



Ministerie van Infrastructuur en Waterstaat

# Action plan for improving road safety for motorcyclists 2



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# Preface

The motorcycle has been around for a long time: Since the 19th century people wanted to use a steam or combustion engine to move, instead of muscle power. A lot has changed since then. Demands on the vehicle, demands on the infrastructure, on the behaviour of the rider, for example due to driving license requirements. At the same time, the car has been transformed into a vehicle that increasingly offers protection to the driver, the passengers and even other road users, while the motorcycle is still, because of the fact that it is a balancing vehicle and lacks safety features a car has, has a clearly higher risk per kilometre travelled.

Powered two-wheelers in general and motorcycles in particular therefore hold a special place. They offer more freedom, have lower CO<sub>2</sub> emissions, alleviate traffic jams and take up fewer parking spaces in the city centres. That's why the ministry works to improve the safe use of motorcycles, so that we increasingly enjoy the positive side and less and less the negative side of motorcycling.

This action plan has been developed in consultation with the members of the Motorcycle Platform: ANWB, BOVAG, CBR, FEHAC, FEMA, National Police Unit, KNMV, LOOT, MAG, MON, Police Academy, RAI Association, RDW, ROF, SWOV and VVN. The Ministry of Infrastructure and Water Management is very grateful for the advice from the members of the Motorcycle Platform.

# 1 Introduction

## 1.1

### Reason

In 2010, the first action plan for improving road safety for motorcyclists was drawn up (Ministry of Infrastructure and Water Management, 2010). The aim of this action plan was to reduce the accident risk per kilometres travelled for motorcyclists and described seven measures. These measures have been implemented and evaluated. To (further) improve the road safety of motorcyclists, new measures will have to be taken.

This action plan is part of the efforts of the Ministry of Infrastructure and Water Management to write a new Strategic Road Safety Plan. The current Strategic Plan or the current target runs until 2020. The measures mentioned in this action plan will certainly fit in with the broader ambitions of the Ministry of Infrastructure and Water Management. The new Strategic Road Safety Plan will specifically focus on reducing the risks of road unsafety. In this way it is directly in line with the goal of this action plan that wants to reduce risks for motorcyclists.

In addition, the international aspect of road safety for motorcyclists is also discussed. In its Roadworthiness Directive (2014/45/EU), the EU discussed the possibility of making roadworthiness testing of motorcycles mandatory. The Netherlands have always indicated (see for example AVVM 1) that according to us, this is an ineffective way to increase the safety of motorcyclists. The directive however leaves room to exclude motorcycles from the application of this directive “where the Member State has put in place effective alternative road safety measures for two- or three-wheel vehicles, taking into account in particular relevant road safety statistics covering the last five years”. This plan of action, which would certainly have been written without the APK Directive - there was already an action plan in 2010 - presents this alternative road safety measures.

## 1.2

### Conditions

The aim of this plan is, as it was in 2010, to increase road safety per kilometre. It is not its intention to discourage (motorcycle) mobility (less kilometres means fewer casualties) to reduce the number of accidents. On the other hand, it is also not the intention to set goals in the area of environment, traffic flow or accessibility if that means a rise in the number of travelled motorcycle kilometres and possibly in the number of victims. The Ministry of Infrastructure and Water Management does not express a preference for a specific modality.

This action plan is limited to motorcyclists. Users of other powered two-wheelers such as mopeds, do have similarities with motorcyclists, but the differences are so great that very different measures are needed.

Another precondition is that the level of enforcement is an important condition for safe road traffic. We assume in this action plan that there is no significant reduction of the enforcement level.

### 1.3 Structure

Chapter 2 gives a summary of the (international) available knowledge and earlier measures. Here we also describe an analysis of facts and figures; what are the biggest risks for motorcyclists? We also evaluate the measures from the previous AVVM.

Chapter 3 describes the developments in ITS and the opportunities that ITS offers for the improvement of road safety for motorcyclists.

Finally, Chapter 4 contains the measures.

## 2 International knowledge

### 2.1

#### Risk factors for motorcyclists: Behaviour

##### Interaction with other road users

Of all serious and fatal motorcycle accidents in the Netherlands, 50% consist of a collision between a motorcycle and a car and 40% are single-vehicle accidents, i.e. an accident where the assumption is that no other vehicle is involved (BRON, 2016). This means that most of the time motorists are involved when motorcycle accidents occur. Accident statistics show that motorcyclists are especially vulnerable in conflict with oncoming turning vehicles, or vehicles entering a main road from a side-road (Crundall et al., 2012).

