



RESTAT

Recognition of Skills to Transform
Accessible Tourism



M3

MODULE 3

Accessible Bike Tours

Produced within the European Programme Erasmus Plus,
Key Activity 2, Strategic Partnerships for VET | Innovation



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Recognition of Skills to Transform
Accessible Tourism

MODULE 3

Accessible Bike Tours

Adaptive recreational cycling Training manual



Co-funded by the
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GENERAL MODULE OVERVIEW

[Structure]

1. UNIT 1: Bike-riding is a right

- 1.1. “Disability is not inability” – a Ghanaian example
- 1.2. Health-benefits of cycling for people with limited mobility
- 1.3. Accessible Cycling Infrastructure
- 1.4. Thinking beyond the bicycle

2. UNIT 2: Options for Inclusive biking

- 2.1. Types of Adapted bikes
 - 2.1.1. Tricycle
 - 2.1.2. Tandem bike
 - 2.1.3. Side-by-side tandem
 - 2.1.4. Handcycle
 - 2.1.5. Wheelchair bike
 - 2.1.6. E-cycle
- 2.2. Choosing the right bike

3. UNIT 3: Barriers to Inclusive Cycling and Solutions

- 3.1. Infrastructure
- 3.2. Bike’s Cost
- 3.3. Imagery and perception
- 3.4. Cycles not recognized as mobility aid
- 3.5. Signage and Maps

4. UNIT 4: Bikes’ technical know-how

- 4.1. Getting to know the Bike parts
 - 4.1.1. Standard Bicycle parts
 - 4.1.2. Tricycle parts
 - 4.1.3. Recumbent parts
 - 4.1.3. Handcycle parts
- 4.2. Bike gears
- 4.3. Bike repair
- 4.4. Bike Safety and First aid
- 4.5. Pedaling rules



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5. UNIT 5: Design an Inclusive Biking Tour

5.1. Design criteria

5.1.1. Design Inclusive Facilities

5.1.2. Inclusive Facilities

5.1.4.1. Cycle path

5.1.4.2. The Built Environment

5.1.4.3. Cycle parking

5.2. Evaluating Cycling routes

5.3. Cycling tips

[Length]: 15 hrs



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LEARNING OUTCOMES

By the end of this course the learner should be able to:

1. identify the challenges facing Inclusive recreational biking for people with reduced mobility
2. know different types of bikes, its major parts and its corresponding target clients
3. assess the facilities' accessibility for inclusive biking activities
4. plan and organize an outdoor biking tour for small groups with special needs.



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GENERAL UNIT 1 OVERVIEW

[Short Unit description]:

1. UNIT 1: Bike-riding is a right

- 1.1. “Disability is not inability” – a Ghanaian example
- 1.2. Health-benefits of cycling for people with limited mobility
- 1.3. Accessible Cycling Infrastructure
- 1.4. Thinking beyond the bicycle



[Length]: 2 hrs



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UNIT 1: BIKE-RIDING IS A RIGHT

1.1. “Disability is not inability” – a Ghanaian example



Figure 1: Yeboah on the bike with his prosthetic right leg

Emmanuel Ofose Yeboah’s story continues to inspire the world until today. Born in Ghana in 1977 with only one functioning leg, Yeboah triumphed over his believed-to-be destiny as a street beggar to pedal 400 miles around the sub-Saharan nation with his charity bike for one solid purpose: to demonstrate to his countrymen that “*disability does not mean inability*” (his own words). His example actually went much further than he could have ever expected: it pushed his country into changing the laws by adding more rights to people with disabilities.

The case of Yeboah not only shows that *disability is only a limitation rather than a total restriction* to one’s achievements, but also confirms that cycling is a type of sports apt for people with physical disability. In addition, cycling can be a great way to help them get engaged in social, sportive and recreational life, as well as obtaining an independent living.



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Unfolding the Myth about disabled people and cycling

Conventional social belief, nevertheless, still considers disabled people unable or unwilling to cycle. This creates big obstacles not only in terms of discouraging social prejudice but even in other more concrete ways that vary from designing transport infrastructure, installation of cycling facilities, access to common public space (parks, museums, etc.) to visual representation of disabled cyclists in relevant policy documents.

In reality, thanks to the fact that cycling can act as a *mobility aid*, many people with reduced motor ability turn to cycling as an efficient means to move around that is much less strenuous than walking. The following picture provides data about the situation in the UK in 2019.



Figure 2: Facts and Stats on Disabled Cyclists (WheelsforWellbeing, 2019)



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1.2. Health-benefits of cycling for people with limited mobility

Cycling has been proved to be among the most effective ways to stay healthy and active for people with physical disabilities who otherwise run a risk twice as high as non-disabled people to be *physically inactive*, as well as *socially isolated*.

According to several studies, regular physical activity is absent from the lives of many disabled people. This is most noticeable in people with learning disabilities or who live in residential care.

For those with reduced motor ability, (non-standard) cycles work as a mobility aid (like wheelchair and mobility scooters) that provide them with the freedom to move and get to places, which otherwise would be impossible for them to do on foot. It is because cycling involves the rhythmic contraction of large limb muscles, it is an ideal aerobic exercise and there is no pressure on joints or muscles when compared with weight bearing exercises.



Figure 3: a disabled cyclist on an adapted bike

The benefits of cycling to disabled people can be summarized into **3 main principal points** as below:



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Field	Benefits of Cycling
	<p>Health</p> <p>Provides a gentle workout, thus improves physical fitness and lowers the risk of developing chronic diseases due to sedentary lifestyle</p> <p>Triggers the body to produce endorphins, a natural painkiller and stimulant for euphoric state, helping to reduce one's dependence on medication</p> <p>Helps older to stay active longer and delays the arrival of diseases associated with age</p>
	<p>Well-being</p> <p>Provides autonomy in getting from A to B, a sense of independence and confidence</p> <p>Reduces spending for private car hires, taxis, or opportunity loss due to physical barrier</p> <p>Improves socialization by making outdoors activities and get-togethers achievable</p> <p>Improves mental wellbeing for being able to actively participate and contribute in social and economic life</p> <p>Puts into practice the UN Convention on Disability Rights by consenting disabled people to enjoy recreational and sportive activities and tourism.</p>
	<p>Environment</p> <p>Enables disabled people to participate in green initiatives, decreasing use on fueled vehicles (like private cars and taxis) for their transport.</p>



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1.3. Accessible Cycling Infrastructure

Cycling infrastructure is accessible when it can accommodate not only non-disabled cyclists but also cyclists with their mobility aid and/or non-standard cycles.

