RIDERSCAN
European Scanning Tour for Motorcycle Safety

FINAL REPORT

Please refer to this report as follows: Delhaye, A., Marot, L. (2015), ***A European Scanning Tour for Motorcycling Safety***, Final Report of the EC/MOVE/C4 project RIDERSCAN.

GRANT AGREEMENT NUMBER MOVE/C4/SUB/2010-125/SI2.603201/RIDERSCAN

Project Coordinator: Aline Delhaye, Federation of European Motorcyclists' Associations (FEMA), Rue des champs, n°62, 1040, Etterbeek (Brussels), Belgium

Project End Date: 30/04/2015 **Project Duration 42 months**

Organisation name of lead contractor for this deliverable: Federation of European Motorcyclists' Associations (FEMA), Belgium
Report Author: Aline Delhaye, Federation of European Motorcyclists' Associations (FEMA), Belgium

Project co-funded by the European Commission
Dissemination Level: public

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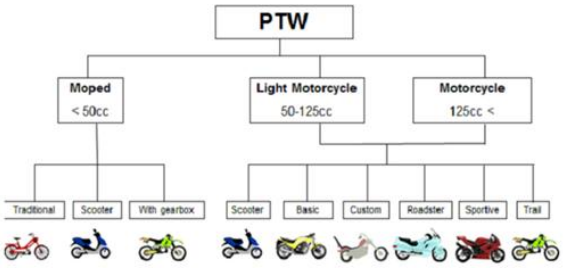
Special Thanks

The RIDERSCAN project is the result of the collaboration of dozens of organisations and hundreds of individuals. The project team would like to take this opportunity to thank:

- **Project Sponsors**: The Motorcycle Industry in Europe (ACEM), Assurance Mutuelle des Motards, The European Commission
- **Activity Sponsors**: ArcelorMittal, German Insurance Association (GDV), Fédération Internationale de Motocyclisme (FIM), Institut für Zweiradsicherheit e.V. (IFZ)
- **Members of the Expert Group**: Bertrand Nelva-Pasqual (Assurance Mutuelle des Motards), Marcellus Kaup (CIECA), Kris Redant, Peter Saleh, Xavier Cocu (FEHRL), Pierre van Elslande (IFSTTAR), Andy Mayo (Local Transport Project), Robbert Verweij (Dutch Ministry of Infrastructure and the Environment), George Yannis (NTUA), Gabrielle Cross (MIRA), Aki Lumiaho (Ramboll/VTT)
- **Activity partners**: Laurent Santucci (AMDM), Vanessa Curcurullo (2Roues Lab), Riccardo Matesic (GSM), Thomas Kakadiaris (Motothesis), George Yannis (NTUA), Peter Erdelyi (Hungarian Vehicle Importers Associations - MGE), Tina Bizjak (Slovenian Traffic Safety Agency), Niccolò Baldanzini (UNIFI), Simone Piantini (UNIFI)
- **Media partners**: Bike.fi, MC-Folket, Moto Magazine, Moto Triti, Motociclismo.es, Motociclismo.pt, Motorrad, Motorrijder, Motovoyager.net, Ride Magazine, Touring NYT,
- **Riders' organisations**: AMM, Biker, Union BVDM, FFMC, MAG NL, MCTC, Motoe, NMCU, SMC, Smoto, UAMK, MAG Ireland, MAG UK, FMP
- **Project survey translators**: Emilio Lopez, Frederic Jeorge, Francis Cervellin, Michael Wilczynski, Duarte Forjaz, Riccardo Matesic, Dolf Willigers, Anne Morck, Thomas Kakadiaris, Morten Hansen, Maria Nordqvist, Anne Kontula, Miroslav Firt
- **The European Commission officers**: Susanne Lindahl (EC/DGMOVE/Road Safety Unit), Casto Lopez Benitez (EC/DGMOVE/Road Safety Unit), Ivan Lukac (EC/DGMOVE/Road Safety Unit), Espen Rindedal (EC/DGMOVE/Road Safety Unit), Maria-Teresa Sanz Villegas (EC/DGMOVE/Road Safety Unit) for their time answering the project questions
- **National road authorities and safety agencies representatives, along with the EU research community**, who kindly accepted to spend quite some time answering the questions related to the project.
- **The OECD/ITF** for having accepted to share the outcomes of the motorcycle safety report before its official publication.
- And all those who spent time and money to support the project and overall PTW Safety enhancement.

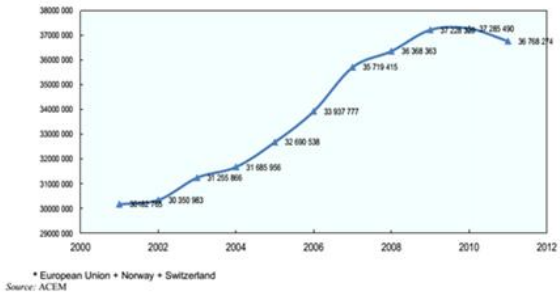
Introduction

Powered two-wheelers (PTWs) are a popular form of transport providing mobility to millions of people worldwide. However, unlike other forms of motorised transport, PTW users, as with cyclists, remain more vulnerable due to the intrinsic characteristics of the vehicle.

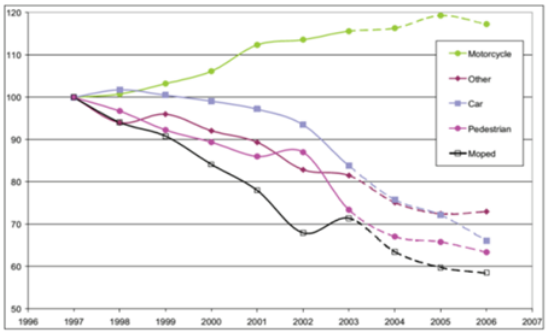


PTWs variety (Source: OECD/ITF report on motorcycle safety, 2015 – to be published)

Over the past decade, collision records highlighted a substantial decrease in PTW casualties (motorcycles and mopeds). This decrease, albeit less pronounced than for other means of transport, is taking place against a substantial increase in the number of PTWs on the roads.



Number of PTWs on the roads (Source: OECD/ITF report on motorcycle safety, 2015 – to be published)



PTWs casualties in Europe (Source: OECD/ITF report on motorcycle safety, 2015 – to be published)

The RIDERSCAN project - *a European scanning tour for motorcycle safety* - is an EU co-funded project gathering existing information on motorcycle safety in Europe, identifying needs for action and creating a cross-border knowledge-based network aimed at improving the overall safety of PTW users in Europe.

Over the last three and an half years (November 2011 – April 2015), the project has created a lasting European framework for communicating and collecting data on PTW safety.

Among the main objectives of the project were the identification and comparison of national initiatives on PTWs, and the identification of best practices. Another important objective was to collect and structure existing knowledge at European level in order to identify critical gaps for future efforts to concentrate on. Finally, the project aimed at identifying the critical needs for policy action, whether at European or national level, with a view to disseminating them to a wide range of relevant stakeholders in Europe in the coming years.

To do so, the project went through a detailed literature review of European documentation, including EU and EU stakeholders' policy papers, EU research project outcomes, and the proceedings of stakeholder meetings and other forums. The total number of collected documents currently exceeds 920, available in the project database.

After a first analysis of the needs, a set of amplifying questions was prepared to further explore national situations for each safety topic. This questionnaire was reviewed by the following experts from the Expert Group members:

- Marcellus Kaup from CIECA for Deliverable 1 on training, testing and licencing.
- Kris Redant, Peter Saleh and Xavier Cocu from FEHRL for Deliverable 3 on infrastructure
- Bertrand Nelva-Pasqual from Mutuelle des Motards for Deliverable 4 on accident reporting
- Pierre van Elslande from IFSTTAR for Deliverable 5 on research
- Gabrielle Cross from MIRA for Deliverable 6 on traffic management and ITS (replaced by Aki Lumiaho in the course of the project)

- Andy Mayo from Local Transport Projects UK for Deliverable 7 on awareness campaigns
- Robbert Verweij from the Dutch Ministry for Infrastructure and the Environment for Deliverable 8 on national strategies.

With the objective of collecting as much expertise as possible and integrating the views of all PTW safety stakeholders, the project collected input from many different perspectives. Contributors included:

- European Commission
- Member States' National Authorities
- Road Safety Agencies
- Motorcycling Community (industry/users)
- Pan-European stakeholders

The total number of interviewed experts was 112.

In addition to these semi-structured interviews semi-structured interviews, the project also undertook 3 pan-European surveys to collect the views of riders themselves in the fields of licencing and training (Training survey), Intelligent Transport Systems (ITS Survey), mobility and safety habits (Motorcycling survey). These surveys were disseminated using the European network of PTW magazines, newly constituted in the context of the project. The total number of motorcyclists surveyed exceeded 31,000. The surveys were kindly analysed by the University of Firenze (ITS Survey), Mutuelle des Motards (Motorcycling survey) and FEMA (Training survey).

All in all, the project activities have enabled the following outcomes:

A summary of **EU research work** and **main conclusions** for the past decade related to the 8 safety fields	Annex 21
An EU **comparison of 3DLD implementation** and motorcycle access schemes	Annex 19
A picture of **EU riders' licences and the main geographical differences** in post-licence training	Annex 1
An **assessment of the 3rd Driving Licence Directive** in terms of training, testing and administrative and licencing changes by riders	Annex 2
Driving licence improvements, problems and best practices according to Member States, testing authorities, and the motorcycling community	Annex 4 Annex 5
An overview of the **main accident causation factors** based on 7 EU/national Powered Two Wheelers (PTW) in-depth accident studies	

An overview of **variables collected per country** in public statistics reports on motorcycling;	
A table of variables recommended by the **CADaS protocol**	
Recommendations for the use of the **CADaS protocol** and harmonization needs	
A summary of **accessible data on motorcycle accidents** in the EU	
A summary of **missing data in the EU** and recommendations on needs for harmonization	
Comparison of **police accident report forms** and recommendations	Annex 20
A picture of EU riders' **problems with infrastructure** and the main geographical differences	Annex 1
A detailed review of existing **PTW/Infrastructure guidelines**, a list of **common problems** throughout Europe and **EU standards to be reviewed** to address priority issues.	Annex 8
An overview of **Best Practices** throughout Member States (use of guidelines, PTW users as VRUs, black spot monitoring, "Vision Zero Roads" for PTWs)	
A **Pan-European Black/White Spot Report Form** to be used using ICT and involving the motorcycling community	Annex 16
A dedicated **infrastructure website** http://www.mc-infrastructure.eu/ addressing PTWs and infrastructure problems, along with a dedicated sub-**website on guardrails**, specifically focusing on roadside barriers http://www.mc-roadsidebarriers.eu/, including a **Motorcyclist Protection System Database**, and **Guidelines for road restraint systems**	
Identification of **needs for PTW research** at national and European level	
An overview of **ITS political context, legal frameworks and initiatives**	
An overview and **classification of ITS systems/functions for PTWs** in PTW-related safety areas	
A European map of **rider acceptance of ITS** for PTWs	
A primary description of the **specificities of the *riding tasks*** and their **impact on ITS development**	Annex 15
A picture of **EU riders' perception of national campaigns**	Annex 1
Motorcycling community **evaluation of PTW safety awareness campaigns** in Europe	Annex 10
Designing safety messages targeting the motorcycling community:	Annex 6

common principles and rider-specific interventions	Annex 13
Dissemination channels and means to reach the motorcycling community: RIDERSCAN pan-European surveys lessons	Annex 1 Annex 2 Annex 3
A comparison of **national overall road safety strategies** and **national motorcycling safety strategies**	Annex 9
A first review of the literature on **Safety Performance Indicators** and a preliminary analysis of PTW specificities	Annex 18
A summary of key **stakeholders' recommendations for action** to improve o data collection and statistics for PTW safety; o access to PTWs; o PTWs' surrounding environment (infrastructure, ITS, traffic management) o communication with the riding community o action plans to tackle the main PTW safety issues	Annex 4 Annex 5 Annex 6 Annex 12 Annex 13 Annex 14

These outcomes were used to address and discuss the 8 safety areas covered by the project in 8 deliverables, the content of which was reviewed by the project experts.