A collision with another road user remains a large proportion of motorcycle accidents. It remains unclear what the cause of this is. It is too easy to assume that this is mainly the case because the motorist does not observe the motorcyclist or deliberately gives no priority. Accident analysis (de Craen, Doumen & van Norden, 2014) shows that drivers are just as likely to fail to give priority to other motorists as to motorcyclists (when these vehicles enter an intersection from the left or right). Therefore, we should not take measures such as 'making the driver aware' of the presence of motorcyclists. Instead we should influence the general (viewing) behaviour of motorists: for instance, through infrastructural measures, enforcement on speed and red light negation and countering distraction in the car. From the motorcyclists' side measures could for example be directed at defensive riding: even though motorcyclists may not be overlooked more often than other road users, the consequences are many times greater than for motorists.

##### Accident causes

The MAIDS research has attempted to map the causes of accidents. That research is not only very out of date (data collection 1999-2000), it also seems difficult to pinpoint the circumstances of accidents with motorcyclists. This is especially important for motorcyclists, because there the outcomes of various accident causes are so similar (namely a serious injured motorcyclist). Riding faster than the maximum speed or an expected speed for example, can lead to a motorcycle not being seen, but also to loss of control over the vehicle, or slipping on a slippery road and the effect is also more serious. To take effective measures, it is essential to separate or name these causes, to prevent - for example - that motorcyclists are made to wear a Hi-Viz vest, while a car on that spot would also not be visible, for example because of a big tree in the bend.

Causes that we must be able to discern include:

- 1) Is the accident caused because a motorcycle (more than a car) is a balancing-vehicle?
- 2) Is the accident caused by the motorcyclist not being observed?
- 3) Is the accident caused by the motorcyclist not having enough control over the vehicle?
- 4) Is the cause of the accident the riding/driving behaviour of the motorcyclist, another road user or by external circumstances?

It is important to map out all these causes. Various European projects, such as UDRIVE, SaferWheels, MUSE et cetera are working on this in the margins, but dedicated research seems relevant.

### Distraction by equipment

Distraction by equipment, especially the smartphone, seems to be a cause for motorists' accidents (see, for example, the American study (Dingus et al., 2016)). It is not clear to what extent distraction is a cause of accidents in the Netherlands. Research among motorcyclists seems to show that this group is, other than motorists and cyclists, working on the phone while driving. That seems to be due to the fact that motorcycling itself is a task with a higher workload than cycling or driving.

The Ministry will introduce an information campaign with a code of conduct in the summer of 2019. Perhaps motorcyclists (who are also often motorists) can benefit from this. It does not seem obvious to investigate this specifically for motorcyclists.

## 2.2

### Risk factors for motorcyclists: Vehicle

A motorcycle is a balancing vehicle, which makes riding more complex and the risk of accidents are greater (Kooijman & Schwab, 2011). 40% of all serious and fatal motor accidents are single-sided accidents (BRON, 2016). One of the main causes of this kind single-sided accidents is that the motorcyclist loses control over the vehicle, which can be caused by the characteristics of the road surface (smoothness, unnecessary road markings, unexpected dirt on the road surface, etc.), excessive speed or a combination of both. A technical problem with the motorcycle is rarely the cause of an accident (MAIDS, 2004, Janse, Talens & Kengen, 2012).

This of course does not affect the fact that it is the responsibility of the rider to ensure that the motorcycle is in good condition. This means both the execution of checks before riding off (tires, brakes, battery, lighting, oil, chain, mirrors) and taking care of it general maintenance. These aspects can be used in informing motorcyclists.

## 2.3 Risk factors for motorcyclists: Infrastructure

### State of the road surface

The road or infrastructure plays an identifiable role in 8% of accidents (Janse, Talens & Kengen, 2012). Road facilities can cause problems for motorcyclists for various reasons, especially in combination with wetness. Speed bumps, markings, repair strips, rutting, lattices, worn road surface, raised lane separation on roundabouts and manhole covers sometimes deliver problems because they become slippery in wet weather or create height differences on the road, thus limiting stability. In addition, pollution such as sand or diesel on the road are more dangerous for a balancing vehicle than for a car (Janse, Talens & Kengen, 2012).

