



Best Practices in Cycling Infrastructure

Strategies, Planning, Implementation, Maintenance and Assessment

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SABRINA: No fears about safety on two wheels.



www.interreg-danube.eu/SABRINA



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#Safetyon2Wheels

1. Introduction

Cycling infrastructure in the Danube region is largely in an **early stage of development**, especially outside of the major urban areas. Considering the **benefits** that cycling has on the environment, tourism, health, transport multimodality, etc. this fact is both a **development opportunity** and a substantial **safety risk** if not properly addressed. The SABRINA project focuses on road infrastructure safety for cyclists, as one of the most vulnerable road users. It tackles cycling infrastructure safety issues on existing, planned, and missing cycling corridors, crossing nine countries in the Danube region, by raising the capacities of all relevant national, regional and local stakeholders, to build and improve bicycle infrastructure in a safe and sustainable way.

In this report, several cycling safety issues identified in the SABRINA project are described (chapter 2). State-of-the-art and evidence-based best practice knowledge on the essential ingredients of safe cycling infrastructure are described in chapter 3, together with practical recommendations for implementation.

The content was collected and collated by all SABRINA partners and comprises evidence from practitioners in the Danube region¹ and beyond, as well as from scientific literature and previous EU research projects (INTERREG and Horizon programmes).

The report facilitates learning from each other by addressing three different levels:

- » Cycling development and improvement **strategies & policies** are presented on national, regional and local level from, but not limited to, countries within the geographic scope of this project. (Chapter 3.1)

- » The chapter on **planning principles** of safe (cycling) infrastructure focuses on regional and local bicycle networks and their planning guidelines and issues. (Chapter 3.2)
- » Finally, examples for safe **cycling infrastructure** are shown. (Chapter 3.3)

In each subchapter, a best practice example is given. Since there is much discussion about the term 'Best Practice' – and whether there can be such thing as 'Best Practice' at all – relevant **good, best** and **promising** practices are included in the report, i.e., a strategy, method or activity in the field of safer cycling infrastructure that ...

- » has shown (or has great potential) to solve an issue, to bring about improvement in a sustainable way, with good public and political acceptance, in a cost-efficient way.
- » is transferable – usually with modifications – to other settings, regions, countries, jurisdictions. Hence, good practices are more than a blueprint to copy & paste!
- » is well enough documented, so that others can build on this knowledge for their individual settings.

The report is closely aligned with SABRINA's Outputs T2.1 (Best practice bicycle safety improvement fact sheets), and T2.3 (National Consultations). It informs Output T3.1 (Safe Cycling Routes Toolkit); the recommendations will be integrated in the Safer Cycling Routes Toolkit (SCRT) decision making algorithm.

¹Specific reference is made to the following SABRINA deliverables: D.T2.1.1 Documented good and poor practices from cycling route infrastructure assessments, D.T2.2.1 Report on available evidence on best practices in providing and assessing cycle route safety, D.T2.3.1 Stakeholder Questionnaire on national and regional problems and solutions in cycling safety, D.T2.3.3 Status Report on current problems and solutions in cycling infrastructure safety, and D.T3.1.2 Report on SCRT user requirements.

2. Identified cycling safety issues

The following chapters present cycling safety issues as identified during EuroVelo route surveys as well as in the course of stakeholder consultations in all participating countries.

2.1. General conditions for cycling

The success of cycling promotion generally depends not only on concrete infrastructure but also on the **mindset**, the (legal) **framework** and the **resources** of decision-makers, the public and other stakeholders. There is a variety of deficiencies that need to be overcome before cycling can be considered acceptable as a travel mode by all levels of society. It is somewhat surprising that the main issues seem fairly similar across the SAB-RINA-countries, although they are all in **different stages of the cultural development process** to make cycling a self-evident and safe part of mobility.

Even though the severity of the following topics differs from country to country, one can identify a certain **universality** of the issues identified during/in the project.

ATTITUDE / CULTURE

Cycling is still predominantly seen as a **leisure activity** and not as an everyday transport mode – by many decision-makers and practitioners as well as a substantial part of the public, especially car users. Further, the **mindset** of decision-makers is still **car-oriented**; therefore, the interests of motorised transport still prevail over those of cyclists. Notably, while towns declare that they aim at “sustainable mobility”, they do not consider cycling as one of its full-bodied components. The difference between objective safety and subjective sense of safety is disregarded – while the latter is key to raising the share of cycling.

AWARENESS

Although the knowledge on **health and environmental benefits** of cycling seems to be ubiquitous, only in a limited number of cases concrete activity can be identified based on this knowledge. A large part of the society in the countries of the Danube Area seems to be divided on the topic of cycling, consequently the agenda of motorised transport often prevails. There are, however, also some positive developments noted, e.g., among younger generations of decision-makers and administrative personnel who have personally experienced less dependency on cars – and tend to act accordingly.

FUNDS

There are various **funding structures** for cycling infrastructure in the countries of the Danube Area, but there is a **lack of systematic integration in other projects** (road/rail/tram), making retrofit at later stages substantially more expensive. What is common to practically all schemes, is that they are mostly **focused on investment**, whereas **maintenance** – and especially safety assessment of infrastructure – are **hardly ever covered**. Funding mechanisms for investment as well as maintenance and safety assessment are partly lacking.

KNOWLEDGE (GUIDELINES & CAPACITY)

The **capacities** of acting people in administrations and consultancies for the development and construction of safe cycling infrastructure, as well as the availability of adequate **technical guidelines** vary across the Danube Area countries. **Expertise, competences and capacities** also differ a lot amongst **authority levels** (national, regional, local) and other stakeholders. In the planning and implementation of cycling networks there is a **lack of strategic approaches**.

What is also common to all, is an inherent lack in the uptake of prevailing **rules and regulations**, and a certain tendency to end up making political instead of evidence-based decisions. EU institutions often depend on **NGO work**, as there is no in-depth inter-governmental co-operation on cycling infrastructure.

LEGAL ISSUES

A large part of the traffic rules and regulations in Danube Area countries have been set up decades ago, with **motorised traffic as key focus**. There seems to be a common understanding among most countries' stakeholders that the individual legal apparatus **does not live up to the requirements of cycling** as a full-fledged transport mode. In addition, currently liability regulations may be detrimental for infrastructure development, as in some jurisdictions **authorities can be held responsible** for crashes on cycling facilities. Two of several other problematic issues include **land acquisition** and **environmental permits** – outside urban areas it is sometimes more difficult to construct a cycle track than a motorway, as the legal tools for linear investments do not apply to cycle tracks. Expertise and legal requirements to carry out **safety assessments** are virtually **absent** in most countries.

RESPONSIBILITIES

Complex and diverse roles and responsibilities exist in the Danube Area countries in the realm of cycling infrastructure. The distribution of responsibilities between national, regional and local levels is often inadequate – **mostly the municipalities** – and sometimes regions – have to **carry the full burden of investments and maintenance**. The common impression is that many jurisdictions could benefit from improved **communication and coordination** between the many actors.

DATA FOR SAFETY ASSESSMENT

In many countries of the Danube Area, both the **accessibility and quality of cycling-related data** are both ranked **poor**; this applies to both data on accidents (not to mention conflicts or near misses) and traffic flows. However, a lack of the latter, exposure data, makes it impossible to correctly **evaluate risks and effects** of safety interventions. Cycling accidents are often **underreported** as they often remain unnoticed by the police. In addition, many of the data on accidents is **not very detailed**. Experts and institutions outside administrations have poor access to data for safety and planning related activities.

The scarcely available data on cycling infrastructure are **hardly comparable** between different jurisdictions. No detailed data is available for safety assessments of infrastructure.

2.2. Infrastructure issues

NETWORK ISSUES

Discontinuous bicycle facilities on cycle routes and a **low directness and connectivity** of cycling network routes, i.e., incomplete cycling network, can disfavour bicycling and might lead to conflicts due to **unsafe or uncomfortable conditions**. Sudden endings of bicycle facilities can be dangerous for cyclists in particular, especially at occasions where the cycling facility ends on the left-hand side of the road with a **large distance**

to crossing intersections and **high traffic volume** and cyclists have to cross the road. Another example is when such endings encourage **detours in unsafe conditions** or **risky manoeuvres** of cyclists when crossing the road. Accurate numbers of accidents in which cycle network issues have led to accidents are scarce, but studies indicate that an incomplete cycle network is one of the main factors that discourage people from cycling.



Figure 1: Sudden end of cycle path at EuroVelo 8 in Croatia



Figure 2: Poorly accessible underpass due to stairs at EuroVelo 9 in Austria

NARROW INFRASTRUCTURE

Too narrow bicycle infrastructure and insufficient space between bicycle infrastructures and curb-side parked cars can cause **dooring collisions** and impose **safety risks** for cyclists. Cyclists are at risk of **frontal collisions** with **oncoming cyclists** and collisions with **vehicle doors** as well as collisions with **other vehicles**. This can happen when cyclists **swerve** to avoid a collision with opening vehicle doors and end up in the path of oncoming traffic or when vehicles overtake cyclists with

insufficient safety distance. These issues are particularly prevalent in **urban areas** as well as at **bridges and underpasses** where there is usually limited space for the implementation of cycling infrastructure. Bicycle crashes due to narrow infrastructure and dooring are a **common phenomenon** and especially in urban areas a significant proportion of bicycle accidents are dooring collisions.

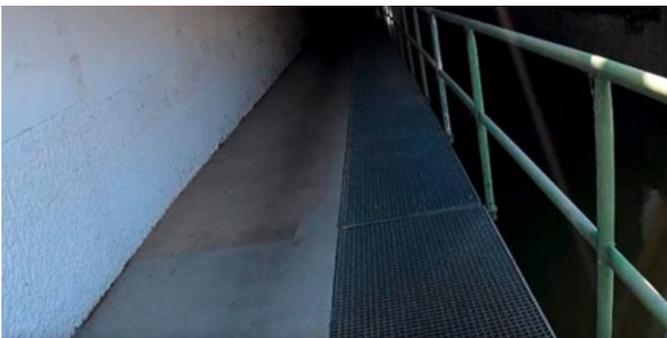


Figure 3: Too narrow bicycle infrastructure at an underpass on the EuroVelo 9 in Austria



Figure 4: Curb-side parked cars too near to bicycle infrastructure on the EuroVelo 6 in Austria

SPEED DIFFERENCES IN MIXED SPACES (PEDESTRIANS, E-SCOOTERS ETC)

Speed differences between cyclists and pedestrians impose safety risks especially in areas where both **share the same space**, i.e., mixed spaces, and can lead to **serious injuries** in particular for pedestrians. Such conflicts typically occur in mixed spaces in **dense, urban**



Figure 5: Conflicts between cyclists and pedestrians at a mixed space on the EuroVelo 14 in Austria

environments or near **tourist attractions**. Studies indicate that a considerable proportion of accidents and conflicts between pedestrians and cyclists appear on shared pedestrian and bicycle paths.



Figure 6: Mixed space of cyclists and pedestrians on the EuroVelo 8 in Croatia, typically with conflicts between walking and cycling tourists during summer

SPEED DIFFERENCES IN MIXED SPACES (MOTORISED TRAFFIC)

In mixed spaces of bicyclists and motor vehicles, the speed differences between the two transport modes can lead to enormous **safety risks especially in passing manoeuvres**. This is particularly problematic on **rural roads** with higher posted speed limits, where motor vehicles travel faster, and speed differences are relatively high. Collisions at these occasions often result in **serious**

injuries and even **death** for cyclists. It is indicated that a considerable proportion of accidents between bicyclists and motor vehicles occurs in mixed spaces where cyclists have to share the road with motor vehicles and that these accidents can often be attributed to drivers' infringements of **overtaking rules**.



Figure 7: Mixed space of cyclists and motorised traffic on a road outside urban area and posted speed limit of 100 km/h on the EuroVelo 6 in Austria



Figure 8: Cyclists and motor vehicles sharing a road section on the EuroVelo 6 in Croatia, with a posted speed limit of 90 km/h

JUNCTIONS AND CROSSINGS: BLIND SPOT

The blind spot issue imposes safety risks for cyclists and can lead to **conflicts and collisions at junctions**. It typically arises in situations when the cyclist is riding straight ahead and has right of way and a motor vehicle turns right but cannot see the cyclist because he is located in the vehicle blind spot, i.e., not visible through the window or mirrors. This is mostly a phenomenon in **urban areas** at junctions with traffic lights that turn green for cyclists and other traffic simultaneously on roads with cycle tracks or cycle lanes and is especially problematic for **heavy goods vehicles and lorries** leading to serious injuries or even death for the cyclists in case of a collision. Studies indicate that a considerable number of collisions, especially between lorries and cyclists, can be attributed to the blind spot issue.

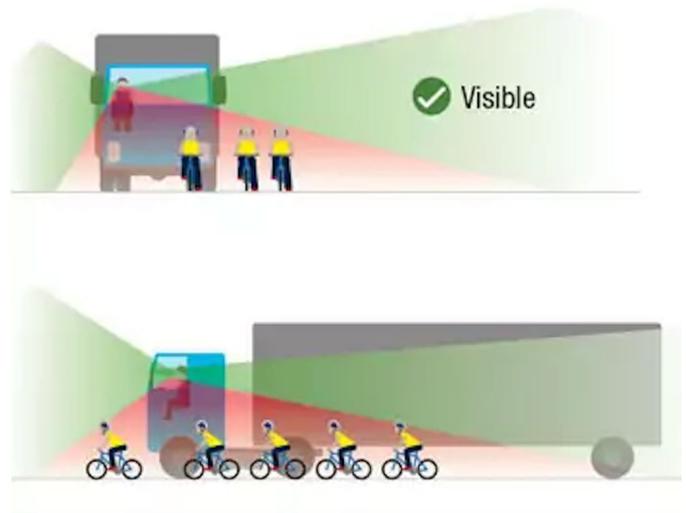


Figure 9: Problem of blind spot occurring at junction on EuroVelo 9 in Austria

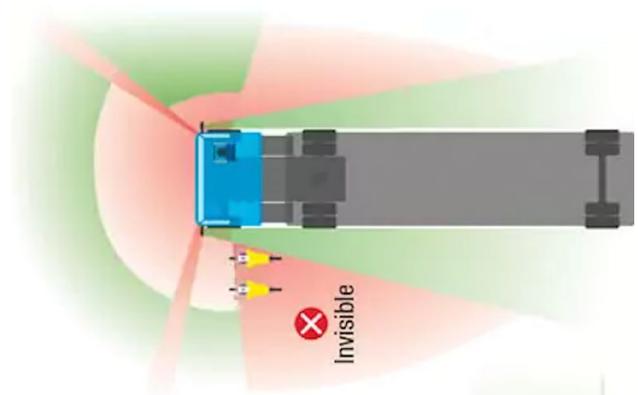


Figure 10: Sharing the road with heavy vehicles is especially risky for cyclists

JUNCTIONS AND CROSSINGS: LEFT TURN ISSUES

Left turns for cyclists are a demanding task and can impose safety risks because cyclists often have to **weave with traffic from behind** and **identify acceptable gaps** in the traffic flow of oncoming traffic. This can lead to conflicts with motor vehicles. This issue is particularly problematic for cyclists with **high traffic volumes** and

high speed of motor vehicles as well as at **wide and complex intersections** which make turning difficult and could lead to cyclists doing risky manoeuvres, i.e., turning without a sufficient gap. Studies indicate that at least a small number of cyclist fatalities is related to these left turn issues.