Safety issue	Deliverables
✓ Training, testing and licensing	Report on existing schemes, problems encountered, good practices, 3rd Driving Licence Directive (DLD) implementation, recommendations for 4th DLD
✓ Data collection and statistics	Report on available and missing data, proposals for harmonization of data collection related to motorcycling
✓ Infrastructure	Report on problems, existing solutions and standardization needs Recommendations for the development of a European road safety assessment programme for motorcycling
✓ Accident reporting	Report on accident reporting methods, recommendations for harmonization of police reporting
✓ Research	Overview of national and EU research on motorcycle safety, identification of duplication and gaps related to the 8 safety areas
✓ Traffic management	Report on existing and best practices
✓ Awareness campaigns	Report on means to address rider and driver behaviour, past and current campaigns, best practices and recommendations, motorcycle press and motorcyclists groups overview
✓ National strategies	Overview and analysis of existing national strategies in Member States, implementation and results, recommendations ; Recommendations for the development of a European Motorcycle Safety Performance Index
✓ Motorcycling Community	Report on motorcycling use and safety characteristics, the motorcycling population and means to reach it;

Figure 1 - RIDERSCAN project list of deliverables

Finally, all recommendations collected were structured according to Europe's main levers for action, namely *Research, Legislation, Standardization* or *Specific Actions*, in the report entitled *Needs for Policy Actions.*

1. PROJECT METHODOLOGY - Activities

The project activities with regard to the 8 safety areas aimed at:

- D1- Gaining a clearer picture of 3DLD implementation, good practices and issues related to its implementation.
- D1 - Identifying priority areas for action and recommendations to improve the 3rd Driving Licence Directive (3DLD) and prepare the future 4th Driving Licence Directive (4DLD).
- D2 - Identifying missing data at European level
- D2 - Making recommendations on data collection harmonisation
- D3 - Gaining a clearer picture of the infrastructure common problems for PTWs in Europe;
- D3 - Identifying priority areas for action through standardization and other targeted activities.
- D4 - Collecting and comparing police accident reports in Europe
- D4 - Crossing analysis with data collection and statistical needs (D2)
- D4 - Making recommendations and identifying needs of harmonisations on reporting
- D5 - Compiling an overview of EU research work related to PTW safety
- D5 - Identifying major research gaps that would require a focus in coming years
- D6 - Setting the scene for ITS with and for motorcycling (definitions, framework)
- D6 - Gaining a clearer picture of existing ITS for motorcycling and existing systems/functions classifications
- D6 - Improving understanding of riders' perception of ITS
- D6 - Identifying specific PTW aspects with regard to ITS developments
- D6 - Reporting on existing traffic management best practices for motorcycling
- D7 - Compiling an overview and an evaluation of existing European awareness campaign that focus on road safety, including those that relate specifically to PTW riders.
- D7 - Making recommendations on ways and means of addressing specific safety messages to the motorcycling community.

- D8 - Comparing existing national road safety strategies and/or national motorcycle strategy/action plans in Europe where they exist.
- D8 - Reporting on national best practices

With the objective of gathering as much expertise as possible, the project collected feedback and information from many different sources, and in many different ways.

1.1. Literature review

- **Literature review from the main related policy documents**

With the objective of gaining a preliminary overview of the key safety aspects to be considered in the PTW safety debate, and of the project safety areas in particular, the project team undertook a detailed comparison of the PTW safety policies of key PTW/road safety stakeholders. This overview is summarized in Annex 14

- **EU research outcomes**

Part of the work consisted of identifying and summarising the main outcomes of EU co-financed projects of relevance to training and licencing. This extensive reviewing work is available in Annex 21, and includes the review of the outcomes of the following projects:

2-BE-SAFE,	**MAIDS**	**ROSYPE**	**SUNFLOWER+6**
APROSYS	**MOSAFIM**	**SAFERIDER**	**SUPREME**
CAST	**MOTORIST**	**SAFERWHEEL**	**TRACE**
DaCoTA	**MYMOSA**	**SAFETYNET**	**TRAIN-ALL**
eSum	**PILOT4SAFETY**	**SARTRE 1-4**	**TRAINER**
EURORAP I and II	**PISA**	**SIM**	**VRUITS**
IN-SAFETY	**PROMISING**	**Smart RRS**	**WATCH-OVER**
IRT	**ROSA**	**STAIRS**	**WHITEROADS**

1.2. Stakeholders' feedback and priorities

The project then worked at identifying priority areas for EU action according to the different stakeholders. This feedback collection took several forms, depending on stakeholders' accessibility and availability, and included the following activities

- **Amplifying Questions**

A questionnaire (Amplifying Questions) was designed to survey the different categories of stakeholders directly involved in policymaking (Member States, the European Union, Motorcycling Community representatives, EU stakeholders). These included:

European Commission

- Casto Lopez Benitez (DGMOVE/Road Safety Unit)
- Espen Rindedal (DGMOVE/Road Safety Unit)
- Ivan Lukac (DGMOVE/Road Safety Unit)
- Maria-Teresa Sanz Villegas (DGMOVE/Road Safety Unit)
- Susanne Lindahl (DGMOVE/Road Safety Unit)

Member States

- Austria
  - Federal Ministry for Transport, Innovation and Technology
  - STATISTICS AUSTRIA
- Belgium
  - SPF mobilité et transports, DG Transport Routier et Sécurité Routière
  - Department of Mobility
- Bulgaria
  - Trafficpol
  - Road Infrastructure Agency
- Finland: Trafi (Finnish Transport Safety Agency)
- France: Délégation à la Sécurité et à la Circulation Routières
- Greece: Ministry of Infrastructure, Transport and Networks
- Hungary
  - HCSO (Hungarian Central Statistical Office)
  - GRSP Hungary Association
- Ireland
  - National Roads Authority
  - Road Safety Authority
- Italy: ISTAT
- Latvia
  - Road Traffic Safety Directorate
  - Latvian State roads
- Luxembourg
  - Ministère du Développement durable et des Infrastructures
  - Police Grand-Ducale
  - SNCA (Société Nationale de Circulation Automobile)
  - Statec (statistical institute)
- Netherlands
  - Department of Road Safety, Ministry of Infrastructure and Environment
- Norway: Norwegian Public Roads Administration
- Poland: General Directorate of National Roads and Motorways
- Romania
  - Ministry of Home Affairs – Road Traffic Directorate
  - Ministry of Internal Affairs, Driving Licencing and Vehicles Registration Directorate
  - Romanian Traffic Police Directorate

- Slovakia: Ministry of Transport, Construction and Regional Development
- Slovenia: Slovenian Traffic Safety Agency
- Spain: Directorate General for Traffic (DGT), Ministry of Interior
- Sweden
    - Folksam (insurance company)
    - Swedish Transport Agency
    - Trafikverket (The Swedish Transport Administration)
- United Kingdom
    - Driver and Safety Standards Agency
    - Department for Transport

Research community

- Austria
    - KFV (Austrian Road Safety Board)
    - AIT (Austrian Institute of Technology)
- Belgium
    - VSV, the Flemish Foundation for Traffic Knowledge
    - Belgian Road Safety Institute (BIVV-IBSR)
- Czech Republic: Transport Research Centre
- France: IFSTTAR
- Germany: BASt (Federal Highway Research Institute)
- Greece: NTUA (National Technical University of Athens)
- Italy
    - Italian Automobil Club
    - Sapienza (University of Rome, Centre for Transport and Logistics
- Netherlands: SWOV Institute for Road Safety Research
- Sweden: Folksam (insurance company)

Motorcycling community

- Belgium:
    - FEBIAC
    - MAG BELGIUM
- Denmark: MCTC
- France: FFMC
- Germany:
    - BMW
    - IVM & IFZ
    - BIKER UNION
- Greece: AMVIR
- Ireland: MAG IRELAND
- Italy:
    - ANCMA
    - DUCATI
    - FMI

- Luxembourg: LMI
- Norway: NMCU
- Sweden: SMC
- The Netherlands:
    - KAWASAKI
    - YAMAHA
    - MAG NL
- United Kingdom: BMF

Answers to the questionnaire were collected via phone interviews, written answers, or face-to-face meetings, summarized in Annex 4/ Annex 5/ Annex 6/ Annex 7

- **European Motorcyclists Surveys**

The project also conducted 3 public surveys targeting the European riding population:

- The *Motorcycling Survey*. A survey targeting European riders was designed to collect information on the motorcycling community around Europe and gain a better overview of similarities and differences in terms of riding, attitudes, and safety needs.

  The Pan-European survey was disseminated at national level via riders' groups and the motorcycling press in addition to being disseminated via Internet. It collected over 17,000 usable answers from 18 European countries. More details on the survey in Annex 1

- The *Training, Testing and Licencing User Survey*. This public survey, which collected 442 answers, aimed at gaining a concrete understanding of the issues riders face in terms of training, testing and recent administrative and licencing changes, including the new rules contained in the 3rd Driving Licence Directive since 2013. See Annex 2

- The *ITS User Survey*. This aimed to capture the attitude of riders towards safety systems at large. The Pan-European survey was disseminated at national level via riders' groups and the motorcycling press in addition to being disseminated via Internet. It collected over 4500 usable answers from 18 European countries.

  Survey findings can be read in Annex 3

- **Project workshops**

To discuss the project outcomes with a whole diverse range of European stakeholders and collect any additional relevant inputs, the project organized 3 *European Motorcyclists Forums (EMF)*, each comprised of a series of workshops.

Complete reports from project workshops: Annex 11, Annex 11 and Annex 13

- **Pan-European stakeholders' feedback**

The project also collected the views *of pan-European stakeholders* and discussed deliverable key findings. These included ACEM, BAST, FERSI , CAST, CIECA, ERF, EURORAP and iGLAD.