### Role of guide rails

Collisions with guard rails and other road guards contribute to 2-4% of the deadly motorcycle accidents in Europe (OECD / ITF, 2015). The guard rail has positive effects for motorists, but the outcome of a motorcycle accident, in which the motorcyclist hits the posts of a guide rail, is often many times more serious than if it happens to a motorist (Janse, Talens & Kengen, 2012). Cable barriers or wire rope fences are considered by motorcyclists as the most dangerous median barriers (Nombela et al., 2010), although research found no difference in accident severity between cable barriers and other type of guard rails (Rizzi et al., 2012).

## 2.4 International developments/measures

### European policy

The communication from the European Commission “Towards a European road safety area: policy orientations on road safety 2011-2020’ (COM (2010) 389) formulated a number of objectives and actions. Objective 7 is aimed at protecting vulnerable road users. Motorcyclists are also included in this.

The European Commission indicates that the problem of the safety of motorcyclists must be addressed through a series of actions aimed at:

1. making other road users more aware of the presence of powered two-wheelers;
2. promotion of research and technological development, aimed at increasing the safety of powered two-wheelers and to reduce the consequences of accidents, such as standards for personal protective devices, airbags, the use of relevant ITS applications (such as eCall) and the gradual installation of advanced braking systems, custom measures to counteract alterations in the construction speed of motorcycles, et cetera. The Commission will propose to include motorcycles in existing EU legislation with regard to the technical inspection of motor vehicles. Finally, the current efforts to



better adapt the road infrastructure to powered two-wheelers (e.g. safer safety barriers) are being continued;

3. Encouraging Member States to focus their enforcement activity on the aspects of speed, driving under the influence, using helmets, altering the construction speed of motorcycles and driving without a license. As a result of the European Union's policy, the Member States themselves have also (re)developed national road safety plans. It goes too far to name all national actions on motorcycle issues by the different Member States here.

### The motorcyclist

Insofar as there is a policy geared towards motorcycles, this is mainly aimed at the motorcyclist: awareness and enforcement campaigns aimed at improving the visibility through the use of distinctive clothing, the use of protective clothing, the (correct) use of a motorcycle helmet and further improvement of the (continued) rider training and learning about risk awareness.

### The motorbike

A number of countries choose mandatory periodic technical inspection. Compulsory ABS is also mentioned regularly as an opportunity to improve road safety. Mandatory ABS for motorcycles is included in the European Regulation 2013/168 / EU, which was implemented in 2016.

### The infrastructure

Motorcyclist protection systems (bottom boards on guard rails) are mentioned in different places although the application differs: some countries refer to bend radii, others to the intensity of motorcycle traffic. In a more general sense (not specifically aimed at motorcycles) obstacle-free verges are also mentioned. In some cases, mention is made of separate lanes or advanced places for motorcyclists at intersections/traffic lights. Only in Austria a sweeping program to remove junk from roads at the start of the motorcycle season is mentioned.

## 2.5

### Evaluation and lessons learned from the first AVVM

The first AVVM consisted of seven measures. Below is the list of measures and the results.

Training higher order skills with motorcyclists.

Status: Done.

Explanation: It has been decided to evaluate the training 'VRO Risk' of the KNMV instead of developing a new advanced driver training. The research was carried out by SWOV and has led to the report 'The effects of a one-day advanced driver training for motorcyclists' (2013). This report reports on an evaluation study of the VRO Risk. Conclusion: taking further training can have a positive effect on the safety of riding and hazard recognition by mo-

torcyclists. The question is how these positive results can be converted into a measure that will improve road safety for motorcyclists in a major way. We propose to include this as a measure to see how this could be done.

Information to motorcyclists.

Status: Continuous

Explanation: In 2013, the ministry invested € 50,000 in the campaign 'On the road with the right motorcycle license' (2014). In 2015 and 2016 the Ministry will invest in total € 100,000 in an information campaign about visibility. The Ministry made € 50,000 available annually to the Motorcycle Platform to provide information about safe motorcycling. Themes can be determined in consultation with the Ministry. The condition is that every year the Motorcycle Platform is responsible for the correct spending, makes a timely proposal for an information theme, checks the progress and tests the quality.

Information and education for motorists.

Status: Not ready

Explanation: Given the limited mass-media communication moments of the Ministry of Infrastructure and Water Management is not possible to point out to motorists the code of conduct for filtering (or lane splitting). We can however, review see whether and how in the communication to motorists we (for example together with ANWB) can inform them about, for instance, the code of conduct for filtering. See also the measure below.

The motorcyclist in the B-training.

