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Sustainable urban mobility, cycling and public transport

THE PEP European Cycling Master Plan – infrastructure module

Note by the secretariat

I. Introduction

1. At its previous session, WP.5 took note of the preparation of the first draft of the cycling infrastructure module in the pan-European region (WP.5/Informal Document (2020) No. 6). It appreciated the availability of the draft definitions for various types of cycling infrastructure contained in the module. It also acknowledged the fact that the development of cycling infrastructure module requires availability of data from many Economic Commission for Europe (ECE) countries.

2. WP.5 invited the secretariat to seek closer collaboration with THE PEP Steering Committee and its secretariat for the development of the module. It requested to table the infrastructure module as an official document at its third-fourth session as well as a proposal with ideas for further development of the module.

3. THE PEP Steering Committee at its eighteenth session, (November 2020) welcomed the work undertaken to develop an infrastructure module under the WP.5 auspices and requested to include the way forward for the implementation of the infrastructure module in chapter 5 of the draft pan-European master plan for cycling promotion (master plan) and to discuss it at the final meeting of THE PEP Partnership on cycling in mid-January 2021 and at the preparatory meeting at the end of January 2021.

4. The adopted master plan by the Fifth High-Level Meeting on Transport, Health and Environment (Vienna, May 2021) sees the infrastructure module, as initiated under WP.5, as a crucial element for achieving the master plan's objectives. Moreover, the adopted master plans in its chapter 5 on the joint actions towards more active mobility in the pan-European region designs actions for the elaboration and finalisation of the infrastructure module.

II. Background

5. The pan-European Master Plan for Cycling Promotion, adopted at the fifth THE PEP High-Level Ministerial Meeting (Vienna, May 2021) was elaborated under THE PEP Partnership on Cycling, jointly launched by the Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology of Austria and the Ministry for Ecological Transition of France. It was supported by the UNECE Sustainable Transport, and Environment Divisions and the World Health Organization Regional Office for Europe as well as the EC`s Directorate General for Mobility and Transport (DG MOVE). It brings together the experience and expertise of cycling experts from 28 countries all over the pan-European region.

6. The Master Plan is designed to help national and local stakeholders streamline efforts to promote cycling. It contains seven key objectives to be implemented by 2030: significantly increase cycling in the region; provide appropriate space in favour of active mobility; extend and improve cycling infrastructure; develop and implement national cycling policies, plans, strategies and programmes; significantly increase cyclists' safety and reduce the number of fatalities and serious injuries; integrate cycling into health policies; and integrate cycling and cycling infrastructure into land use, urban, regional and transport infrastructure planning.

7. Inter alia, the Master Plan calls for expansion and improvement of cycling infrastructure. It recognizes the challenges associated with infrastructure development, in particular: Deficient collaboration at various administrative levels in constructing, managing, maintaining, and promoting cycling infrastructure; and Insufficient or lack of design standards to construct safe, harmonized, and attractive cycling infrastructure.

8. The Master Plan formulates important recommendations for overcoming the above-mentioned challenges:

- Recommendation 3.1: "Develop a methodology for and monitor implementation of a trans-European cycling network". Through a coordinated approach involving ECE and WHO/Europe member States, ECE should support the development of a trans-European cycling network based on official national cycle routes and EuroVelo networks and incorporating urban networks and regional cycle routes. The establishment of such a network will help national and regional governments to identify, design and prioritize backbone cycling corridors and may facilitate fundraising."
- Recommendation 3.2: "Coordinate the establishment and maintenance of trans-European, national, regional, and local cycling networks": Such networks should be created in partnership with the relevant national, regional, and local authorities and stakeholders, in light of their respective competencies, in order to ensure that the appropriate infrastructure for various purposes including bicycle parking facilities is in place.
- Recommendation 3.3: Standardize cycling infrastructure - "Minimum infrastructure quality standards that ensure the coherence, directness, safety, comfort and attractiveness of cycling networks should be adopted at the highest possible level and, at a minimum, as a condition for all projects financed by states, the European Union or international financial institutions (see recommendation 3.1)."

9. The present document consists of two Annexes: Annex I provides an overview of the diverse types of cycling infrastructure and the purpose they serve, including the economics of cycling infrastructure and Annex II provides an overview of national and international cycling network best practices across the ECE region.

10. For the drafting of this document, the ECE Sustainable Transport Division has joint forces with the Confederation of the European Bicycle Industry (CONEBI) and the European Cyclists' Federation (ECF).

Annex I

Definitions and types of cycling infrastructure

I. Types of cycling infrastructure

1. Various types of cycling infrastructure have been identified and are used in the countries across the ECE region. For the purpose of this report, the types of infrastructure listed below have been selected with the aim of proposing and adopting common definitions and their interpretation as far as possible:

- Cycle track
- Non-compulsory cycle track
- Greenway
- Cycle lane
- Cycle street
- Street with contraflow cycling
- Bus-and-cycle lane
- Sidewalk with cycling allowed
- Agricultural / forestry / industry / water management road
- Cycle crossing
- Grade-separated cycle crossing
- Advanced stop line / bike box / bike lock
- Indirect / hook / two-stage turn provision
- Traffic-light exemption for cyclists
- Wayfinding
- Cycle highway

A. Cycle track

2. A cycle track is an independent road or part of a road designated for cycles, signposted as such. A cycle track is separated from other roads or other parts of the same road by structural means.

3. The above definition is sourced from the United Nations 1968 Convention on Road Traffic and the 1968 Convention on Road Signs and Signals and is agreed upon by the Contracting Parties to both legal instruments.

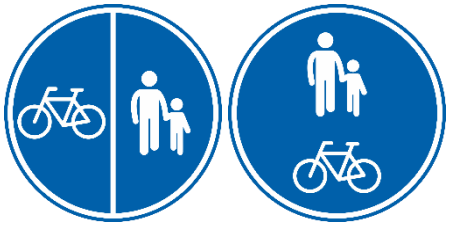
4. A cycle track is thus seen as a physically segregated cycle path. The physical segregation is approached in different ways in various countries. For example, it can be achieved by separating the cycle track from roads by some structure but also by road safety equipment (so called “light separation”) or sufficient space, such as 75 cm of buffer space in Hungary (Buczyński 2020, page 160).

5. Cycle tracks are signposted with a mandatory sign referred to as “D, 4. Compulsory cycle track” in the Convention on Road Signs and Signals.

