a recognisable stereotype similar to a wheelchair or crutches in the pedestrian environment.

How successfully these documents visually communicate that disabled people cycle has been assessed here by looking at the variety of cycles illustrated and determining how many imply that the user is likely to have a disability. A person does not have to have a disability to ride a tricycle or a handcycle, but many do, and for the purpose of communicating that cyclists may have different needs, this assumption is key.

Regardless of the user, other cycle types such as tricycles, ‘tag-alongs’ and tandems are all valid cycles with different handling characteristics that need to be catered for in a cycle network. By investigating how disability is depicted in this way, the diversity in cycles depicted is accurately assessed and has implications for all users of cycles other than bicycles.

2. Analysis

2.1 Measuring variety

For the analysis presented, here a cycle is defined as any type of cycle and a bicycle is defined as a two-wheeled solo cycle. For each document the number of images containing one or more cycles has been counted, along with the number of images containing one or more cycles that are not bicycles.

For example, Figure 1 is the front cover of one of the policy documents (APPCG, 2013). It is one image containing one or more cycles. Depending on one’s interpretation, there are between four and six different styles of cycle in the image but they are all bicycles. The image does not contain an image of a cycle that is not a bicycle. By this definition there is no variety of cycle type in this image and the first data row of Table 1 shows that when all the images have been assessed in this way there is no variety of cycle type in this document.

The documents are listed in ascending order of number of pages, from 16 to 358. The frequency of images containing cycles varies from one in every two pages to almost three per page. Photographs and other types of image have been counted separately, partly because it is easy to do but mainly



Figure 1. All Party Parliamentary Cycling Group report

to see whether there is a difference in the variety of cycle types represented in the different media types.

From a total of 358 images there are 12 images that contain a cycle other than a bicycle. Looking at the variety among these there are two two-wheeled cargo bikes, a Danish Bullitt and a Dutch Bakfiets, and ten images of the Danish Christiana style cargo bike. All 12 images are of cycles used by couriers to transport goods, or families to transport children and shopping. There are no cycles that would be associated with disability.

2.2 Types of variety illustrated

The cover image of the GLA document (2013) is a 2D rendered view of a 3D model from which a fly-through animation was created for the launch of the document. The view is of Victoria Embankment, looking south towards the Palace of Westminster and the iconic face of Big Ben. Clearly separated from the three-lane carriageway of motor vehicles and the expansive pedestrian footway alongside the River Thames is a proposed two-way cycle track.

Looking at the moving agents in the image, there is variety in the models of motor vehicles in the three-lane

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| Document | Pages | Images containing cycle(s) | | | Images containing cycle(s) other than bicycle(s) | |
|---|-------|----------------------------|-------------|----------|--|----------|
| | | Images per page | Photographs | Drawings | Photographs | Drawings |
| <i>Get Britain Cycling</i> (APPCG, 2013) | 16 | 0.9 | 5 | 9 | 0 | 0 |
| <i>Time to Choose Cycling</i> (BC, 2014) | 20 | 1.3 | 5 | 20 | 1 | 0 |
| <i>The Mayor's Vision for Cycling in London</i> (GLA, 2013) | 33 | 0.5 | 13 | 3 | 1 | 0 |
| <i>Handbook for Cycle-Friendly Design</i> (Sustrans, 2014) | 36 | 2.8 | 61 | 39 | 0 | 0 |
| <i>Draft London Cycling Design Standards</i> (TfL, 2014a) | 358 | 0.6 | 177 | 26 | 3 | 7 |

Table 1. Number of images that contain cycles compared with number of images that contain cycle's other than bicycles

carriageway: different types of car, different colours, a coach parked in the middle distance. There is variety in the models of pedestrians on the footways. However, on the cycle track the cyclists appear to be copies of one model repeated approximately 20 times. It suggests that there is no variety in cycles or cyclists within this computer-aided design model library.