- **Participation in policy debates**

Inputs from public workshops and other public events related to the topics covered were also collected and included in the overall analytical process. Attended events include:

Event	Place	Date
European Motorcyclists Forum	Köln (DE)	3/10/2012
DaCoTA Conference	Athens (GR)	22-23/11/2012
FEMA Committee Meeting	Stockholm (SE)	1/06/2013
FEMA Committee Meeting	Brussels (BE)	5/10/2013
Slovenian Road Safety Authorities Meeting	Ljubljana (SLO)	13-16/10/2013
IFSTTAR Journées scientifiques Deux-roues motorisés	Paris (FR)	15-16/10/2013
EC DG MOVE Workshop on National Road Safety Strategies and Action Plans	Brussels (BE)	25/11/2013
FOR Net 10th Stakeholder workshop on Naturalistic Driving Studies	Brussels (BE)	26/11/2013
2013 Annual POLIS Conference - Innovation in Transport for sustainable cities and regions	Brussels (BE)	4-5/12/2013
Forum for Automobile & Society on Road Safety	Brussels (BE)	21/02/2014
FIA Workshop Road Safety & Connected Mobility	Brussels (BE)	21/02/2014
European Motorcyclists Forum	Brussels (BE)	5-6/03/2014
ITS Advisory Group	Helsinki (FIN)	16/06/2014
ITS EU Congress	Helsinki (FIN)	18-19/06/2014
FEMA Committee Meeting	Reykjavik (ISL)	31/05/2014
EC Infrastructure Meeting	Brussels (BE)	13/06/2014
iMobility Forum VRU WG ERTICO	Brussels (BE)	23/04/2014
ifZ Conference	Köln (DE)	29-30/09/2014
TRB Meeting	Brussels (BE)	5/11/2014
iMobility Forum Research & Innovation WG Workshop	Brussels (BE)	27/01/2015
5th iMobility Forum Plenary Meeting	Brussels (BE)	28/01/2015
European Motorcyclists Forum	Brussels (BE)	2-3/02/2015
3rd EU-US Transportation Research Symposium on "Road Vehicle Automation"	Washington (USA)	14-15/04/2015

1.3. Internal reviews and analysis

In parallel with these 360° collection and review processes, the project team also performed a few internal analyses of the information collected. These included

- D1/D8 - A comparison of PTW safety policies and stakeholders' priorities (Annex 14)
- D1/D9 - A detailed analysis of main EU research outcomes regarding PTW safety (Annex 21)
- D1 - A detailed comparison of today's licence access schemes in Member States including minimum age, training and testing requirements) (Deliverable 1)
- D1 - A qualitative analysis of the answers provided by riders on the new Riding Licencing scheme (Annex 2)
- D2 - A summary of the findings of in-depth PTW accident causation studies (Annex 17)
- D2 - An overview of variables collected per country in public motorcycling statistics and the identification of missing data or needs for harmonizing data (Deliverable 2)
- D2/D4 - A review of the CARE initiative and related CADaS protocol (Annex 17)
- D3 - A comparison of national PTW safety guidelines for road design (Annex 8)
- D3 - The design of a black spot report form to be used by the PTW riding community
- D4 - The comparison of 9 accident report forms from 9 Member States (Annex 20)
- D6 - An overview of the EU policy and research framework on ITS and transportation (Deliverable 6)
- D6 - An overview and classification of ITS developments for motorcycling (Deliverable 6)
- D6 - An analysis of close to 200 descriptions of the difference between riding and driving with regard to ITS development and training aspects (Annex 15)
- D6 - A comparison and structuring of ITS research priorities for PTW safety identified by different expert discussion platforms (Deliverable 6)
- D6 – An analysis of EU riders' priority rating of ITS systems/functions for PTWs (Annex 3)
- D7 - An analysis of the motorcycling community's subjective evaluation of a representative sample of national awareness campaigns aiming at tackling motorcycle safety issues (Deliverable 7)
- D7 - A compilation of PTW-safety-related awareness campaigns in Europe (Annex 10)

- D8 – A comparison of existing national strategies with regard to PTW safety (Annex 9)
- D8 – A preliminary perspective on PTW safety relevance of existing Safety Performance Indicators (Annex 18)
- Overall analysis of Member States' feedback (Annex 4)
- Overall analysis of the motorcycling community's feedback (Annex 5)
- Overall analysis of EU stakeholders' feedback (Annex 6)

Finally, the project reported on **Key Challenges** for each safety areas, before writing **Conclusions.**

Based on these inputs and a comprehensive review of needs, the project team finally compiled a list of **Recommendations** and priority actions for European and national levels.

The project report structure and content was finally reviewed by the **project Expert Group**, made up of representatives from:

- CIECA for Deliverable 1 on *training, testing and licencing*;
- NTUA for Deliverable 2 on *data collection, statistics*;
- FEHRL for Deliverable 3 on *infrastructur*e;
- Mutuelle des Motards for Deliverable 4 on *accident reporting;*
- IFSTTAR for Deliverable 5 on *research:*
- VTT for Deliverable 6 on *traffic management and ITS;*
- Local Transport Projects UK for Deliverable 7 on *awareness campaigns;*
- the Dutch Ministry for Infrastructure and the Environment for Deliverable 8 on *national strategies*.

Detailed outcomes can be read in the following deliverables:

Deliverable 1 on *Training, Testing and Licencing*

Deliverable 2 on *Data Collection and Statistics*

Deliverable 3 on *Infrastructure*

Deliverable 4 on *Accident Reporting*

Deliverable 5 on *Research*

Deliverable 6 on *Traffic Management and ITS*

Deliverable 7 on *Awareness Campaigns*

Deliverable 8 on *National Strategies*

Deliverable 9 on *the European Motorcycling Community in Europe*

Project recommendations are listed separately in the report on *Needs for Policy Action*.

The project also collected relevant information from each EU country covered. **Country Fact Sheets** on PTW safety information are available for the following countries:


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_austria.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_belgium.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_bulgaria.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_cyprus.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_czech_republic.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_denmark.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_estonia.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_finland.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_france.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_germany.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_greece.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_hungary.pdf


http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_ireland.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_italy.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_latvia.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_malta.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_netherlands.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_norway.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_poland.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_portugal.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_romania.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_slovakia.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_slovenia.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_spain.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_sweden.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_switzerland.pdf

 http://www.fema-online.eu/riderscan/IMG/pdf/fact_sheet_-_united_kingdom.pdf

2. PTW SAFETY KEY CHALLENGES

2.1. Improving PTW Safety Knowledge

In its upcoming report on PTW safety due for release in 2015[1], the OECD/ITF states: *Additional research is needed to better understand current challenges related to PTW mobility and safety problems. Operational research and development is needed to achieve a traffic system which better integrates and protects PTWs in a cost efficient manner. A co-ordinated and concerted cooperation between a variety of disciplines (e.g. civil and mechanical engineers, economists, educationalists, psychologists, transport planners, lawyers etc.) is key to the development of a consistent set of measures to address real issues regarding the safety of PTW riders*

This backs up the priorities identified in 2008, when the first international workshop on PTW safety[2] concluded that

- *Counter-measures need to be based on scientific research into driver and rider behaviour and before-and-after evaluations should be conducted*.
- *Where proposed counter-measures are not based on objective research, but are supported by all stakeholders, policy makers should test and evaluate the proposal in a pilot scheme*
- *Enhanced awareness of motorcycles should be incorporated into the development of all vehicle ITS projects.*

• Collecting relevant data for improving PTW safety

As highlighted by DACOTA, **aggregate road safety data** concern **road accident data**, **risk exposure data** and **road safety performance indicators**, but also **causation indicators** (as those resulting from in-depth data) and **health indicators** (as those resulting from epidemiological data). These indicators, combined with additional information on other important road safety aspects such as those related to behavioural, social and political aspects, enable work on an integrated approach.

Supporting road safety decision-making requires having quantitative information on **road users' attitudes and behaviour**, on **road safety measures** implemented, **rules and programmes** (including enforcement), and on their **social costs and benefits**.

As regards PTW use and safety aspects,

- none of these data and other statistical elements have yet been properly designed and accepted at international level to enable proper benchmarking between countries.
- Since the first pan-European in-depth study on PTW accidents (MAIDS, 2004), data collection has expanded and several countries have undertaken in-depth studies to gain a

[1] IMPROVED SAFETY FOR MOTORCYCLES, SCOOTERS AND MOPEDS © OECD 2014 (to be published)
[2] http://www.internationaltransportforum.org/jtrc/safety/Lillehammer2008/lillehammer08.html

better understanding of PTW accident causation factors. However, often due to the **lack of exposure data** and **methodological differences**, the information collected is difficult to use for policymaking and further research.

- The analysis of **fatality or injury numbers**, though indicative of trends, is not sufficient to understand **accident causation factors** and **relative risk levels**. Collecting and analysing reliable exposure data is indispensable.

In 2002, the OECD Road Transport Research Programme developed a common methodology to collect on-the-scene detailed data from motorcycle accidents. Unfortunately, as underlined by numerous research projects investigating EU and national accident databases, in-depth data collection methodologies still widely vary from one country to another.

The private iGLAD initiative is also an interesting way forward to be considered. IRTAD work is of course to be included in the overall effort to guarantee a sustainable approach to data collection in the field of road safety.

- ## Reporting on PTW accidents

It appears quite clear that, while everyone agrees that accident details are key to gaining a better understanding of accident causation factors and designing adequate countermeasures, the overall challenge remains to find acceptable ways to harmonize the information-collecting process, not the least because the primary task of those in charge of filling in accident reports, i.e. police officers, is to first manage the accident consequences and protect human lives.

Nevertheless, several things can be done to progressively harmonize accident data collection, enable European comparisons, and define sound road safety strategies for the different transport modes. These include

- **fostering the use of the CADaS protocol at national level** to have comparable data throughout Europe,
- proposing **harmonized age brackets.**

For PTW-specific accident reporting, there is a need to

- complete the CADaS protocol with specific **data related to accidents involving PTWs**, such as environmental aspects or vehicle details;
- propose and include a **common classification of the types of PTW**;
- identify the (obvious) **share of responsibility** per road user involved in an accident.

In order to evaluate the correct exposure rate to identified accident-related risk factors, it is also necessary to

- propose a harmonised way of measuring the **number of PTWs on the road**;
- identify and propose common categories for the **type/frequency/motivation of vehicle use**;

More specifically on *accident report forms*, it is advisable to:

- harmonise **formats** and **headings**;
- propose a harmonised **classification of vehicles involved in an accident**
- include **GPS coordinates** for the accident location
- include the following information for each vehicle involved in the accident:
    - Point of impact (front left, front right, etc.)
    - The angle of impact (0°, 45°, 90°, 135°…360°)
    - Impact severity (light, medium, hard)
- include **pictures** of the **scene** and the **damage to each vehicle** involved.

• Dedicated research tackling PTW safety challenges

Today, research needs are so acute that what is needed is a strategic approach to PTW safety research. Without such a strategic plan, there is a high risk that public money will be spent on already investigated areas, while forgetting critical fundamental aspects or other specific research needs.

As stated in the OECD/ITF Report on Motorcycle Safety (2015, to be published)[3], i.e. a safe system approach aimed at preventing accidents and mitigating them when they happen. With this in mind, Rijnaerts and van der Valk's model[4] is a very convenient model to base a strategic approach on:

Looking at the model, the key research focuses are clear:

1. to find ways of keeping riders (all types, all vehicles) outside the **orange** and **red** phases, and find solutions to help them to remain in the **green** phase;
2. train the rider to anticipate the **orange** and **red** phases;
3. protect the rider and passenger when the **red** phase unfortunately happens

To this end:

[3] IMPROVED SAFETY FOR MOTORCYCLES, SCOOTERS AND MOPEDS © OECD 2014 (to be published)
[4] Safety Aspects of Powered Two Wheelers, Problems – Solutions - Van Der Valk, K., Rijnaerts, W.