Sign D, 4. Compulsory cycle track

6. Cycle tracks with good surface can provide a very comfortable cycling experience, especially if they lead through natural/attractive landscapes away from noisy roads. They provide a high level of safety for cyclists between the crossings as they are segregated from the carriageway.

7. The Convention on Road Signs and Signals further refers to tracks or paths that can be used by two categories of road users, e.g. cyclists and pedestrians or horseback riders. In such a case, a shared track/path is signposted by the signs “D, 11 a Compulsory path or track for two categories of road users” or “D, 11 b Compulsory shared path or track for two categories of road users”.



Signs D, 11 a / D, 11 b for two categories of road users

B. Non-compulsory cycle track

8. A non-compulsory cycle track is an independent road or part of a road designated for cycles, but the cyclists are not obliged to use them.

9. The most common way of signing non-compulsory cycle tracks, adopted in Austria, Belgium, Denmark, France, and Luxembourg, for instance, is to put the bicycle symbol on a square rather than a round background. The sign is identical with the sign G, 18 “advised itinerary for cyclists” included in the “Proposal for Amendments to Annex 1 and 3”, submitted by the Group of Experts on Road Signs and Signals (UNECE 2019b). At the same time, the definitions for the non-compulsory cycle path in countries applying this sign are more specific as to the rights of cyclists and other road users than the definition proposed for the G, 18 sign.[1]

Road sign C113 in France

[1] For example, the French sign C113 is described as: “Recommended track or cycle lane reserved for two or three-wheeled cycles. This sign indicates that access to a cycle path or lane is recommended and reserved for two- or three-wheeled cycles and indicates to pedestrians and drivers of other vehicles that they are not allowed to use or stop on the path or lane.” (Ministère Français de l'Intérieur 1967) Translation by ECF.

10. National legislation may permit admit additional users to use cycle track or their access to the track can be permitted through adequate signage.

C. Greenway

11. A greenway is a non-mandatory cycle track independent from the road network, which often follows a canal or a disused railroad. Its use is open to road users as signposted or defined in the national legislation.

12. Nowadays, the definition of greenways and the exact range of users included (pedestrians, skaters, cyclists, equestrians etc.) may vary from country to country. Dedicated signs for greenways also do not exist in all countries (ECF 2018, page 12). In many countries, greenways are simply signposted essentially with non-mandatory cycle-track signs.

13. As they usually lead through natural areas or along rivers and canals, greenways represent attractive infrastructure for cyclists. For instance, the European Greenways Association covers many disused railway corridors, canal tow paths and historic routes that were converted into traffic-free routes and encourage the use of non-motorised transport.

14. Examples of different signs denoting a greenway:

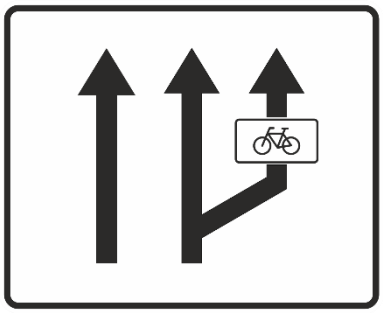
France

Belgium

D. Cycle lane

15. A cycle lane is a part of a carriageway designated for cycles. A cycle lane is distinguished from the rest of the carriageway by longitudinal road markings (UNECE 1968b).

16. In contrast to a cycle track, a cycle lane is not separated from other parts of the road by physical segregation. Most European countries sign cycle lanes with signs by the side of the road, in addition to horizontal markings and in some cases such signage is not in conformity with the Convention on Road Signs and Signals. To achieve a better standardisation for cycle lane signage, the "Proposal for amendments to Annex 1 and 3" (UNECE 2019b) includes a new sign: E, 2 b "lane reserved for a specific type of road user".



Sign E, 2b

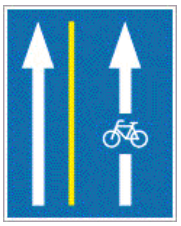
17. In some cases, cycle lanes can provide cycling infrastructure at a relatively low cost and can improve the perceived safety, but with insufficient widths, high speeds, or high volumes of motorised traffic, the protection they provide can be illusory (ECF 2018, page 12). The risk is even higher with so-called advisory cycle lanes, included in several national legislations, which are not reserved for cyclists.

18. The necessary degree of segregation between cyclists and cars in terms of safety depends mostly on vehicular traffic speed and volume. The guidelines and standards in different countries give different thresholds as to the speed and volume of traffic necessitating a separation of bicycle infrastructure. As a rule of thumb, streets with a 30 km/h speed limit can be considered safe for cyclists (CHIPS project 2020).

19. Examples of different roadside signs denoting a cycle lane:

Belgium, Luxembourg (compulsory cycle lanes only)

Poland, Spain



Hungary

UK

Cycle lane road markings in Belgium, ©ECF

E. Cycle street

20. A cycle street is a specially designed section of road or an area where special traffic rules apply and it is signposted as such at its entries and exits.

21. Nowadays, the special rules vary somewhat between countries but generally aim to prioritise cyclists over motor vehicle traffic. Common elements are a speed limit of 30 km/h, a prohibition for motorised vehicles to overtake cyclists, and a permission for cyclists to ride side by side if it is not generally allowed on other roads (Buczyński 2020, pp 163–165).

22. Cycle streets are based on the principle of dominant usage: The number of bicycles using the street should be higher than the number of motor vehicles on that street. Measures such as filtered permeability, e.g. closing a short section of a street for motor vehicles, are often introduced to eliminate the possibility of through-traffic and ensure the intended function (CHIPS project 2020).

23. Examples of different road signs is use for a cycle street:

Netherlands

Germany

Belgium

Luxembourg

24. Even if there are no specific legislative provisions for cycle streets, public roads can be used as segments of the cycling network if their design and role in the road network ensure low volumes and speed of motorised traffic. For example, 27 per cent per cent of the surveyed sections of the EuroVelo network comprise public roads with very low traffic, which are considered suitable for all users by the European Certification Standard, a set of criteria developed by the European Cyclists' Federation (ECF) to certify EuroVelo routes and evaluate their quality (ECF 2018). Another 18.4 per cent per cent include roads with low traffic, which are also suitable for most users.

F. Street with contraflow cycling

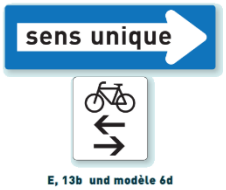
25. A street with contraflow cycling is a road that is one-way for general traffic but may be used by cyclists in both directions.