JUNCTIONS AND CROSSINGS: ROUNDABOUT ISSUES

Roundabouts can be problematic for cyclists as passing through roundabouts is a challenging **orientation task, physically demanding** and it involves **bicycle-motorised vehicle interactions**. Conflicts particularly arise when motorists entering the roundabout do not give way to the cyclist on the edge of the roundabout or motorists leaving the roundabout **overtake the cyclist** at the edge of the roundabout. Roundabouts are

especially problematic for cyclists when there is no **bicycle facility**, when there is a marked cycle lane next to the circulation carriageway when there are **multiple lanes**, and when there are **high speeds and high traffic volumes**. Studies indicate that a considerable percentage of especially bicycle-motor-vehicle accidents occur at roundabouts.



Figure 11: This roundabout in Tulcea, Romania, is lacking any markings (central, cycle path, lanes) and makes it very difficult to navigate by cyclists and drivers together.



Figure 12: This roundabout in Pula, Croatia, has recently been built, and even though cyclists can be frequently seen along this road section, no infrastructure has been dedicated to them (EuroVelo 8).

POOR DRIVING CONDITIONS

Poor driving and road surface conditions are a major risk factor for cycling safety. Uneven road surface conditions due to **potholes or damage from tree roots**, the presence of **sand and gravel** as well as **slippery road surfaces** caused by water and snow can cause cyclists to **lose control or skid** and fall, often resulting in **serious injuries**. Poor riding conditions are typically observed on **unpaved roads**, but also on old, **not properly**

maintained bicycle infrastructure whose paved surface has cracked and worn over time, or on bicycle infrastructure that is often affected by water and snow but is not subject to (winter) maintenance services. Studies indicate that a high share of especially single bicycle accidents can be attributed to poor driving conditions or road surface conditions.



Figure 13: Potholes and damage due to tree roots at EuroVelo 8 in Croatia



Figure 14: Presence of unpaved / gravel road at EuroVelo 8 in Croatia

POOR SIGNING

Poor signing, i.e., **missing signs, signings in a poor state** or **inappropriately placed** cycle signing, imposes risks for cyclists as it is difficult for them to understand where to ride and which traffic rules apply. This **decreases the level of service** on cycling routes and can lead to conflicts. This is particularly problematic at complicated

intersection alignments and **road works**, when detours are not properly signposted, leading cyclists to undertake **risky manoeuvres** or even **break traffic rules**. Studies indicate that poor and missing signing are problematic and amongst the most important factors for the severity of bicycle crashes.



Figure 15: Incomprehensible traffic sign at road section at the EuroVelo 6 in Austria



Figure 16: Problematic traffic signs at construction site, with not safe detour route at EuroVelo 14 in Austria

OBJECTS ON/ASIDE INFRASTRUCTURE

Objects on or aside the bicycle infrastructure and roadway, e.g., **bollards, railings, traffic signs, trees, bushes** or **parked cars**, often impose safety risks for cyclists as they either represent **obstacles** that cyclists could possibly collide with or limit visibility. Cyclists get injured when hitting such objects and falling, or the **limited**

visibility caused by these objects lead to collisions. This is particularly problematic on **narrow roads** and bicycle infrastructure, in **curves** or **at junctions**. Studies indicate that a considerable share of cyclists' accidents are collisions with a stationary object.



Figure 17: Bollard in the middle of the cycle path at EuroVelo 6 in Austria



Figure 18: Railing as obstacle at EuroVelo 14 in Austria

3. Recommendations and best practice examples

Based on the analysis in chapter 2, recommendations and best practice examples are reported in the following chapters. The chapter is structured along three main topics:

- » **Strategies and policies**
- » **Planning principles**
- » **Infrastructure**

In each of these subchapters, several different aspects of the topics are described, and best practice examples are given.

(Cycling) **strategies and policies** (chapter 3.1) provide a **framework** for future activities to build and improve bicycle infrastructure in a safe and sustainable way on **national, regional or local level**. By setting medium to long-term goals and priorities, appropriate actions can be determined to achieve these goals.

Planning principles which are presented in chapter 3.2 include several guidelines covering general requirements and criteria for cycling infrastructure planning for decision makers.

In chapter 3.3 recommendations and examples for concrete **infrastructure** designs are given. The examples aim at ensuring the **safety and comfort** of cyclists at sections/stretches and junctions, e.g.:

- » Physical separation of cycling infrastructure from motor vehicle traffic when speed differences and/or traffic volumes are high
- » Sufficient widths and adequate minimum turning curves should be provided, taking account of new vehicle types like cargo bikes and bicycles with children or cargo trailers
- » Road markings and pictograms can help to improve safety, e.g., by keeping cyclists out of dooring zones

These following recommendations comprise a large variety of very different aspects of cycling infrastructure development. Each one of them can contribute to the success of promoting cycling as a mode of transport. In some cases, the success depends on the **interaction of several factors**. In many cases – this is also an outcome of the stakeholder interviews of all SABRINA project partner countries – the **communication and cooperation between all institutions and the public** is crucial for the success of sustainable infrastructure planning.

3.1. Strategies and policies

Defining a vision for a country, region or city is an important element which **reflects values and thought structures**. Depending on the stakeholders involved, cycling strategies may focus more on improving traffic safety, fight climate change or foster physical activity. Taking health and environmental impacts of cycling into account can help to **promote cycling on a strategic level**. With the “EU Cycling Strategy. Recommendations for Delivering Green Growth and an Effective Mobility in 2030” the European Cyclists’ Federation (ECF) wants to address fragmentation in the development of relevant policies across EU institutions and avoid inefficiencies in the expansion of local cycling strategies and devises to encourage the European Commission to develop their own EU Cycling Strategy.² One outcome of the stakeholder interviews was, that a **clear and long-term strategic vision** of a basic cycling network should follow the five principles: **cohesion, directness, safety, comfort and attractiveness**.

²https://ecf.com/sites/ecf.com/files/EUCS_full_doc_small_file.pdf [26.05.2021]

The following chapters present cycling (safety) strategies in the SABRINA project partner countries (and beyond) at the **international, national, regional and local level** and describe examples of good implementations in the fields of **education and training, promotion and awareness** raising as well as the **connection of cycling with public transport**.

3.1.1. International and national strategies

An increasing number of European countries have put in place and implemented **national strategies on cycling**. Among them are Austria (with a Cycling master-plan), Croatia, Slovakia, Czech Republic and Hungary. In Bulgaria and Romania cycling is a part of the national road safety strategies. Most of these national strategies and/or action plans set **clear activities and precise goals** for the development of cycling at the national level allowing national governments to set a **clear framework**. This way, they can signal to regional and local authorities that cycling is important and it should be considered in public policies. The framework provided by national cycling strategies ideally refers to the **coordination of cycling policies, exchange of good practice, capacity building** for local and regional authorities, **co-**

funding of investments in cycling infrastructure and the **funding of pilot projects, research and awareness-raising campaigns**. In addition to a general framework for the development of cycling, national cycling strategies enable the adoption of **new legislative and fiscal frameworks** at national level. Finally, national cycling strategies are also a means to **boost dynamics** at national level and in various cycling-related areas such as cycling tourism, inter-modality, education or physical activity.

The analysis shows that the existence of a good national or regional cycling strategy and the reliance on it in the process of creating programming documents is one of the factors that **increase the effectiveness** of countries in applying for EU funding for bicycle investments. First, cycling strategies often include specific **investment needs and projects** which can easily be transferred to the programming documents. Second, they show to European institutions that planned investments are not isolated ad-hoc ideas but **part of a larger strategy** whose stages and final benefits are clear for the national decision-makers. Third, they guarantee that the implemented projects will make a real contribution to the **long-term goals** of countries and regions.



Pan-European Master Plan for Cycling Promotion

Problem / issue to be solved: The Transport, Health, Environment Pan-European Programme (THE PEP) is a joint initiative of the World Health Organisation (WHO) and United Nations Economic Commission for Europe (UNECE). The ministers of Transport, Health and environment of the Pan-European Countries signed the Pan-European Master Plan for Cycling promotion. It aims at promoting cycling as climate-friendly zero-emission healthy and sustainable active mode of mobility and emphasizes the positive effects on environment, climate, health, recovery and economy as well as a creator for green jobs and social inclusiveness and wellbeing.

What is it about?

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: Increasing 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.

To help all countries in the region to unlock the potential of cycling, the Master Plan includes 33 recommendations, grouped under 11 areas:

- » Develop and implement a national cycling policy, supported by a national cycling plan
- » Improve the regulatory framework for cycling promotion
- » Create a user-friendly cycling infrastructure
- » Provide sustainable investment and efficient funding mechanisms

- » Include cycling in the planning processes and facilitate multimodality
- » Promote cycling through incentives and mobility management
- » Improve health and safety
- » Improve cycling statistics for use in efficient monitoring and benchmarking
- » Promote cycling tourism
- » Make use of new technology and innovation
- » Promote cycling for a more resilient transport system

Main actors & barriers: implementation depends on the efforts of the member states

References & contacts: Pan-European Master Plan for Cycling Promotion (unece.org) (in English)

European Cycling Strategy (EUCS) by ECF



Problem / issue to be solved: The European Cycling Federation (ECF) developed the EU Cycling strategy (EUCS) as recommendations for delivering green growth and effective mobility by 2030. One main objective was the removing of the fragmentation in the development of relevant policies across EU institutions and avoiding inefficiencies in the expansion of local cycling strategies. Another important focus was to show the big impact cycling has on socio-economic and environmental indicators.

What is it about?

ECF together with over 1,000 experts involved in the process of developing the EUCS determined four objectives that are central for the strategy timeframe 2030: (1) Grow cycle use by 50 % at an average across the EU; (2) Halve rates for killed and seriously injured cyclists (in km cycled); (3) Invest 3 billion € in cycling in the period 2021-2027, and 6 billion € from 2028-2034; (4) At a qualitative

level, it is strongly advised that cycling is treated as an equal partner in the mobility system. To achieve these objectives, policy recommendations to the EU, national and regional/local level are formulated in the Chapters 3 to 11 of the documents. Key recommendations to the EU include: Behavioural change; Cycling-Friendly Infrastructure; Vehicle Regulation; Multimodality and Intelligent Transport System; A financial and fiscal playing field for cycling; The European bicycle industry; Contribution of cycling to achieve global goals; Governance, as well as Monitoring & Evaluation.

What triggered the improvement process? The list of challenges where cycling can make a cost-efficient impact at city, regional, national, and global level is long. In recognition of the many co-benefits of cycling, there are a growing number of public authorities that have placed cycling high on their political agenda as well as developing and implementing an integrated policy on cycling. The European Union, however, is not yet a member of this group. This document makes the case why, in addition to the EU having the competence to act, Union action has great added value in improving conditions to get more people cycling, compared to Member States' action at local, regional and national level alone.

Main actors & barriers: implementation is depending on the EU Commission – DG Transport. ECF marked the hand-over of the EUCS to the EU Commissioner for Transport Violeta Bulc during Velocity Arnhem-Nijmegen 2017. The Commission replied positively by stating its will to land the cycling strategy as part of the 2018 initiative on multimodality.

Impacts, costs, benefits, lessons learned: should the EUCS be implemented, the following impacts could be achieved:

- » economic benefits of cycling:
513 billion (2017) – 760 billion (2030)

- » jobs in the cycling economy:
650.000 (2017) – 875.000 (2030)
- » number of cycling trips per day:
160 million (2017) – 240 million (2030)
- » number of cyclist killed/100 million km cycled:
1.6 (2014) – 0.8 (2030)

References & contacts: <https://www.ecf.com/what-we-do/eu-cycling-strategy> (in English)

Cycling Master Plan 2021-2025 (AUT)



Main goals: The Cycling Masterplan 2015-2025 aims to increase the cycling mode share in Austria to 13 percent by 2025 as a contribution to the achievement of national and international environment, energy and health goals. There are six priority areas with 24 measures:

- » The klimaaktiv mobil cycling campaign
- » Cycle-friendly conditions
- » Information systems and awareness raising
- » Optimising connections
- » Cycling as an economic factor
- » Cycling for the promotion of health

Topics concerning safety: The priority area of “Cycle-friendly conditions” addresses the measure “Road safety for cyclists” with the goal that a high level of safety must be achieved for cycling in road traffic by:

- » increasing the share of cyclists (safety by numbers),
- » improving the visibility of cyclists (improvement of visual appearance as well as building measures in accordance with the Austrian Guidelines for the Design, Construction and Maintenance of Roads (RVS)),

- » learning the correct and safe handling of bicycles in road traffic (road safety education) and reinforcing environmentally-friendly and sustainable mobility behaviour (mobility education) at an early age (measure “Road safety education and cycle training” in priority area “Information systems and awareness raising”)

The measure “Initiating implementation-oriented research projects” (priority area “Cycle-friendly conditions”) recommends that road safety research should be consistently pursued in the area of cycling. The measure “Education and training in the area of cycling/bicycles” (priority area “Cycling as an economic factor”) aims at integration of cycling matters in academic road safety education.

References & contacts: <https://www.klimaaktiv.at/service/publikationen/mobilitaet/mprad2015englisch.html> (in English)

3.1.2. Regional and local strategies

Besides national cycling strategies, **regional and local strategies** are equally important: although cycling is primarily considered as a transport mode for short and medium distances, routes connecting towns and cities are also needed – e.g., for **leisure cyclists** as well as for **commuters** from neighbouring towns. The laws in many countries require that municipalities are responsible for this type of transport infrastructure. The regional structure in several Danube Area countries, however, is highly fragmented, with small and economically weak municipalities, and insufficient capacities in the cycling domain; it is a difficult task for them to provide funding for relevant projects, as well as professional staff. Therefore, municipalities often do not include new, interconnecting cycleways into their priority lists, or postpone

them for later periods – not least because they are not seen as a service primarily for their own residents. In consequence, **gaps remain** within the cycling network – and cyclists may end up on dangerous A-roads, e.g., higher level roads, which usually lowers their subjective perception of safety and thus the attractiveness of cycling.

If the aim is to implement **useful, interconnecting and safe networks** of cycle routes, i.e., off the 2nd and 3rd class roads with heavy traffic, it is necessary and appropriate to start thinking about financial contribution from regional resources. There are notable examples of regional authorities assuming a coordinating role, but not yet at a systemic level, and every region **approaches the issue differently**.

For the EU countries that have national documents on cycling, it appears advisable that **regional administrations coordinate the implementation of the national strategies and action plans**.

Strategy of infrastructure development for alternative transport in Chisinau (Republic of Moldova)



Main goals: The increase of citizens who prefer to travel by bicycle has increased the need to create a well-developed, comfortable infrastructure in the shortest possible time. The process of preparing this project/draft (local strategy development) was a public one – active citizens, cyclists and future users of the bicycle infrastructure were involved. A series of working group meetings, as well as public surveys, ensured real engagement and the collection of information from bicycle users.