Figure 2 is an extract from the BC document (2014). Each of the three scenes has been assessed as a single image. Looking at the cyclists and the cycles, variety can be seen in

- gender – two and three
- number of cyclists – two incidents of a single cyclist and one of an accompanied family group

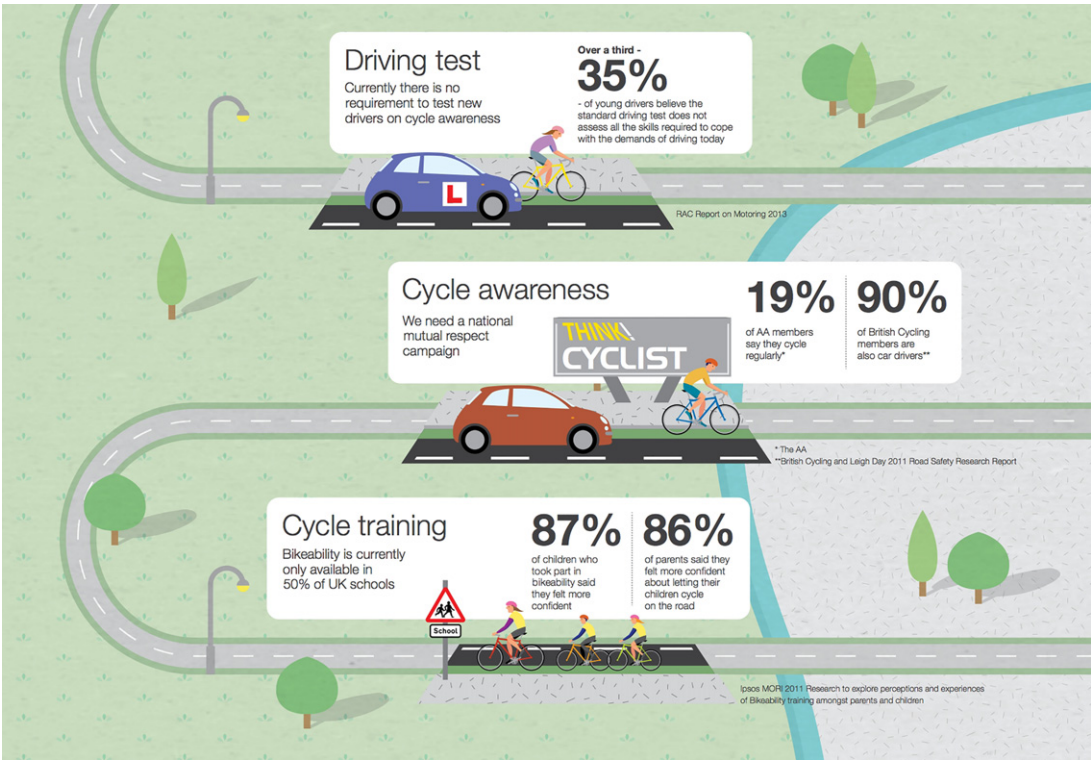


Figure 2. Extract from *Time to Choose Cycling* (BC, 2014: p. 10)

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- colour of bicycle – five bicycles and five different colours
- type of bicycle – two racing style bicycles and three hybrid style
- age – ranging from about 10 years up to middle age.

The primary purpose of the document is to communicate a ten-point plan but, as this list indicates, other information is being conveyed in parallel with those points that could graphically describe the diversity in cycling that the plan aims to bring about. Through the course of the document's 25 images, there is an opportunity to represent other characteristics, including disability.

2.3 Measuring cyclists and cycles

Sustrans (2014) is a 36-page graphically rich design guide. There are almost three images that contain cycles per page, along with other images of layouts and contexts that contain no cycles at all. Figures 3 and 4 are extracts from the four-page section entitled 'Understanding user needs'.

Dimensioned silhouettes are used to describe the widths of bicyclists, pedestrians and wheelchair users. There are no drawings of other types of cyclists that are dimensioned in this way; however, that is not unusual in cycle design guidance. Only dimensioned bicyclists are represented in the national guidance for England (DfT, 2008).

The silhouette of the wheelchair user in Figure 4 is a stereotypical image of a mobility-impaired person and is conveying more information than how much space the wheelchair requires. With this image comes the information that to cross a road a flush kerb will be required, and that to move between grade-separated areas a ramp or a lift will be required. There is no stereotypical silhouette for a disabled cyclist conveying that a similar step-free route will be required.

'Table H.4' of the document provides figures for the size and handling characteristics of four types of cycle with the following note: 'a wide range of adapted bikes are used for disability cycling: their design requirements will generally fall within the ranges in this table'. There is no row in the table for 'adapted bikes' and the table is illustrated with a bicyclist.