26. While a one-way street might be too narrow for two cars to pass each other, it will often be wide enough for a car and a bicycle. Moreover, one-way streets often serve to reduce through-traffic in residential areas, but this is not necessary for cyclists as cycling does not generate noise, pollution, or substantial safety hazards for inhabitants. Panels with the exception for cyclists should be added under the no entry sign to allow the contraflow cycling and under the one way sign to inform other road users of it. In most European countries, the administrative regulations allow to add an exception for cyclists under one-way signs if the traffic speed is limited to 30 km/h (Buczyński 2020, page 165–169).

27. In many cities, contraflow cycling can provide an easy way to create a safer alternative route for cyclists: Instead of cycling with heavy traffic on the main road, cyclists can make use of the network of local streets.[2]

28. Streets with contraflow cycling can but do not have to be cycle streets. On cycle streets, it is recommended to avoid indicating dedicated space for contraflow cycling (marking contraflow cycle lanes), as it would conflict with the intended use (cycling side by side, using the entire width of the carriageway).

29. Examples of different roadside signs denoting contraflow cycling:



Luxembourg

Germany

G. Bus-and-cycle lane

30. A bus-and-cycle lane is a lane reserved for (public transport) buses and cycles.

[2] In a study in the Brussels Capital Region, an analysis of 992 accidents did not reveal an increased risk of accident on a contraflow street compared to another road of the same category. It even seemed that the number of accidents per kilometre of local access road was lower on contraflows than on the rest of the local network (Bruxelles Mobilité 2014).

31. Bus-and-cycle lanes can for instance be signed by combining the bicycle symbol with the bus symbols or the “BUS” inscription, or by use of relevant additional panels in combination with other signs (Buczyński 2020, page 169).

32. Bus lanes provide more space for cyclists than a normal public road, but the cyclist still shares the bus lane with motorised traffic. While it is not the most attractive type of infrastructure for cyclists, it can be much safer than alternative road layouts.

Sign permitting cyclists to use the bus lane in Luxembourg

33. Several national administrative regulations point out that streets with bus lanes with no cycling allowed and no separate cycling infrastructure create a critical cycling safety risk by obliging cyclists to ride between the buses and private cars.

H. Sidewalk with cycling allowed

34. A sidewalk with cycling allowed is a part of the road originally designed for pedestrians where cycling has been (conditionally) authorised, either by general rules or through a bicycle panel under the pedestrian track sign.

35. General rules usually include a permission or obligation for children under a certain age to cycle on the sidewalk (pavement). The legal age limit for cycling on the sidewalk varies depending on the country and can lie between 8 (Germany) and 13 (Luxembourg).

36. Austria, Germany, and Switzerland also provide an option to authorise cycling on the sidewalk by placing an exception for cyclists under the sign for a pedestrian track. In all of these cases, adult cyclists using the sidewalk need to give way to pedestrians.

Sign permitting cyclists to use the sidewalk in Germany

37. Cycling on the sidewalk can also be allowed in other situations, such as when supervising children allowed to cycle on the sidewalk (Germany, Poland) or if the carriageway is unfit for cycling traffic (Hungary) (Buczyński 2020, page 170).

38. Considering the many changes in the sidewalk’s surface and the shared space with pedestrians, the cycling comfort and safety are limited.

I. Agricultural / forestry / industry / water management road

39. An agricultural, forestry, industry and/or water management road is a non-public road closed to general traffic. These roads typically carry very low motor vehicle traffic, and with proper signs, cycling can be exempted from the general prohibition.

40. Cyclists often share these roads with agricultural, maintenance or service vehicles. Special infrastructural solutions such as “tractor locks” exist to block the entry of non-authorised vehicles. These roads can be very attractive for cycling but may be damaged or dirtied more often because of use by heavy machines (ECF 2018, page 12).

41. Examples of signs denoting an agricultural, forestry, industry and/or water management road:

Belgium

Poland

42. Administrative barriers might obstruct utilising the full potential of such roads for cycling network development in some countries. Owners of the roads can also be reluctant to allow or encourage cycling traffic on them, as organising or promoting cycle traffic is not a part of their statutory goals. Overcoming these barriers is an important pre-requisite for an efficient network building programme.

J. Cycle crossing

43. A cycle crossing is the place where cyclists need to interact with motor vehicles on a crossing even if cycle tracks can provide physical separation in between the crossings. The crossing space should be denoted by horizontal markings and also by road signs for approaching motor vehicles.

44. Nowadays, the meaning of these markings and signs are not always the same. Clear regulations for right of way on cycle crossings are important for the development of dedicated cycling infrastructure. Especially if cyclists enjoy the right of way when cycling on the carriageway but lose it on a parallel cycle track when crossing a road, the usefulness of building dedicated cycling infrastructure is questionable.

45. In most frameworks and their practical applications, the right of way on cycle crossings follows the same logic as the right of way for motor vehicles: The cycle track along a primary road enjoys the right of way over entry arms of minor roads, and cyclists continuing straight have the right of way over motor vehicles changing direction (e.g. turning left or right from a primary road onto a minor road). This principle stems from 1968 Convention on Road Traffic in article 16.2.[3]

K. Grade-separated cycle crossing

46. A grade-separated cycle crossing is a cycle tunnel or bridge on a cycle track which offers cyclists a way of crossing a natural or artificial barrier, such as rivers, busy roads, and railway lines. It is often designed to cater for pedestrians as well (EC 2020).

47. Grade-separate cycle crossings are often the most expensive part of a cycle network, but correctly planned and designed, they can be very safe and efficient. For instance, the need to build kilometres of cycle tracks along main roads can be avoided by connecting two low-traffic local roads with a cycling-only bridge or tunnel.

L. Advanced stop line, bike box, bike lock

48. An advanced stop line, bike box or bike lock is an area on an entry arm of a junction that reserves space for cyclists and either makes it easier for a cyclist to perform a turn manoeuvre or increase the cyclists' visibility for car drivers.

[3] Notable exceptions: There are some doubts about the right-of-way principles in Croatia and Slovenia, while in Belgium a double line of squares denotes cycle crossings with no priority for cyclists, in contrast to the meaning of similar signs in most other European states.

Sign indicating an advanced stop line in Belgium

49. This can also make it easier for cyclists to wait in front of traffic lights without being affected so much by the motor vehicles' emissions. These solutions and their signage are not systematised across countries (Buczyński 2020, page 172).

