



**ICT**  
applications  
for safe  
cycling  
in Europe

**SAFE** **CYCLE**

The Intelligent Bicycle Initiative  
for safe cycling in Europe

# Increase safety of cyclists with ICT and ITS

Cyclists in Europe make around 50 million trips per day and this figure is increasing. Cycling is a crucial mode of transport in the common European challenge of making transport sustainable: cycling is energy efficient, environmentally friendly and very suitable for short distances. At the same time, around 7% of all European road safety victims are cyclists. Therefore, actions to promote cycling in cities should go together with improving road safety. Apart from the traditional measures like a dedicated cycling infrastructure, improving visibility and reducing speed of cars, decision makers also have to look as well at intelligent solutions to improve the safety of cyclists. ICT can be used to develop intelligent applications that assist cyclists and other road users to avoid, prevent, or mitigate accidents.

The main SAFECYCLE objectives are:

- To identify e-safety applications that will enhance the safety of cyclists in Europe.
- To create knowledge and awareness concerning the e-safety applications in the domain of cycling (policy, industry, users).
- To speed up the adoption of (new) e-safety applications in cycling.

The results of the project can be found on the website: [www.safecycle.eu](http://www.safecycle.eu)

## What kind of applications can we think of?

### E-safety applications to be used by cyclists



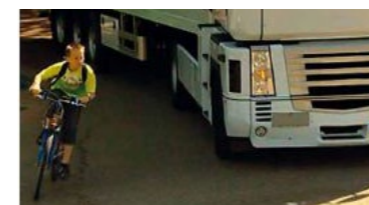
Cyclists can increase their visibility by wearing clothes or accessories that can be attached to the body. The 'speed vest' (Clark & Hansen) for example, shows the actual speed of cyclists at the back of the vest. As a result, the visibility of cyclists improves and other road users are able to better anticipate cyclists' speed. The so-called 'Hidden Helmet' (Hövding) inflates when an accident occurs and protects the head of the cyclist.

### E-safety applications for bicycles



Applications for bicycles are related to: power supply, physical problems of cyclists, bicycle design, communication with other road users and general road safety issues. Physical problems for example, may lead to a reduced use of bicycles, although this is not always necessary. From a "design for all" point of view, bicycles should be available for all kinds of users, also for people with hearing impairment or stability problems. With an application like HindSight (Cerevellum) a rearview camera with a display on the handlebars can be used to monitor what is going on behind the bicycle and thus avoid stability and sight problems when looking over the shoulder.

### E-safety applications for other vehicles



Applications which are part of vehicles play a role in mitigating the impact in case of accidents, detect obstacles or vehicles which are difficult to see, adapt speed and give assistance in difficult situations. The bicycle airbag for vehicles (TNO) is an example of an application that mitigates the impact in case of an accident. After a collision, airbags cover the whole windscreen and parts of the side doors and thus reduce the impact for cyclists.

## What kind of applications can we think of?

### E-safety applications for infrastructure

There are several options to include ICT in infrastructure, for example in cycle lanes, on intersections in traffic lights. In traffic lights there are various options for ICT. The Traffic Eye in Zürich (CH) detects if there are cyclists waiting at a red light. If so, they get a green light in advance so they are ahead of other traffic from behind (e.g. trams), thereby preventing conflicts. In several Dutch cities, e.g. in Groningen, traffic lights thereby faster for cyclists when it is raining. Reduced waiting times increase cycling comfort in general, and also enhances the safety of cyclists as cyclists are expected to commit less red light offences.



### E-safety applications for smartphones and websites

Applications for smartphones and websites are fully in development and can be found all over the world. There is a wide range of applications with an educational or informational purpose. Other applications use crowdsourcing to register problems in the bicycle network and solve them. Some applications are useful to avoid unsafe situations during the trip. An interesting example is the Routeplanner of Ghent (BE), enabling cyclists to plan a safe route, avoiding (perceived) dangerous situations for cyclists, like very busy roads without appropriate cycle infrastructure, tram tracks or cobblestones. Apart from that, information is given about dangerous locations along the route and busy spots that require special attention. The application is interactive as users can upload pictures of and comment on dangerous locations.