Main objectives and tasks:

- » Improving urban mobility metrics: integrate the bicycle as a mode of transport with full rights.
- » Reducing the intensity of traffic on city roads, through the flow of motorists and passengers of public transport, by bicycle.
- » Establishing principles for development of cycling infrastructure in the city of Chisinau, based on existing experience and local specifics in urban mobility.
- » Creating a comfortable and safe environment for the development of cycling. Enabling the safe use of the bicycle by a wider circle of the population and improving urban accessibility.
- » Ensuring the equality of all road users, especially vulnerable groups of the population – children, people with disabilities, elderly.
- » Stimulating the authorities to develop and implement programs for the development of urban infrastructure in accordance with international criteria for sustainable development and the formation of a “city for people”, “a comfortable city for life”.
- » Increasing road safety by reducing the number of vehicles and the speed of road traffic, especially in residential areas – giving priority to pedestrians and cyclists.
- » Reducing the level of air and noise pollution, while reducing traffic intensity and redirecting part of the traffic to the bicycle; improving the health of the capital’s citizens.
- » Proposing ways to attract investment for the development of bicycle infrastructure. Defining the principles for the creation of several urban bicycle rental centres.
- » Stimulating the development of a culture of cycling and changing people’s attitude towards the bicycle. Treating the bicycle as a mode of transport and not as a means of recreation. Increasing the tourist attractiveness of Chisinau.
- » Establishing so-called “corridors” for cycling from one sector to another, taking into account current

developments in the development of cycling infrastructure.

- » Giving recommendations for improving the regulatory framework for cycling.

Topics concerning safety:

The expected results for the development of alternative transport:

- » Improving the health of the capital’s residents
- » Increasing the types of transport for citizens
- » Reduction of death and trauma as a result of road traffic crashes
- » Tourism development
- » Reducing air pollution and reducing background noise
- » Rational use of the city budget

Funded by (describe the resources needed):

UNDP, ACM, EcoPro

Timescale (start/end date):

July 2020-present (development and approval stage)

Evidence of success (results achieved):

In Summer 2020, the Automobile Club of Moldova (ACM) was invited by Mayor Chironda and involved (along with another NGO, urbanism and cycling experts, UNDP) to develop a Local Strategy on alternative transport and cycling in Chisinau (capital of Moldova). Initially, a Public Survey was conducted among the residents of the capital, related to the bicycle infrastructure of Chisinau. More than 2,000 people were interviewed by the middle of September. The purpose of this survey was to determine the potential of cycling infrastructure in Chisinau and to what extent the residents of the city are ready to support this initiative. Preliminary results in September showed that among those who travel by private car or public transport, 80% would like to use a bicycle as an alternative mode of transport if the appropriate infrastructure appears in the city.

The Cycling Infrastructure Development Strategy in the city of Chisinau has been developed and submitted to the public hearings and to the Local Council of Chisinau to be approved and launched for its official use and implementation (so far available in Romanian language) and was published in October 2020.

Difficulties encountered/ lessons learned:

Political issues, elections, lack of sufficient local expertise in municipal government bodies.

Further information:

Survey: https://point.md/ru/novosti/obschestvo/alternativnyi-transport-bolee-2000-chelovek-pri-niali-uchastie-v-oprose?fbclid=IwAR2t3VXTbANpXHT-o8IPgJP9f86GvfWdj_LBU0RKH7L6VBeMh0QnS-gcbnof4 (in Moldovan)

Strategy: https://www.md.undp.org/content/moldova/ro/home/library/climate_environment_energy/ghid-biciclete-chisinau.html (in Moldovan)

3.1.3. Legal frameworks

Legal frameworks can be seen as a **mirror for values and attitudes** of a society. Before motor vehicles dominated traffic at higher speeds, road space was both traffic and recreational space – equally available for pedestrians, carts, equestrians, and other uses such as games or commerce. With the advent of motor vehicles, **communication and social rules of behaviour** between road users became **increasingly difficult** due to the higher speeds. More and more rules, regulations and signs were created, which led to a segregation of road space in favour of motor vehicle traffic and disadvantaged walking and cycling.

On an international level the Vienna Convention on Road Traffic (1968) aims “to facilitate international road traffic and to increase road safety through the adoption of uniform traffic rules”.³ In the recent reforms and amendments of the traffic acts on national level one can find promising developments to ensure and promote active and safe transport by bicycle:

» **Reduction of speed:** In the Netherlands, a plan to introduce a standard limit of 30 km/h in built-up areas, instead of 50 km/h, was approved on October 27, 2020.⁴ In Spain, the Council of Ministers has approved a proposal to significantly amend traffic legislation. The urban speeds on single lane roads with a pavement which does not differ in height from the road’s surface will now be limited to 20 km/h. Roads with a single lane each way will be limited to 30 km/h. Roads with 2 or more lanes each way will remain unchanged with a limit of 50 km/h.⁵ Since January 1, 2021, Brussels (Belgium) is a 30 km/h zone. A maximum speed of 30 km/h is in force on all roads in the Brussels Capital Region, with the exception of the major axes where the speed limit remains 50 or 70 km/h.⁶

» **Passing distance of motor vehicles:** While there are currently no specific rules in the Netherlands and Denmark⁷, concrete definitions of a mandatory passing distance for motor vehicles exist, amongst others, in Portugal and Germany. The German Road Traffic Act defines sufficient side clearance as at least 1.5 m in urban areas and at least 2 m in extra-urban areas.⁸ Since January 1, 2014 the Portuguese Road Traffic Act says that motor vehicles must respect a minimum distance of 1.5 m from bicycles when overtaking.⁹ The parliament of the Czech Republic approved a similar provision (1.5 m) in April 2021. Other countries, among them Austria, are currently considering respective regulations.

³https://unece.org/fileadmin/DAM/trans/conventn/Conv_road_traffic_EN.pdf [26.05.2021]

⁴<https://ecf.com/news-and-events/news/30-new-50-dutch-reduce-default-speed-limit-nation-wide> [26.05.2021]

⁵<https://www.eltis.org/in-brief/news/new-spanish-law-require-30-kmh-speed-limit-urban-areas> [26.05.2021]

⁶<https://www.brussels.be/brussels-30-kmh-zone-1-january-2021> [26.05.2021]

⁷<https://safercycling.roadsafetyngos.org/best-practice-guide/> [26.05.2021]]

⁸https://www.gesetze-im-internet.de/stvo_2013/_5.html [26.05.2021]

⁹<http://www.ibexinsure.com/news-item/new-road-traffic-act-in-portugal-1> [26.05.2021]

- » **Right-turn casualties:** Since spring 2020 the German traffic act codifies crotch speed for right-turning motor vehicles over 3,5 tons. The Danish Ministry of Transport appointed the Danish right-turn committee in 2005. This unique type of cooperation between different parties and players lasted for several years and consisted of drivers and haulage contractors of the trucking industry, Danish Cyclists' Federation, the Police, the Danish Road Safety Council, as well as researchers and representatives from government ministries and agencies. Following their proposed broad spectrum of knowledge-based, inclusive measures, the number of annual right-turning cycling casualties dropped from about 35–40 to 10–15.

Since **cycling trips** are often **shorter** than trips with other modes of transport, cycling is often perceived as a local issue. However, the possibilities of local authorities to provide and ensure safe cycling infrastructure are affected by national legislations like regulations on signs and signals.

3.1.4. Policy Development and Evaluation Tools

Policy development and evaluation tools play a crucial role for cycling policies and strategies. Such tools can **support the development process** of cycling policies and strategies and/or help to investigate whether the implemented policies, activities and interventions have the **desired effects**, and what can be done differently to **improve the impacts**.¹⁰

Bicycle Policy Audit (BYPAD)

Problem / issue to be solved: In terms of quality management, it is necessary to question how effective and efficient cycling policy is. Therefore, an assessment of the current situation is required.

What is it about? The tool BYPAD offers an opportunity for cities, towns and regions to evaluate the quality of their cycling policy themselves. It considers cycling policy as a dynamic process, consisting of nine fields in permanent development and influencing each other. By using a strengths and weaknesses analysis for these nine modules, the quality of cycling policy is evaluated and concrete suggestions on how cycling policy can be improved in the future are made.

The BYPAD method is developed for the different categories of geographical areas in terms of size and organisation: 1) towns (less than 50.000 inhabitants), 2) cities and agglomerations (above 50.000 inhabitants) and 3) regions as the administrative level above the municipalities (like provinces, regions, counties).

After the implementation of the audit all cities and regions receive the official BYPAD certificate together with a bicycle action plan from their national auditor.

Main actors & barriers: The BYPAD (Bicycle Policy Audit) was developed by an international consortium of bicycle experts as part of an EU funded project.

Impacts, costs, benefits, lessons learned:

The audit has been implemented in almost 250 cities, towns and regions spread over 25 countries. Since 1999, bicycle-experts from different regions are educated to become certified auditors in order to guide the towns, cities and regions to implement BYPAD and to join the BYPAD network.

References & contacts: https://www.bypad.org/about/one_minute (in English) [11.06.2021]

¹⁰Garrard (2015)

CIVITAS WIKI project



Problem / issue to be solved: Over 70% of all Europeans live in cities and cities are becoming increasingly congested. Citizens suffer from poor air quality and noise, which makes the cities less liveable. CIVITAS is a network of cities for cities dedicated to cleaner, better transport in Europe and beyond. Since it was launched by the European Commission in 2002, the CIVITAS Initiative has tested and implemented over 800 measures and urban transport solutions as part of demonstration projects in more than 80 Living Lab cities Europe-wide.

What is it about? The mission of the CIVITAS WIKI project was to provide information on clean urban transport and the CIVITAS Initiative to EU city planners, decision-makers, and citizens. With its policy documents, WIKI wants to inform people in cities about a number of topics that currently play an important role in urban mobility. The final policy analysis focuses on the topic of cycling in the city. This document provides information about measures that can be taken in order to increase the use of cycling as a transport mode in the urban environment.

References & contacts: [11.06.2021]

- » <https://civitas.eu/projects/wiki> (in English)
- » 5th Policy analysis: Smart choices for cities. Cycling in the City: https://ec.europa.eu/transport/sites/default/files/cycling-guidance/smart_choices_for_the_city_cycling_in_the_city_0.pdf (in English)

3.1.5. Assessment of cycling infrastructure safety

It is advisable to regularly **assess safety aspects** of current and future cycling infrastructure. Whereas **road safety audits** and **inspections** are already common for infrastructure for motorised traffic, the assessment of cycling infrastructure safety is still under development. While the **CycleRAP** methodology has its origin in the field of traffic safety and focusses solely on the assessment of the level of risk that is built into cycling infrastructure, the **European Certification Standard (ECS)** and the **ADFC** quality certification consider cycling infrastructure safety aspects as part of a broader set of criteria to evaluate the quality of a cycling route. The different approaches are presented below.

Regular and **independent monitoring and evaluation** of cycling infrastructure (before and after comparison, needs and requirements of all involved parties, crash and traffic data) is not only essential for road safety but can also be used for **public relation**. Ideal is a regular data collection and analysis for infrastructure safety assessment according to a **national plan** and giving **access to the database** to all relevant stakeholders.

iRAP Star Ratings of NACTO-GDCI's Global Street Design Guide

Problem / issue to be solved: Every year 41,000 cyclists die in road traffic-related crashes worldwide. Millions more are injured while cycling, some of whom become permanently disabled. 22,800 road users lost their life on the European Union (EU) roads in one year, 2000 of which account for cyclists. Despite the massive underreporting problem with bicycle crashes, the increase in bicyclists' fatal and serious injuries on roads is

apparent. Infrastructure safety plays an important role in preventing bicycle crashes. Modern cities are invited to take seriously into account overall safety of vulnerable road users on their roads, including bicyclists. New road infrastructure designs that support shift towards safe, sustainable, and healthy cities through transforming of streets plays a key role in preventing bicycle crashes with serious injuries and fatalities.

What is it about? To prevent the growth in the cycling fatalities and serious injuries, the International Road Assessment Programme (iRAP) Star Ratings of NACTO-GDCI's Global Street Design guide (GSDG) offers a useful framework for validating the design strategies offered in the Global Street Design Guide. The Star Ratings of the GSDG's transformations provide decision-makers, engineers, and designers around the world with possible reconfigurations for a variety of street and intersection types, drawing from global case studies that have also been endorsed by iRAP's proven methodologies. For those using the iRAP methodology, this effort can also offer ideas and potential strategies for achieving higher safety ratings while simultaneously supporting broader citywide goals.

What triggered the improvement process? In the respective document an integration of iRAP star ratings for infrastructure safety into the GSDG is tested with the aim to create a 5-star environment for all road users while supporting mobility outcomes that can best provide for healthy, safe, sustainable, equitable, and liveable cities for both current and future generations. The safety assessment of the road infrastructure in cities has become an ever-growing demand in cities which aspire to improve road infrastructure safety performance. This Guide provides an interesting insight on how the proposed design changes can be assessed and evaluated even before the actual work takes place. iRAP road safety assessment is one of the available methods to assess safety of designs.

Challenges: Decision-makers, engineers and designers involved in road infrastructure around the world are busy people dealing with multiple priorities where road safety is a small part of their everyday business. Moreover, the availability of funding is in most cases limited. The star rating of designs provides a useful tool in raising awareness about infrastructure safety but also offering valuable insights at the early stage of projects on how the safety ratings of proposed designs are assessed and can be improved.

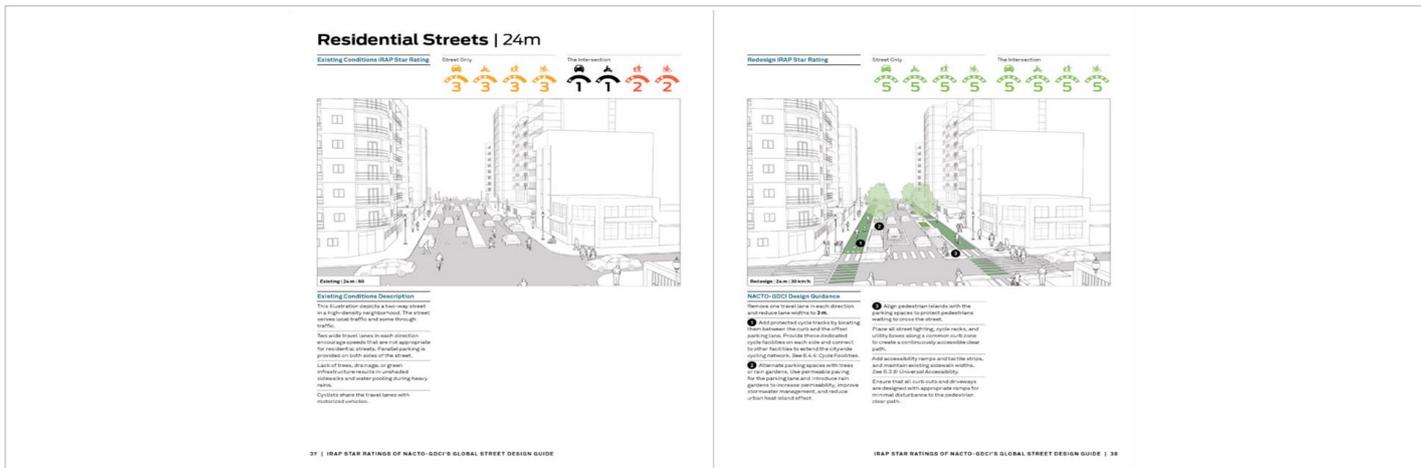


Figure 19: iRAP Star Rating for the example of residential streets

Impacts, costs, benefits, lessons learned: The impact of assessing road design for safety in early stage of design can have huge impact on overall safety of one project. Costs for star rating road design is significantly lower than improving safety in post implementation phase.