M. Indirect / hook / two-stage turn provision

50. An indirect / hook / two-stage turn provision provides space on the carriageway and/or signing allowing cyclists wishing to turn left to cross the intersection in two separate stages.

51. Turning left in right-hand traffic (and vice versa for countries with left-side traffic) is a particularly challenging manoeuvre for cyclists on carriageways. They need to signal the turn by taking a hand off the handlebar, find their way into faster moving motorised traffic, watching out for cars coming from behind and also from the opposite direction, all at the same time while paying attention to the road surface. How cyclists are supposed to approach this manoeuvre depends on the country. For instance, Germany allows cyclists both to turn left directly from the carriageway and to cross the intersection in two separate stages: first by stopping at the right side of the carriageway after the crossing, reorienting themselves by 90 degrees, and then by turning left at the end of the phase or the next relevant green light (indirect/hook/two-stage turn). Cyclists are always obliged to turn left directly in Croatia, Slovenia, and Portugal, while they are always obliged to turn left in two stages in Denmark (Buczyński 2020, page 175).

"Indirect turn for cyclists" sign in Hungary

N. Traffic-light exemption for cyclists

52. A traffic-light exemption for cyclists allows cyclists to bypass a traffic light A dedicated sign underneath the traffic light indicates in which directions cyclists might go without observing the traffic light. Cyclists crossing on a red light generally are obliged to yield to perpendicular traffic and pedestrians.

53. This type of infrastructure evolved in some countries as traffic lights are usually designed to regulate motor vehicle traffic, either to avoid conflicts between motor vehicles or between motor vehicles and pedestrians. Apart from a few advanced cycling countries in Europe, most traffic lights are not optimised for the flow and safety of cycle traffic, even if dedicated signals for cycle traffic are provided. This leads to safety risks, including accidents caused by large trucks turning right while the drivers do not see the cyclist in the dead angle

(Ministère français de la Transition écologique et solidaire 2017). Several countries have therefore recognised that it can be beneficial to allow cyclists to bypass traffic lights.[4]

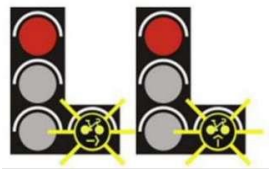
54. While in some cases the exceptions are added to prioritise cycling, in many they simply represent a compromise between having traffic lights not suited for cycling and an expensive junction reconstruction (Buczyński 2020, page 176–177).

55. Examples of different roadside signs denoting a traffic-light exemption for cyclists:

Belgium

Germany

Denmark



Luxembourg

O. Wayfinding

56. Wayfinding covers all infrastructure allowing cyclists to orient themselves and navigate along cycle routes.

57. The most important wayfinding infrastructure in the cycling context are upright signs mounted on posts, street furniture, walls etc. providing or confirming the route direction and number (ECF 2012, page 11). Signs are required at major crossings or turning points, while regular confirmation signs reassure cyclists of being on the right route. The sign content can comprise confirmation of the direction, the next main town name, the distance, attractions, and village names (ECF 2018, page 31–34). In the case of cycle-node systems, the signing content also covers the number of the next node. In addition, information boards can help interpret the route and add interest to the trip.

58. Wayfinding also comprises road markings, which play an important role as they help the cyclists follow the route, especially in poor visibility conditions, improve the recognisability of cycle infrastructure for other users, and can also warn against obstacles (Buczyński 2017).

59. Wayfinding infrastructure can increase the level of awareness for cycling and support a positive cycling culture. Cyclists can directly benefit of the relevant guidance in terms of trip length, duration, and comfort (EC 2020).

60. Many European countries have adopted national standards for wayfinding infrastructure. While the content proposed in these standards is often quite similar, the actual designs can vary considerably.

61. In order to provide consistent and clearly recognisable signing for the cycle routes that make up the EuroVelo network, the European Cyclists' Federation (ECF) collaborated with the ECE to prepare a signing recommendation. This recommendation is included in the Consolidated resolution on road signs and signals (R.E.2; UNECE 2010) and can be easily incorporated in the different national signage systems to ensure the safe conduct of international and national cyclists (see examples below). For more information, see the Chapter on the EuroVelo network.

62. Examples of national wayfinding infrastructure, incorporating EuroVelo route information panels:

[4] A study in Strasbourg covering 179 crossings equipped with new signs denoting a traffic-light exemption for cyclists concluded that there were no accidents directly linked to the new traffic-light exemption signing (Delattre 2018).

Austria

Croatia

Czechia

France

Germany

P. Cycle highway

63. A cycle highway is a mobility product that combines different types of infrastructure, such as cycle tracks or cycle streets, to provide a high-quality functional cycling connection. As the backbone of a cycle network, it connects cities and/or suburbs, residential areas and major (work) places (CHIPS project 2020). It stands for safe and fast cycling, reliability, and comfort. It carries a clear name, an own visual identity, a logo, an individual identification sign, and other elements which help promote it and communicate with the users. Variations and alternative names given to cycle highways include superhighways and bicycle roads (EC 2020).

64. Cycle highways have higher quality requirements for their components to fulfil the needs of all types of cyclists at all levels of experience and fitness. Mature cycle highways can satisfy users with different types of bicycles, such as cargo bikes, recumbent bikes and pedelecs, including speed pedelecs with a maximum speed of up to 45 km/h. They are primarily designed for commuters, while leisure and tourism use are secondary. Focus areas are a wide and smooth surface, few stops, very low or no traffic, and lighting during night-time. A cycle highway's benefits far outweigh its costs, according to a German study on the Ruhr cycle highway RS1 (see below), as it encourages commuters to cycle and reduces congestion in urban areas.

II. Benefits from investing in adequate cycling infrastructure

65. Cycling infrastructure is very cost-effective compared to other modes of transport, according to the research available (Haubold 2018, page 1). A significant part of the cycling benefits that have been quantified so far result from cycling infrastructure's positive effect on public health, notably through reduced mortality. There are few studies on the costs and benefits of specific types of cycling infrastructure, except for cycle highways. The calculations are mostly made at a global level for all types of infrastructure considered together.

66. A German study on the feasibility of the Ruhr cycle highway RS1 from 2016 calculated a cost-benefit ratio of 1:4.8 for an increase in cycling modal share of 10 percentage points. These annual benefits take maintenance already into account. The study also concluded that the "highly congested" qualified and local road network of the Ruhr metropolitan region "will be relieved by some 52,000 car trips" per day, leading to a reduction in carbon dioxide emissions by 16,600 tons annually. The construction costs for the about 100 km cycle highway were estimated to be €184 million, including all bridges and extra structures (Regionalverband Ruhr 2016, page 4).