### Interactive applications

Cooperative systems allow wireless communication between a vehicle and another vehicle (V2V communication) or between a vehicle and roadside infrastructure (V2I and I2V communication) with the ultimate aim of achieving benefits for many areas of traffic management and road safety. An example related to Safecycle is a system where bicycles transmit signals, which are received by intelligent infrastructure (V2I). The signals are processed and transmitted to other vehicles or traffic signs.



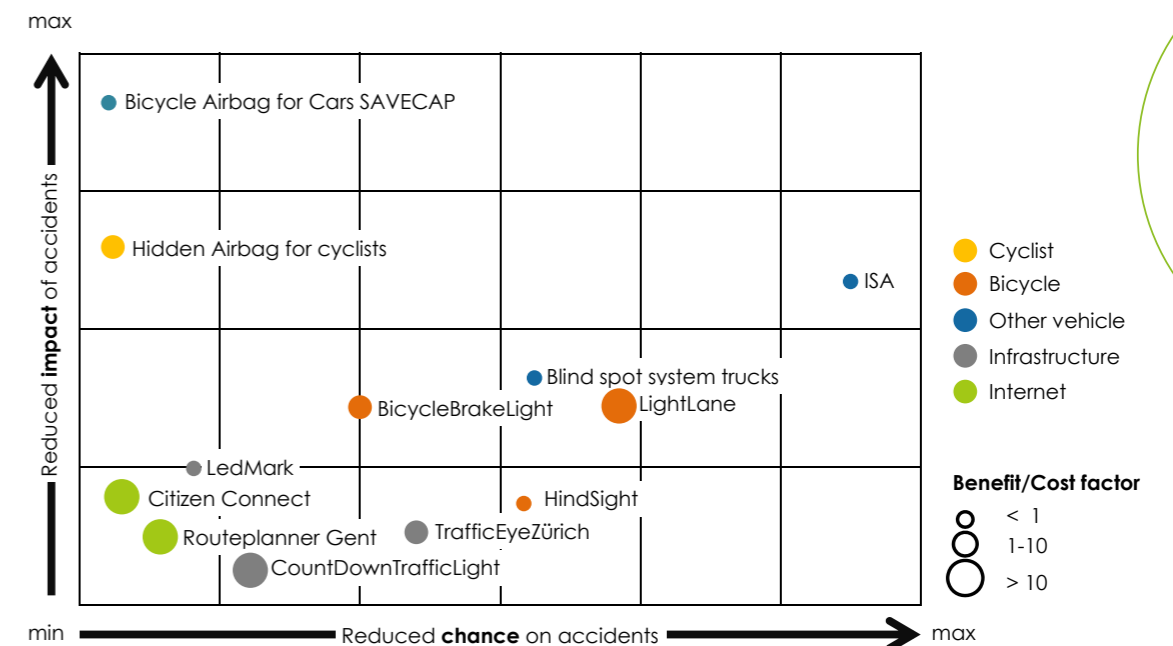
# Potential impact of e-safety applications

In most Northern EU countries, cycling is a substantial mode of transport with for example a share of approx. 26% in the Netherlands. Discussions with experts revealed that e-safety applications could have a high potential for cyclists' safety. In other countries (e.g. Italy, Czech Republic) cycling is less frequent: e.g. a share of approx. 5% in Italy or 3% in the Czech Republic. Applications are thought to be useful as ways of increasing awareness about cycling and of increasing the visibility of individual cyclists. The potential of e-safety applications differs between the different target groups. For young children blind spot systems are very interesting, for teenagers reducing red light offences might be effective and for elderly people safer cycling routes are useful applications. Some applications are suitable for all types of cyclists, such as the bicycle airbag for cars.

E-safety applications to avoid accidents	Example 1	Example 2
Visibility of cyclists	Intelligent bicycle lights	Virtual cycle lanes
Cyclist detection	Blind spot detection	Night view systems
Bicycle friendly infrastructure	Bicycle preference traffic lights in case of rain	Anticipating traffic lights
Internet applications	Safe journey planner	Map unsafe situations for cyclists

### The impact assessment showed the following:

- Apps that require installation in passenger cars or trucks result in a very low Benefit / Cost ratio.
- For apps to be installed on bicycles, two out of three seem to have a positive Benefit / Cost ratio.
- The infrastructure-based systems show a mixed picture.
- The Internet apps have the highest Benefit / Cost ratio (due to low costs).