An easy way to understand this concept is to look at the *Dutch cycling infrastructure*, which is so advanced and well-designed that catering to all categories of cyclists, including disabled ones has long become a social norm. Watch the video below:



Video 1: Dutch cycling infrastructure

Major characteristics of the Dutch cycle track are noted:

- **Extensively present**, allowing people to make short-distance journeys without difficulty
- **Highly safe**, making it possible for everyone from 8 to 80 to cycle carefreely since the tracks are very well-designed
- **Wide enough** to allow different categories of cyclists to comfortably blend in, cycle with a companion, or even surpass when necessary
- **Very Inclusive**, allowing also motorized *mobility scooters* alongside other non-motorized cycles, to go up to 30 km/h



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- **Offering benefits for everyone:** protecting pedestrians from motorised traffic and offering quality of life to people with disabilities

1.4. Thinking beyond the bicycle – A case study

When thinking of cycles, most people would only think of bicycles, the most popular form. However, apart from bicycles, there exist other types of cycles that can be categorized as “non-standard cycles” to accommodate a variety of needs by elderly and disabled cyclists.

It is important to alter the above common perception because according to the **social model of disability**, “a person is disabled by the society, rather than his/her impairment of health condition”. Such an initiative was started in the UK in 2017 by a group of activists called *Beyond the Bicycle Coalition* that aimed to change both the mindset behind current local laws and cycling infrastructure.

Case study: thinking ‘beyond the bicycle’

In 2017 a group of people in London got together to form the Beyond the Bicycle Coalition – an alliance representing users of non-standard cycles including Disabled people, those using cargocycles, cycles being used for freight and families.

By meeting on a quarterly basis and maintaining regular contact via an online Slack group, the Coalition has acted as a forum for facilitating discussion and developing ideas that will lead to improved infrastructure, facilities and recognition, along with reduced user costs, for users of non-standard cycles.

To date, the Coalition has been successful in helping to shape the debate around cycling during the 2018 local elections, as well as influence the transport policies of London Borough councils. As well as acting as a forum for users of non-standard cycles, the Coalition works on a case-by-case basis to prevent the installation of access control barriers where they prohibit use by larger cycles.

By working collaboratively with local councils, cycling campaign groups, cycle suppliers and business the Coalition has helped to raise the profile of Disabled, freight and family cyclists in London and promote the common cause of users of non-standard cycles.

The Coalition believes that cycle infrastructure and networks that meet the needs of users of non-standard cycles will, by default, be accessible to *everyone*.



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UNIT 2 - GENERAL OVERVIEW

UNIT 2: Options for Inclusive biking

2.1. Types of Adapted bikes

2.1.1. Tricycle

2.1.2. Tandem cycle

2.1.3. Side-by-side tandem

2.1.4. Handcycle

2.1.5. Wheelchair cycle

2.1.6. E- cycle

2.2. Choosing the right bike



Martyn Ashton, once a world champion trials mountain bike, stays active with his passion sport after a crash accident.

Credit: Velonews

[Length]: 2 hrs



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UNIT 2: Options for Inclusive cycling

2.1. Types of Adapted bikes

As mentioned in the last chapter, a variety of non-standard cycles have been developed in order to meet the diverse special needs a cyclist may have. Such needs may range from keeping balance, limited visual ability, to lack of physical strength in the lower part of the body, etc.

Note:

A number of disabled cyclists still use a standard two-wheeled bicycle as means of transport since cycling is less tough than walking. Likewise, for family or personal purpose non-disabled cyclists may also turn to non-standard cycles (such as transport/cargo bikes, trailer bikes, or e-bikes). Therefore, as tourism professionals it is also important not to assume that disabled people use only non-standard bikes or vice-versa.

The below table illustrates several common non-standard bikes, their utility, and for practical information, also their price range. The list is not exhaustive.

Name	Illustration photo	Characteristics	Target user	Price (Euro)
Tricycle	 <p>(Credit: van Raam)</p>	<ul style="list-style-type: none"> - Having 3 wheels - Offering good <i>Stability</i> 	<ul style="list-style-type: none"> - People having trouble balancing, recovering from stroke, or suffering from dyspraxia (a form of developmental coordination disorder) 	500 – 1,500
Handcycle	 <p>Credit: TfL</p>	<ul style="list-style-type: none"> - Having pedals in the front to be moved by the hands - Usually having 3 wheels (sometimes 4) 	<ul style="list-style-type: none"> - People with little or no mobility in the lower body 	1,000 - 3,000



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Side-by-side Tandem	 <p>Credit: photojB/Sustrans</p>	<ul style="list-style-type: none"> - May have two/three/four wheels - Can come as one rider in front of the other (<i>Tag-along</i>), or two people side-by-side as in the photo 	<ul style="list-style-type: none"> - People with visual impairment that need support with pedalling or steering from another person 	1,000 – 3,000
Wheelchair cycle	 <p>Credit: Van Raam</p>	<ul style="list-style-type: none"> - Having an adjustable seat for a wheelchair user on the front and a cyclist at the back pedalling 	<ul style="list-style-type: none"> - Anyone without the physical ability or confidence to cycle on their own to enjoy the feeling of cycling 	5,000 – 7,000
Recumbent	 <p>Credit: photojB/Sustrans</p>	<ul style="list-style-type: none"> - A sporty, ergonomic version of tricycle - Placing cyclist in a laid-back reclining position, distributing their weight in a more comfortable way - May come in two or three-wheeled form 	<ul style="list-style-type: none"> - Sports-minded cyclists who also want comfort - Cyclists aiming for unpaved roads and offroad (like conventional mountain bikes) 	2,000 – 4,000
E-cycle	 <p>Credit: WheelsforWellbeing</p>	<ul style="list-style-type: none"> - Having an integrated electric motor to assist propulsion - Come with small motor (<i>pedelecs</i>) or powerful one similar to a <i>moped</i>. 	<ul style="list-style-type: none"> - Cyclists that need to ride longer distances in greater comfort 	1,000 – 5,000

Table 1: Types of non-standard cycles

2.2. Choosing the right bike

Choosing the right bike can help people with limited mobility to achieve their freedom to move and stay active, especially when they can no longer use a regular bike. With advanced technology, many types of non-standard bikes have been developed and sold on the market that can meet different unique needs.



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Being disabled should not be a barrier to enjoying cycling and there are a number of options available to suit many types of disability including those with learning difficulties and people suffering with arthritis.

These can include: bicycles fitted with stabilisers, to give riders that extra bit of confidence; tricycles, that have the option of a supported or recumbent seat; handcycles, where the rider is able to power the front wheel by hand, bicycles made for two, which allows side by side cycling.