67. A 2014 study on commuter cycling in Auckland, New Zealand, found that "transforming urban roads over the next 40 years, using best practice physical separation on main roads and bicycle-friendly speed reduction on local streets, would yield benefits 10–25 times greater than costs." (Macmillan 2014, page 1)

68. Another 2014 study by the Brussels Capital region's transport authority found that investments in cycling yielded returns that were five to nine times higher than the original investments already under current conditions. An ambitious cycling policy would lead to societal gains in Brussels of around €300 to 550 million, representing 8 to 19 times the original investment. Moreover, 500 additional jobs linked to cycling could be created by 2020 (Haubold 2018, page 2).

69. The average cost-benefit ratio for cycling projects in both urban and rural environments was £5.50 of social benefits for every £1 of public money spent, according to a 2014 study by the British Department for Transport (British Department for Transport 2014, page 11).

70. A 2009 paper by the League of American Bicyclists and the Alliance for Biking & Walking also concluded that a "modest mode shift from driving to riding has considerable impacts in savings on health, road construction, congestion, and environmental remediation." The paper cites the example of North Carolina's Outer Banks, which spent US$ 6.7 million on bicycle infrastructure and have seen an annual nine to one return on that one-time investment (League of American Bicyclists 2009, pages 2 and 8).

Annex II

National and International Cycling Network Best Practices

1. This chapter presents cycling networks that can be found around the world and can be considered as a good practice in regard to the organization of the network, its signage, its maintenance, its promotion as well as additional services that are being offered.

I. National cycling network best practices

A. Austria – Wide variety of scenic routes

2. A wide variety of options exists for every type of cyclist on regional and thematic cycling routes. Detailed information on the routes for trip planning and preparation is made available on respective websites.

3. For example, in the region of Oberösterreich[5] the overall network covers 5,000 km and the length of the routes varies from 8 km to almost 400 km. Interested cyclists are able to see the length, the degree of difficulty, the time needed to complete the route and the difference in altitude. Moreover, advice is given on what types of bikes to use (e.g. mountain bikes, touring bikes, etc.) and in what season it would be best to make the trip.000km and the length of the routes varies from 8km to almost 400km. Interested cyclists are able to see the length, the degree of difficulty, the time needed to complete the route and the difference in altitude. Moreover, advice is given on what types of bikes to use (e.g. mountain bikes, touring bikes, etc.) and in what season it would be best to make the trip.

4. Another example is the "Dampfross & Drathesel"[6] cycling route that makes use of previous train tracks. For these type of scenic routes also additional services such as tourism agencies that can plan complete trips, suggestions for hotels and restaurants as well as bike rentals are offered.

5. Even though many great services, and sometimes even a full touristic package, are offered with the different routes, the experience of using the regional and thematic cycling routes could improve for cyclists, if these routes be connected in a national network, hence interconnections between the various routes would exist.

B. Belgium – Flanders – Cycle Highways

[5] www.oberoesterreich.at/service/reise-ideen/artikel/detail/2283/oberoesterreich-landesradwege.html
[6] www.dampfross-drahtesel.at/route-stopps/

6. The Belgian region of Flanders has a wide network of cycle highways[7] that has been developed over the past years and is being extended further. Five provinces cooperated to establish a coherent intercity functional network. The network is built with the aim to connect all Flemish cities to facilitate commuting as well as leisure cycling. When finished the total length will be 2,700km. The cycle highways are mostly part of existing cycling routes with common standards, branding and communications. Most of the cycle highways are located on separated cycle tracks or in low-traffic residential areas increasing the safety for the cyclists.

7. As such it is the first cycle highway network of this scale but there is still further space for improvement such as improved coordination with neighbouring initiatives in the Brussels Capital Region, Wallonia and the Netherlands.

8. The province of Limburg is already doing the first move towards coordinating cycle routes with neighbouring countries with its 1,166 km long-distance Meuse Cycle Route that crosses through Belgium, Germany and the Netherlands.

9. When developing a cycle network also maintenance is an important aspect to keep up the quality of the paths and make it user friendly for a long time. Concrete examples exist from the Province of Limburg and the Province of Antwerp.

10. In Limburg a dedicated quality monitoring system exists for the cycle network. Thanks to this, Limburg is often praised for its high quality network that is characterized by the state of the surface of the paths, the appropriate width of the cycle paths, the absence of motorised traffic as well as safe crossing points leading to a general satisfaction rate of 98 per cent per cent primarily due to the quality of the road surface. This high level can be kept up thanks to quality charters in all the municipalities of Limburg as well as 3 full-time engineers employed by the department of mobility of Limburg working on the design & implementation of projects on the network.