References & contacts: [11.06.2021]

- » WHO (2020): <https://apps.who.int/iris/bitstream/handle/10665/336393/9789240013698-eng.pdf> (in English)
- » iRAP (2021): <https://irap.org/cyclerap/> (in English)
- » European Commission (2020): https://ec.europa.eu/transport/media/news/2020-06-11-road-safety-statistics-2019_en#:~:text=Compared%20to%20previous%20years%2C%20fewer,%E2%80%93%20a%20decrease%20of%2023%25. (in English)
- » European Commission (2021): https://ec.europa.eu/transport/road_safety/users/cyclists_en
- » <https://globaldesigningcities.org/wp-content/uploads/2020/09/iRAP-Star-Ratings-of-the-Global-Street-Design-Guide.pdf> (in English)

CycleRAP methodology

Problem / issue to be solved: Every year in the EU, a large number of bicyclists are fatally or seriously injured on roads, and cyclists belong to a large portion of all those fatally or seriously injured. Of these bicyclist crashes it is estimated that the road design plays a role in at least half, and a significant proportion are single bicyclist crashes. Road authorities (in particular urban and municipality authorities) are grappling with provision of infrastructure for bicyclists and with associated impacts to vulnerable road users' safety.

What is it about? CycleRAP is an evidence-based infrastructure risk evaluation model. It aims to reduce crashes and improve safety specifically for bicyclists

and other light mobility users by identifying high risk locations without the need for crash data. CycleRAP will power software tools used for pinpointing and mapping where crashes are likely to occur and offer suggestions for treatments to reduce this risk. The model uses data about the features of a road, street, or path to evaluate the risk of crashes for bicyclists and light mobility users – irrespective of the type of facility (or whether it is on or off road) and for all crash types. It can be used anywhere in the world. The iRAP bicyclist Star Rating provides an assessment of the level of risk that is built into cyclist infrastructure, with 1 star being the highest risk and 5 the lowest. The concept of CycleRAP originated in 2015 by the collaborative efforts from iRAP, the Royal Dutch Touring Club (ANWB), the Province of Friesland and the Dutch Institute for Road Safety Research (SWOV). They have developed a first-generation model dedicated to assessing bicycling risk, "CycleRAP version 1.3". Several pilot assessments using the CycleRAP model have been completed or are underway in the Netherlands. iRAP, via its subsidiary company, Road Assessment Services Ltd (RASL), is assisting in the quality review of these pilot projects. In late 2018, ANWB engaged RASL to conduct further research to strengthen the evidence base that underpins CycleRAP attributes.

CycleRAP measures the risk of four crash types: vehicle – bicycle/ light vehicle; crashes between bicycles/ light vehicles; bicycle/light vehicle – pedestrian; and single bicycle/light vehicle crashes; and is applicable on any kind of road or other facility. CycleRAP can be used in conjunction with, or independently of, the iRAP Bicyclist Star Rating (which is focussed on vehicle-bicycle crash risk and best suited for assessing roads or facilities associated with roads). Like Star Ratings, CycleRAP provides an objective measure of the likelihood of a road crash occurring and its severity when one does occur.

What triggered the improvement process? In 2014, SWOV published several studies on the development

of a quantitative method for assessing bicycling safety. In 2015, ANWB formed a cooperation agreement with the City of Amsterdam and SWOV to develop a Network Safety Index (NSI) to map the road safety situation, with a particular focus in urban areas, with the goal of helping municipalities to increase proactive measures to promote road safety. A second goal of the collaboration was the development of the CycleRAP instrument as part of the iRAP/EuroRAP methodology.

Challenges: CycleRAP needs to be as practical and affordable as possible to use. The model was tested extensively in the Netherlands, and as a result of this, a second generation of the model has now been developed. The new version simplified the data requirements and crash types to improve its efficiency, effectiveness and the quality of the outputs. Reducing the number of attributes will reduce the labour-intensive exercise of coding. Currently there are 55 CycleRAP attributes, plus 14 location attributes that should be collected for each 25m coding segment. To reduce the assessment burden, CycleRAP is now undergoing its final stages of testing and will be ready for pilot projects in the second half of 2021. The development of the second generation of the model has been overseen by the CycleRAP Advisory Committee, which involves stakeholders from over 20 organisations around the world. Attributes could be consolidated and simplified as much as possible. There are a few cases where there is unnecessary duplication (such as tram rails being separate from bicycle facility surface quality) or where, based on current assessment data, attributes appear of limited value.

Impacts, costs, benefits, lessons learned: The initial CycleRAP model was piloted on over 450 km of road and other facilities in the Netherlands. In 2018, ANWB engaged iRAP to undertake an evaluation of the CycleRAP pilot trials and to complete a comprehensive literature review to strengthen the link between the model and available evidence. The report is available at www.irap.org/cyclcrap.

www.irap.org/cyclcrap.

CycleRAP is intended to be an enhancement of the iRAP Bicyclist Star Rating, providing an objective measure of the likelihood of a road crash occurring and its severity when one does occur. The focus is on identifying and recording the road attributes which influence the most common and severe types of crash, based on scientific evidence-based research. In this way, the level of bicyclist risk on a particular network can be defined without the need for detailed crash data, which is often lacking for bicyclist crashes.

References & contacts: [25.06.2021]

- » Website in English, <https://www.irap.org/cyclcrap/> & https://www.irap.org/project/irap_urban_cyclcrap/ & <https://www.irap.org/2021/05/innovation-project-in-focus-cyclcrap/> (in English), www.irap.org/cyclcrap (in English)
- » CycleRAP Research and Review: Evaluation and Literature Review Report, CycleRAP Research and Validation report, International Road Assessment Programme (iRAP), 8 February 2021 (in English)
- » https://resources.irap.org/Report/CycleRAP_RV2020_Evaluation_and_literature_review_report.pdf https://www.anwb.nl/binaries/content/assets/anwb/pdf/belangenbehartiging/cyclcrap/cyclcrap-rd-acceptation-report_280319.pdf (in English)

European Certification Standard (ECS)



Problem / issue to be solved: The European Certification Standard (ECS) aims to improve the quality of EuroVelo, the European cycle route network, and other routes by identifying critical deficiencies and motivating decision-makers to invest in solutions to the identified problems. ECS provides quality control to motivate different target groups with varying levels of experience to use the certified trans-national routes.

What is it about? The European Certification Standard (ECS) is a set of rules developed by the ECF to certify EuroVelo routes and evaluate their quality. It can also be used to assess the quality of national or regional routes. It can help set up national standards where they do not exist and harmonise the different regulations in the European states. The criteria for the assessment are categorised according to (1) infrastructure, (2) services and (3) promotion.

Regarding (1) infrastructure the following criteria are assessed:

- » Continuity of the route: physical disruptions, legal disruptions, entry and crossing restrictions
- » Route components: infrastructure type, direction, infrastructure width, volume of motorised traffic, speed limit, traffic category, dangerous crossings
- » Surface: surface material, surface quality
- » Different route components, traffic, surfaces or widths in a minor section
- » Gradients
- » Attractiveness: area/landscape, attractions, nuisances
- » Signing: conformity with signing standards, EuroVelo logo integration, sign content, signing defect
- » Public Transport: public transport reliability, number and capacity of connections

In addition to the short and long ECS Manual (see references), EuroVelo Route Inspectors use an app specifically designed to evaluate long-distance cycle routes: the European Certification Standard app. Official EuroVelo Route Inspectors have participated in the mandatory ECS training.

References & contacts: [11.06.2021]

- » Website: <https://pro.eurovelo.com/projects/european-certification-standard#:~:text=The%20European%20Certification%20Standard%20>

%28ECS%29%20is%20a%20set,harmonise%20the%20different%20regulations%20in%20the%20European%20states. (in English)

- » Short Manual in English: <https://eurovelo.com/download/document/European-Certification-Standard-Manual-short-version-English.pdf>
- » Long Manual in English: https://eurovelo.com/download/document/ECS-Manual-2018_04_16.pdf
- » App (log in necessary): <https://ecfapp.com/pages/index> (in English)

3.1.6. Intermodality of cycling and public transport

Cycling is perfectly suitable to be **interconnected with other modes of transport**. Especially when **combined with public transport**, cycling can be encouraged as the **first/last mile solution** on journeys. Measures that ease this combination include the **provision of cycling facilities close to public transport** stops, hubs and interchanges and the possibility to take bicycles onboard public transport, including adequate **onboard storage**. Covered and locked **garages** protect bicycles from theft and weather. Good bicycle parking facilities are properly located, comfortable, visible and easily understandable, differentiated, secure and safe, available, i.e., the number of spaces should match the number of users, as well as maintained and serviced. They are more advanced than just a parking facility and indicate that cyclists are respected.¹¹ Moreover, the introduction of a **single ticketing** system including shared/rented bicycles support the use of different modes of passenger transport.¹²

¹¹ <https://cyclingsolutions.info/good-bicycle-parking-isnt-rocket-science-just-get-it-right/> [08.06.2021]

¹² https://ec.europa.eu/transport/themes/urban/cycling/guidance-cycling-projects-eu/cycling-measure/19-multimodal-integration_en [11.06.2021]

Bike+Ride services at the Austrian-Hungarian border region (Austria / Hungary)

Problem / issue to be solved: CO₂ emissions need to be reduced at both regional and local levels. Linking up sustainable modes of transport, like the rail and the bicycle, can encourage workers to utilise these modes instead of cars. It is shown that cycling can meet the needs of commuting in the region if there are no timetable bottlenecks or comfort obstacles. At the same time, among other factors, suitable infrastructure for cyclists was missing when GYSEV Ltd. (Győr-Sopron-Ebenfurth Railway) took over the operation of the public rail passenger transport in the West Transdanubia region starting from 2001.

What is it about? In order to better cater for the needs of bikers, several measures have been taken: The railway operator now runs low floor electric trains for getting on and off easily, with and ample space for bicycles transport. Platforms in all stations have been renovated to match train floor levels. Secure bike storage areas have been established at 39 stations, conveniently storing more than 1800 bikes along the lines. Moreover, GYSEV offers many discounts to cyclists: bicycle ticket prices have been standardised within 50 km transport distance. On the cross-border routes the price of the EURegio Special return tickets include the carriage of bicycles in Hungary as well as in Austria. People can use these tickets even with stopovers.

What triggered the improvement process? Regarding passenger transport, the strategic goal of GYSEV Ltd. was to establish a passenger transport company of regional significance along the West Transdanubia region and at the cross-border lines between Austria and Hungary. To reach this goal, the above-mentioned bot-

tlenecks had to be eliminated, including cycling related issues. At the same time, demand from the public and commuters also motivated the company to take the necessary steps.

Main actors & barriers: GYSEV Ltd. is a key actor of public transport in the West Transdanubia region, playing an active role as a catalyst of green transport. For 18 years, it has worked towards transforming into an intermodal passenger mobility hub, providing innovative services and infrastructure development to smooth out modal transfers for commuters and visitors. Intensive cooperation with municipalities, commuters and other public transport actors, and the complex management of service and infrastructure development both at local and regional levels is also a valuable experience and a key success factor. Local, regional and national authorities along line managed by the company contribute financially to the operation of passenger transport.

Impacts, costs, benefits, lessons learned: The utilisation of Bike+Ride (B+R) parking and the transport of bicycles on trains are constantly increasing on GYSEV lines, as the quality of service is improving. Secure bicycle storage facilities had to be extended several times due to heavy demand to a current capacity of 1881 bicycle storage places. Despite a drop in petrol prices (10%) and a rise in car numbers (22%) in the region, passenger numbers increased by 8% in the period 2012-18. For cross-border trains to Austria, the increase is 34%. In 18 years, since 2002, GYSEV has spent ~2,2 million € on cycling and intermodality-related development. Projects were partly financed with own capital and partly through Structural Funds (Hungarian OPs: WTROP, Transport OP; Integrated Transport Development OP; ETC programmes: INTERREG AT-HU, CENTRAL, DANUBE).



Figure 20: Covered bicycle parking in Sopron (Source: ikvahir.eu 2014)



Figure 21: Covered bicycle parking in Wulkaprodersdorf

References & contacts: [11.06.2021]

<https://www2.gysev.hu/> (in Hungarian),

<https://www.raaberbahn.at/> (in German)

3.1.7. Education and training

Daily use of the bicycle in road traffic requires **various skills** which are generally acquired during childhood and adolescence and lay the **foundation for future mobility behaviour**. In a society where cycling is the norm and the environmental conditions support chil-

dren's cycling, learning to cycle can be seen as a family matter with parents teaching their children and passing on this tradition, their knowledge and skills. However, in countries where cycling is not yet part of the mobility culture, other approaches are necessary to **ensure the acquisition of these skills**. **Targeted cycling programmes** from national and local authorities in cooperation with schools or day care facilities guarantee that the responsibility does not rest solely with the parents. Moreover, **cycle training** can **increase road safety** of all age groups i.e., by improving the skills and confidence riding a bike, and can be an opportunity to get to know new bicycle types like pedelecs / e-bikes or cargo bikes.¹³ In order to provide adequate cycle education and training, it is necessary to **train the instructors as well** – as it is the case for example in Hungary or Austria.^{14 15}

In addition, it is necessary to include **scenarios in the theoretical and practical education of drivers** in which special attention to cyclists is needed. For example, it is recommended to include the so-called Dutch Reach in the list of requirements for drivers to pass the driving test, i.e., to open the door of the car with the hand that is furthest from the door. In this way one automatically turns the own body to face the rear where a cyclist may be approaching, and 'dooring' incidents can be reduced.

Know how is not only necessary to those riding a bicycle in public traffic but is also key to **improve the conditions** for (safe) cycling. Since cycling is an **interdisciplinary topic** and needs efforts on different (political and administrative) levels a **common understanding and teamwork** is necessary.

¹³ PRESTO (2010a)

¹⁴ <https://cyclingsolutions.info/cycling-children-cycle-training-and-traffic-safety> [26.05.2021]

¹⁵ https://ec.europa.eu/transport/themes/urban/cycling/guidance-cycling-projects-eu/cycling-measure/cycle-training_en [26.05.2021]

Cycling education

BringaAkadémia – A Hungarian cycling safety educational programme (Hungary)



Problem / issue to be solved: Cycling is a strong symbol of freedom. Already children feel that on two wheels they can go faster and further, while they also experience their independency. On the other hand, only a minority of them will cycle with proper theoretical and practical knowledge day-to-day – to school, to the grocery store, or to the grandma.