It is important to consider certain **aspects when suggesting/choosing the right bike** for a potential customer:

- Physical conditions and special needs of the person: muscle power, lower body power,
- Characteristics of the bike and its intended Target group
- Usage preferences of the cyclist (to cycle alone or in pair/group; pedalling with little or more electric support, for transport/therapeutic purpose, etc.)
- Their cycling infrastructure situation in their intended place of use (within the city, offroad, etc.)
- Practical information: price of bike with needed accessories, any public reimbursement policy (as non-standard bikes are evidently more costly than regular bikes)
- Local community's awareness and attitude towards inclusive cycling .

CASE STUDY 1: WALKING AID INSTEAD OF CRUTCHES

Due to a tumor causing fractures in the ankle, Ronald (the Netherlands) cannot walk without pain and difficulty. He opted for a walking aid through his insurance and got one neat and light walking bike with which he can go to grocery shopping alone. The slim-designed and portable bike allows him to easily manoeuvre his moves even in narrow space (between the shopping aisles), as well as "walk" distances as far as 3km.

"Footbiking" enables Ronald to maintain the pleasure to walk quite fast and smoothly, instead of using his mobility scooter or crutches that can be heavy and tiring to use.

Nevertheless, Ronald says that not many people are aware of such walking aids: *"Arrived at the hospital I continue my way "walking / footbiking" on the balance bike and always meet a lot of people who don't know this handy walking aid. I am therefore always surprised how many people do not know that such a walking bike exists!"*



Credit: Van Raam



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UNIT 3: Barriers to Inclusive Cycling and Solutions

[Short Unit Introduction]

Barriers to Inclusive Cycling may come in many forms: physical, architectural, financial and attitudinal.

In this Unit, we will explore and analyze the most common barriers that impedes inclusive cycling and accordingly propose corresponding solutions.

[Structure]

- 3.1. Infrastructure
- 3.2. Bike's Cost
- 3.3. Imagery and perception
- 3.4. Cycles not recognized as mobility aid
- 3.5. Signage and Maps

[Length]: 3 hrs



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3.1. Infrastructure and Facilities

Having the spacious, well-designed cycle tracks as in the Netherlands that allow different types of non-standard cycles to democratically blend in with other bikers (Unit 2) is the dream of cyclists in many other countries!

As a matter of fact, though prioritized in many EU Member States, integrated Cycling infrastructure is still under development and poses certain challenges in not just a few countries.

In Oct 2015, the European Councils made up of EU ministers adopted a “**Declaration on Cycling**” in Luxembourg, urging the Commission, Member States and local authorities to take actions to render cycling a climate friendly transport mode and further integrating Cycling into the multimodal transport policy.

Guidelines have also been provided on Quality Design of Cycle infrastructures and networks, detailed in the Commission’s “[Basic quality design principles for cycle infrastructure and networks](#)”. A glimpse of the specific measures can be summarized by the chart below:



Chart 1: EU Specific Guidance on Cycle infrastructure

In the context of Inclusive Cycling, the problem is twofold: (1) incomplete cycling infrastructure for regular two-wheeled cyclists and (2) underdeveloped Inclusive infrastructure for disabled cyclists using non-standard bikes.



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(1) General cycling infrastructure: still incomplete

Research on cycling infrastructures across Europe has shown that in many European cities, cycling networks are not yet complete, with only some fragmented tracks or lanes that fail to form a real “cycle networks”:

Cycle network, by definition, is “an interconnected set of *safe* and *direct* cycling routes covering a given area or city” (PRESTO project, 2010).

Problem:

Connectivity issue: in many cities, it was found that “cycle routes begin and end to nowhere. Tracks which are fragmented and scattered certainly could not be described as a network” (Vassi & Vlastos, 2014). There is also the need to get connected to other modes of transport.

Safety issue: cycle tracks should be well separated from motorized traffic and avoid to generate stress or undue level of detour to cyclists.

Solutions

Shared facilities: a sharing mentality has been on the rise and in reality, sharing infrastructures are easier to do and more cost-effective than building more and new ones.

For example, *sharrows* (where cars and bike can share the road), *bicycle boulevards* (or *fahradstrasse*), shared bus and bike lanes, have been increasingly used over Europe. In the Netherlands, people with a mobility scooter can choose either to ride on the road or within the cycle tracks (Unit 2).

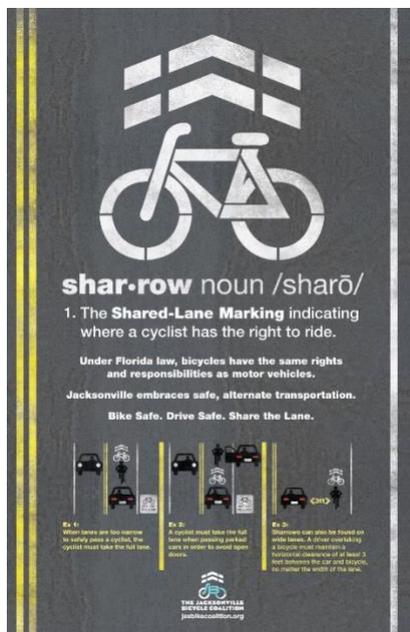


Figure 4: sharrow



Figure 5: Bicycle boulevard in Barcelona



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(2) Underdeveloped Cycle infrastructures for disabled cyclists

As disabled cyclists, they have to face many other challenges due to the inaccessibility of existing cycling infrastructure, which are usually designed for two-wheeled, able-bodied cyclists only.

As tourism professionals, it is important to recognize where the problems are and can offer opportune support, and where possible, solutions, since often times they may seem too familiar to be noticed.

The issues with inaccessible cycling infrastructure can be summarized as below:

“There is a lack of fully inclusive infrastructure across cycle networks. Narrow cycle lanes, steps, speed reduction treatments, physical obstacles, barriers and potholes reduce accessibility for **non-standard cycles, which are often wider, longer and heavier than standard bicycles**. Accessibility can also be reduced for disabled cyclists who ride on two wheels but who may not be able to lift, carry or walk their cycle. “
(*WheelsforWellbeing, 2017*)

Several typical infrastructural designs are given below just to give us some idea of the accessibility challenges. The list is *not* exhaustive.



SPEED BUMPS

Problem: creating discomfort and pain that is usually reduced by cycling



NARROW CYCLE LANES AND JUNCTIONS

Problem: creating turning difficulty for wider cycles, as well as less visibility due to lower seating position of non-standard cycles

Solution: assign sufficient space to accommodate all types of cycles



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KERBS LINING PREVENTING ACCESS TO/FROM CYCLE PATHS

Problem: creating a trap for disabled cyclists within the cycle track who cannot carry their bike over the kerb.