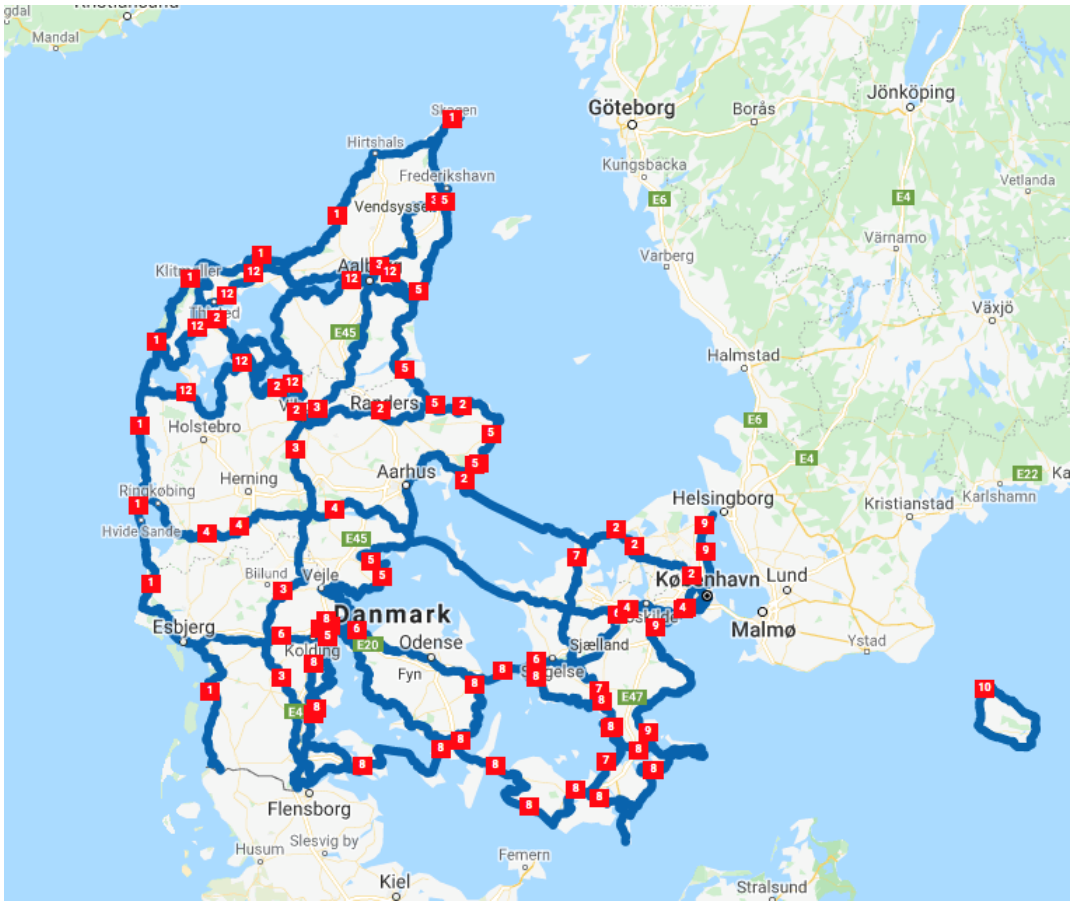
11. Nonetheless also such a well-managed network encounters some issues including damages or obstructions to signage, the conditions of the road, litter, peripheral infrastructure as well as vegetation. Problems in the network are detected mostly by cycling monitors (+50 per cent), followed by tourists using the network (31 per cent). In addition, maintenance workers and municipalities verify the quality of the network based on monthly checks.

12. The cycle network of the province of Antwerp is about 2,850km long with 720 cycle nodes. Also this network enjoys a high rate of satisfaction due to good signage, suitable restaurants and hotels along the way, the possibility for tranquil bike rides as well as attractiveness of the landscapes. In addition, the province has worked on continuing the networks across the border to allow for seamless bike rides into other regions of Belgium as well as into the Netherlands. Users of the Antwerp network can consult an online map where it is possible to report problems with the route, such as bad conditions of the road (e.g. potholes, uneven ground, slippery), signage, incoherency of the cycle network, etc. Most of the reported problems come from volunteers (57 per cent), followed by tourists (34 per cent), interns and municipalities.

C. Denmark – Fully integrated cycle network

13. Denmark has 12 national cycling routes that are managed by the Danish Road Directorate with a length of more than 4,200km. A national cycling route has the following characteristics (i) it extends north-south or east-west through several regions (ii) is over 200km long (iii) it is accessible in all types of weather and (iv) it should be coherent in regard to signage and road design. The routes are primarily intended for cycling tourists and go past cycling paths or low dense traffic areas.

[7] https://fietssnelwegen.be/



Source: www.turisme.nu/turister-risikerer-online-mareridt/

14. The national Danish cycling routes' official map is made up of so-called route relations in OpenStreetMap, where they are maintained and continuously updated according to material provided by the Road Directorate, partly by employees of the Road Directorate and partly by experienced volunteer OpenStreetMap enthusiasts.

15. The Danish cycling network is fully integrated into the Danish road network putting cycling on the same level as other modes of transport.

D. France – Coordination through itinerary committees

16. The French national cycling network (Schéma national des véloroutes[8] – National Cycle Route Scheme) is co-developed by Vélo & Territoires (collective of regions and municipalities to promote cycling) counting 58 routes with a length of more than 25,400km. 69 per cent of this was completed by the beginning of 2020. The aim of the National Cycle Route Scheme is to establish a network of major national cycle routes in order to develop and promote daily mobility and cycling tourism.

17. Vélo & Territoires is responsible for monitoring the progress of the National Cycle Route Scheme which has to be built according to specifications[9] made by the relevant French ministries. These specifications explain what is considered as a cycle path including linearity from one city to another, continuity of the path without any interruptions, safety, common signage, regular maintenance and it has to be accessible to all types of cyclists. Moreover, the aim of the National Cycle Route Scheme is explained based on five principles (i) realizing a network of 7,000–9,000km, (ii) researching the possibility of transferring existing infrastructure for bicycles, (iii) connecting the main cities along the route, (iv) proposing at least one cycle route per region by taking into consideration notable tourist attractions and (v) assuring continuity with the existing networks in neighboring countries. Other

[8] www.velo-territoires.org/schemas-itineraires/schema-national/

[9] www.velo-territoires.org/wp-content/uploads/2016/09/cahier_des_charges-VVV_mai_2001.pdf

specifications in the report refer to rules when crossing through cities, the admissible types of cycle routes, technical characteristics (min. width of 3–5m), signage, maintenance, additional services to offer along the route (bike repair services, bike rental, parking, etc.) as well as an environmental impact assessment that should be conducted regularly.

18. One interesting aspect about the French network are the itinerary committees that support the development for individual route projects such as the EuroVelo routes that cross through France. These committees are formed by project teams that are supported by public bodies including regional councils, county councils as well as inter-city cooperation bodies or tourism boards. Depending on the local situation European or state funding is used to support the committees. The committees are set up for a fixed time, between 2 and 5 years, with fixed goals, an action plan and a budget. They are supported by both France Vélo Tourisme (public-private association working on promoting Cycling Tourism in France) and Vélo & Territoires.

19. The different stakeholders that are planning the cycle route of the national cycle network then work together on common signage of the route, the development of qualified services along the route, the creation of communication tools, the organisation of events as well as the monitoring of the route. Currently there are about 30 committees of this kind in France with a different type of organization depending on the individual route.

E. Germany – Integration of hospitality sector in bicycle tourism

20. The Cycling Network Germany[10] comprises 12 national long-distance routes of 11,700km connecting all regions of Germany. Routes 1 to 6 go from west to east and routes 7 to 12 are from north to south. All routes can already be accessed today as they go along existing long-distance routes. with developed service offers. The sign posting into the national network is in development.

21. The network is geared towards every day and tourist cyclists. The next step in promoting this national cycling network is the establishment of a coordinating agency as part of Germany's overall climate action plan.