2.4 Other guidance

In parallel with the policy and design guidance being developed and published in England, new design guidance was consulted on in Wales and published in December 2014. This guidance contains precisely the type of image that conveys how people use cycles for mobility (a handcyclist and a bicyclist cycling together) while the accompanying text makes reference to the legal obligations of the authority responsible for the cycle network.

All public authorities have a duty under the Equality Act 2010 to ensure they meet the needs of disabled people, and actively involve disabled people in the design and delivery of their services such as the provision or improvement of pedestrian routes and cycle routes. (Welsh Government (WG, 2014))

However, in common with the guidance analysed above, space requirements for cyclists are graphically illustrated with an image of a dimensioned bicyclist.

3. Cycles as mobility aids

3.1 Variety of cycles

All cycles are mobility aids in the broadest sense of the term regardless of the user. At the moment, the figures are not available to verify it but it is highly likely that the majority of people cycling with a disability today are using a bicycle,

Widths required by cyclists

The space required by cyclists in motion needs to take account of

- 'dynamic width' of the cyclist
- clearance when passing fixed objects
- distance from other traffic (both cyclists and passing motor vehicles).

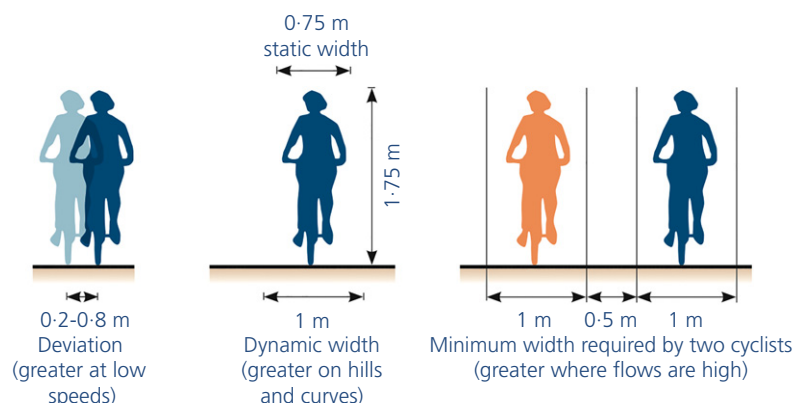
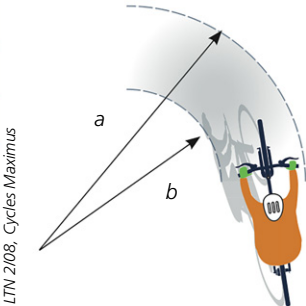


Figure 3. Extract from *Handbook for Cycle-Friendly Design* (Sustrans, 2014: p. 7)

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| Table H.4 Cycle parking and manoeuvring at low speeds: minimum dimensions | | | | |
|---|-------------------|--------------------|----------------------------|------------------|
| | Overall width: mm | Overall length: mm | Minimum turning circle: mm | |
| | | | Outer radius (a) | Inner radius (b) |
| Conventional bicycle | 700 | 1800 | 1650 | 850 |
| Tandem | 700 | 2400 | 3150 | 2250 |
| Bicycle and trailer | 800 | 2700 | 2650 | 1500 |
| Cargo trike | 1200 | 2600 | 2300 | 1000 |



A wide range of adapted bikes are used for disability cycling: their design requirements will generally fall within the ranges in this table

Typical minimum widths required by pedestrians and wheelchair users

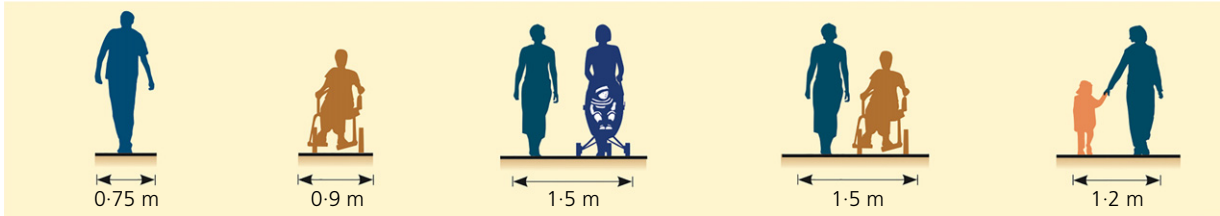


Figure 4. Extract from *Handbook for Cycle-Friendly Design* (Sustrans, 2014: p. 8)

possibly adapted in some way; the bicycle is also a mobility aid in the narrower sense of being an aid for a disabled person. Often this is not appreciated because disability is masked by the ease of movement when cycling. Someone whose disability visibly limits movement off the bike can be freely mobile when on it and appear able-bodied. Not surprisingly, being smaller, lighter, cheaper and easier to store than larger types of cycle, if at all possible the bicycle will be the preferred option.