- *Fundamental research* is needed to define **riding models** and understand the related **risk patterns** and the role of **risk awareness** and anticipation to avoid road conflicts potentially leading to accidents;
    - More **in-depth investigations** and **naturalistic riding studies** will allow a better understanding of fatal and serious injury **crash patterns and causes**.
    - Rider visibility and other **perception problems** deserve further study in order to identify key contributing factors and effective countermeasures

- *Active safety work* is needed as **emergency manoeuvres**, which take place in the **orange** phase, should enable riders to reach a perfect emergency stop or –swerve. In-depth accident data show that these manoeuvres are often poorly performed. The model authors' believe that there are 3 groups of causes for this failure:
    - primitive **reaction of fear** which prevents riders from taking action; this survival reflex takes command of the riders' thinking and acting.
    - the **dynamic properties of the single track vehicle** and its relation with the surrounding environment;
    - the **level of vehicle control** of the average PTW rider

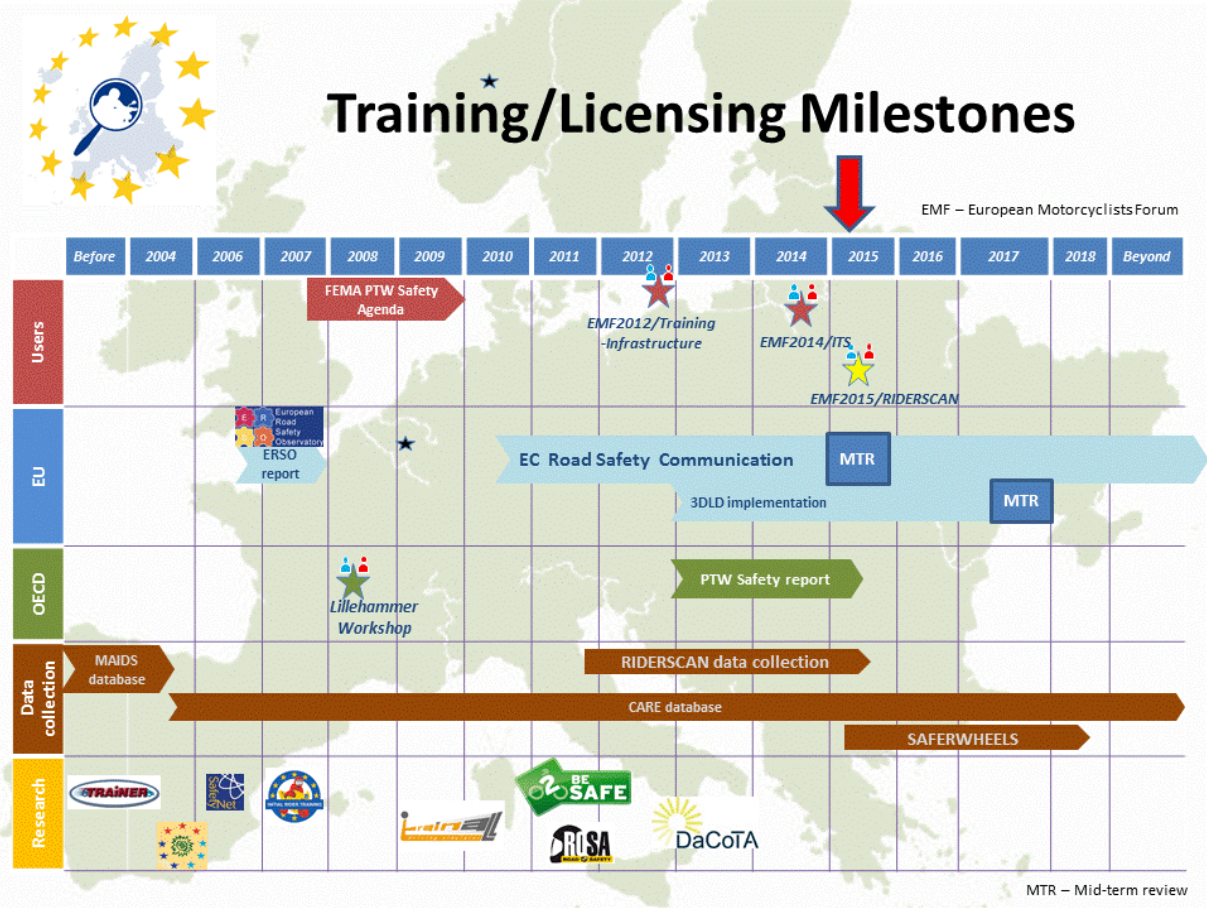
  Priority research action would therefore include
    - the understanding and identification of PTW **safety critical events**
    - **which and how information is processed** by the rider,
    - identification of **mental failures**, in order to find appropriate measures to address these risks

- *Passive safety work*: once in the **red** phase, PTW riders suffer relatively severe injuries or worse, because of the lack of **passive safety features**;

  Priority research work should focus on
    - developing passive systems which mitigate the consequences of an accident
    - Development and implementation of safety equipment adapted to countries with hot weather
- Finally, research work will require **accurate exposure data**, for which relevant methods, tools and indicators need to be developed and used to measure PTWs in traffic flows and analyse their mobility and behaviour

2.2. Improving access to PTWs

Since the first pan-European in-depth study on PTW accident (MAIDS, 2004), several PTW access milestones have been achieved, namely training and licencing.



Since then, several EU research projects have investigated a number of human factor aspects and their potential relation to training and licencing, including the work undertaken within the 2BESAFE[5] project (2011) which describes the *requirements of the riding task every rider has to tackle, in particular, risk awareness*, and concludes that *there is need to improve motorcycling training, with more specific targeting of new (or returning) leisure riders, but there is also potential for improving the training of car drivers or developing campaigns that focus on the responsibility of the driver to actively search for motorcyclists*.

- **Giving sense to progessive access**

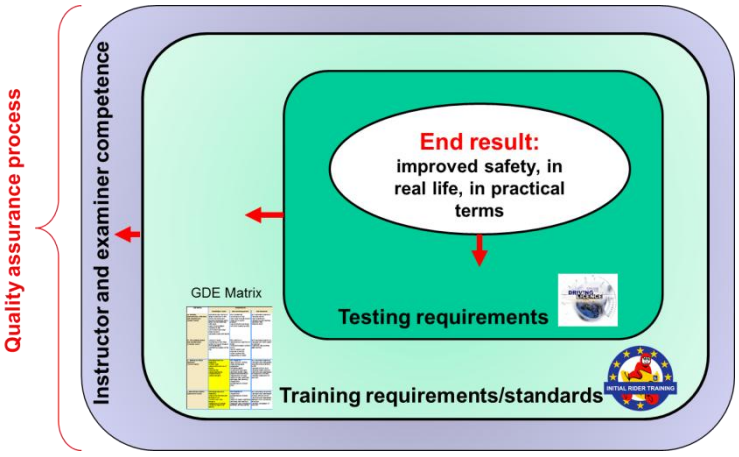
The "3rd Driving Licence Directive" was adopted by Europe in 2006. However, due to the freedom left to Member States to set up their own access scheme, the Directive has made PTW access in Europe more expensive and more complex in the vast majority of EU Member States, while leaving aside the critical issue of training content. This has created a real schism between the motorcycling community and road authorities.

[5] http://www.2besafe.eu/

According to ACEM, the minimum requirements for training are not justified and are counter-productive. Another point is that while the Directive seeks to encourage progressive access, the way it is implemented by Member States leads to the opposite effect and to additional cost, with the result that people wait much longer to take a test, and maybe start with a much bigger motorbike, which is not what was intended. It would be a good idea to look at this in a more pragmatic way.

- **The testing paradigm & instructors' training**

The pre-licence training curriculum (PLTC) should aim at teaching the necessary knowledge, skills and mental attitude to ride defensively, in full awareness of risk exposure and accident causation factors, and not simply at passing the licencing test.



The licence test should instead be a quality assurance of the candidate's competence - meaning the minimum skills, knowledge and attitude needed to safely operate a motorcycle on public roads. To this end, Category A training instructors and examiners should be experienced riders accredited by national certification programmes.

In 2008, the first international workshop on PTW safety was held in Lillehammer, hosted by the Norwegian Ministry of Transport. This identified the need for training to focus on risk awareness as the top priority for improving PTW safety. Acknowledging the variety of training programmes based on *countries' vehicle fleet and training resources,* workshop participants concluded that *motorcycle training should therefore build on existing standards, focus on risk awareness and risk avoidance, and develop an understanding of the rider/motorcycle capacities and limitations.*

This is confirmed by the OECD/ITF Motorcycle Safety Report (2015, to be published) which underlines the need for training to *not only focus on basic manoeuvring skills and mastering traffic situations, but also address attitudes towards safety.* The report also highlights the need for *other road users [to] be made aware of the specific risks associated with PTWs vulnerability and crash patterns.*

Today's EU regulatory framework only briefly describes the content of testing. Finding an adequate system enabling access to PTWs, while ensuring that novice riders & drivers have the skills, knowledge and attitudes needed to safely operate the vehicle chosen on public roads, is one of the critical issues needing to be addressed by Europe today.

- **Training content**

The EU co-financed Initial Rider Training project came up with the first complete initial rider training programme in 2007 designed from a European perspective. Highly experienced instructors, supported by academics, designed a training programme applicable in a modular way (to better match 3DLD requirements). This included the design of tailored courses, such as those for so-called *returning riders*. However, apart from Ireland, it has not yet been used as a reference for shaping national training curricula.

Therefore,

- with the objective of reducing novice/returning riders' risk exposure, there is a need to:
  - **make use of new technologies** to develop new simulation techniques and open up new opportunities for training programmes;
  - **standardize minimum training curriculum requirements** and linking driving licence tests to this standard would significantly improve the quality of rider training programmes (need for a "quality seal");
  - **encourage safe riding behaviour**: the type of bike chosen by riders provides a clear indication of their motives, the experience they seek and their concept of riding (when they can choose the bike). One implication is that **persuasive communications**, tailored to the motivational requirements of the average rider of each motorcycle type, could be provided when buying a motorcycle in an attempt to encourage safe riding behaviour.
- with the objective of encouraging progressive access, there is a need to:
  - **evaluate the effects of the various age limits on progressive access** to ride a class I moped in EU Member States is a necessary step in the overall evaluation of 3DLD safety benefits;
  - **research** how the skills trained in riding schools (e.g. manoeuvring skills, braking skills, being aware of high-risk situations) are effectively learned and used in real traffic situations, would help to find effective ways to improve young riders/drivers training programmes, and identify specific training needs according to experience and vehicle;
  - **address training content / instructors' competence in a legislative framework** becomes an essential complement to the 3rd Driving Licence Directive (for PTWs);

2.3. Ensuring a safer Road Environment

The general influence of road and surrounding traffic on the driving speed, level of vigilance, attention paid, accident severity is a well-known fact. Where an environmental perturbation can be managed by a car driver, it can be a real challenge for a PTW rider.

- **The infrastructure**

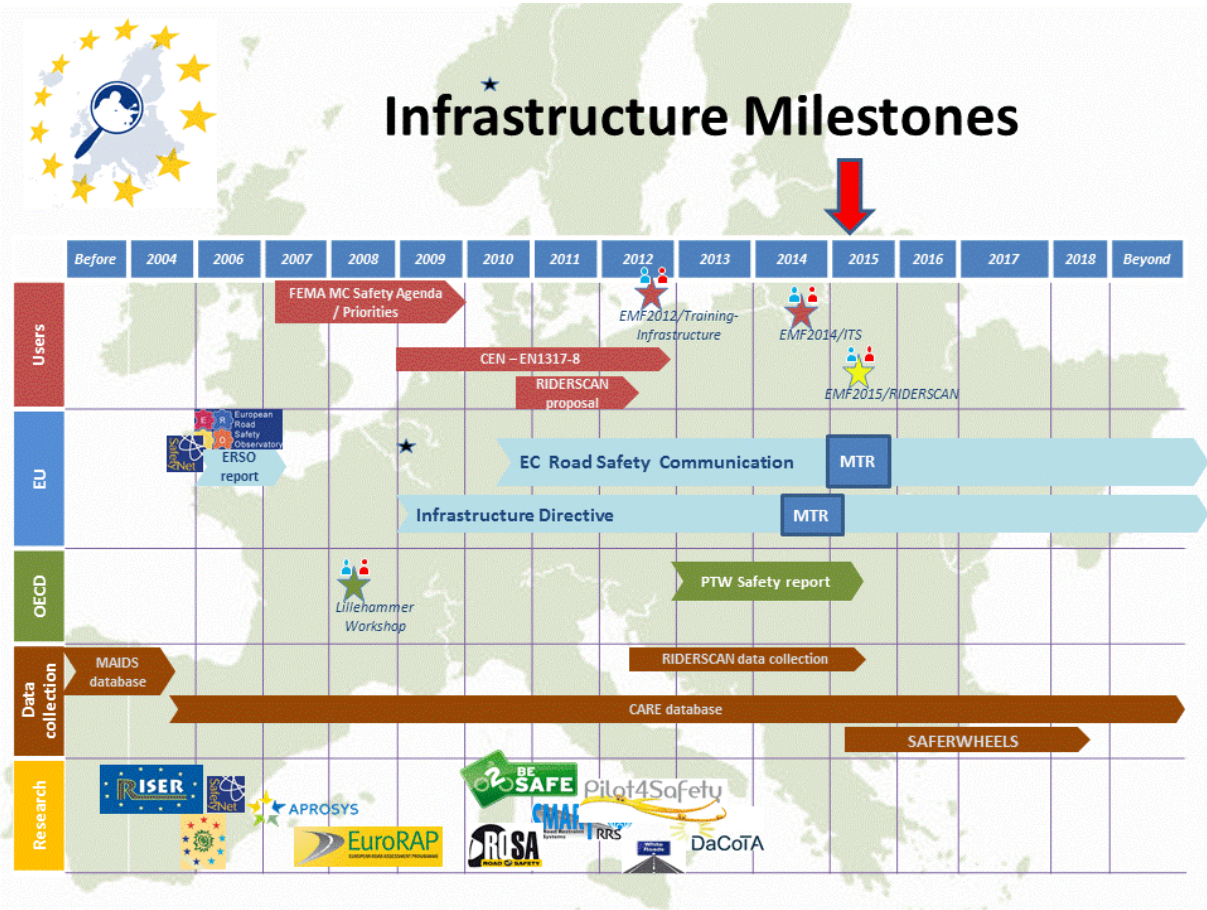
PTW riders are more sensitive to road design and maintenance than car drivers. The design of roadway elements influences how a road user interacts with the roadway. These elements include bends, junctions, the road surface and the roadside.