22. The Cycling Network Germany was established on the basis of the "National Cycling Plan 2002 to 2012"[11] by the German Federal Government. With this network, the federal and state governments are jointly committed to overarching standards and a high level of quality in cycle tourism. The overarching standards include a high quality of the network and its infrastructure, with good promotion and common signage.

23. Route 3, that is also part of EuroVelo 1, was developed as a premium long-distance path as part of a pilot project. The federal government as well as 5 German regions participated to make this a model route for the other routes of the German cycling network. The project lasted from 2008 to 2012 with a funding of 900,000€.

24. Besides the national cycling network many local initiatives exist at the 'Länder' level that are all combined in the Bicycle Route Planner Germany[12] also facilitating planning a journey from one region of Germany to another. All in all, this planner includes more than 100,000 km of cycle routes, 568 thematic routes, more than 100,000 points of interest and more than 5,000 cyclist friendly accommodations.

25. Overall, the German cycling network consists of various national, regional and local cycling networks and the network is well known for its Bett & Bike cycle-friendly accommodation[13] system. This system was co-developed by the Germany cycling association (ADFC) establishing quality criteria for bike-friendly hosts. If a host has this type of standard, bike tourists can rely on a bike-friendly service thereby facilitating the planning of bicycle trips. Different categories of accommodation such as hotels, hostels, holiday apartments, guesthouses and campsites, are offered for either bike tourists, mountain bikers or campers. Moreover, specific hosts for e-bike users exist also making it possible for cyclists to charge

[10] www.radroutenplaner-deutschland.de/veraDNetz_EN.asp
[11] https://nationaler-radverkehrsplan.de/
[12] www.radroutenplaner-deutschland.de/veraHome_EN.asp
[13] www.bettundbike.de/

their e-bike while resting. In total, cyclists can choose from about 5,800 different types of hosts that offer a safe place to lock their bike.

26. To make the Bett & Bike offers as accessible as possible a separate mobile application is available that allows users to find their next destination while they are already on their way. As an alternative, also a website is available in both German and English, highlighting to cyclists some of the 'special hosts' such as a former jail, a historical sleeping car or a furnished construction trailer. To further improve its integration, the Bett & Bike accommodations are usually shown in the regional Bicycle route planners.[14]

F. Luxembourg – Full integration into the tourism package

27. The national cycle network of Luxembourg[15] consists out of 23 routes with a total length of 600 km as of the beginning of 2020. In the future, it is planned to extend the network to a total of 900 km. The routes are designed in such a way that they pass by various tourist attractions such as natural monuments, castles or rivers.

28. This network is promoted by the main tourism website of Luxembourg closely integrating bicycle tourism with other types of tourism. In addition to detailed descriptions of the available routes, (including GPS data, length of the route, difficulty level, hospitality services in the area, etc.) and the recommendation of specific routes, Visit Luxembourg also offers the purchase of overnight bicycle trips in Luxembourg. Therefore, this is a good example of how cycle tourism can be fully integrated with other kinds of tourism by clearly advertising for it at the main tourism website.

G. Netherlands – Well connected network of long-distance, regional and local cycling routes

29. The Netherlands has an extensive network of long distance cycling routes[16] spanning the full country. The main target group are cycle tourists that are planning a trip for a few days. All of these routes are completely signposted in both directions. A positive aspect of this network is its strong integration with local and city cycling networks that amount to 33,000km and are organized via more than 8,900 nodes leading a cyclist from one node to the other. These local networks are targeted towards daytrips.

30. Currently the cycling network is in a transition. The long-distance routes are officially added to the country wide system of nodes and only the most iconic long-distance routes are kept and further promoted, whereas other long-distance routes are incorporated into the regional networks.

[14] www.radroutenplaner-deutschland.de/veraRoute_EN.asp

[15] www.visitluxembourg.com/fr/que-faire/nature-excursions/suggestions-tours-velo/pistes-cyclables-nationales

[16] www.nederlandfietsland.nl/lf-routes

31. The main iconic long-distance routes are currently the LF Maasroute from Maastricht to Rotterdam with 480 km, the LF Zuiderzeeroute starting and ending in Amsterdam with 440 km as well as the LF Kustroute from Cadzand Bad to Nieuwschans along the Dutch coast with 610km. For 2021 two further iconic long-distance routes are planned, the LF Hanzeroute and the LF Waterlinieroute.

32. To facilitate accessibility for users, they can check up to date route information online[17] where information on construction sites are published and possible diversions are proposed. Moreover, users can report potential problems with the cycle route (e.g. blockage, illegible signage, incorrect route, etc.) online[18] that further improves the quality of the network.

H. Spain – Repurposing old train tracks for bicycles

33. Vias Verdes[19] can be used by cyclists in Spain which travel across the country. These are 120 greenways on unused railway infrastructure spanning a total of 2,900 km in peri-urban areas and dedicated to cycling but also walking. The program is coordinated by the Foundation of Spanish Railways (FFE) and exists since the 1990s with further plans for extension in the future.

34. In 1993 there were more than 7,600 km of railway tracks that were no longer used for train service or that had never been used because its construction was abandoned. With the greenways, the historical and cultural value is preserved from its disappearance because it offers enormous potential to develop initiatives for ecotourism and sustainable mobility according to new social demands.

35. The project has received support from the former Ministry of Public Works, Transport and the Environment as well as the Ministry of Agriculture, Fisheries and Food in the framework of the Natural Paths Program that executed more than 50 per cent per cent of the currently existing greenways. Other entities involved in the development of the greenways are Autonomous Communities, Provincial and City Councils, public entities, as well as cycling groups, ecologists and citizen groups that demand the preservation of these old rail infrastructure.

36. The design of the greenways largely makes use of the qualitative advantages of the previous railway routes which means that the paths have gentle slopes and wide curves making them very accessible also to people with limited mobility. Moreover, the greenways are separated from public roads adding to safety of their users. In case the greenways pass a public road, protected crossings are installed or foreseen.

37. Complementary services such as restaurants, hotels, bike rentals, museums and information offices have been installed along the greenways and where possible they were housed in former railway stations to further preserve the cultural heritage. At the beginning of 2020 more than 150 stations have been renovated to offer these complementary services.

38. The impact the greenways have is also economical and not just cultural. The Vía Verde de la Sierra (Cádiz-Sevilla) currently provides 25 direct jobs in the management and maintenance of the already renovated stations and they receive 300,000 visitors / year. Another success story is the Girona greenways network, whose annual impact is valued at around 3.5 million euros, with a creation of 62 direct jobs and nearly 300,000 visitors / year.