Status: Done

Explanation: Research and report by DHV 'Attention to motorcyclists in the training and the examinations for driving license B' (January 2012). The report contains a number of recommendations. The most important conclusion was that not seeing motorcyclists is a much broader problem in the area of not observing well and looking for other types of road users. Therefore, it is not a specific motorcyclist problem. It is therefore not opportune to pay specific attention to observing motorcyclists in the B licence training program. The motorist must pay attention to all vulnerable road users.

Investigate the effect on traffic safety of motorcyclists' visibility.

Status: Done

Explanation: Research and report by SWOV 'The roles of motorcyclists and car drivers in conspicuity-related motorcycle crashes' (2011). The report provides a good insight into the problem around 'visibility' and shows that brightly coloured and/or fluorescent clothing does not increase visibility under all conditions. Contrast with the environment is what counts. The report can serve as a source in formulating the message of an information

campaigns about 'seeing and being seen'. The report raises further research questions about accident and mobility data, about the effectiveness of fluorescent motorcycle clothing in a Dutch setting, about the expectations of road users about the presence of motorcyclists and about the scenario of accidents with link-turning cars and oncoming motorcyclists. Are those follow-up research questions still topical and desirable?

Drafting CROW guidelines.

Status: Done

Explanation: Executed by CROW and a working group with stakeholders. The information in the CROW manual 'Handbook for powered two-wheelers - A Guide to safe road design, road maintenance and road management' has been further defined and included in the general CROW guidelines.

Implementation of the 3rd driving license directive.

Status: Done

Explanation: The third European driving license directive has been in force in the Netherlands since January 2013. Since 2014, direct access to the A2 driving license is possible from the age of 20 onwards, besides the stepped access system from 22 years when in possession of an A1 driving license. The European Commission will conduct an evaluation in 2018 on the implementation of the 3rd driving license directive.

# 3 ITS developments for motorcycles

## 3.1 Definition of ITS systems

‘ITS’ stands for Intelligent Transport Systems and is a collective term for the application of information and communication technologies in vehicles. The development of ITS systems in vehicles has gained momentum in recent years. This can provide possibilities for more safety, better flow and more sustainability. Manufacturers of motor vehicles are more and more designing systems that can support the driver in the driving task (the so-called Advanced Driver Assistance Systems, ADAS). That support can be basic, partially or under certain conditions (assistance, partial or conditional automation). Nowadays there are even systems that completely override the driving task under specific circumstances (Automated Driving Functions, ADF). Those functions can be highly automated or fully automated.

To support/execute the driving task, these systems sometimes depend on information from outside the vehicle: They have to digitally connect (Connected) to perform a task (such as navigation or speed advice). Systems sometimes have to work together (Cooperative). Others systems can fully perform the driving/executing of the driving task themselves (Automated).

In short: A lot of attention is paid to ‘Connected and Automated Driving’ (CAD). Not only by the vehicle manufacturers; a lot of attention is also paid by policy makers. Some years ago the European Commission introduced the ITS Directive and the ITS Action Plan to promote the development of ITS applications. The C-ITS action plan has recently been added. The Netherlands have written, together with other member states, the ‘Amsterdam Declaration’, with ambitions in the field of experimenting, legislation and knowledge for CAD.

## 3.2 Lack of attention for ITS in motorcycles

Cars and trucks have undeniably benefited the most from the development of CAD. Various systems are already available for these vehicles, such as Adaptive Cruise Control, Lane Departure Warning /Assist, Blind Spot Assistant, Emergency Brake, Intelligent Speed Adaptation, et cetera. In some cases, these systems can also use the infrastructure for C-ITS, such as beacons along the road.

Many of these systems are not (yet) available for motorcyclists or on the motorcycle. That is due to various causes: On a motorcycle there is less room to mount systems, the market for motorcycles is smaller so systems are not directly and not specifically designed for motorcycles, the effect of systems is not known on motorcycles etc. Most important however, is that a motorcycle is too often seen as a 'car on two wheels', with the assumption that technology that works well on a car will also work well on a motorcycle. This lack of attention is important for the motorcycle in two respects:

#### 1. Taking along motorcycles in C-ITS systems in cars

The connected or cooperative systems in cars are often still limited to cooperation or communication with other cars. Even the detection of motorcycles by for example, Blind Spot Indicator Systems - BLIS) is often not regulated. This is directly harmful to the safety of the motorcycle rider. To make this possible we must ensure that the voice of motorcyclists is heard in the forums where the system requirements for C-ITS systems are determined.