What is it about? BringaAkadémia's goal has been to provide professional background knowledge for cycling safety education to primary school teachers (and police officers) by training-of-trainers courses and by developing educational materials (like the BringaAkadémia workbook for pupils and the BringaAkadémia Mentors' guide for teachers). Vuelta Ltd. (a private company elaborating the BringaAkadémia programme) has dealt with cycling safety education since 2004. In their first 4 years they have implemented 'cycling project days' in dozens of primary schools, bringing along there their bikeability track equipment and giving lessons about safe cycling in classrooms. In 2008, they had been assigned by the government to develop and implement a cycling safety education programme in Hungary as a pilot project, based on Western European best practices, that focussed on practices for improving the pupils' cycling skills.

BringaAkadémia objectives: The main aim has been to involve all 10 to 11 years old pupils in cycling safety education nationwide in Hungary. Other objectives of the BringaAkadémia are:

- » To involve more primary school teachers in training-of-trainers programmes that prepare them for cycling safety education.
- » To reach all 4-5th class pupils in Hungary, at least through the BringaAkadémia workbook.
- » To strengthen cycling safety education in primary schools by implementing a theoretical course that is obligatory for all pupils and which can become the basis of voluntary practical cycling courses is the long-term objective.
- » To establish an obligatory theoretical cycling exam in the 4th or 5th class of primary schools.

What triggered the improvement process? Almost all children love cycling, but the majority of them are not acquainted with the basic rules and highway code stipulations for cyclists. In Hungary, the National Curriculum contains traffic safety education, i.e., three lessons per year on average, in primary schools. However, this amount of lessons is not sufficient to provide well-founded practical knowledge of these rules. For primary school teachers (and police officers who are regularly presenting at these traffic safety classes in primary schools) there is a lack of useful traffic safety educational or supporting and advisory material. In addition, according to a survey of the Hungarian Institute for Transport Sciences (based on 2014 data), cycling safety knowledge of 1st and 2nd grade pupils is excellent, but as the children are growing up, results are getting worse – in 3rd and 4th class only 42% are aware of basic traffic codes for cyclists. Among 5th to 8th grade students the latter value is getting better (59%), but accident statistics show that it is not enough. The data shows that there is a huge need for cycling safety education, and this should be started in primary schools.

Main actors & barriers: Their main partners were the Office of the Government Commissioner for Active Hungary, the Institute for Transport Sciences (KTI), the

Commission on Prevention of Accidents of the Hungarian Police (ORFK-OBB) and the Hungarian Cyclists' Club. The Commission on Prevention of Accidents of the Hungarian Police (ORFK-OBB) provides the possibility to reach police officers with their programmes, and, in addition, in the last three years BringaAkadémia and ORFK-OBB have implemented training for trainer courses for police officers (for the 'police officers of the schools' primarily) in every Hungarian county, based on the BringaAkadémia methodology. On the international level, they have formed professional partnerships with organisations dealing with the same issue in the last six years. First of all, they have helped to start safety cycling education in Romania, in cooperation with Fundația Comunitară Mureș, a civil organisation in Mureș county. In 2014, they organised a training for trainers' programme in Târgu Mureș, that was the basis of AcademiaVelo programme. In the last six years the Romanian partner has been improving its programme permanently, reaching hundreds of pupils and dozens of teachers in the secondary schools or at various cycling events.

Impacts, costs, benefits, lessons learned: BringaAkadémia programmes, events and booklets have reached ten thousand children, and hundreds of primary school teachers were trained for educating cycling safety and guiding cycling tours to pupils. As a first step, in the framework of the Safe4Cycle project, Vuelta Sport Association in cooperation with three partners (Easy Drivers Radfahrschule from Austria, Mobycon from the Netherlands, Fundația Comunitară Mureș from Romania) it was decided to develop a cycling road safety education programme in the frame of the Erasmus+ Programme. The four partners had two and a half years and a 340,000 € subsidy from Erasmus+ for the implementation of the project.

An important impact of the work at national level in 2017 was that attention has been raised for the importance

of cycling safety at the highest levels of the Hungarian government. The government commissioner for cycling and active leisure, initiated to form a task force to complete the Workbook and the Mentors' Handbook (also including rules for pedestrians) in August 2017. A task force has been formed from experts from the Office of the government commissioner, the Institute for Transport Sciences (KTI), the Commission on Prevention of Accidents of the Hungarian Police (ORFK-OBB), the Hungarian Cyclists' Club and Vuelta Association. The resulting Safe4Cycle Workbook was delivered to all 4th and 5th grade students in November 2018 (200,000 copies in total).

With the start of the Safe4Cycle project (funded by the Erasmus+ Programme with 283,000 €) with the European partners Mariborska kolesarska mreža (SLO), Fundația Comunitară Mureș (RO) and the Bikeability Trust (UK), recent activities focus on interactive videos, an interactive workbook and a new training for trainers programme.



Figure 22: Practical cycling safety education



Figure 23: Theoretical cycling safety education

References & contacts: [11.06.2021]

- » www.bringaakademia.hu (in Hungarian),
- www.bringaakademia.hu/en (in English),
- www.facebook.com/bringaakademia (in Hungarian)
- » www.safe4cycle.com (in English)

Training and education for (prospective) experts

Urban Mobility Academy (Czech Republic)



Problem / issue to be solved: Urban transport and mobility are very complex issues. Important topics in the integrated urban development, such as sustainable development, climate change in urban areas, reducing barriers, innovative mobility solutions, or a human-oriented social city concept relate to many disciplines and sectors, and require the engagement of various stakeholders and network structures.

What is it about? Together with the Faculty of Transport CTU Prague, the University of Pardubice and the University of Economics Prague are updating the SUMP methodology (so-called SUMP 2.0), based on ongoing consultations with politicians, officials, experts and the public. This participation can be seen as a mutual

educational programme in which everyone is both teacher and student.

The four following characteristics make the approach of the Partnership unique:

- 1) Focusing on training of new urban mobility managers;
- 2) Providing independent consultations on the SUMP development and implementation;
- 3) Talking more about the humanitarian dimension of SUMP than the technical one;
- 4) Stronger emphasis on the need of creating public and street space with regard to the promotion of active mobility, environmental protection and safety of vulnerable users.

The website www.akademiamobility.cz was developed analogue to the EU website www.eltis.org. This is a platform where not only single lessons, but also all relevant information on sustainable mobility planning is published. The Urban Mobility Academy compiles a “library” with information, guidance and inspiration useful for those who struggle for regional and urban mobility support. The library content focusses on various target groups such as local politicians, engaged citizens and associations, professionals, business sector, or transport service providers.

The website structure is based on four areas of the new Urban Agenda for the EU:

- 1) Governance = Participation = Communication Strategy = Strategic Planning;
- 2) Active Mobility Support; Public Space Solutions;
- 3) Public Transport; Multimodality;
- 4) Smart Technologies.

References & contacts: www.akademiamobility.cz (in Czech) [11.06.2021]

3.1.8. Promotion and awareness raising

The link between **promotion and awareness raising** concerns two areas. On the one hand, following the idea of “**safety in numbers**”, the more people cycle, the safer it is for each individual cyclist.¹⁶ On the other hand, safety concerns **influence whether people cycle or not**, i.e., various studies, e.g., Sanders (2015), found that people say they would cycle more if they felt safer. Depending on the aims and objectives, promotional campaigns or targeted cycling campaigns for schools, workplaces or specific population groups like children, students or the elderly may be recommended.

In recent years, the number of cycling campaigns has increased significantly across European countries as many European cities have started to **promote cycling as a mode of urban transport**. Experience shows that infrastructure is no longer the only concern in the traffic domain – and relatively **inexpensive** communication, promotion and awareness raising campaigns are also an **efficient** contribution to reaching the main goal. Awareness raising can include a wide variety of activities aimed at encouraging individuals to **change their habits** and to use the bicycle as a mode of transport instead of driving, by **explaining its potential benefits**. Moreover, cycling campaigns can also address **specific issues of cycling safety** e.g., the visibility of the cyclist to other road users or the safety of the environment around the cyclist.¹⁷ However, promotion and awareness raising activities do not only encompass broad promotional or safe cycling campaigns, but also **bike events and festivals**, the certification of **cycle friendly employers**, the installation of **bicycle counters** or the implementation of **shared bicycles schemes**.¹⁸

At international level, several high impact actions regarding cycling can be identified that influenced people’s mode choice in favour of the bicycle in time:

World Bicycle Day – In April 2018, the United Nations General Assembly declared June 3 as International World Bicycle Day. The resolution for the World Bicycle Day recognises “the uniqueness, longevity and versatility of the bicycle, which has been in use for two centuries, and that it is a simple, affordable, reliable, clean and environmentally fit sustainable means of transport”. The World Bicycle Day is a global holiday meant to be enjoyed by all people regardless of any characteristic. Professor Leszek Sibilski, Polish social scientist working in the United States, led a grassroots campaign with his sociology class to promote a UN Resolution for World Bicycle Day, eventually gaining the support of Turkmenistan and 56 other countries. The bicycle as a symbol of human progress and advancement promotes tolerance, mutual understanding and respect and facilitates social inclusion and a culture of peace. The bicycle further is a “symbol of sustainable transport and conveys a positive message to foster sustainable consumption and production and has a positive impact on climate.”^{19/20}

Kidical Mass – Kidical Mass is a family bike ride that encourages families to ride bicycles for transportation, fitness and fun. The rides are no more than a few miles (2-4 miles depending on the ages of the children) and should be comfortable for people of all ages and abilities. The goal is to bring people together by riding bikes through a neighbourhood to a destination where everyone can gather and enjoy food, refreshments and conversation. Kidical Mass usually occurs once a month on a weekend. Kidical Mass is popular in various countries from Europe to the United States.^{21/22}

¹⁶ Elvik & Bjørnskau (2017)

¹⁷ PRESTO (2010b)

¹⁸ PRESTO (2010c)

¹⁹ https://en.wikipedia.org/wiki/World_Bicycle_Day [07.06.2021]

²⁰ <https://www.bicyclenetwork.com.au/rides-and-events/world-bicycle-day/> [07.06.2021]

²¹ <https://kinderaufsrad.org/> & <https://www.kidicalmass.at/> [07.06.2021]

[https://en.wikipedia.org/wiki/Critical_Mass_\(cycling\)](https://en.wikipedia.org/wiki/Critical_Mass_(cycling)) [07.06.2021]

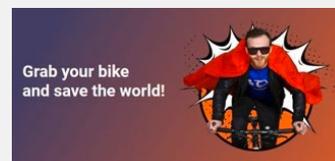
CityChangers Campaign (Czech Republic)

Problem / issue to be solved: Based on an analysis conducted, it was found that there is a lack of interest and awareness towards the SUMP concept among policy-makers at all levels; it seems that the whole Czech society is so far only interested in the topic to a limited extent. Therefore, a marketing concept is needed to present the topic to the public and policymakers in an appropriate way. This goal will be achieved in cooperation with MasterCard which is the author of the CityChangers draft campaign.

What is it about? The CityChangers campaign will put together cities, companies, non-profit organisations and civic initiatives which strive for making our cities better places to live. The initiative gathers active and engaged people from local communities. It is a platform of local politicians and officials, but also, primarily, of active citizens in local communities. The aim is to interconnect all people involved to address the issue of transport and mobility jointly and to help cities to communicate these issues. Having a vision and knowledge of theory is essential, but that basis needs to result in tangible changes in streets and neighbourhoods. In addition, every change should be discussed with the public. The campaign aims at looking for and sharing good practice examples, to inspire Czech towns and cities. There is also the need to present the topics in a positive way. Every mobility plan includes a communication and marketing strategy to ensure public participation throughout the development and implementation phases. The association will cooperate with cities to develop their communication strategy as well as a long-term communication plan, to give publicity to the mobility topic and to implement communication sub-activities.

References & contacts: www.citychangers.eu (in Czech) & <https://en.dobramesta.cz/citychangers> (in English) [11.06.2021]

Bike to Work (BTW) campaign (Slovakia)



Problem / issue to be solved: The most often mode of commuting in Slovakia is a car. Thus, a goal of the Bike to Work campaign is to show people that commuting by bike is often possible and that it is even better and more attractive than by car. Organisers hope that at least part of the participants commute by bike after the campaign for a longer time - and the experience of the last 9 years since the campaign has been established show that this is a justified assumption.

What is it about? Nationwide campaign for increasing the use of the bicycle for commuting to work. The main element is a gamified competition of commuters in number of trips, driven kilometres and emissions saved, accompanied by numerous events and awareness raising activities.

Main actors & barriers: The initiator was the Citizens' Cycle Initiative Banská Bystrica association (OCIBB). It was active in motivating citizens of the municipality Banská Bystrica (Central Slovakia) to use bicycles and to demand more cycle routes. In 2012, it recognized a large potential of the Bike to Work campaign in other countries and organised it in Banská Bystrica. The first-year success was phenomenal, so they developed the campaign further nationwide and it is now the most popular and biggest cycle campaign in Slovakia. There are more main actors beside the OCIBB: the Ministry of Transportation and Construction of the Slovak Republic provides important political support showing that commuting by bike is of national interest. Municipalities are also very important within the campaign, but they have to show interest by joining the competition (otherwise its citizens cannot participate) and appoint a local coordinator (some of them are really active and in

some towns he/she even becomes a formally appointed municipal cycling officer) and organise the final event. Crucial, though not compulsory actors are employers that very often quickly recognise benefits of commuting by bike and create a supportive environment (e.g., showers, safe bike storages, etc.). There are two main barriers: low awareness in the population and authorities about cycling as a part of transportation (thus low interest or even disrespect) and lack of funds for even better public relations and fees.

Impacts, costs, benefits, lessons learned: Such big campaigns generate several impacts and benefits, among them:

- » significant increase of cycling during the campaign month and slight increase in the rest of the season
- » slightly increased focus of municipalities to support cycling and implementation of some modest measures (many municipalities began to collaborate with local cycle communities, some of municipal „bike to work coordinators“ are appointed as permanent cycling officers);
- » hundreds of companies and institutions improved the environment for commuting by bike (mainly by creating bike parking places);
- » increased environmental responsibility of part of the population.

Costs of the campaign consists of (amounts in 2020) the operation of internet registration/evidence system (23,000 €), the advertisement of the campaign (10,000 €), and fees (7,000 €) (another app 16,000 € is provided as a voluntary work). Main funding sources are grants/donations from public and private organisations and merchandising. An interesting new source of income are heat maps created from registered data of participants (via internet registration/evidence system) sold to municipalities to help them to improve cycling environment efficiently.