Figure 2 PTW/Infrastructure basic needs

With regard to infrastructure, the first international workshop on PTW safety[6] in 2008 concluded that:

- *It was a fundamental safety requirement that motorcycles should have a place in overall transport policy and infrastructure policy/management.*
- *Each level of government should include measures in their infrastructure guidelines for accommodating motorcycles, developed with input from relevant stakeholders. The guidelines should be relevant to the needs of the jurisdiction concerned, and coordinated with other jurisdictions and levels of government. An international transfer of best practices was also recommended.*
- *The needs of motorcyclists should be included in the basic training for road designers as well as highway and traffic engineers.*
- *Identification and resolution of roadway design problems (e.g. accident black spots & "corridor" analysis) should include input from rider organizations & relevant experts.*

[6] http://www.internationaltransportforum.org/jtrc/safety/Lillehammer2008/lillehammer08.html



In 2015, the OECD/ITF Motorcycle safety report[7] (to be published) further underlines that:

- *Infrastructure is essentially thought for cars*
- *Infrastructure should be improved to better integrate PTWs, taking into consideration the wide variety of users and the large speed differential at intersections;*
- *There is a clear problem of infrastructure maintenance (potholes, debris ..), to which PTWs are very sensitive*
- *With the development of self-explaining roads and appropriate traffic calming measures and PTW friendly equipment ("forgiving" roads)*
- *In some case, the use of dedicated lanes* should be considered

Since the first pan-European in-depth study on PTW accidents (MAIDS, 2004), several important milestones have been reached as regards PTWs and infrastructure needs:

- A number of guidelines on how to design and maintain roads with PTWs in mind have been published.

However, most of them remain just good intentions and are hardly used by local authorities and road engineers

- The "Infrastructure Directive" [8] has been adopted by Europe;

[7] IMPROVED SAFETY FOR MOTORCYCLES, SCOOTERS AND MOPEDS © OECD 2015 (to be published)

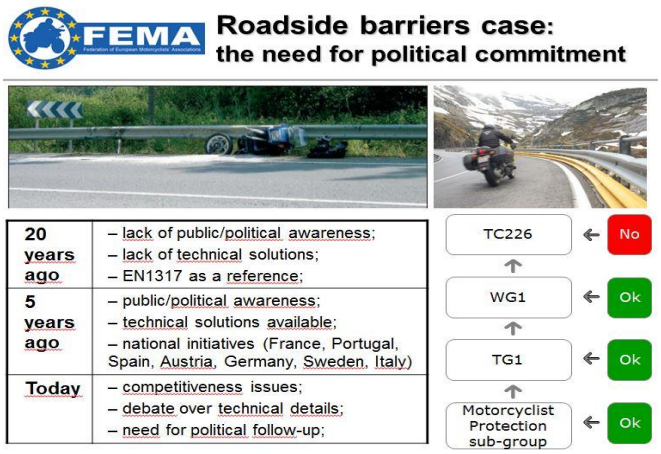
However, the Directive has hardly been used by road authorities to improve PTW safety and does not apply to the road network responsible for the largest number of PTW accidents, namely secondary roads.

- EuroRAP has included some PTW features in its star-rating system.

But not all EU countries use either the EURORAP star-rating system or other road assessment programmes

- The CEN/TC226 has adopted a technical specification for Motorcycle Protective Systems

However, the CEN/TS1317-8 is still only a non-binding technical specification, despite years of campaigning. TS1317-8 should fully integrate EN1317, the European standard applied by all Member States in their national standards, and be included in their national road design guidelines.



The need for political commitment

Without a clear political commitment to tackle infrastructure issues, market competition will play a delaying role deterring improvements. The example of EN1317 on roadside barriers (guardrails) and protection for PTWs is illustrative of the necessary time it takes for a standard to evolve without the involvement of public authorities.

Disseminating the information

Disseminating correct information, making road authorities, planners and engineers aware of the problems on the one hand and existing solutions on the other hand, is another challenge that Europe should consider tackling.

Using riders' community to identify road hazards (black spots) (Annex 16])

Several initiatives, including the actual writing of PTW/Infrastructure guidelines in some cases, have directly leveraged rider community expertise. These initiatives have been praised on several occasions by road authorities as they enable them to increase the efficiency of their actions.

Examples of such initiatives can be found here:

- Cross Sectorial collaboration in Germany
- Taking into account powered two wheelers in road infrastructure design in France

[8] European Directive 2008/96/EC

New technologies and smart applications are providing new opportunities to involve the rider community in identifying black spots in support of local road authorities' efforts to improve the road network.

To this end, the project worked at designing a ***pan-European road hazard report form***, which could support local initiatives while at the same time contributing to a common understanding of road hazard problems. The questionnaire targets everyday riders.

Research needs (Annex 6, Annex 14):

PTWs have certain special characteristics which, according to the research community, directly or indirectly impact road transport research outcomes, whether for the safety of PTW users or road safety in general.

Dedicated consideration is required to gain a better understanding of PTW dynamics and interaction with traffic, and of specific accident causation factors, enabling us to identify risk domains and risk-contributing factors.

With specific regard to the infrastructure, the fact that PTWs are single-track vehicles, without an encapsulating protective shell, means that a rider may have difficulty handling tasks while controlling the vehicle, in particular when cornering or braking and even more so in emergency situations to mitigate or avoid an accident. Even with excellent brakes and tyres, vehicle control in all kinds of situations requires special training and experience or specific riding assistance systems on board the PTW. The single-track character also implies that riders have more difficulty coping with imperfect road surfaces and obstacles on the road.

Among the identified research needs in the field of infrastructure, the research community lists the following:

- **Better understanding of PTW - infrastructure interactions**
  - Improved data collection
  - In-depth understanding of the vehicle-road interaction and its dynamics, including detailed analysis with simulation tools (vehicle-infrastructure interaction simulation)
  - Research on accident scenarios and biomechanics
  - Incorporation of data gathered in naturalistic riding studies
  - Interaction between motorcycle tyres and road surface conditions
- **Safer road design**:
  - Understand the effects of the road environment on road users
  - A more forgiving road environment
  - Making roads self-explaining for PTWs
  - Improve the environment to enhance reciprocal perception of riders and drivers
  - "Friction measuring" research

- Infrastructural measures to reduce speeds (such as humps or lane narrowing) have to be re-evaluated from the point of view of PTW rider safety
- Roadside obstacles need to be designed to provide better protection for PTW riders who may collide with them

Road maintenance:

- Development of more durable roads that are easier to maintain in a good state
- Development of "holistic asset management solutions"; how to make work zones safe?

Black spot management:

- Research on local accidents and on suitable countermeasures.

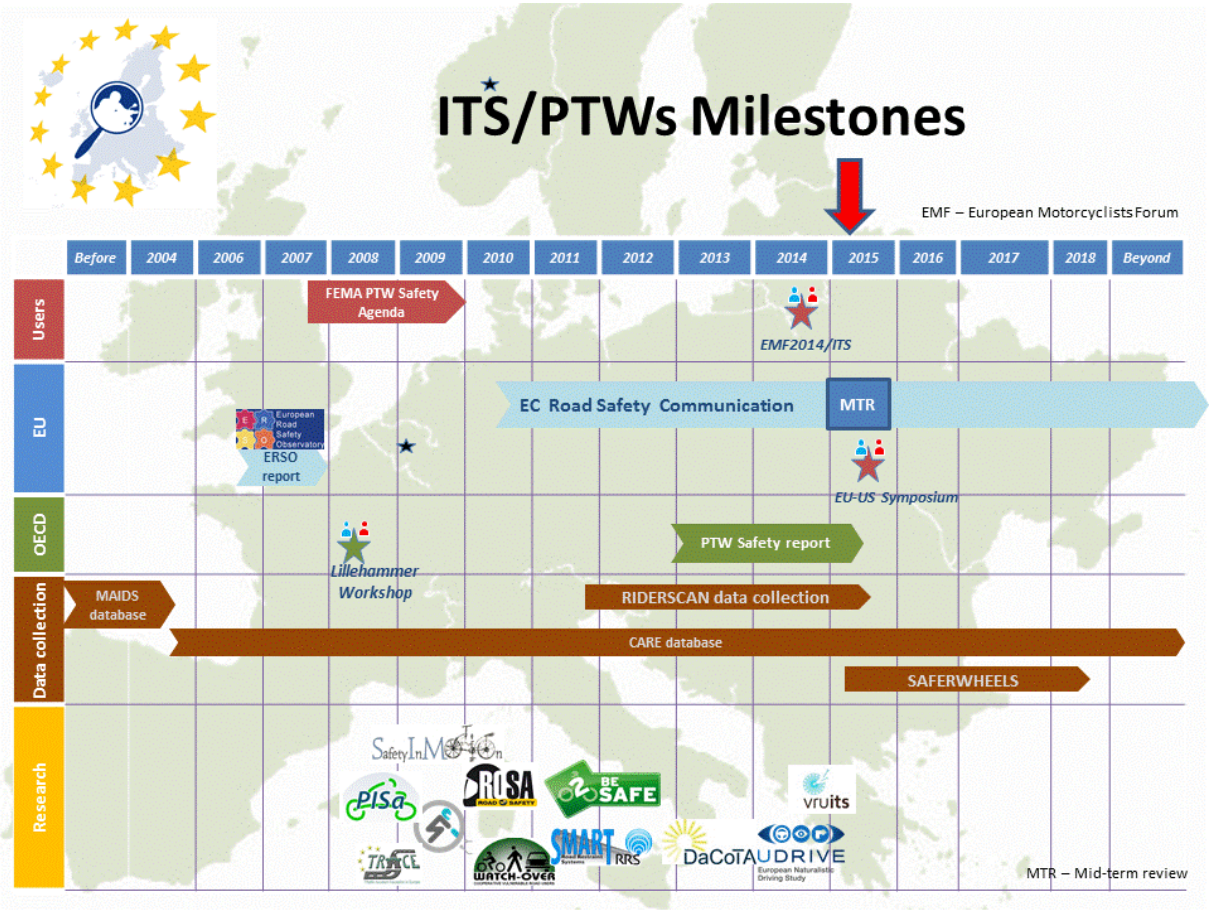
The Automation of the transport system

With regards to ITS, the first international workshop on PTW safety[9] concluded that

- it was *a fundamental motorcycle safety requirement that, by default, PTWs should have a place in overall transport policy and infrastructure policy/management;*
- *Enhanced awareness of motorcycles should be incorporated in the development of all vehicle ITS projects*

This is confirmed by the OECD report on Motorcycle Safety [10]which states: *While Intelligent Transport Systems (ITS) offer opportunities to improve the safety of drivers as well as riders, they require more R&D on their capacity to prevent PTW crashes, as ITS applications for cars are not directly transferable to PTWs. Any ITS application which removes, or interferes with, the longitudinal or lateral control of the vehicle could have adverse effects.*

[9] http://www.internationaltransportforum.org/jtrc/safety/Lillehammer2008/lillehammer08.html
[10] IMPROVED SAFETY FOR MOTORCYCLES, SCOOTERS AND MOPEDS © OECD 2014 (to be published)



The Motorcycling/ITS paradigm: *the skilled rider can manage the situation that the smart rider would never have to encounter*.