39. The greenways program, therefore, provides an excellent opportunity to find a new purpose for the very valuable Spanish railway heritage that is currently in disuse, and which is mostly publicly owned with direct economic benefits for the surrounding community.

[17] www.nederlandfietsland.nl/lf-routes/actuele-info
[18] www.meldpuntroutes.nl/#/
[19] www.viasverdes.com/principal.asp

I. Switzerland – Excellent public transport connection

40. The Swiss National cycle route network is developed by Veloland[20] Schweiz and consists of nine (Nr. 1–9) national routes, 53 regional routes and 59 local routes. All of the national and most of the regional routes are fully developed.

41. A map of the network provides information to cyclists also on the length, the surface of the cycle path, the altitude and the level of difficulty. Moreover, there are suggestions on how to reach the route, where to sleep, eat and what sights to visit on the way.

42. In addition, the Swiss network has a particularly good connection to the public transport system and train stations are clearly marked on the official maps. Also, the Swiss train service SBB itself has good conditions for cyclists in general. Bicycles can be transported on most Swiss trains and in case full capacity has been reached there is the option of bicycle shipping (shipping the bicycle as luggage on the train).

43. Overall, the Swiss cycle network is a very well developed and integrated network making it very accessible to all interested parties. Not only is the Swiss public network one of the greenest and environmentally friendliest in the world, but it is also very reliable, secure and effective.

II. International cycling network best practices: EuroVelo, the European Cycle route network

A. What is EuroVelo?

44. EuroVelo is the European network of long-distance cycle routes that cross and connect the whole continent. The development of EuroVelo will lead to safe, direct, coherent, and connected cycling infrastructure and cycle route networks that will benefit all categories of cyclists. The network is developed and coordinated by the European Cyclists' Federation (ECF) in cooperation with a network of National EuroVelo Coordination Centres and Coordinators.

45. All EuroVelo routes have a length of at least 1,000 km, connect at least two countries, and have an internationally recognisable identity/theme. Wherever possible, the routes should be based on existing or planned national or regional cycling routes.

46. There are currently 17 EuroVelo routes in the network:

- EuroVelo 1 – Atlantic Coast Route
- EuroVelo 2 – Capitals Route
- EuroVelo 3 – Pilgrims Route
- EuroVelo 4 – Central Europe Route
- EuroVelo 5 – Via Romea Francigena
- EuroVelo 6 – Atlantic-Black Sea
- EuroVelo 7 – Sun Route
- EuroVelo 8 – Mediterranean Route
- EuroVelo 9 – Baltic-Adriatic
- EuroVelo 10 – Baltic Sea Cycle Route
- EuroVelo 11 – East Europe Route
- EuroVelo 12 – North Sea Cycle Route
- EuroVelo 13 – Iron Curtain Trail
- EuroVelo 14 – Waters of Central Europe

[20] www.schweizmobil.ch/de/veloland.html

- EuroVelo 15 – Rhine Cycle Route
- EuroVelo 17 – Rhone Cycle Route
- EuroVelo 19 – Meuse Cycle Route

Schematic EuroVelo Diagram

47. The routes are numbered based on whether they cross Europe on a North-South or West-East axis. Currently there are ten North-South routes (odd numbers 1-–-19) and seven West-East routes, including two circuits (even numbers 2–14). These 17 routes have a combined length of more than 90,000 km and cross 42 different countries (ECF 2019a). All routes are presented on www.eurovelo.com, with overview information for each country and stage. An extension of the network is possible. A formal process is established within ECF for this purpose (ECF 2016).

48. Official EuroVelo signage has been installed across the European cycle route network to make it easier for cycle tourists to follow the routes across borders. The distinctive EuroVelo route information panels can be incorporated into national signage systems in several different ways (ECF 2016).

49. The ECE Global Forum on Road Traffic Safety (WP.1) incorporated the signing of the EuroVelo routes into the Consolidated Resolution on Road Signs and Signals (R.E.2) in 2010 (UNECE 2010).

50. Examples of signing incorporating EuroVelo route information panels:

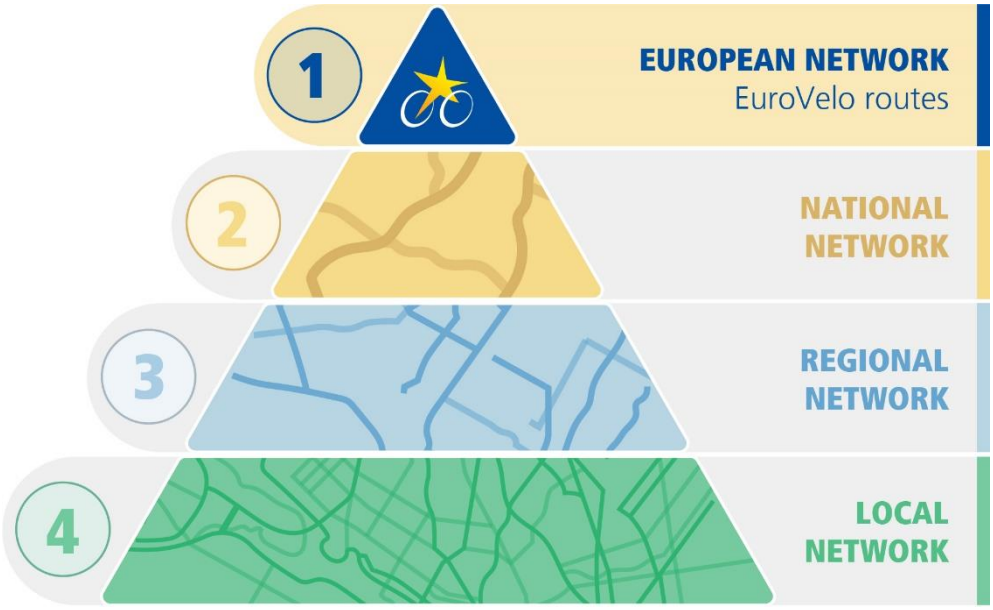
Netherlands

UK

Serbia

51. EuroVelo is a registered trademark of the ECF, and only routes approved by the ECF can be called EuroVelo. This is an important badge of quality for both the cyclist and the route promoter.

52. The EuroVelo network forms the backbone of many national, regional, and local networks across Europe.



The EuroVelo network in relation to other cycling networks

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