# Recommendations

## Recommendations for standardisation

- A possible future concept of **active communication** bike-to-car and bike-to-infrastructure has to be included in the concept of cooperative systems which is already standardized (CEN/TC 278/WG 16 and ISO/TC 204/WG 18)
- Work out “use” cases where active communication based on a **chip integrated in a bicycle** can address specific traffic problems as well as “business” cases.
- Further investigate the potential of establishing a **new working group for ITS applications for cyclists** to enhance common SAFECYCLE solutions to be promoted and financially supported throughout Europe.

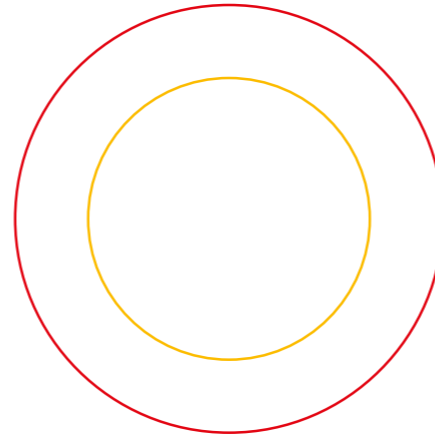
## Recommendations for deployment

- **Increase knowledge** amongst authorities about the benefits of e-safety applications for bicycles.
- Make the results of impact evaluations of deployment of ICT and ITS applications accessible through **databases like 2DECIDE**.
- **Transfer experience and know-how** to stimulate the cooperation with and between local authorities and application developers
- Gain knowledge about the **financial demand and possible turnover** of various stakeholders, and to get insight in tools for co-financing
- Stimulate cooperation between **car industry, bicycle manufacturers and ITS companies** for the development and deployment of applications with a focus on cyclists
- Convince **existing platforms like ERTICO and national ITS organisations** to look with a wider scope than ‘just cars’ and focus on cyclists as well.
- Vehiclebased safety applications for cyclists should be part of the **euroNCAP system**

- **Increase a higher public acceptance** by bringing stakeholder groups (car industry, bicycle manufacturers and ITS companies) together in a roundtable discussions with end users and cyclists representatives (associations etc.).
- Contact bodies with advanced experience in **campaigns** to develop a strategy to successfully change approaches of various stakeholders and user groups.

## Recommendations for a research agenda

- **Evaluation of best practices** with focus on transferability to other regions and other transportation circumstances.
- Further **comparative research into national frameworks on supportive policies** in cross-cutting SAFECYCLE-issues (cycling-ITS-safety) and investigate possibilities for national demonstration projects.
- Research on **HMI (human machine interface) between cyclists and their bicycle**.
- Cost-benefit analysis of the **incorporation of cyclists in cooperative systems**.
- Realise actions aimed at **fostering cooperation on e-safety applications for bicycles** beyond Europe.
- Large-scale demonstration and field operational tests focusing on the impact of **individual e-safety applications for cyclists versus hidden applications** that benefit all users passing a certain location.
- Research on communication **between chips in bicycles and smartphones**, which will allow a multitude of interesting applications.
- More research is needed in the **causes of bicycle accidents** (e.g. use of data from in-depth investigations) and harmonisation of accident data across Europe.
- More knowledge is required about the **impact of e-safety applications for cyclists**.
- What is the **risk impact for cyclists who are not equipped** with applications in case a lot of cyclists do use ICT and ITS applications?
- Analysis of the **need for harmonization** to speed up deployment.
- Research on **data collection issues** in relation to development and evaluation of cycling applications, and data formats and technologies to be used.



# Results of SAFECYCLE

The SAFECYCLE project was active between June 2011 and November 2012 and has led to a variety of outcomes:

- An overview of the state-of-the-art of 121 e-safety applications.
- A SWOT analysis for 30 applications.
- An impact assessment and cost-benefit analysis for 11 applications.
- Recommendations for follow up in the fields of standardization, deployment and a research agenda.
- Three workshops with experts and a final conference in Vienna.
- Presentation of the SAFECYCLE project results in nearly 20 conferences.
- More than 300 followers of the project on LinkedIn, originating from 40 different countries.

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