Solution: making wider and dropped kerbs to allow step-free access



An example of a 'forgiving kerb': a gentle slope allows cyclists to join or leave the track where they like



ACCESS CONTROL BARRIERS PREVENTING ENTRY

Problem: many kissing gates and kerbs blocking passage for non-standard cyclists as many of them cannot dismount/walk their bikes through

Solution: widen the space between the barriers, substituting kissing gates with wheelchair-friendly cattle grids.



INSUFFICIENT PARKING/STORAGE SPACE

Problem: narrow and obstaculous parking facilities usually exclude non-standard cycles that need wider space, or not clearly signaled

Solution: widen and clearly allocate space for non-standard cycles, taking into consideration their high costs



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3.2. Bike costs

Bike costs are a real issue to seriously consider if you intend to provide service of non-standard bike rentals or bike tours.

Unfortunately, non-standard bikes are remarkably more expensive than the standard ones (see Unit 2 for references) and their high costs may exceed some public initiatives/subsidy limit.

In addition, non-standard bikes also require special (and more demanding) parking and storage structure, since their high value also render them particularly attractive to thieves.

3.3. Imagery and perception

It is still generally assumed that disabled people do not or cannot cycle. Such assumption is usually reflected in general cycling and transport policy or the cycle signals (photos, diagrams) and language that usually apply to only two-wheeled cycles.



Another issue is that Disabled people are usually referred to as “pedestrians, car drivers, bus riders or taxi users” in transport policy rather than “cyclists”.

Such limited awareness of “Disabled people as Cyclists” has influenced transport policy, guidance, planning and signals, resulting those less relevant and supportive for people with disability using non-standard bikes.

General public image shall move away from associating cycling and cyclists with only athletic able males on the two wheels, but welcome broader representation of cyclists by other *vulnerable groups* including elderly people, disabled people, young children, and women. A banner created by *Cycle Bath*, an UK-based cycling community can illustrate the above point about Inclusive Cycling Imagery and Language.



Figure 6: Inclusive Cycling Imagery (Cycle Bath)



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3.4. Cycles not recognized as mobility aid

Thanks to its non-weight bearing advantage, cycling helps people with special needs to substantially reduce pressure on their joints, balance, or breathing difficulties, thus saving their energy and time when trying to move from A to B.

Useful and important as such, nevertheless, cycles are yet to be widely recognized as mobility aid for mobility-impaired people and as a result, they are often asked to dismount in certain public places (footway, park, shopping centres, trains, etc.)



Table 2: Places where disabled cyclists often asked to dismount in the UK (Wheels for Wellbeing, 2018)

It is important for non-standard cycles to receive similar recognition to that of mobility scooter that enjoys the possibility to cycle on the footway in several countries, as well as being exempted from the request to dismount. Non-standard cycles, in many contexts, are still obliged to use the road together with motorized traffic.

Recommendations for tourism professionals and managers to promote inclusive cycling:

- Design and use special Badge for cyclists with special needs in and around the receptive structures to inform that they can enter with their cycles
- Allocate sufficient space and create passage for people using their cycles as mobility aids. Below are the recommended width to allow easy passage by WheelsforWellbeing, the advocate group for Inclusive Cycling (UK):

Infrastructure	Minimum width	Ideal width
Access control point	1.5m	2.0m
Cycle lane	1.5m	2.0m
1-way cycle track	1.5m	3.0m
2-way cycle track	2.8m	4.0m



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- Replace the term “bicycle” with “cycle” when applicable and add photos of non-standard cycles to relevant signals and banners
- Advocate for local public policy to raise awareness and accommodative actions towards non-standard cyclists with regards to transport policy, infrastructure, facilities and so on.

3.5. Signage



Signage is of vital importance for non-standard cycles in order to help them find accessible routes, reserved facilities and enjoy their ride without dismay.

Since inclusive infrastructure is still under development, signage will help to make a big difference to the local image of accessibility, and make the most of accessible structures that at times go unnoticed.

When designing and installing signs, it is suggested that the following criteria be taken into consideration:

- *Use logos depicting non-standard cycles as well as bicycles*
- *Signage should be put in place that clearly denotes cycle parking allocated for non-standard cycles (e.g. “Reserved for cargo and non-standard cycles. Priority to disabled cyclists”). Signs should be on a vertical pole*
- *All signage should be in large font size (at least 36pt), with the use of easy read language and symbols for instructions*
- *Lighting in cycle parking bays needs to be at least 100w in order for people with poor vision to be able to read signage*

(WheelsforWellbeing report, 2017& 2019)



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UNIT 4 - GENERAL OVERVIEW

[Structure]

UNIT 4: Bikes' technical know-how

- 4.1. Getting to know the Bike parts
 - 4.1.1. Standard Bicycle parts
 - 4.1.2. Tricycle parts
 - 4.1.3. Recumbent parts
 - 4.1.4. Handcycle parts
- 4.2. Bike gears
- 4.3. Bike repair
- 4.4. Bike Safety and First aid
- 4.5. Pedaling rules

[Length]: 5 hrs



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4.1. Getting to know the Bike parts

4.1.1. Standard Bicycle parts

Let's start from the standard model that lays the foundation to other non-standard cycles. It is important to identify essential bike parts and understand their functions in order to be able to inspect the bike with security before any ride.

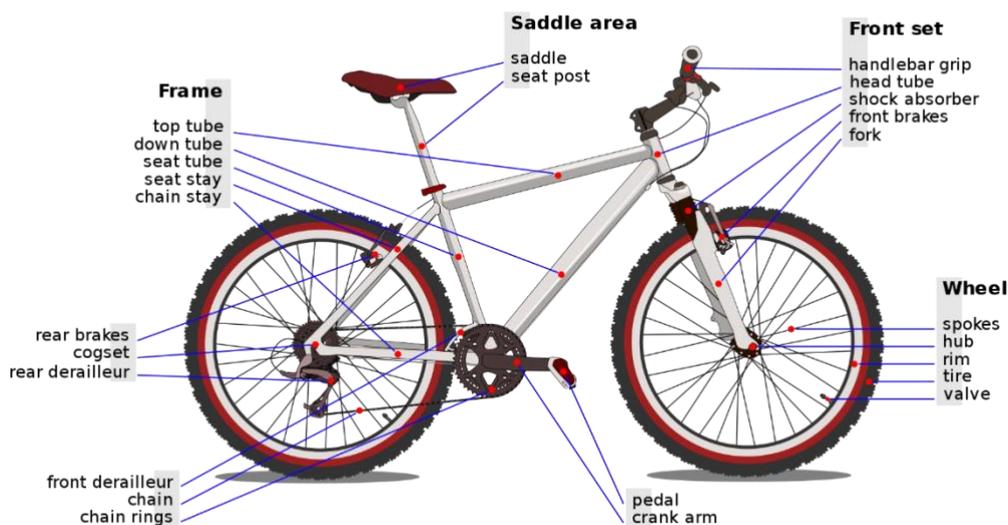


Figure 7: Bicycle parts diagram (Credit: Creative Common)