References & contacts: www.dopracenabicykli.eu
(also in English) [11.06.2021]

Cycle Friendly Employer (CFE) Certification, Bucharest (Romania)

Problem / issue to be solved: Bucharest is the most congested city in the EU, according to ECF, and the introduction of bicycle voucher schemes for 1 million bikes in Romania could create socio-economic benefits of more than 600 million €. Only from reduced mortality – 418 premature deaths could be prevented per year – the amounts to an economic value would be 319 million € per year. The calculations are based on the World Health Organisation’s Health Economic Assessment Tool (HEAT). GRA, together with the EU Bike2Work project consortium, has developed an EU-wide certification for companies that encourage and promote cycling – the so-called CFE Certification.

What is it about? The Cycle Friendly Employer Certification is the only European certification that attests the level of involvement, promotion, and evaluation of companies’ support for the bicycle as an alternative means of transport among employees. According to ECF, employees cycling to work have on average 1.3 days less sickness absence days per year. The project started in 2014 and the companies that encourage cycling can be awarded the distinction „Cycle Friendly Employer“. What triggered the improvement process? Each company acts in such a way as to prove that it is a responsible company towards environment and the employees. ECF states that the benefits of cycling for reducing morbidity (diseases) to be 40% of the mortality benefits. The “Cycle Friendly Employer” Certification can have major benefits for employees and the company’s image and assure a long-term statement for the employees regarding cycling topic.

3.2. Planning principles

Main actors & barriers: GRA is the only NGO in Romania certified to audit companies and make available its knowledge of cycling to them, providing consultancy and audit to companies. In two years, more than 50 of the largest companies across the country joined the certification. These companies include: Raiffeisen Bank, Ericsson, Oracle, Orange, Telekom, Stefanini, In-Soft, Romanian Post, and KFC, which encouraged their employees to use the bicycle as an alternative means of transport even after the end of the campaign. Nevertheless, barriers seen by the companies (especially the HR departments) are still the unsafe/missing infrastructure, the Romanian legislation which makes the way from and to the office covered by the company insurance as well as behaviour change of the staff which often still see the car as status symbol and an important benefit.

Impacts, costs, benefits, lessons learned: Over 1,700 employees in Romania cycled during the Bike2Work/CFE campaign (2015-2016) and over 300 companies in the entire country have joined the Bike2Work campaign and encouraged their employees to cycle as an alternative means of transportation. Active cyclists have recorded over 200,000 kilometres, totalling over 15,000 hours of cycling, understanding the positive impact, both personally and environmentally.



Figure 24: Cycle Friendly Employer Certification

References & contacts: <https://www.bike2work.ro/certificare-cfe> (in Romanian) [11.06.2021]

Not only visions and strategies reflect values and thought structures of a society. In addition, **ideas and priorities of the planning disciplines, politics and administration** are engraved in public space, the built environment. However, in many countries the road system and public spaces have not been designed with cyclists in mind.²³ Cycling therefore should become **institutionally integrated** in land use and transport planning as well as urban design, i.e., by including cycling in transport plans, focussing on developments in land-use planning that favour **compact and mixed city development**, including cycling provision, and the (re-)building of **safe street designs and public spaces for cyclists and pedestrians**.²⁴

Improving the quality of public space, including public transport terminals, revitalising the urban parterre and providing more space for pedestrians and cyclists are solutions that **increase the quality of life for citizens**. The theory can be beautiful, but the reality is often somewhat different. Towns and cities of today must face a number of **challenges** and must decide what is more important and useful for the neighbourhoods, and the city as a whole. What should be provided? New car parking lots or new cycle lanes? And mostly this is not a technical question, but a philosophical one – **what are our priorities?**

Unfortunately, current **cycling infrastructure** on urban and rural roads (in contrast to the mostly well-maintained/well-developed highways) is **deficient**, often leading to critical situations. **Insufficient path widths, obstacles** at the edge or on the path, **blind curves and crests, poor pavement** and a **lack of markings and illumination** are some examples of how single accidents

²³ ETSC (2020)

²⁴ PRESTO (2010c)

are generated, i.e., collisions with no crash opponent (also see chapter 2.2). Adequate cycling infrastructure is not only necessary to prevent (single) accidents but to support children, elderly and people with disabilities to travel independently by bicycle. In this regard, in the Netherlands and Belgium the term “vergevingsgesind fietspad”²⁵ was coined, meaning that the infrastructure is **forgiving to mistakes**, which can always happen.

While it is taken for granted that highways, urban and rural roads are planned, built, and maintained adequately, there is still a **lack of knowledge and guidelines** on how to do the same for proper cycling infrastructure. However, over the last years an increasing number of **guides and manuals** on cycle (infrastructure) planning and design became available. The European Commission provides an (not complete) overview of guidance and standards developed in several Member States at the national level and additional guidance developed by non-governmental organisations (NGOs), cycle interest groups and by regional/local administrations for cities.²⁶

The **CROW Design Manual for Bicycle Traffic** was first published in the 1970s in the Netherlands and describes the steps required to create ‘Dutch-style’ bicycle-friendly infrastructure. Other well-known examples are available in English from Denmark, the UK and USA. Within the framework of EU funded projects like e.g., “mobile2020” or “EcoVeloTour”, a **handbook** to facilitate cycling in small and medium sized towns of Central and Eastern Europe (2012) respectively **guidelines for sustainable cycling tourism** in the Danube region (2019) have been compiled. Within the project “**Safer Cycling Advocate Program**”²⁷ a best practice guide focusing on providing and promoting cycling safety has been published in 2020.

3.2.1. National guides and manuals (available in English)

Copenhagenize. The Definitive Guide to Global Bicycle Urbanism (Denmark, 2018)



Mikael Colville-Andersen shows cities how to re-establish the bicycle as a respected, accepted, and feasible form of transportation. Chapters address among others:

THE LEARNING CURVE

- » Copenhagen’s Journey
- » Climaphobia and Vacuum-Packed Cities
- » Arrogance of Space
- » Mythbusting
- » Architecture
- » Desire Lines & Understanding Behaviour
- » A Secret Cycling Language
- » A2Bism
- » The Art of Gathering Data

THE TOOLBOX

- » Best-Practice Design & Infrastructure
- » Prioritizing Cycling
- » Design & Innovation
- » Cargo Bike Logistics
- » Curating Transferable Ideas
- » Communication & Advocacy

²⁵ <https://www.fietsberaad.nl/Kennisbank/Vergevingsgesind-fietspad-inzending-veilig-fietsid> [08.06.2021]

²⁶ https://ec.europa.eu/transport/themes/urban/cycling/guidance-cycling-projects-eu/cycling-infrastructure-quality-design-principles/existing-guidance-and-standards_en [08.06.2021]

²⁷ <https://safercycling.roadsafetyngos.org> [24.06.2021]

sustrans Handbook for cycle-friendly design (UK, 2014)



The UK charity sustrans wants to enable people to travel by foot, bike or public transport for more of the journeys we make every day. The handbook is structured along the following chapters:

- » Introduction
- » Understanding user needs
- » Network planning
- » Streets and roads
- » Traffic free routes
- » Rural areas: Roads and villages
- » Crossings 1: General
- » Crossings 2: Rural
- » Interface with carriageway
- » Bridges and other structures
- » Destination signage
- » Cycle parking
- » Cycle/rail integration
- » Development planning
- » Maintenance and management

https://ec.europa.eu/transport/sites/transport/files/cycling-guidance/sustrans_handbook_for_cycle-friendly_design.pdf (in English)

<https://www.sustrans.org.uk/for-professionals/infrast-structure/national-cycle-network-design-principles/> (in English)

3.2.2. Guides and manuals developed in EU-funded projects (available in English)

PRESTO Cycling Policy Guide. Cycling Infrastructure (EU, 2010)



Within the EU project PRESTO – Promoting cycling for everyone as daily transport mode – four Policy Guides „Giving Cycling a Push“ were prepared to offer a clear and systematic framework for decision makers: 1) General Cycling Framework; 2) Cycling Infrastructure 3) Promotion of Cycling and 4) Electric Bicycles. The Guide on Cycling Infrastructure includes the chapters

- » Give Cycling a Push / PRESTO policy guides and fact sheets
- » The riding bicycle
- » The standing bicycle
- » Cycling and public transport
- » The PRESTO fact sheets on infrastructure

<https://ec.europa.eu/energy/intelligent/projects/en/projects/presto> (in English)

Guidelines for sustainable bicycle tourism (EU, 2019)



The guidelines are a preliminary output in the frame of the EU project “EcoVeloTour. Fostering enhanced ecotourism planning along the Eurovelo cycle route network in the Danube region”. They provide a basis for planning and improving all mobility-related infrastructure and services in connection with bicycle tourism as the main representative of eco-tourism. It is structured as follows:

- » Executive Summary
- » About these guidelines
- » Bicycle based eco-tourism
- » Planning for different types of cyclists
- » How to start bicycle tourism in your region
- » Infrastructure for high-level bicycles tourism
- » Transport services and intermodality
- » Bicycle rental schemes
- » Accommodation and gastronomy
- » Information, communication and marketing
- » Measuring bicycle based eco-tourism
- » Success stories and good practices
- » Checklist for implementation

<http://www.interreg-danube.eu/approved-projects/eco-velotour/outputs> (in English)

3.2.3. Selected national guides and manuals from the SABRINA partner countries

National Design Manual for Bicycle Traffic (Design of Bicycle Roads and Infrastructure Elements as part of the Hungarian Road Engineering Standards), provided by the Hungarian Road Management Authority



The Hungarian Road Engineering Standards has a far-reaching history. As part of the digitalisation process in the past decades, the Standards became accessible online in 2009, at that time on a subscription-based model. According to a government decision, the system became available openly and free of charge in 2017. Among others, the Standards includes

- » Directions on the Design of Bikeable Public Roads
- » Barrier-free Road Facilities
- » Track Design of Cycle Paths, Footpaths and Sidewalks
- » Data Upload and Operation Procedure for the National Cycle Path Registry System

²⁸ <https://www.crow.nl/publicaties/design-manual-for-bicycle-traffic> [24.06.2021]

²⁹ <https://safercycling.roadsafetyngos.org/> [24.06.2021]

³⁰ https://ec.europa.eu/transport/themes/urban/cycling/guidance-cycling-projects-eu/cycling-infrastructure-quality-design-principles/basic-quality-design-principles_en [09.02.2021]

3.2.4. Planning cycle routes and networks

Bicycle traffic should be considered in all (traffic) planning and design measures. In addition to the design principles and the criteria for deployment and operation of cycling infrastructure presented above (Chapter 3.2.), the following **five principles** should be respected according to e.g., the CROW Design Manual for Bicycle Traffic²⁸ (see chapter 3.2), the Safer Cycling Advocate Program²⁹ or the European Commission³⁰ already on a superior level:

- » Safety
- » Comfort
- » Directness
- » Attractiveness
- » Coherence (connectivity/accessibility)

The **definition of a cycle network** is crucial. It provides a mesh or grid that connects the main zones of origin and destination within an urban area to offer effective movement for cyclists. A well-designed cycle network includes a hierarchy of different route segments that provide for different levels of cycling traffic and also offer route choices. Depending on the guidelines, cycling networks with three to four levels are recommended: The (1) **primary network** is the backbone of a cycle network which represents a high-quality and high-performance connection between cities, suburbs, residential areas and major (work) places like cycle highways or main routes that cross the urban area, and carry most cycle traffic. The (2) **secondary network** offers connection, collection and distribution routes which provide links between the principal cycle routes and local zones. Finally, (3) the third level incorporates **feeder cycle routes** within local zones, and/or connections from zones to the network levels above.

Before starting the detailed planning of a cycling facility, the demand as well as the approximate location of each link and its importance in the **network hierarchy** must be determined in advance. Only then the suitable form of organisation can be chosen and planned in an implementation-ready manner. The preparation may consist of the following steps^{31/32/33/34}:

- » **Analysis of the current situation** / inventory of existing cycling regime: definition of the planning area, survey on traffic volume and accidents, inventory of problems
- » **Defining objectives** / estimating the expected traffic situation: future demand, sources, destinations and their desired lines of bicycle traffic
- » **Planning the cycling network** in hierarchical form: specification of main routes, top local routes and local routes
- » **Defining the organisational principle** (mixing or separating cycle traffic with motorised vehicles)
- » **Selecting appropriate cycle infrastructure / cycle measures**
- » **Routing and detailed planning** of cross-sections and interlinking areas
- » **Implementing measures**
- » **Monitoring and assessing** the planning and implementation process

It is recommended to organise a **participation process** to include relevant stakeholders and the needs of citizens and users as well as to inform the public regularly about ongoing activities.

With regard to defining the organisational principle (mixing or **separating cycle traffic** with motorised vehicles), according to the Safer Cycling Advocate Program 2020 which refers to Dutch decision matrices and

³¹ <https://www.cyclemanual.ie/manual/planning/components/> [27.05.2021]

³² <http://www.fsv.at/cms/default.aspx?ID=90406537-9b2d-4210-98b1-81c25b098607> [09.02.2021]

³³ https://ec.europa.eu/transport/themes/urban/cycling/guidance-cycling-projects-eu/planning-cycling-cities/cycle-network_en [27.05.2021]

³⁴ Meschik et al. (2008)

Danish know-how, the separation of bicycle traffic from motorised traffic is necessary when **speeds are high** (50 km/h or higher) and where there is **high motor vehicle traffic volume**. In general, distributor roads and direct major roads should have full separation. For minor roads, full separation is not required as long as speeds and motor vehicle traffic volumes are low and there is good roadside visibility.³⁵

FUNCTION TRAFFIC ROAD		SPEED (km/h)	INTENSITY (cars/day)	CYCLE ROUTE FUNCTION		
				BASIC NETWORK		MAIN CYCLE ROUTE
				($I_{bicycle} < 750/day$)	($I_{bicycle} 500 - 2500/day$)	($I_{bicycle} > 2000/day$)
LOCAL ACCESS ROAD	Not applicable	0	SOLITARY TRACK			
	Walking space or 30 km/h	1 - 2.500	MIXED TRAFFIC (WITH OR WITHOUT ADVISORY CYCLE LANE)	CYCLE STREET OR CYCLE LANE (WITH RIGHT OF WAY)		
		> 4.000	CYCLE TRACK OR CYCLE LANE			
DISTRIBUTOR ROAD	50 km/h	Not applicable	CYCLE TRACK (ADJACENT OR SEPARATED)			
	70 km/h					

Figure 25: Decision matrix regarding cycle facilities for outside urban areas

ROAD FUNCTION		SPEED (km/h)	INTENSITY (cars/day)	CYCLE ROUTE FUNCTION	
				BASIC NETWORK	MAIN CYCLE ROUTE ($I_{bicycle} > 2000$ bikes/day)
				DISTRIBUTOR ROAD	n/a
60	1 - 2.500	MIXED TRAFFIC OR CYCLE SUGGESTION LANE	CYCLE STREET, IF $I_{CAR} < 500$ CARS/DAY		
	2.000 - 3.500	ADVISORY CYCLE LANE OR CYCLE LANE	CYCLE TRACK		
	> 3.000	CYCLE TRACK			
CONNECTOR ROAD	80	irrelevant	SEPARATED CYCLE TRACK		

Figure 26: Decision matrix regarding cycle facilities for inside urban areas

³⁵ <https://safercycling.roadsafetyngos.org/best-practice-guide/> [09.02.2021]

Requirements and quality criteria of the cycling masterplan Burgenland (Burgenland, Austria)

What is it about?