PTW Intelligent Vehicle Systems have the potential to improve riders' safety. Indeed, compared to other VRU categories such as pedestrians and cyclists, PTWs are the only category with a permanent on-board electricity supply for powering additional safety functions, applications, features, services and devices. Hence, PTW users can benefit from far more advanced Intelligent Transport Systems (ITS) solutions, applications and services than other VRUs.

However, there are a number of obstacles that will likely lead to a lower coverage and slower uptake compared to passenger cars. Most new PTW safety functions will require major research and developments due to interference issues. The PTW Human Machine Interface (HMI) will require specific design, specification and development in order not to cause/produce any disruptive, endangering, imminent, and multiple media messages, warnings, alarms and/or requests for immediate interaction or reactions while the PTW user is riding and scanning traffic.

Available solutions as well as ongoing R&D have focused on cars and trucks, with only limited applicability to motorcycles, light PTWs, bicycles and pedestrians – in that order. This has to do primarily with technical and practical limitations, notably with regard to the user

interface, available space to install equipment without hindrance to the user, exposure to outside environmental conditions and the lack of a high-quality power source. There are also economic factors: if the bill is to be paid by the road user, the cost of the ITS equipment has to be small compared to the cost of the transport means itself. Manufacturers of motorcycles, light PTW's and bicycles do not have R&D budgets anywhere near those of car manufacturers. As a result, few ITS solutions have been developed that target traffic participants other than the car or truck drivers as the primary user.[11]

A better understanding of the riding activity (tasks, modelling, patterns) and the actual needs and constraints of PTW users is a prerequisite for

- the design of PTW ITS and/or efficient adaptation of car ITS to PTWs;
- the evaluation of their safety impact based on real road practices;
- rider acceptance, and in turn market and industry investment.

Indeed, the most important issue with ARAS in a PTW environment is the HMI; which is lots more than just how and where the SatNav device is attached to the PTW.

The technological challenges are numerous. All these issues are directly related to the very different **riding dynamics and handling** of a PTW compared to a 4-wheeled vehicle. Indeed, the 7 contact points between the rider and the bike - footrests, saddle, tank sides and handlebars – are not all suitable for warning strategies. The clocks (rev & speed) with the traditional (non-time-critical) warning light panels are not suitable either since they are out of sight.

The **timing of warnings** (audio, visual, haptic, tactile) is critical not only due to the desired impact of the warnings but also riding dynamics: (semi-)automatically slowing down a bike in the middle of a curve may cause a non-desired manoeuvre that the rider is unable to control; in a hazardous situation in a curve the safest action instead of decelerating might be to accelerate the bike!

All in all, riders are accustomed to listen to the satnav guidance in the earphones and monitor the oil pressure warning light on the panel. When it comes to a warning via haptic/tactile means this is all new and riders need to be considered as novices. How, when, by which means and by which of those seven contact points the warning should be delivered based on the riding situation is totally vague, whether for the administration or for the industry.

As regards the PTW industry, many OEMs are well prepared for the ARAS challenge (e.g. BMW, Honda, Yamaha; Piaggio only in R&D) but several OEMs have a model range that does not support the introduction of ARAS systems and functionalities; ABS is just not enough. However, in view of the difficult economic context, with a decline in the PTW market in the range of 47% since 2008[12], but also poor research investment on this transport mode, ITS systems development has not taken off as much as in the car segment. **User**

[11] ITS ACTION PLAN / framework contract TREN/G4/FV-2008/475/01
http://ec.europa.eu/transport/themes/its/studies/its_en.htm
[12] "A Global Vision for the Powered Two-Wheeler Market" – ACEM conference 29/01/2014

awareness and acceptance are poor and the willingness to engage in a path seen to be led by car industry researchers and designers does not support rider commitment, contrary to what is witnessed among automobile clubs (e.g. FIA).

Developing ITS for PTWs will require the coordination and support of different stakeholders: authorities, researchers, manufacturers and users. Generally speaking, riders are very safety-minded and want safer infrastructures, safer vehicles and fewer accidents. In view of that, they will adopt new technologies when they are seen to improve the situation for riders and other road users. To this end, rider acceptance will be a key element to consider.

While riders recognise the incredible possibilities of improving road safety, they are probably not ready to accept anything for the sake of novelty. Road safety is a real concern for motorcyclists but ITS raises a number of questions. Key challenges for user acceptance of ITS include liability issues, driver distraction, awareness and training, safety, vulnerable road users, and pan-European solutions. Nevertheless, motorcyclists are interested in new technologies – especially the younger generation. But they also like the freedom to choose the new motorcycles with features like super advanced ABS systems. Choice remains the key.

Research needs with regards to ADAS/IVIS

When looking at accident factors, the data available indicates that the most common type of accident involving motorcyclists is a collision with a passenger car, and in the majority of such cases, the car driver is at fault[13]. With the deployment of ITS solutions, the impact of other vehicles, human behaviour, and training must therefore be studied and integrated into a specific impact assessment of intelligent transport systems.

Moreover, as highlighted by the report on "Safety and comfort of the Vulnerable Road User"[14] commissioned by DG MOVE, assistive and cooperative systems are expected to have a significant impact on the safety of motorcyclists, influencing both PTW and car drivers' perception and decision-making. Hence the safety potential and impact of new cooperative and informative applications for accident avoidance and mitigation needs to be further developed.

The current state-of-the art in ITS has not been subjected to any dedicated impact assessment with regard to its positive or negative consequences for other road users, and accident causation risks are not fully known or understood, in particular with regard to PTW use. Their specific characteristics, including limitations, capabilities, profiles and vulnerabilities, require the development of a specific assessment methodology based on a careful identification of the existing differences to car use.

Assistive and cooperative systems are expected to have a significant impact on the safety of motorcyclists, influencing car drivers' perception and decision-making. With the deployment of ITS solutions, the impact of other vehicles, human behaviour, and training must therefore

[13] MAIDS study, ACEM, 2005
[14] Framework Service Contract TREN/G4/FV-2008/475/01
http://ec.europa.eu/transport/themes/its/studies/doc/2011_05-safety-and-comfort-vulnerable-road-user.pdf

be studied and integrated into a specific impact assessment of intelligent transport systems with regards to PTWs.

Research needs with regards to ARAS/OBIS

Based on the functional logic of Advanced Driver Assistance Systems from CLEPA, it can easily be understood how far PTW research is from the car sector.

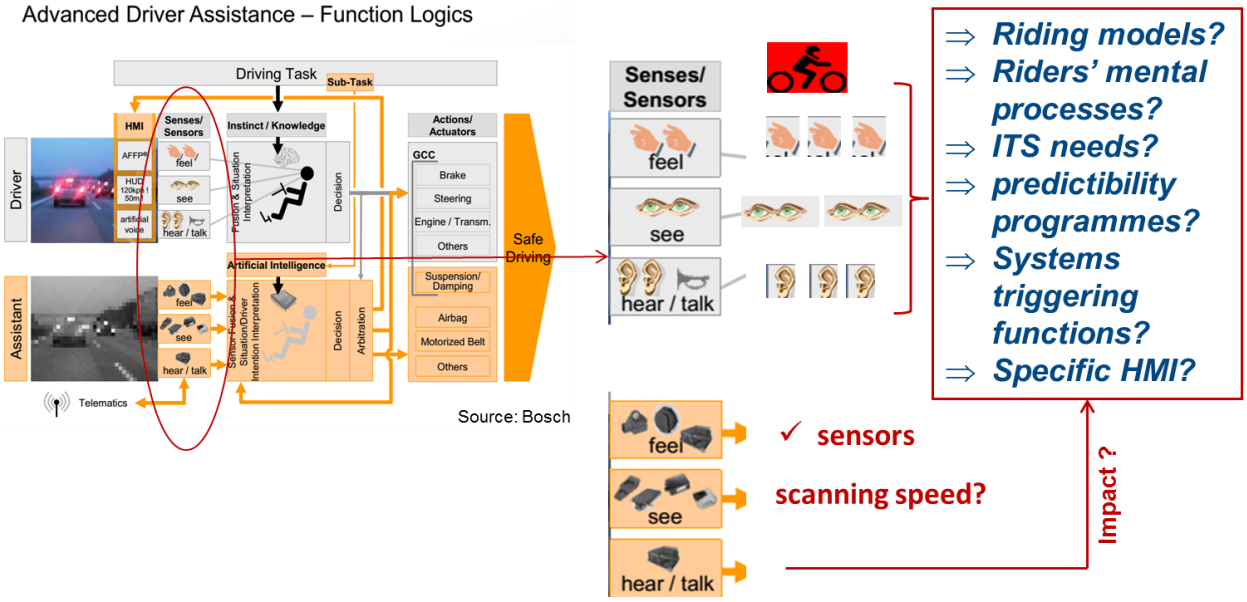


Figure 3 Advanced Driver Assistance - functional logic[15]

The ITS systems identified by the Monash study have been discussed in terms of critical motorcycling safety issues, namely loss-of-control crashes, multiple vehicle crashes, and additional factors such as conspicuity, alcohol and unlicensed riding. While some of these systems address specific safety issues, such as interlocks and alcohol-related crashes, other systems will show comprehensive benefits across a number of crash types. For example, advanced braking systems are relevant to any event where emergency braking is used. Importantly, this is one area of ITS development that has shown a significant amount of development. However to date there are no available studies on the effectiveness of the systems identified, with the exception of DRLs. In addition to technical development, future research should address issues such as acceptability, usability, negative behavioural adaptation, and further in-depth analysis of crash causal factors such as distraction[16].

[15] Stakeholders meeting on the deployment of ITS and vehicle technologies to improve road safety – Brussels 8/3/2013 http://ec.europa.eu/transport/road_safety/pdf/stake_8_3_2013/session_2_thomas_lich_and_dr_peter_e_rieth.pdf

[16] INTELLIGENT TRANSPORT SYSTEMS AND MOTORCYCLE SAFETY, Bayly et al., 2007 - http://www-nrd.nhtsa.dot.gov/pdf/esv/esv20/07-0301-O.pdf

2.4. Safety awareness campaigns

In 2008, the Lillehammer Workshop[17] highlighted the need to

- *Get safety messages to the riders: Safety messages to riders should be developed in partnership with rider groups, in order to use the effectiveness of peer advice in communicating key issues to riders on issues that will impact their communities (priority n°6);*
- *Develop integrated awareness campaigns, which should be regular, targeted campaigns addressing both motorcyclists and other road users, where necessary supported by other action (e.g. enforcement), on safety-related subjects;(Priority 7)*
- *Portray responsible riding: Codes of practice should be developed in order to promote and market motorcycling responsibly; the motorcycling press and rider organisations should also promote responsible behaviour codes. (Priority 9)*
- *To develop an awareness of PTWs and mutual respect between road users, education activities and campaigns should be set up from childhood, to emphasize that "road safety means road sharing". (Priority 10)*

The OECD/ITF Motorcycle Safety Report (2015, to be published)[18] which further underlines that, although it is acknowledged that there is *little research evidence on communication campaign effectiveness, it is assumed that the media can*

- *positively influence attitudes and behaviours;*
- *provide information*
- *increase the acceptability of safety measures*

The CAST project, backed up by the comments of one of its authors, referred to the previously identified need to have a better understanding of pan-European problems, hence the need for accurate data, before putting forward pan-European campaigns on specific accident causation factors.