#### 2. Application of these systems, whether or not in adapted form, in/on the motorcycle itself

The first developments are visible with manufacturers who produce both cars and motorcycles that ADAS facilities, initially developed for the car, are also applied in/on the motorcycle. In addition, some motorcycle manufacturers (Honda, Yamaha and BMW) bundled their R & D strength to collaborate on ADAS facilities for the motorcycle. It is important to follow these developments closely and look for broad public attention for the contribution of these systems to the safety of the motorcyclist. To make this possible, we must first investigate what is possible for motorcycles, what actually works for motorcycles and what the motorcyclists themselves think of those systems.

### 3.3

#### Test environments

The Netherlands already have a considerable number of test environments at its disposal to test applications of smart mobility solutions. These test environments are also possibly very relevant for testing with motorcycles. Among other things, to investigate to what extent ADAS facilities in cars take motorcycles into account. But also to, like described under 3.2, test ADAS applications on motorcycles themselves.

# 4 Measures

## 4.1

### Information to motorcyclists and other road users

Continuous attention to information. The Ministry proposes to make € 50,000 available annually to the Motorcycle Platform to provide information about safe motorcycling. Themes and target group can be determined in consultation, but must be in line with what has been researched to appear to work in terms of the campaign's approach to influence behaviour. The condition is that it is Motorcycle Platform is responsible for the right spending, to make a timely proposal for an information theme, to guide the progress and test the quality. There will be a permanent working group set up from the Motorcycle Platform for this.

## 4.2

### Improved detection of motorcyclists will be included in the requirements for detection systems

The observation of motorcycles by (safety) systems must be included in the test procedures. In addition, the Netherlands will also argue for including these requirements in the European admission requirements for systems such as AEBS and ACC.

## 4.3

### Insights into opportunities of (C-) ITS for motorcyclists

1. Investigate which systems for engines can be effective for road safety increase Research which systems can actually be applied to motorcycles. Include explicitly what motorcyclists want on systems on the motorcycles themselves.
2. Ensure good knowledge transfer to the retailer in order to inform the consumer what systems there are, what they are meant for and what can be expected of them.
3. From a broader perspective, the (powered) two-wheeler must receive continuous attention in the developments in (C-) ITS systems (V2V and V2X).

## 4.4

### Investigating the accident factors with motorcyclists

It turns out to be difficult to properly name the circumstances of accidents

with motorcyclists. Most recent in-depth research (MAIDS) is already 20 years old. It is essential to know the causes of accidents to call for effective measures. In addition to a good registration (naturally) of crashes with motorcycles, an in-depth investigation is carried out into the characteristics of motorcycle accidents.

#### 4.5 Attention for higher order skills/risk perception

A training aimed at risk perception demonstrably leads to safer driving behaviour and improved hazard perception (Boele & De Craen, 2014). It should now be considered whether and how this can either be further stimulated or can be introduced as part of a driving exam. The latter must be done at EU level. Especially motorcyclists (who are particularly vulnerable when they are hit) benefit from this. Attention to higher order skills will also be an important point of attention in the National Action Program of the SPV, especially for novice drivers. Higher order skills can only be tested after having gained experience for a while, not in the exam itself but in a second phase. The consequence of this is that this knowledge will have to be offered in the training for both the student and the driving instructor or examiner. The Ministry will examine whether there is international support to introduce these higher order skills such as risk perception into the driving examinations.

In addition, motorcyclists who already have their driving license, can participate in the continued motorcycle training VRO Risk. The Ministry of Infrastructure and Water Management will investigate how participation in such a refresher course can be encouraged.

#### 4.6 Adapt UNECE requirements for helmet standards

The quality of a helmet is demonstrably deteriorating over time. Intention is to quantify this and perhaps adjust the UNECE standards, so the production date of the helmet or an expiration date is visible. The Ministry of Infrastructure and Water Management will put this on the European agenda.

#### 4.7 Visibility

In the first action plan a literature study and accident analysis on the visibility of motorcyclists was performed (De Craen et al., 2011). This research provides reasons for (simulator) research into the visibility of motorcyclists and the viewing behaviour of motorists. Issues in this respect are whether it is indeed the case - as the accident analysis suggests – that with crossing

traffic a motorcyclist is not more often overlooked than a car.

The Ministry of Infrastructure and Water Management will commission an investigation into visibility of motorcyclists and viewing behaviour of motorists.



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