The “Masterplan Radfahren Burgenland” sets requirements and quality criteria for (daily and touristic) cycling routes and cycle storage. The requirements and quality criteria are presented in a matrix according to

- » different categories: route guidance, technical requirements, facilities and maintenance as well as

- » different segments of the cycle network: regional main route, top local route, local route for everyday cycling (red) and touristic cycle routes (yellow).

The matrix shows which criteria are mandatory ✓ respectively preferable (✓).

References & contacts: [11.06.2021]

https://www.burgenland.at/fileadmin/user_upload/Downloads/Abt._2/RAD_Masterplan_BGLD_2018.pdf (in German, short summary in English and Hungarian at the end of the document)

		Everyday cycling routes			Leisure and touristic routes
		Regional routes / main routes	Local main Routes	Local network	
		Lead through and connect	Collect and distribute	Access areas	
Routing	Continuous network	✓	✓	✓	✓
	Direct and no detours	✓	✓	(✓)	
	Safe (road safety)	✓	✓	✓	✓
	Separation and mixing principle according to Austrian Guidelines RVS	✓	✓	✓	
	Pedestrian traffic taken care of	✓	✓	✓	✓
	Scenic value / attractiveness				✓
	Security (not secluded or remote)	✓	✓	✓	
Technical requirements	Design according to guidelines for cycling facilities	✓	✓	✓	✓
	Widths according to guidelines instead of minimum widths	✓	(✓)	(✓)	(✓)
	Dust-free and even surface	✓	✓	(✓)	(✓)
	Design speed 30 km/h	✓	✓	(✓)	(✓)
	Energy-saving possible – even speed levels	(✓)	(✓)	(✓)	
	Priority at junctions, crossing aids	(✓)			
Equipment	Storage facilities at all destinations	✓	✓	✓	✓
	Signposting	✓	✓	✓	✓
	Information signs, further information				✓

Figure 27: Requirements and quality criteria for cycling routes

Sustainable Urban Mobility Plan “Nin Vision 2030“, implementing a bicycle network (Croatia)

Problem / issue to be solved: Before the development of a SUMP, the town of Nin in Croatia had a negligible amount of sustainable transport measures incorporated into its spatial planning documentation, especially for cycling. Detailed project documentation, such as traffic plans and studies did not exist, and network development was defined entirely through spatial planning and the Town of Nin development strategy.

What is it about? Recreational cycling activity in the town of Nin is especially strong in the pre-tourist season and postseason. A well-designed cycling network would be an immense asset in capitalising on cycling tourism activities within the area. “Nin Vision 2030” incorporates extensive chapters which explain in detail all the phases involved in sustainable mobility measures, including cycling network planning. In short, three main steps are covered by the planning: 1. defining the attractors (points of interest) of Nin, 2. route plotting and 3. structuring a hierarchy within a network. Planning of the cycling network was done in accordance using the “Design Manual for Bicycle Traffic by CROW”.

What triggered the improvement process? Lack of proper documentation related to sustainable traffic opened a demand leading to the creation of the Sustainable Urban Mobility Plan for Nin, and consequentially to the cycling network plan.

Main actors & barriers: Even though Nin is a major tourist attractor, including for recreational cyclists, the lack of a proper cycling network coupled with disorganisation within the planning department severely hindered any potential for cycling tourism development within Nin. The problem was recognised, and in cooperation with FPZ, Nin Vision 2030 was developed.

Impacts, costs, benefits, lessons learned: Nin has over 110 km of cycling routes in and around the town. The cycling network within the town is partially complete and needs to be connected to the surrounding routes, EuroVelo 8 route among them. The costs of such an undertaking are estimated to exceed 2,000,000 €. However, the development and integration of the SUMP into the city plans has a potential to open the channel towards different fund opportunities supported by EU. It is important to note that the development of cycling as a daily mode of transport, without systematically solving the issue of non-existent cycling infrastructure, will not be complete and a well-working alternative to a motorised traffic for commuting and daily tasks.

References & contacts: Sustainable Urban Mobility Plan “Nin Vision 2030“, Mr. sc. Marko Ševrović, Mr. sc. Marko Šošarić, Prof. dr. sc. Ivan Dadić, University of Zagreb Faculty of Transport and Traffic Sciences, Zagreb, 2018 (Croatian) – CDROM



Figure 28: Cycling trail in Nin



Figure 29: Cycling trail near Nin

3.3 Infrastructure

3.3.1 Junctions and crossings

Cycling accidents predominantly occur at junctions between cycling facilities and facilities for other – mostly motorised – road users. The following principles can help ensuring the safety and comfort of cyclists at junctions:

- » Good **visibility and physical proximity** (or adequate distance, >5 m) between road and parallel cycling facility, at least for the last 20 metres before the junction
- » **Straight trajectories** should be ensured for cyclists to avoid ambiguities on their further route choice and/or changes of direction
- » **Right-of-way regulations** should be self-evident for all users
- » **Directional arrows** (road markings) increase clarity of dedicated use and trajectories
- » conflict areas should be **colour-coded** (including those with pedestrians)

The following chapters present a selection of junction interventions relevant for cycling safety.

3.3.1.1 Advanced stop lines (bike boxes)

At **traffic light-controlled junctions**, stop lines for cyclists should be placed 3-5 metres in front of the stop lines for motor vehicle traffic. Thereby it can be ensured that cyclists have had the chance to position themselves in front of motorists and be **visible** for them when the traffic light is green. This can be crucial in avoiding blind-spot collisions with (right-turning) HGVs.



Figure 30: Advanced stop line (bike box) for cyclists

3.3.1.2 Protected intersections

Protected intersection aims to **improve the safety situation** at intersections for VRU's by means of **physical separation between transport modes**, providing **clear guidance, adequate visibility** as well as **encouraging predictable user behaviour**. Protected intersections come as a seamless continuance to protected cycle lanes and offer protection on those parts of the network where vulnerable road users are more exposed. Some of the features a protected intersection can be equipped with are **painted cycle lanes, corner refuge islands, curb extensions, cycle friendly signal phasing** and other³⁶. In addition, one can find corner islands, bike queue areas and waiting zones for turning cars. Protected intersections also provide more safety for pedestrians through shorter and safer crossings and pedestrian islands.³⁷

³⁶ Falbo, N. (2014): Protected intersections for bicyclists, available at: <http://www.protectedintersection.com/>

³⁷ <https://nacto.org/publication/dont-give-up-at-the-intersection/protected-intersections/> [29.11.2021]

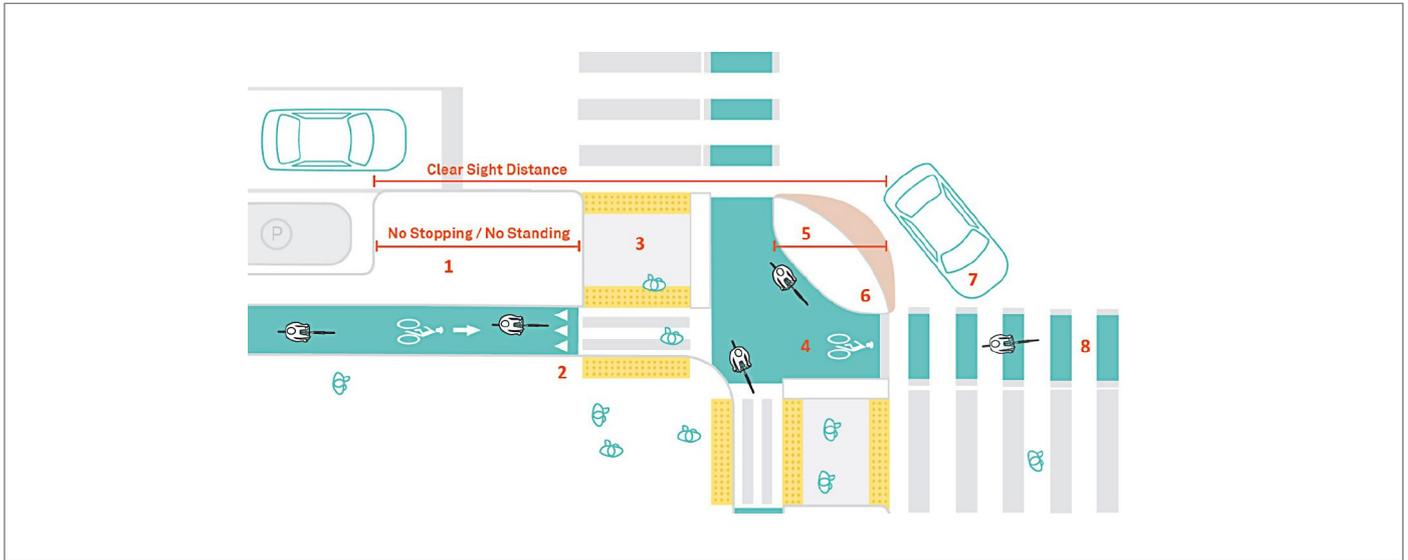


Figure 31: Example of a protected intersections design

3.3.1.3 Roundabouts

Roundabouts can pose a significant safety problem for bicycle traffic, therefore cycling facilities should be designed considering the following aspects:

- » Cyclists riding on cycle paths against the direction of travel of the roundabout are particularly at risk due to the viewing habits of motor vehicle drivers
- » Unidirectional cycling facilities can be problematic as (illegal) bidirectional use can be expected
- » No cycling facilities (e.g., cycle lanes, advisory lanes)

should be implemented on the core carriageway of the roundabout

Roundabouts are safer for cyclists when they³⁸:

- » have a **low volume of motor vehicle traffic**;
- » encourage **low traffic speeds**;
- » only have one lane;
- » are smaller in total size, with larger and higher central islands.

Single-lane, low-traffic (< 6000 vehicles per day) roundabouts with an outer diameter of up to 30 metres allow for mixed traffic of motorised and bicycle traffic³⁹; cycle facilities should end well ahead in the approach of the roundabout entrance to enable a safe transition. For larger facilities and higher volumes, segregation of traffic modes is strongly recommended.



Figure 32: Segregation of two-way cycling facility and motor vehicle traffic on a roundabout in the Netherlands

³⁸ <https://www.cyclemanual.ie/manual/designing/4-8-roundabouts/> [08.06.2021]

³⁹ <https://www.cyclemanual.ie/manual/designing/4-8-roundabouts/> [08.06.2021]

3.3.1.4. Over- and underpasses

Where cycling routes intersect with roads that have high AADT, crossings are very often grade-separated in order to provide **maximum level of both safety and mobility**. Overpasses and underpasses can be also used to **cross other barriers** – railroads, rivers or canals, cliffs etc. This type of infrastructure provides **continuity of access** for bicyclists and **prevents significant detours** due to high-risk roads and unsurpassable natural or built barriers.

The following aspects should be considered when planning an over- or underpass:

- » Gradients on ramps should not exceed 6 %
- » Segregation of cyclists and pedestrians where feasible
- » Keep the additional energy demand limited and minimise detours and differences in altitude
- » Especially for underpasses:
 - Good visibility and lighting
 - Headroom > 2.5 metres, width > 3.5 metres

Over- and underpasses consist of different types of structures, including bridges, and are generally very **expensive**, though some cost savings can be realised depending on the materials used.



Figure 33: Underpass in Tulln/Austria



Figure 34: Cycling bridge in Slovakia

3.3.2. Types of facilities between junctions

3.3.2.1. Mixed with motorised traffic

Mixed traffic of cyclists and motor vehicles can only be recommended on roads with **low volumes of traffic operating at low speeds**. When sharing the same space with motorised traffic, cyclists are endangered by **conflicts with parked vehicles** (collisions with opening car doors) and by **overtaking manoeuvres** (“squeezing collisions”). The latter can be mitigated by avoiding critical lane widths between 3.0 and 3.75 metres.

Bicycle or Sharrow pictograms can be used to indicate the shared use of a street, and to imply a safe trajectory choice for cyclists, i.e., avoiding collisions with opening car doors and discouraging dangerous overtaking manoeuvres. A KfV study⁴⁰ showed that the pictograms successfully **encourage cyclists to ride outside of the door zone**. It should be noted, however, that pictograms are **no replacement for proper cycle facilities** and should only be implemented in urban areas with moderate motorised traffic, along main cycling routes.



Figure 35: Use of sharrows in Tulln/Austria

Cycle streets

Cycle streets are a fairly recent type of cycling infrastructure where **priority is given to cyclists**. The implementation of a cycle street is recommendable along major cycling routes if a **high volume of cyclist traffic** (i.e., more than 50% cycling share, at least in summer) and **relatively low motor traffic loads and speeds** are to be expected. The concept implies that **entry restrictions, one-way regulations and speed limits for motor vehicles** may apply, and cars must **give way** to cyclists, whereas **cycling is usually allowed in both directions**, using the full width of the road. For homogenous cycling speeds and safety, it is advisable to give priority to cycle streets. They are usually marked with road signs and large bicycle road pictograms on the carriageway.



Figure 36: Cycling street in Austria

⁴⁰ KfV (2020): Dooring-Unfälle: <https://www.kfv.at/download/20-dooring-unfaelle> [23.02.2021]

Cycle lanes

Cycle lanes are facilities **marked on main carriageways, without level changes**, usually adjacent to the first driving lane for motor vehicles, and next to a pedestrian sidewalk or a parking lane. They are usually marked with **solid edge lines** and can be reinforced e.g., by painted cycling pictograms and directional arrows. The regular minimum width of cycle lanes should be around 1,5 metres. Higher widths are required for main bicycle routes, or if permitted speed for motor vehicles is higher than 50 km/h, or for cycling lanes alongside kerbside, perpendicular or angle parking lanes. As for cycle tracks, **collision rates** are usually **higher at junctions than on stretches**. Cycle lanes will only unfold their positive impact on **safety and comfort** if they are always kept free of **flowing and parked motor vehicles**. It is advisable to **paint**, e.g., in red, the surfaces of cycle lanes on **potential conflict points**, such as with turning or joining motor vehicles or pedestrians.



Figure 37: Cycle lane in Slovakia



Figure 38: Cycle lane in Austria on a road with tram tracks

Edge lanes / advisory lanes

Edge lane roads (also depicted as “2 minus 1 roads”) are road configurations which usually allow **two-way traffic, for both motor vehicles and bicycles**. They are typically applied on **low volume roads**, and where the provision of other cycling facilities (cycle paths or cycle lanes) is not affordable or unfeasible for other reasons. They are used in **urban areas** in several countries, but have successfully been applied also in **rural settings**, e.g., in Denmark and the Netherlands. The **core lane for motor vehicles** can be **narrower** than normal driving lanes. **Passing motor vehicles are allowed to use (parts of) the edge lane** in case no cyclists are endangered. When applied in rural areas, typical speed limits for motor vehicles are 60 or 70 km/h, and the 2 minus 1 configuration itself can be seen as a measure of speed management for motor vehicles. Edge lanes should have a minimum width of 1 metre. For more information see e.g., <https://cyclingsolutions.info/edge-lane-roads/> [23.01.2021]



Figure 39: Advisory Cycle Lane in Hungary

3.3.2.2. Mixed with pedestrians, E-Scooters etc

Shared (cycle and pedestrian) paths should only be foreseen for facilities where **low volumes of pedestrians and cyclists** can be expected, when **road space does not allow for separated facilities**, and **cycling in mixed traffic** on the carriageway is **not an option**. They are **not recommended in densely populated urban areas**. On shared paths, it is advisable to assign separate space for the two modes, however not only by classical edge lane markings but by a tactile separation which can be sensed by persons with handicaps, e.g., a level change of ~3 cm, or a strip of cobblestone.