However, as safety awareness can take different form and involve different stakeholders, work heading in the right direction can already be started. This includes:

- campaigns aiming at **increasing mutual recognition and acceptance** on the road.
- the identification of a **general baseline for European awareness campaigns for PTWs**, to be further adapted in line with national/regional/local PTW safety patterns;
- **Reaching riders in PTW dealerships**, as the type of bike chosen by riders provides clear information on their motives, the experience they seek and their concept of riding (when they can choose the bike). Such persuasive communications, tailored to

[17] http://www.internationaltransportforum.org/jtrc/safety/Lillehammer2008/lillehammer08.html
[18] IMPROVED SAFETY FOR MOTORCYCLES, SCOOTERS AND MOPEDS © OECD 2014 (to be published)

the motivational requirements of the average rider of each motorcycle type, could be provided when buying a motorcycle in an attempt to encourage safe riding behaviour;

- further research on **risk definition, identification, awareness** and **assessment** considering different mobility patterns and riding styles in Europe (focusing on specific rider groups at greater risk such as novice or returning riders) would enhance knowledge not only for the design of robust awareness campaigns, but also for hazard perception training purposes and ITS development;

  Such a study would also investigate the influence of cultural differences between European countries on road safety: behaviour, perceptions, attitudes, beliefs of road users; understand the link between different social factors (age, alcohol, riding in groups) and behaviour.

- Complementary studies should include research on:
  - **Other Vehicle drivers' perception failures,** road user distraction, and ways to increase VRU awareness (including PTWs);
  - **Behaviour in traffic**: to better understand all road users' behavioural patterns and their interaction (with and without technology involved); testing of: long-term analysis of rider behaviour in traffic; measures to improve the behaviour of all road users;
  - **Extreme behaviour**: understand the causes of extreme behaviour and design effective measures to reduce it; identify the specific group of motorcyclists showing extreme behaviour and find means to reach them;
  - **Protective equipment**: develop and test personal safety equipment.

2.5. Designing a Safe System also for PTWs

In 2008, the Lillehammer Workshop[19] highlighted the need for road authorities and policymakers to

- *Integrate by default motorcycle safety requirements in overall transport policy and infrastructure policy/ management. (Priority 2)*
- *Base countermeasures on scientific research into driver and rider behaviour and before-and-after evaluations (priority 3)*
- *Meet with motorcycle stakeholders to enable communication and build mutual confidence (e.g. forums, councils,) in order to exchange views, discuss needs and secure the necessary financing\resources for safety counter measures. (priority 13)*

This is confirmed by the OECD/ITF Motorcycle Safety Report (2015, to be published) which further highlights the need to

[19] http://www.internationaltransportforum.org/jtrc/safety/Lillehammer2008/lillehammer08.html

– *Address PTW safety from a safe system approach (**prevent** errors and **protect** the users from their consequences)*

– *Design a toolbox of measures addressing specific PTW needs*

– *Further work on PTW conspicuity (through lighting and electronic detectability)*

– *Improve infrastructure to better integrate PTW-specific needs (self-explaining and forgiving roads)*

– *Involve all relevant stakeholders in drawing up and implementing a shared road safety strategy*

As PTW riders have specificities not shared by other road users, it is essential to know these in order to take them into account. Specific measures are necessary to enhance PTW riders' safety. Moreover, measures designed for other road users should also consider the specific characteristics and vulnerability of PTWs and their riders.

Several approaches to PTW safety can be considered when drafting road safety strategies:

– *Designing a specific approach* => PTW Safety Action Plans/Strategies. PTW users' specific needs are well considered. But there is a possible side effect: the effectiveness of the plan is reduced by the existence of multiple road safety plans.

– *Including a specific section on motorcyclists and moped riders within the overall road safety strategy*. The specificities of PTW riders are recognised and measures can be specifically designed. But it is essential to not lose track of these when designing measures for other road users.

– *Integrating PTW users' needs within all sections*. This method has the advantage of comprehensively including PTW users in the mobility scheme and keeping their presence on the road in mind. Nevertheless, attention must be paid to not ignore the fact that PTW riders are a particular group of road users with their own vulnerability and needs.

Regarding the content of the strategy itself, actions and measures should be chosen and designed depending on the road safety issues identified nationally/regionally/locally. There is no one-size-fits-all solution, and the problems faced by Member States will greatly depend on cultural and mobility patterns.

While the majority of the measures will require a strategy tailored to national circumstances, there are some areas where Europe has a role to play:

- Design appropriate **frameworks** (e.g. licencing, training, awareness campaigns) that can be then tailored to national circumstances;
- Make sure PTWs are fully and adequately **integrated in all European transport policy papers** (e.g. White Paper on Transport Policy, ITS directive, etc…);

- Support **standardization work** and efforts (e.g. infrastructure) that rightly integrate PTW needs and requirements:
    - infrastructure
    - definitions of injuries;
    - protective clothes
    - conspicuity
    - safety management
    - etc.
- **Increase knowledge**:
    - fundamental research leading to proposals for potentially successful PTW road safety measures: riders' needs, their characteristics (riding behaviour, cognitive performance, mentality, acceptance, motives, mobility needs, etc), their interaction with the elements comprising the road network (other road users, the road environment and their PTW)
    - in-depth accident and naturalistic studies to better understand accidents that happened on the road and to design effective and coherent measures to tackle the different safety issues;
    - risk perception and risk assessment work
- Develop road safety management tools designed for PTW safety:
    - common **impact assessment** and **cost-benefit analysis methodologies** to evaluate the impact of safety concepts (design better evaluation and better cost-benefit analyses of safety measures and their effects)
    - identify **relevant safety performance indicators** based on an understanding of PTW riding models, risk patterns, and accident causation factors;
- **Enhance stakeholders' dialogue**; the European Union could provide added value by stimulating positive national debates on PTW safety, fostering dialogue between the motorcycling community and national road authorities;
- **Benchmark** national strategies and specific road safety actions targeting PTW safety; **sharing of best practices**;
- Develop awareness-raising campaigns based on shared values and topics easily adaptable at national level.

3. PROJECT CONCLUSIONS

On training, testing and licensing (deliverable 1)

Answering EU citizens' day-to-day mobility needs is one of Europe's key objectives. Based on EU equality principles, in times where alternative mobility and co-modality solutions are being greatly encouraged to ease congestion on European roads, priority should be given to allowing every citizen to choose his/her form of transport based on his/her mobility needs.

Due to the intrinsic characteristics of PTWs, designing an acceptable access scheme promoting the development of experience is a prerequisite for improving PTW safety. To this end, it is important that PTW training and licencing schemes be economically accessible (in comparison with other individual forms of road transport) and provide the necessary training content for minimizing risk exposure once on the road.

While the present EU regulatory framework's positive effects on motorcycle safety is at best not yet documented, it has for sure increased both the complexity and the cost of existing training and licencing schemes, leading to a significant drop of newly-licenced riders in several EU Member States.

As one of the main strategic objectives of the European Commission Road Safety plans is to improve drivers' training, the mid-term review of the *EC Communication on Road Safety 2011-2020* is an opportunity to address the PTW training and licencing challenges, including the establishment of an overall European training framework.

On data collection and statistics (deliverable 2)

In 2008, hosted by the Norwegian Ministry of Transport, the first international workshop on PTW safety took place. Following 2 days of discussions with one hundred safety and PTW experts, the workshop came up with a top-20 list of recommendations to improve PTW safety, including the need to *enhance research and evaluation of appropriate countermeasures*.

In 2015, the OECD/ITF Motorcycle safety report[20] (to be published) further highlights the need *to develop and apply relevant methods, tools and indicators to measure PTWs in traffic flows and analyse their mobility and behaviour (exposure data),* completing this recommendation with the statement that *more in-depth investigations will allow a better understanding of fatal and serious injury crash patterns and causes*.

Aware of the need for more reliable data in general, the European Commission has already financed several projects and taken the initiative to address this issue, but projects are not enough and there is a major need to encourage Member States to join the effort. To this end, the mid-term review of the *EC Communication on Road Safety 2011-2020* is an opportunity to work at:

[20] IMPROVED SAFETY FOR MOTORCYCLES, SCOOTERS AND MOPEDS © OECD 2014 (to be published)

- harmonising data collection methodologies
- engaging in naturalistic riding studies, to collect information on **exposure** and **users' attitudes and behaviour**, **road safety measures** implemented, **rules and programmes**, and their **social costs and benefits**

On infrastructure (deliverable 3)

Today, one can say that with regard to infrastructure and PTW safety, all necessary preliminary steps have been taken, and all relevant experts agree on the need to better integrate PTW needs into road design, maintenance, and auditing/inspection. The necessary information and expertise is available in Europe. It is now a question of putting it all together, starting with the information collected within the project.

As one of the main strategic objectives of the European Commission Road Safety plans is to *better adapt road infrastructure to PTWs*. The mid-term review of the EC Communication on Road Safety 2011-2020[21] is thus an opportunity to address the challenge, making use of the recommendations drawn up by the various experts, including the need to review existing EN standards to better include PTW requirements.

On accident reporting (deliverable 4)

As highlighted by the 2BESAFE project, research and data acquisition are not an end in itself; they are a necessary prerequisite for developing and implementing effective and efficient road safety countermeasures.

Acquisition of additional and better data on PTW accidents, mobility and other issues should therefore receive top priority at European level.

As underlined by the OECD/ITF working group on motorcycle safety, there is a critical need to *improve the knowledge on PTW mobility and crash mechanisms*. WG members further underline the need to *develop and apply relevant methods, tools and indicators to measure PTWs in traffic flows and analyse their mobility and behaviour (exposure data)*.

Improving accident reporting methods and content will undoubtedly improve this knowledge and contribute to a better understanding of PTW crash mechanisms, leading to effective crash prevention measures.

As one of the main strategic objectives of the European Commission, road safety plans are to *encourage research* into increased PTW safety, while the mid-term review of the *EC Communication on Road Safety 2011-2020* is an opportunity to address the steps necessary for enhancing PTW crash causation knowledge.

[21] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52010DC0389

On research (deliverable 5)

With the preparation of the new Work Programme 2016-2017 under H2020, the RIDERSCAN project team is confident that several of the key research activities identified in the RIDERSCAN Needs for Policy Actions report could be addressed and answered within a reasonable space of time to guarantee their PTW-safe integration into tomorrow's transport system.

On traffic management and ITS (deliverable 6)

ITS and cooperative rider support systems have a good potential to increase riding safety and traffic safety at large, as indicated by a number of interesting European projects. The standalone systems have led and will lead the way – ABS, combined ABS, airbags, radars, scanners etc., and they may be excellent systems in the event of a crash and just before.

Today, stability and braking power are seen by many political stakeholders as top priority. 112 eCall and intersection safety is in turn identified by some industry stakeholders as the way forward. However, again, these are assumptions not based on actual data and they will need to be properly researched and assessed in order to guarantee user acceptability, market deployment, and hence PTW industry investments.

Similarly a proper integration of PTWs into *intelligent* traffic management activities would help reduce PTW risks within traffic flow and post-crash support in the case of an accident involving a PTW.

Horizon 2020 could provide the right framework to enhance PTW-specific research, thus enabling the development of IVS for PTWs on the one hand, but also increased inclusion of PTW specificities in ADAS and IVIS functions/systems.