In order to ensure a safe and enjoyable ride, cyclists need to perform a basic **ABC check** beforehand:

A: Air – check that there is air in the tires

B: Brakes – check front and rear brakes (e.g. by means of a quick release) to see if they work well

C: Chains and cranks – check if the chain and cranks are properly set

A *short ride* is advised to make sure the bike is running properly before hitting the road. In addition, cyclists need to make sure the bikes are clean so that they can work well (any traces of grease, soil or mud in the chains, sprockets, derailleurs, etc.)

4.1.2. Tricycle's parts

Tricycle differs from a standard bike most of all due to the fact that it has three wheels, while other parts stay quite similar. Some tricycles may be also low-step to allow easy mounting for cyclists with impaired mobility.



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Below a diagram that illustrates tricycle's parts:

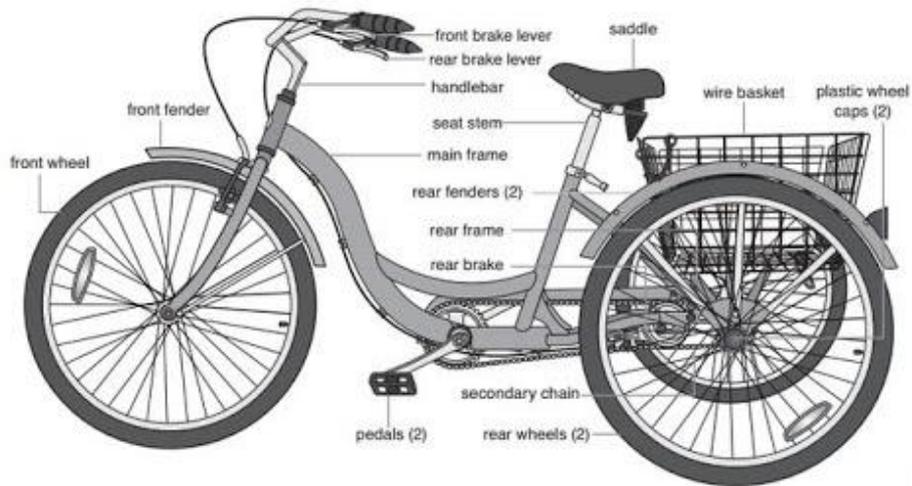


Figure 8: Tricycle parts (Credit: ForOffice)

4.1.3. Recumbent tricycle parts

The photo below illustrates all parts of a leg-powered recumbent tricycle (trike). For more information refer to **Unit 2 – Types of non-standard cycles**.



Figure 9: Recumbent tricycle's parts (Credit: Recumbent)



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4.1.4. Handcycle's parts

A handcycle distinguishes itself by the way it is operated: by the arms rather than the legs and like tricycles, usually have three wheels as well (though also known as *handbikes*).

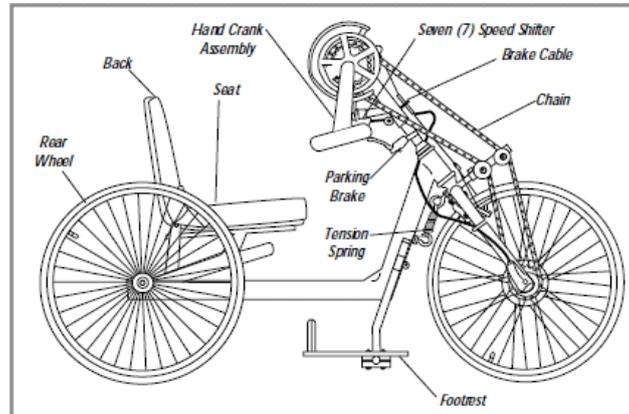


Figure 10: Handcycle parts (Credit: TopEnd)

Here's a close-up look of an adjusted handcycle:



Figure 11: An adjusted handcycle (Credit: Van Raam)



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Handcycles are also available in **recumbent** model in order to reduce pressure on cyclists' back and facilitate more challenging rides.

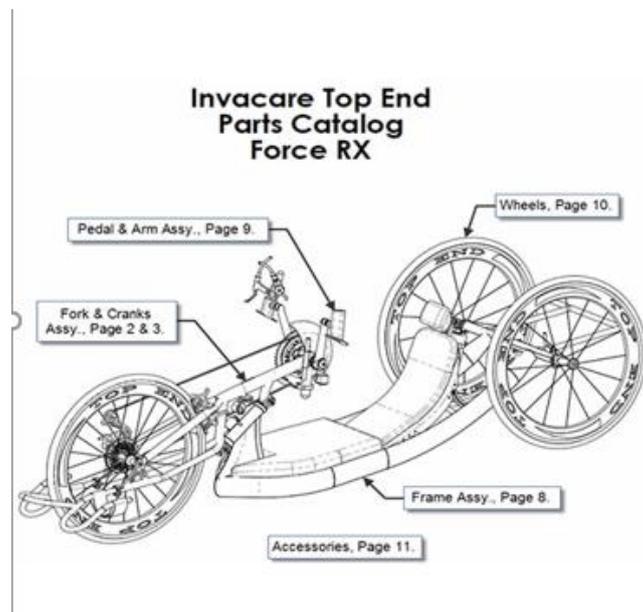


Figure 12: Recumbent parts (Credit: How iRoll sports)

4.2. Bike gears

4.2.1 The basics

Understanding how to pedal effectively and changing gears will enable riders to bike longer and faster and on different terrain. Riders will also better use the energy and benefit from a deeper knowledge of how to change gears.

The right hand-lever on the handlebar operates the rear gear by moving the chain across the sprockets. The left hand-lever on the handlebar shifts the chain from one chainwheel to another.