Figures 5–10 show several types of cycle that are used by people unable to ride a bicycle.

- A tricycle with a toe clip to keep the cyclist’s left foot on the pedal, carrying a lockable luggage box and a crutch used as a walking aid at either end of the journey.
- A handcycle consisting of a ‘clip-on’ hand-cranked front wheel unit that attaches to the cyclist’s regular wheelchair and lifts the small front wheels one or two inches off the ground.
- A recumbent tricycle with two wheels at the front which tends to have a large turning circle but is a useful alternative to the upright tricycle because it relieves stress from other parts of the body.
- A tandem tricycle, like a two-wheeled tandem, is a solution used by blind and visually impaired cyclists and also for accompanying people with an intellectual disability who may be unable to cycle safely alone in some circumstances.



Figure 5. Tricycle

Figures 9 and 10 show the different types of ‘electrically assisted pedal cycles’. A tricycle with the motor mounted in the front wheel and battery mounted below the seat, incidentally has a back support that puts the cyclist somewhere between the sitting positions of the upright and recumbent tricycles above.

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Figure 6. Handcycle



Figure 8. Tandem tricycle



Figure 7. Recumbent tricycle



Figure 9. Electrically assisted tricycle

A handcycle, with the motor mounted in the front wheel and the battery attached to the 'clip-on' unit, allows it all to be decoupled from the wheelchair when the cyclist reaches their destination. As tricycles are heavier than bicycles, and arms lack the strength of legs, many disabled cyclists choose to use power assistance to accelerate more easily, manage inclines at a reasonable speed and to extend the distances they can cycle. This holds for bicycles too and not only for people considered to have a mobility impairment. Respiratory and cardiovascular diseases limit the power a person can generate and so power assistance can make it possible to cycle.

The vehicle in Figure 11 does not appear to have much in common with a cycle, but when used to go for a ride with other

cyclists it performs like a cycle and the experience of the user is one of cycling with a group. It complies with the requirements of The Use of Invalid Carriages on Highways Regulations (ICHR, 1988) as a class 3 invalid carriage. Its width may not exceed 0.85 m and its speed may not exceed 8 miles/h (12.91 km/h) when on the road or 4 miles/h (6.45 km/h) when on the footway. It is smaller and slower than some cycles; however, it is not legally allowed to use cycle-only infrastructure. Conversely, disabled people using cycles as mobility aids are not permitted to cycle on the footway or in pedestrian-only areas as they can when using mobility scooters or powered wheelchairs. Assuming this legal inconsistency is superseded by

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Figure 10. Electrically assisted handcycle

the Equality Act 2010 (2010), well-designed cycle-specific infrastructure is an opportunity for all these various types of mobility aid to move more freely than they do on the footway and more safely than they could on a busy road.

Although not generally used by disabled cyclists, the cargo bike also needs to be considered as a cycle type, being used to transport goods when making last mile deliveries and by families to transport children.

3.2 Understanding the requirements of disabled cyclists

Disabled cyclists present new challenges to designers of cycle infrastructure, although meeting their requirements make a better cycle network for all cyclists. Some examples are as follows.

- Many disabled cyclists require continuous, step-free, safe, direct, door-to-door routes. Some require access along footways, within pedestrian areas or within buildings such as shops and transport interchanges such as railway stations. Compare this with the mobility-impaired person



Figure 11. Boma 7, electrically powered four-wheel cycle

represented by the wheelchair user in Figure 5. Cycle-specific routes in particular can be composed of barriers and narrow filtered permeability arrangements that present no problems to adept bicyclists but inconvenience or exclude disabled cyclists. Speed reduction measures aimed at the most able are not inclusive of disabled cyclists.