Figure 40: Pedestrian and bicycle lane along the roadway in Ruse, Bulgaria: The lanes are wide enough and do not cross with pedestrians

3.3.2.3. Separated from motorised traffic and/or pedestrians

Cycle tracks are facilities which are **physically separated** from roadways dedicated for motor vehicle use, however they may be **shared with pedestrians or other non-motorised vehicles**. Layouts encompass designs along the roadside with a physical separation to alignments completely separated from roads. What all designs have in common are **higher collision rates at junctions with motor traffic** than on sections between junctions ('mid-block').

Tracks alongside roads can be segregated e.g., by **level changes (kerbstones), guardrails, bollards or vegetation**. They can be designed as **uni- or bidirectional tracks**. Bidirectional tracks alongside roads should only be implemented after thorough **safety assessment** and avoided, e.g., when there are many side or property access roads. Care should be taken that **passing or overtaking is safely possible**, with typical minimum widths of 1-2 metres for the unidirectional and 2-3 metres for the bidirectional setting. A verge of at least 0.5-1 metre between traffic lane and cycle track is advisable, as well as clear marking and signing of travel directions and use obligations & restrictions.



Figure 41: Bidirectional layouts of cycle tracks in Bulgaria



Figure 42: Bidirectional layouts of cycle tracks in Serbia

3.3.3. Driving conditions (Maintenance)

Even though it is not always possible to determine the actual cause of an accident, there is evidence that **frequent sweeping** of roads and paths as well as **faster patching of paths and roadsides** can help **preventing accidents**. However, the usual high standards for highways and urban streets/roads are rarely applied to cycle paths.

It is not only a matter of appropriate **lighting, signs and road markings, surfaces and dimensions** that allow safe commuting even at higher speeds, but also of **regular cleaning, vegetation control and winter maintenance** of the hazards caused by pollution, wetness, slippery conditions, snow and ice. Depending on the functional class and traffic flows of roads and paths, they may need to be kept passable without significant obstacles, 24/7, during the day or on weekdays. For **de-icing of paths**, conventional salting, gritting, spreading salt brine solution alone or in combination with other thawing agents may be used. A **response team** should be available to carry out systematic and extra sweeping, e.g., when leaves are falling, or broken glass is left on the roads and paths. When it comes to **roadworks**, special consideration should be given to cyclists since dealing with roadworks can be a **source of inconvenience and danger**. Regardless which authority or company initiated the road works, it is crucial to address cyclist **safety, passability, and comfort**. It should be prevented that cyclists have to struggle over high kerbs or must dismount and wheel their bicycle. If necessary, the roadworks should not last more than a day and should take place outside peak hours.^{41/42/43}

Registering and monitoring cycle track quality is a crucial part of maintenance and assessment. It can be realised by special measuring vehicles or specially equipped

bicycles for easy, visual observation. In the Danish city Aarhus, the assessment of the condition of the cycle track is carried out by visual inspection by bicycle. Even though inspection by bicycle is a demanding task, it means in the long run that the technicians involved gain a **better insight** into how important even the most minor unevenness is for cyclists. Therefore, **inspection by bicycle** rather than by car is likely to **increase the number of repairs and improvements for cyclists**. The assessment is based on a five-level grading system from excellent condition to unacceptable condition. The prioritisation of repairs is based on the condition assessment.⁴⁴

It may be reasonable to **include private cyclists** into the process of maintenance and assessment. Cyclists in the Netherlands who observe a problem with the infrastructural network, can inform the Dutch Cyclists' Union or Meldpunt (a specialised **hotline** for crime reporting), which will pass on the problems to the local public authorities. In Vienna, cyclists can report problems via an **online platform** (www.radkummerkasten.at [11.06.2021]) which **locates** the situation with a photo directly **on a map**. The entries are checked by the advocacy association "Radlobby Wien", which forwards the problems to the responsible municipal departments, the heads of the affected district or the Mobility Agency of the City of Vienna. Moreover, there exists an **app** of the city of Vienna (www.wien.gv.at/sagswien/index.html [11.06.2021]) for reporting concerns, danger spots or disruption, which can also be used for cycling issues. Regarding maintenance during winter, there is a map available online which gives an overview of **which cycle tracks are cleared from snow** and which are not. Information on cleared bike paths can also be obtained from the **"snow telephone"**. It is also possible to report snowy or icy cycle tracks.

⁴¹ <https://cyclingsolutions.info/winter-maintenance-and-cleaning-of-roads-and-cycle-tracks/> [27.05.2021]

⁴² <https://cyclingsolutions.info/reparationer-af-cykelstier-og-veje-uden-cykelstier/> [27.05.2021]

⁴³ <https://cyclingsolutions.info/prioritizing-construction-and-maintenance-resources-for-cycling-areas/> [27.05.2021]

⁴⁴ <https://cyclingsolutions.info/registering-and-assessing-cycle-track-quality/> [27.05.2021]



Figure 43: Winter maintenance cycle path in Denmark

Drava bike Trail (Slovenia)

Problem / issue to be solved: The Drava cycling route is a continuation of the successful long distance-cycling route in Austria – the Drauradweg in Carinthia. The implementation of the Slovenian part of the route connection was carried out for several years, without major shifts. The spatial location of the route included 18 different municipalities, which initially caused challenges in coordinating the construction.

What is it about? The Drava bike trail is a good practice example about establishing partnerships for the spatial cooperation and coordination procedures with regard to the development and management of the Drava cycling route between Dravograd and Središče ob Dravi. The project leader is the regional development agency (RDA) Koroška and the partnership within the project includes all 18 municipalities, the Maribor development agency and the Maribor – Pohorje tourist board. The coordination of activities was conducted together with the Slovenian Infrastructure Agency. The purpose of the partnership is primarily a better integration of 18 municipalities along the river Drava in the project execution, a better cooperation with other stakeholders and a stronger interaction with national authorities associated with the project. In three years, they managed to mark 145 km of cycling route with signposts, put up information boards

and equipment on roads, and created visual identity maps, the process for including providers, and promotion.

What triggered the improvement process? The Drava cycling route had “existed” in Slovenia for more than 15 years, but was never really managed as one route. For a long time, the involved municipalities did not start developing and essentially connecting the route according to cycling standards for long distance routes. The partnership was established on the initiative of the RDA Koroška, that provided the human resources to coordinate the project.

Main actors & barriers: The main barrier for establishing the Drava cycle route was a lack of coordination and cooperation of all stakeholders on the route. Key success factor besides all institutional and financial resources is to have human resources, which are fully devoted to developing a route and a tourist product.

Impacts, costs, benefits, lessons learned: Drava Bike trail is a good practice example that shows how to approach long distance cycling routes development. It is essential to connect all stakeholders along a route, provide financial resources for one project leader that coordinates activities on the whole route and cooperates with individual municipalities for spatial cooperation and management on one side and national institutions on the other. It is important to develop the route according to cycling standards for long distance routes. It is also important for the route to be developed as a tourism product with providers, information and promotion involved.

References & contacts: [11.06.2021]

- » <https://dravabike.si/en/> (in Slovene)
- » https://smart-villages.eu/language/en/good_practice/drava-bike-trail/ (in English)

3.3.4. Organisational measures

While exact definitions of organisational measures can vary depending on a source, it can be summarised that organisational measures are those measures for which no significant infrastructure project investment is required in order to implement them. The Institute for Social-Ecological Research (2021) defines/defined the following examples for legal and organisational measures:

- » **Time windows** for trucks and delivery vans in city centre areas
- » Possibility to **take bicycles on trains, trams or buses**
- » **Lowered speed limits** throughout the city (e.g., Graz), traffic calming
- » **Parking regulations** for different areas (residential, commercial, city centre, etc.)
- » **Enforcement** of parking regulations
- » **Mobility management plans**

Organisational measures such as these can **improve cycling conditions** and consequently also safety.

Furthermore, **making one-way streets accessible for two-way cycling**, is another cost-effective and important organisational measure, especially considering that directness is one of the key paradigms when designing cycling networks.



Figure 44: Contraflow cycle facilities in Czech Republic



Figure 45: Contraflow cycle facilities in Austria

3.3.5. Signing

Signs communicate **critical information** with the potential to **improve road safety**. The purpose of cyclist-related signage is to provide bicyclists (and other road users) with adequate information that allows them to **anticipate certain situations**, which can significantly enhance reaction times. There are several signage solutions which can improve cycling safety⁴⁵:

» **Rectangular Rapid Flashing Beacon**

The RRFB is a type of beacon that makes use of high-intensity light-emitting diodes (LEDs) that blink in a rapid and irregular pattern, similar to what is seen on many modern emergency vehicles.

» **Adding supporting cyclist signs**

This comprises all signs indicating the presence of cyclists on the route, signs for cyclists in mixed traffic, yield/stop for cyclists or signs indicating dangers for cyclists, such as dooring.

» **Pavement Markings**

A range of pavement markings can be used at sections and intersections in order to indicate the presence of bicyclists and/or bike facilities and to provide information about upcoming manoeuvres which will need to be undertaken, as well as a guidance for bicyclists on the correct path through an intersection.

All signs should be periodically checked to make sure that they are in **good working condition**, free from graffiti, reflective at night, and continue to serve their purpose. Good signing should also be a part of planning **detours due to construction sites**.



Figure 46: Yield to crossing bikes from both directions. Different signs but the same meaning. Left Netherlands, right Australia

⁴⁵ <http://www.pedbikesafe.org/> [29.11.2021]

4. Appendix

4.1. Project overview

Project SABRINA – Safer Bicycle Routes in the Danube Area

- » **11 Project Partners**
- » **4 Associated Strategic Partners**
- » **9 Danube Area Countries**
- » **Few thousand km of EuroVelo routes** inspected for cycling infrastructure safety

One common goal:

To help decision makers to plan, design, and implement safe and sustainable solutions for improved cycling infrastructure in the Danube region.

Sabrina Partnership:

Project Partners:

- » European Institute for Road Assessment – EuroRAP (Lead Partner; Slovenia)
- » The University of Zagreb, Faculty of Transport and Traffic Sciences (Croatia)
- » Austrian Road Safety Board (Austria)
- » Westpannon Regional and Economic Development Public Nonprofit Ltd. (Hungary)

- » Partnership for Urban Mobility (Czech Republic)
- » Green Revolution Association (Romania)
- » Municipality Ilirska Bistrica (Slovenia)
- » Agile Transport Analysis S.R.L. (Romania)
- » Automobile Club of Moldova (Moldova)
- » Club “Sustainable Development of Civil Society” (Bulgaria)
- » Ekopolis Foundation (Slovakia)

Associated Strategic Partners:

- » Ministry of the Sea, Transport, and Infrastructure (Croatia)
- » Ministry of Regional Development (Czech Republic)
- » Ministry of Transport (Czech Republic)
- » Ministry of Infrastructure (Slovenia)

Project duration:

1 July 2020 – 31 December 2022

Budget:

Overall:	2,086,019.00 EUR
ERDF:	1,701,992.40 EUR
ENI Contribution:	71,123.75 EUR



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4.4. Abbreviation List

Abbreviation	Full name
AADT	<i>Annual average daily traffic</i>
ACM	<i>Automobile Club of Moldova (PP Moldova)</i>
ADFC	<i>German Cyclist's Association</i>
AF	<i>Application form</i>
AFM	<i>Administrația fondului pentru mediu (Romanian Environment Fund Administration)</i>
AMS	<i>Austrian Public Employment Service</i>
ATA	<i>AGILE TRANSPORT ANALYSIS S.R.L (PP Romania)</i>
B+R	<i>Bike+Ride</i>
B2B	<i>Business-to-Business</i>
B2C	<i>Business-to-Consumer</i>
B2G	<i>Business-to-Government</i>
BTW	<i>BikeToWork</i>
BYPAD	<i>Bicycle Policy Audit</i>
CFE	<i>Cycle Friendly Employer</i>
CSDCS	<i>Club "Sustainable Development of Civil Society" (PP Bulgaria)</i>
CycleRAP	<i>Cycle Road Assessment Programme</i>
DTP	<i>Danube Transnational Programme</i>
EC	<i>European Commission</i>
ECF	<i>European Cyclists' Federation</i>
EIRA	<i>The European Institute of Road Assessment (LP Slovenia)</i>
Ekopolis	<i>Ekopolis Foundation (PP Slovakia)</i>
FPZ	<i>University of Zagreb, Faculty of Transport and Traffic Sciences (PP Croatia)</i>
GHG	<i>Greenhouse Gas</i>
GDP	<i>Gross Domestic Product</i>
GRA	<i>Green Revolution Association (PP Romania)</i>
GYSEV	<i>Győr-Sopron-Ebenfurth Railway</i>

Abbreviation	Full name
HEAT	<i>Health Economic Assessment Tool</i>
iRAP	<i>International Road Assessment Programme</i>
KOI	<i>Key Opinion Leader</i>
KFV	<i>Austrian Road Safety Board (PP Austria)</i>
LP	<i>Lead Partner</i>
NACTO	<i>National Association of City Transportation Officials</i>
NECP	<i>National Energy and Climate Plans</i>
NSI	<i>Network Safety Index</i>
ÖBB	<i>Austrian Federal Railways</i>
OCIBB	<i>Občianska cykloiniciatíva Banská Bystrica (Citizens' Cycle Initiative Banská Bystrica association)</i>
OIB	<i>Municipality Ilirska Bistrica (PP Slovenia)</i>
OP	<i>Operational Programme</i>
PP	<i>Project Partner</i>
PUM	<i>Partnership for Urban Mobility (PP Czech Republic)</i>
SCRT	<i>Safer Cycling Routes Toolkit</i>
SDG	<i>Sustainable Development Goal</i>
SEB	<i>Socio-economic business</i>
SRTMP	<i>Sustainable Regional Tourism Mobility Plan</i>
SUMP	<i>Sustainable Urban Mobility Plan</i>
TDM	<i>Tourism Destination Management</i>
TSDOP	<i>Territorial and Settlement Development Operational</i>
UNDP	<i>United Nations Development Programme</i>
VRU	<i>Vulnerable road user</i>
WP	<i>Work Package</i>
WPL	<i>Work Package Leader</i>
WPRED	<i>West Pannon Regional and Economic Development Public Nonprofit Ltd. (PP Hungary)</i>



SABRINA: No fears about safety on two wheels.



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