Figure 13: Bike gears

4.2.2. What determines the number of bike gears?

It's a multiplication of the number of sprockets at the rear with the number of chainrings at the front. A double chainring set-up with a 10-speed rear cassette is therefore a 20-speed bicycle — meaning that it's possible to use all of the 10 sprockets in combination



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with each of the two chainrings. Likewise, a triple chainring paired with an 11-speed cassette is a 32-speed set-up, and so on.

The big chainwheel is for riding along flats while the smaller chainwheels are for riding uphill or when there is a strong headwind. It is important to keep pedaling while changing gears and shift the gear one to three notches at a time rather than. From biggest to smallest and viceversa.

It's about efficiency and having a much broader range of gears for a given situation. Just like a car, bicycles benefit from a low gear to accelerate from a standstill, or to climb a steep hill, and at the other end of the scale a high gear helps you to achieve high speeds without over-revving.

Gears enable to maintain a comfortable pedaling cadence regardless of the gradient or terrain — something that no one single gear is capable of. Having lots of gears is not about making the bike faster: a bike with 30 or more gears is not an indication of a machine designed to break the land speed record any more than a bike with only a single gear, assuming similar ratios.

Some people choose to ride single-speed bikes. These still have a gear – which is determined by the size of the front chainring and rear cog.

Single-speed bikes are common among people living in flat areas, because they require little maintenance. They are also used by some racers who want to drop weight and cut down on any extra complication coming from the shifting process – in this case it is crucial the choice of the correct gear ratio.

4.3. Bike maintenance

Bike maintenance includes: a pre-ride inspection, securing bolts, and cleaning and lubricating key components. Also, there are bike parts that should always be serviced and adjusted by experienced mechanics.

In case you ride frequently is better to bring the bike in for twice-yearly tune-ups to ensure that complex, hard-to-evaluate components such as spokes, bearing surfaces, derailleurs and cables are inspected and serviced regularly.

4.3.1 Inspecting the bicycle

We all can get in a habit of simply hopping on our bicycle and riding off, assuming that our bike is in the same condition we left in our last ride. A quick safety check before every ride should become second-nature.

Bicycles are held together by dozens of bolts and nuts. Maintaining a tight ship is important because loose bike parts can lead to serious wear and tear, create a safety hazard or causing a low performance.



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When tightening bike bolts, consult the owner's manual for proper torque specifics. Over-tightening can lead to component damage.

The best defense against loose components is a routine inspection before every ride. This will help to catch potential problems before they develop into safety hazards.

Brakes: Squeeze your rear and front brake levers to make sure that the brakes engage properly;

Air: Check the sidewall of your tire for the recommended tire pressure. While you're checking the air, ensure your quick-release levers and thru axles are tightened as well, then, make sure you have your patch kit and pump with you. Performance road tires need their air checked every 3-4 days depending on storage conditions. Mountain bike tires can be checked less frequently as they have higher volume under lower pressure,

Chain: Keeping your chain lubricated and everything clean will ensure your bike shifts easier and the drivetrain (made up of the front chain rings, rear cassette, rear derailleur and chain) last much longer.

4.3.2 Cleaning your bicycles

A regular schedule of maintenance is crucial. It can happen weekly or more often depending on the use or the type of riding. If you spend a lot of time riding in wet, muddy conditions, clean your bike frequently.

Keeping your bike parts properly lubricated and cleaned is important for good performance. In particular, lubrication protects moving parts from excessive wear caused by friction and helps keep rust and corrosion at bay.

Of course, over-lubricating can lead to component damage or poor performance because will attract dirt and other abrasive particles. Excess lube should be carefully wiped away before the bike is on the road.

4.4. Bicycles Safety and First aid

The first recommendation and preparation for safe bike riding is proper training. This includes common resources like an experienced rider, or community program.

Initial training involves simple instruction from parents, or instructor on balance and pedaling and proper supervision of beginner riders is a prerequisite: it is highly recommended that children, and beginners in general, ride only in enclosed areas.

4.4.1 Principle of bike safety

Parents and caregivers should encourage biking while stressing safety, including mandatory use of properly fitted and secured helmets. For this reason, it is *strongly recommended* some early investment in safety equipment such as protective clothing and a helmet in order to prevent a significant number of injuries, specifically:



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- Helmets - *very important*
- Selection of proper bike
- Bicycle maintenance
- Reflective clothing for low-visibility conditions
- Bike safety equipment: reflectors on wheels and frame

4.4.2 Bicycling safety guidelines and tips to avoid common injuries

Inexperience, high speed and not wearing protective gear can lead to cycling injuries for children and beginners. A third of hospital emergency visits for Youngers with cycling injuries involve broken bones, and one in 10 serious injuries result from collisions with vehicles and even cycling deaths.

The following guidelines can reduce the risk of a bicycle accident.

- Use a bike in a way that is appropriate for the age of the rider;
- Be aware of the need for skills and experience before riding a bike on public roads;
- Use reflective stripes on clothing and bicycles, and use flickering lights - also during daylight hours - to make cyclist more visible to motorists;
- Be aware of the understanding among motorists and bicyclists about sharing the road.
- Be sure and promote safe motorist and bicyclist practices such as proper speed, yielding right-of-way, not driving while drinking;
- Keep away from busy streets and parking lots;
- Know and obey traffic rules;
- Teach increased awareness of surroundings. (Beware of opening car doors, sewer grating, uneven surfaces, etc...)
- Cyclists must follow the same rules as motorists. Use hand signals before turning. As we are all sharing the same road, obeying the rules of the road will allow for an enjoyable and safe ride for both bicyclists and motorists.
- Avoid major roads and sidewalks.
- Announce your presence and arriving ("On your right") on bike and walking trails as you come up behind and pass other bike riders and pedestrians;
- Have first aid training to have the skills and confidence to provide emergency treatment for common cycling injuries like falls, fractures or bleeding.

4.3.4 First aid on the trail

In order to handle a medical emergency, it is crucial the proper first aid training. Several emergencies should be addressed urgently to help stabilize the victim before medical staff can be reached.



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This paragraph describes some common biking injuries and how to handle them, but be aware that there are many more serious injuries that can happen on the trail.

A recommendation is to take a first aid training course to learn how to treat a wide range of injuries.

Broken leg, arm or wrist

Create a sling for securing a broken forearm or wrist. In case of an upper-arm break, create a sling that wraps around the neck and wrist only.

Secure a splint that covers from above the broken area to below it. Use strong materials for the splint; sticks, a flat piece of wood can be used. Clothing can be wrapped around the splint to secure it.

Broken finger

Create a splint for the broken finger by taping it to another finger; keep something soft such as a piece of clothing, between the fingers to make it comfortable.