- Many disabled cyclists require smooth surfaces. Rough surfaces and speed reducing 'humps' can be uncomfortable or at worst painful due to existing health conditions or an inability to stand out of the saddle. The castors (the small wheels at the front of wheelchairs) of handcycles can become grounded when levels change too quickly.
- Cycling slowly or using something other than a bicycle is a very different experience. Advanced stop line areas are a very different proposition in a handcycle. Trying to position oneself to reach the request button when using a staggered toucan crossing can be an impossible task for some types of cycle.
- Visual contrast and legibility of cycle infrastructure are important to the visually impaired and to people with intellectual disabilities. Being mobile is about more than just free movement.

Not being able to negotiate steps or 100–150 mm vertical kerbs is applicable to other cyclists as well. Parents carrying a child on their bicycle or using a cargo bike are equally disadvantaged. The requirement for a step-free cycle network extends beyond the needs of disabled people.

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4. Conclusions and recommendations

In the policy and design documents analysed, the vision of an inclusive cycle network that can carry a diverse cycling community has been put into words but not into pictures. There is very little, sometimes no, visual variety of cycle types. With the exception of the cargo bike, cycles other than bicycles are not illustrated, and by association the visual representation of disabled cyclists has been omitted from cycling policy and guidance covering England.

Maximum dimensions of other cycle types exist in design guidance but diagrams detailing design minima are based on the bicycle – the smallest type of cycle and the least demanding to design for. It is unclear what cycle dimensions are being recommended to design cycle infrastructure around and this uncertainty may increase the probability of practitioners designing for the bicyclist rather than cyclists in general and disabled cyclists in particular.

Aware of the need to represent disabled cyclists graphically, authors and publishers may reasonably ask: what proportion of images should illustrate the types of cycle used by disabled people, or alternatively, what proportion should there be within each image? An argument can be constructed based on available data (PT, 2014) that to represent disability adequately the proportion should be as much as one image in five, or 20% of cycles illustrated. That will be high when comparing the number of bicycles sold to that of other types of cycle; however, two out of the three policy documents analysed here only have five photographs in each, so one in five would make a reasonable minimum. The design guidance documents on the other hand have many more photographs, but in order to communicate graphically to designers and engineers the reasons behind recommended minimum design parameters, such as cycle track widths, photographs of larger cycle types, perhaps with bicycles alongside them, are required. With this in mind one in five or 20% of cycles illustrated might be considered as an absolute minimum. At the moment, good photographs illustrating the desired, typical cycling situations that include other cycle types such as handcycles and tricycles are hard to find, so when developing new policy and guidance the question of where these photographs are going to come from is best considered at the beginning of the process.

Unlike the wheelchair user represented by the silhouette in Figure 4, there is no recognised symbol to convey the message that a cyclist has a disability.

The tools used to design cycle infrastructure may lack some of the basic components to design for cycles other than the bicycle.

The following recommendations are offered in order to help create inclusive local and national cycle networks.

- Determine a symbol or set of symbols, an equivalent to the silhouette of the wheelchair user, that represent disabled cyclists and can convey their requirements graphically.
- Include disabled cyclists and a variety of cycle types when researching and/or testing new cycle infrastructure interventions.
- Research the types of cycle and determine a standard for maximum size and handling characteristics to act as a minimum requirement for cycle infrastructure. This will reduce the number of exceptions where disabled cyclists are inconvenienced or excluded from the network while providing a benchmark for manufacturers to work to and for disabled cyclists to base decisions on when purchasing expensive cycles.
- Investigate where and how the cycling network interfaces with other areas of the public realm and ensure design continuity for disabled cyclists in pedestrian areas, at transport interchanges (accessible lifts and access to public transport) and public buildings (accessible lifts).
- Consider the question: What is cycling in its broadest sense and how can it be illustrated?

Following consultation, in December 2014 the revised TfL document (2014b) was published, containing two significant additions: a handcyclist in the form of a silhouette cycling on a stepped track alongside a wheelchair user on an adjacent footway, and a plan view of several instances of a tricyclist representing '1.3 m largest types of cycle' in a diagram illustrating 'user interaction for different path widths'. In this case, the consultation process proved a successful way to influence design guidance; however, that was not the case with WG (2014). Hopefully, a better, more systematic process can be found to ensure that the variety of cycles, beyond the bicycle, is fully considered in design and planning.

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