Concussion

Its always best to be cautious with a head injury; a concussion may happen even if the rider does not lose consciousness. In this case do not let the rider get back on the bicycle, but just walk both bikes until you can get help; meanwhile continue to monitor the rider conditions because concern include vomiting, headache that progressively worsens, becoming less conscious and bruising behind the ear or around the eyes.

Broken collarbone

The broken collarbone is a very common injury, even among professional cyclists. Create a sling youll probably have to use a shirt to secure the arm and keep the arm at a 90-degree angle.

Lacerations

First of all, clean the wound carefully, then gently spray clean water over the wound in order to clear away debris. If possible, apply a sterile dressing (a dry and clean piece of clothing can be used as dressing). If the cut is severe, it requires pressure to stop the bleeding; in this case put pressure directly on the wound may stop steady bleeding. The sides of the wound may need to be pushed together as well to slow the bleeding. In the case of arterial bleeding where blood spurts from the wound pressure must be applied to the artery itself on a point close to the wound.

4.5. Pedaling techniques



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Peddalling is absolutely key in cycling and there are a surprising number of factors that come into play. Following some tips on how to pedal properly and improve the skills on the pedals.

- Get your bicycle set up correctly. The right set-up will put you on the road to a good ride. It's important to be set up on the bike properly to allow proper functioning of the muscles.
- Pedal smoothly and consistently
- Toes on the foot pushing downward on the pedal stroke should be slanted up slightly
- Look ahead at a point in front of the wheel in a way you can see your whether your pedal stroke should be modified depending on possible obstacles.
- Pull your pedals in semicircles, in fact cyclists should focus on pulling (instead of the pushing) their pedals, using a semicircular motion. As the pedal moves towards the bottom switch from a pushing down motion to a pulling back movement; bike riders are often told to try to pedal in circles, but this should be avoided;
- Play with cadence. There is a lot of research around the optimum pedaling rate, the cadence. High cadences became fashionable, in thanks partly to **Lance Armstrong** who favored fast leg speeds, but beginners should not try to push cadences too high to begin with. Keep at a cadence that is manageable but over time look to increase this. It is important to be comfortable.



Figure 14: Lance Armstrong at Tour de France. Credit: Outside magazine



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Unit 5: Accommodate an Inclusive Biking Tour

- 5.1. Design Inclusive Facilities
 - 5.1.1. Cycle path
 - 5.1.2. Cycle parking
 - 5.1.3. The Built Environment
- 5.2. Evaluating Cycling routes
- 5.3. Cycling tips

Case study: inclusive cycling hubs

In 2016 a large-scale bike share scheme was set up in Portland, Oregon (USA) with the support of Nike. However, just weeks before its launch a local politician voiced concerns that the scheme excluded Disabled people, as it did not include any non-standard cycles.

The local transport authority subsequently revised its plans and decided to expand the scheme to cater for Disabled cyclists. One year later, in July 2017, [Adaptive Biketown](#) was born.

The scheme rents out cycles for people with a range of disabilities, including tandems, handcycles and tricycles, and aims to increase access to cycling for all Disabled people. It is run by the Portland Bureau of Transportation, in conjunction with a local non-profit disability organisation and a cycle shop specialising in non-standard cycles.

Adaptive Biketown, Oregon, USA



[Length]: 3 hrs



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5.1. Inclusive design criteria

Non-standard and disabled cyclists are still far from well-represented in public transport or leisure activity, as can be easily noticed by the scarcity of non-standard cycle signs around us.

Therefore, in order to encourage people with disability to take to cycling, it is the society's responsibility to provide inclusive design and facilities to accommodate their diverse needs. The fundamentals ones to be presented in this section include: Cycle Path and Cycle parking.

5.1.1. Cycle path

The first step is to alter the **mindset** that associates cycling to only two-wheeled bicycles an able-bodied cyclists.

Instead, we should adopt the awareness to make cycle networks **step-free, barrier-free and spacious** in order to accommodate the diverse needs of non-standard cyclists who wish to travel with their youngest as well as elderly family members, use tricycles, tandems, or handcycles, etc.

That does not necessarily mean to separate non-standard cyclists from the wider environment. That would be contrary to the Inclusive mandate we are trying to promote.

So inclusive cycling networks shall allow cyclists to make continuous and uninterrupted journey – at the basic level, have clear and accessible wayfinding, as well as interact and interlink with the public transport and the built environment (buildings and offices).



Figure 15: Example of inclusive cycle path

An exemplary design can be seen from the [Dutch Cycling Infrastructure video](#) (Unit 1.3.)



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5.1.2. Cycle parking

Parking for non-standard cycles are still absent in many parking facilities, where only narrow cycle parking bays intended for two-wheels bikes are made available.

Insufficient parking plays a big role in discouraging people with disability to take to a biking tour, not because they cannot cycle but due to inaccessible cycling-related facilities. In addition, as explained in previous sections, non-standard cycles have much higher costs, which makes it of particular important to have a secure and stable storing place.

Another issue is that, sometimes when such parking facilities are available, they are not so clearly marked so that people can recognize them immediately. More vertical and eligible *signs*, as well as outstanding *ground markings* (of a different paint color) are needed to facilitate easy wayfinding.

The following pictures illustrate the difference between a clearly-marked cycle park and another without clear ground marking:



Figure 14: Mixed cycle parking

Vs



Figure 15: Cargobike parking in Malmo, Sweden

As we can see from the photo on the right, the supportive stands are also made lower compared with those useful for two-wheeled bicycles (**half-height stands**). It is due to the fact that most non-standard cycles are self-standing, and that those exclusively reserved parking cannot be used by two-wheeled bikes.

Here is another useful ground marking to be taken into consideration:

More design and technical recommendations for Inclusive Cycle Parking design can be found in the **Table 3** below, suggested by the advocate group *WheelsforWellbeing*:



Credit: VelopA



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<p>Dimensions</p>	<ul style="list-style-type: none"> • The minimum gap between cycle stands/bays should be 1m • At least one bay for non-standard cycles should be allocated at the end of a row of standard cycle parking stands, with these bays a minimum of 1.5m wide in order to allow for dismounting
<p>Accessibility</p>	<ul style="list-style-type: none"> • Parking facilities for non-standard cycles should either be located on ground level or have step-free access (e.g. via a shallow ramp or large accessible lift) • Where possible, install cycle parking bays that people on non-standard cycles can ride into and out of (meaning no need for reversing, turning or lifting a cycle)
<p>Designation and markings</p>	<ul style="list-style-type: none"> • Signage should be put in place that clearly denotes cycle parking allocated for non-standard cycles (e.g. <i>"Reserved for cargo and non-standard cycles. Priority to Disabled cyclists"</i>). Signs should be on a vertical pole • Blue and white paint should be used to delineate the area of a non-standard cycle bay (which could also feature a logo that depicts a Disabled cyclist and cargo cycle) • Blue and white paint might also be used on stands/poles to help with differentiation • All signage should be in large font size (at least 36pt), with the use of easy read language and symbols for instructions
<p>Further considerations</p>	<ul style="list-style-type: none"> • Lighting in cycle parking bays needs to be at least 100w in order for people with poor vision to be able to read signage • At public facilities a help point (similar to those found on tube platforms) should be installed, which includes help for deaf people using British Sign Language (BSL), text and a face so that people can lip-read • Non-standard cycle parking bays should be under shelter, not exposed to the elements and nearest to the entrance of any facility it is serving • Thought should be given to the possibility of the co-location of Disabled car and cycle parking bays, as well as family car and cycle parking bays • Reserved cycle parking for Disabled cyclists should be monitored and cycles that are wrongly parked should be removed. A Disabled cyclists' Blue Badge scheme could help in identifying cycles and cyclists genuinely entitled to park there (see here) • Where no inclusive cycle parking spaces have been provided, a notice should be appended that acknowledges this issue and signposts the user to alternative provision, where they can cycle into their destination and store their cycle indoors (e.g. a bookable cycle shed exclusively for use by Disabled cyclists)

Table 3: Design and Technical suggestions for Cycle parking (WheelsforWellbeing, 2019)



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5.2. Cycling tips

General tips

Being disabled should not be a barrier to enjoying cycling and there are a number of options available to suit many types of disability including those with learning difficulties and people suffering with arthritis. These can include: bicycles fitted with stabilisers, to give riders that extra bit of confidence; tricycles, that have the option of a supported or recumbent seat; handcycles, where the rider is able to power the front wheel by hand, bicycles made for two, which allows side by side cycling.

For women riders

It is also important to ensure that you have a comfortable saddle if you are to get the most enjoyment from cycling. These are available in a number of different material types and women only saddles, that take into account the wider pelvis, are also available.

For blind riders

Cycling is also available to people who are blind or visually impaired, thanks to **tandems** (whether *side-by-side* or *fore to aft*).

In the case of a fore to aft tandem, to be successful the front rider, usually known as the pilot, needs to have good vision, agility and patience. The rider who sits behind, usually known as the stoker, is required to have energy, a sense of adventure and trust.

Mounting a bicycle for the first time can be tricky for a blind rider. A good way to assist is for the pilot to stand over the crossbars with their feet on the ground and a good, firm hold on the handlebars. This helps steady the bike for the stoker. When the stoker feels comfortable and have let the pilot know that they are ready to go, the pilot will then push off and ride as if on a single bicycle. Once in motion the pilot will pass verbal information to the stoker regarding the route ahead. This can include the rising and dropping gradient of any approaching hills, if there are any speed bumps in the road, when they are approaching a bend and it's severity along with when to slow down and when to stop.

For mobility-impaired riders

If you suffer from neck, back or knee pain, saddle sores, or hand or foot numbness, your bicycle probably does not fit you properly. A good bike seat should be level, so it is able to support your full body weight, and allow you to move around on the seat if need be. If your saddle is tilted too far back this can cause pressure points and too much forward tilt may make you slide forward putting pressure on your arms, hands and knees.



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Other common cycling complaints include neck pain, often the result of riding a bicycle that is too long or handlebars that are too low, hand pain or numbness, this can be tackled by using padded cycling gloves and by riding with your elbows slightly bent as straight elbows take direct blows from bumps and any uneven road surface.



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GLOSSARY

A

Adapted bikes/cycles: bikes modified to fit the needs of an individual rider ¹

B

Built environment: man-made structures, features, and facilities viewed collectively as an environment in which people live and work ²

Bicycle boulevard: streets with low motorized traffic volumes and speeds, designated and designed to give **bicycle** travel priority ³

C

Cycle network: an interconnected set of safe and direct **cycling routes** covering a given area or city” ⁴

Cycle track: an exclusive **bike** facility that combines the user experience of a separated **path** with the on-street infrastructure of a conventional **bike** lane. A **cycle track** is physically separated from motor traffic and distinct from the sidewalk ⁵

Cycle lane: a part of a road that is separated by a line from the rest of the road, for the use of people riding bicycles:

Cycle parking bay: a space/slot in the parking lot designed to park a cycle in ⁶

E

E-bike: a bicycle with an electric motor that helps to move the bicycle forward even when the rider is not turning the pedals, also often used to refer to any bicycle with an electric motor, including those where you must turn the pedals ⁷

¹ Rad Innovation

² Oxford languages dictionary

³ NACTO

⁴ PRESTO report, 2010

⁵ NACTO

⁶ Collins dictionary

⁷ Cambridge dictionary



H

Handcycle (handbikes): A three-wheeled cycle propelled by the arms rather than the legs, used as an alternative to a conventional bicycle by some disabled people⁸. Though most handcycles are tricycle in form, with two coasting rear wheels and one steerable powered front wheel, they are also known as **handbikes**.

K

Kerb: the edge of a raised path nearest the road⁹

Kissing gate: type of gate that allows people, but not livestock, to pass through

M

Mobility Aids: devices designed to assist walking and improve the mobility of people with mobility impairment. There are various walking aids nowadays: wheelchairs, mobility scooters, canes, crutches, rollators, robotic rollators, and many others¹⁰

N

Non-standard cycles: cycles that are not the normal two-wheeled, leg-propelled bikes but modified to fit the needs of an individual rider (three-wheeled, hand-operated, etc.)

P

Bike Parking Stand: a device to which bicycles can be securely attached for parking purposes (also called bicycle parking rack/bike rack)

R

Recumbent: a type of cycle (usually three- or four-wheeled) that places the rider in a laid-back reclining position

⁸ Lexico

⁹ Cambridge

¹⁰ IGI Global



S

Sharrows: a road marking in the form of two inverted V-shapes above a bicycle, indicating which part of a road should be used by cyclists when the roadway is shared with motor vehicles ¹¹

Standard cycles: regular two-wheeled, leg-propelled bicycles

T

Tricycle (trike): A vehicle similar to a bicycle, but having three wheels, two at the back and one at the front ¹²

Tandem: a type of cycle that allows two riders to pedal at the same time, and could be either side-by-side or fore and aft

W

Wheelchair cycle: a type of non-standard cycle that allows you to transport a wheelchair user

¹¹ Lexico

¹² Lexico



APPENDICES



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