Recognition and adequate integration of PTW characteristics into ITS deployment activities, both as *vulnerable* and *powered* users of the transport system, will significantly contribute to an increased awareness of the specificities of this transport mode by all stakeholders.

On awareness campaigns (deliverable 7)

PTW accident investigation work has highlighted the relevance of human factors, including individual behaviour, in accident causation. Awareness campaigns, broadly speaking, have the capacity to play an important role in tackling some of these factors.

One of the main strategic objectives of the European Commission Road Safety plans is to *improve awareness of PTW riders by other road users*. The mid-term review of the EC Communication on Road Safety 2011-2020 is therefore an opportunity to address the challenge, making use of the recommendations issued by the various experts, one of which is the need to include representatives of the PTW community in the design and development of comprehensive and efficient awareness campaigns tackling PTW safety issues.

On national strategies (deliverable 8)

The RIDERSCAN project team views the mid-term review of the EC Communication on Road Safety 2011-2020 as a unique opportunity to integrate RIDERSCAN project findings and outcomes addressing PTW safety challenges, making use of the recommendations issued by all PTW safety experts.

4. PROJECT IDENTIFIED NEEDS & RECOMMENDATIONS

Based on the inputs collected during the project on *training, testing and licencinsg (D1), data collection & statistics* (D2), *infrastructure (D3) accident reporting* (D4), *research* (D5), *traffic management & ITS (D6),* awareness campaigns (D7), and *national strategies (D8),* the project recommendations include the following:

4.1. Research Needs

KNOWLEDGE on PTW SAFETY	Exposure studies: o develop a **methodology** to collect and analyse mobility data harmonised at EU level o mobility data (annual mileage for PTWs) to separate impact of exposure, intrinsic risk and compensatory behaviour of riders. Development of PTW accident **prediction models** by means of accident simulations and vehicle dynamics to see which state of the road has which effect on the brake system, on the tyres, on the rider behaviour, what are the reactions of different vehicles on the same section of road, at the same speed? Etc. Mobility research: understanding PTW use, riding models, etc. Naturalistic/Simulation studies to identify: o skills, attitudes & behaviours; how to influence different types of riders to take safer decisions when riding; o riding models, risk patterns and the role of risk awareness o *safety critical events* o which and how information is processed by the rider

	○ mental failures - Road conflict investigations - Accident data collection (pre-during-post collision) and accident dynamic reconstruction - More in-depth investigations will allow a better understanding of fatal and serious injury crash patterns and causes - Assessment of injuries linked with crash types (link between crash data and hospital data); - Improvement of crash simulation and crash dummies (taking into account their particular postures to understand their specific injuries) to better understand ○ the consequences of an accident ○ how injuries work and how to prevent them - Research into the relationship between weather and accidents should be continued by including more data allowing additional factors to be considered. - PTW conspicuity and other perception problems - Speed: comparative study on speed differences on comparable road types within Europe. - Effectiveness of safety activities / cost-benefit analyses - Design a PTW-specific impact assessment methodology - Compile and expand key existing studies for PTW use. - Development and implementation of safety equipment adapted to countries with hot weather
ACCESS to PTWs	- **Effects of the various age limits on progressive access**; ○ EU harmonisation: evaluation of the effects of the various age limits to ride a class I moped between EU countries; ○ In what way is learning to ride a moped different from learning to ride a motorcycle; or learning to ride a low performance motorcycle different from learning to ride a high performance one? ○ Risk awareness: motorcycling experience effect (including training, type of riding licence, number of year of practice and frequency of motorbike use) on motorcyclists' risk awareness.

	Training: o the content and effectiveness of training (including post-licence training) with the aim of improving the behaviour and safety of both drivers and riders; o further research should identify specific training needs according to experience and vehicle o young riders: search for effective ways to improve training for young riders/drivers o rider training: which skills and how should they be trained during training (e.g. manoeuvring skills, braking skills, noticing risk situations) at driving schools; and how do the skills learned work in real traffic situations? How can these be learned effectively and efficiently, in how much time and in which sequence? **New technologies:** o The development of new simulation techniques offers new opportunities for training programs.
INFRASTRUCTURE	**Better understanding of PTW/infrastructure interactions** o Improve data collection o Gain an in-depth understanding of the vehicle-road interaction and its dynamics, including detailed analysis with simulation tools (vehicle-infrastructure interaction simulation) o Research accident scenarios and biomechanics o Incorporate data gathered in naturalistic riding studies o Study the interaction between motorcycle tyres and road surface condition o Safer road design: o Understand the effects of the road environment on road users o Provide a more forgiving road environment o Make roads self-explaining for PTWs o Improve the environment to enhance reciprocal perception of riders and drivers o "Friction measuring" research

	○ Re-evaluate infrastructural measures to reduce speeds (such as humps or lane narrowing) from the point of view of PTW rider safety ○ Design roadside obstacles to provide better protection for PTW riders who may collide with them **Road maintenance**: ○ Development more durable roads that will be easier to maintain in a good state ○ Develop a "holistic solution for asset management"; with the aim of making work zones safer **Black spot management**: ○ Research local accidents and suitable counter-measures. **Testing methodologies**: ○ Define a testing methodology for roadside and other infrastructure equipment which remains practicable for road equipment manufacturers
INTELLIGENT TRANSPORTATION SYSTEM	Further research is needed regarding the expected costs/benefits of ITS on riding activity: ○ Understanding issues of automation for PTW use; ○ Interaction of PTWs with automated and non-automated vehicles ○ User acceptance ○ ITS efficiency (estimate of the relative damage reductions associated with deploying ITS in motorcycles; the effectiveness of ITS technologies can be established through the collection and evaluation of crash data, field testing and analytical modelling of risks ○ Assess the benefits of both assistive systems and rider training, especially in direct comparison to each other ○ Prioritization of ITS for PTW safety Fundamental: ○ Data acquisition design, implementation, and data analysis tools ○ Effects on rider performance and behaviour of human-machine interaction with new technologies covering such

	issues as distraction, cognitive workload, over-reliance on technology, training requirements, situational awareness, and so on ○ Extensive on-road research examining the effects of using assistive systems on PTWs. ○ Incident, near-miss and pre-crash data ○ Modelling (riding tasks, motivation for action, accident causation factors, identification of safety critical events) ○ Specific PTW features, applications and services and their interaction with other road users ○ Perception research[22] (reliable object recognition and tracking, situation awareness, accurate road representation, detection of free space, perception architecture, etc.) ○ Development of methodologies, including PTW-specific impact assessments based on eIMPACT, 9 safety mechanisms[23] ▪ direct in-car modification of the driving task; ▪ direct influence by roadside systems ▪ indirect modification of user behaviour ▪ indirect modification of non-user behaviour ▪ modification of interaction btw users and non-users ▪ modification of road user exposure; ▪ modification of modal choice; ▪ modification of route choice; ▪ modification of accident consequences Research on vehicle technology for two-wheeler safety, including interaction of other vehicles' technology with PTWs ○ Large scale Field Operational Tests (FOTs) related to naturalistic driving conditions to capture VRU-related behavior and ITS requirements ○ advanced intelligent sensing

[22] iMobility Forum Workshop on Automation; Angelos Admitis – ECCS - .ppt
[23] http://www.eimpact.eu/

	○ V2X communication platform for cooperative ITS applications ○ Research on the 112 Pan-European eCall for PTWs (drafting the minimum technical and functional specifications with identified interfaces for additional features, triggering design, tests, verification, validation, short-listed solutions, demonstrations) ○ Research on active and passive systems (incl. conspicuity technology) ○ Interaction of other vehicles' technology with PTWs ○ Study the interaction of an automated vehicle with its environment and other (non-automated) road users; develop technology and equipment on board other vehicles (cars and trucks) that can contribute to improving motorcycle safety (blind spot) ○ post-deployment field operational tests in a real traffic environment with a full set of analyses, rider acceptance, willingness to pay In-depth identification of accident causation factors and Safety Critical Events, and prioritization of motorcycle safety problems that are amenable to ITS intervention ○ *Naturalistic riding studies* (INRS and NRS): baseline data collection with instrumented PTWs to define current practices, capabilities and issues ▪ Identify PTW-specific driving tasks, patterns and styles ▪ Understand riders' motivation for action ○ *Field Operational Tests and Perception research to* ▪ Validate interpretation of rider intentions ▪ Define triggering patterns Rider (and instructor) training and testing needs (e.g. coming *e-mirrors*) ○ Effects on rider performance and behaviour of human-machine interaction with new technologies that deals with issues such as distraction, cognitive workload, over-reliance on technology, training requirements, situational awareness, and so on

	○ Instructor training scheme to master ITS
COMMUNICATION on PTW SAFETY	Further research on • **risk definition, identification, awareness** and **assessment** considering different mobility patterns and riding styles in Europe (focusing on specific rider groups at greater risk such as novice or returning riders) would enhance knowledge not only for the design of robust awareness campaigns, but also for hazard perception training purposes and ITS development; Such a study would also investigate the influence of cultural differences between European countries on road safety: behaviour, perceptions, attitudes, beliefs of road users; understand the link between different social factors (age, alcohol, riding in groups) and behaviour. • study specific risk of novice rider and design effective measure to increase their safety • **Other Vehicle drivers' perception failures,** road user distraction, and ways to increase VRU awareness (including PTWs) • **Behaviour in traffic**: to better understand all road users' behavioural patterns and their interaction (with and without technology involved); testing of / long-term analysis of rider behaviour in traffic; measures to improve the behaviour of all road users • **Extreme behaviour**: understand the causes of extreme behaviour and design effective measures to reduce it; identify the specific group of motorcyclists showing extreme behaviour and find means to reach them. • **Protective equipment**: develop and test personal safety equipment
SAFE SYSTEM	• Fundamental research leading to proposals for PTW road safety measures: ○ Investigation of road conflicts ○ Identification of accident black spots ○ Riders' needs, their characteristics (riding behaviour, cognitive performance, mentality, acceptance, motives, mobility needs, etc.) ○ Riders' interaction with the elements comprising the road

	network (other road users, the road environment and their PTW) ○ Riders' behaviour: comparison at EU level; study of young riders; means to improve the behaviour of road users in general and of PTW users in particular. • In-depth accident and naturalistic studies to better understand accidents that happened on the road and to design effective and coherent measures to tackle the different safety issues; ○ PTW accident reconstruction • Risk perception and risk assessment work • Develop road safety management tools designed for PTW safety: • Common impact assessment and cost-benefit analysis methodologies to evaluate the impact of safety concepts (design better evaluation and better cost-benefit analyses of safety measures and their effects) • Identify relevant safety performance indicators based on an understanding of PTW riding models, risk patterns and accident causation factors; • Mobility research and design of a holistic approach to PTW safety: understanding PTW use and the motorcyclist community.

4.2. Standardization Needs

KNOWLEDGE on PTW SAFETY	• Need to develop and apply relevant methods, tools and indicators to measure PTWs in traffic flows and analyse their mobility and behaviour (exposure data). • Standardize the definition of "seriously injured". • Harmonize accident (macro/micro) reporting methodologies
ACCESS to PTWs	• **Standardizing minimum training curriculum requirements** and linking driving licence tests to this standard would significantly improve the quality of rider training programmes (need for a "quality seal") • Standardise EU rider/instructor training curricula
INFRASTRUCTURE	• Review standards for 'PTW- friendly' road infrastructure and design

INTELLIGENT TRANSPORTATION SYSTEM	PTW tools for road safety management Integration of PTWs in automated traffic control systems Define a test protocol through which the behaviour of motorcycles (from a safety point of view) can be rated. The process would be similar to that for cars and the gaining of "stars" through crash tests defined in such test protocols as "EuroNCAP"
COMMUNICATION on PTW SAFETY	
SAFE SYSTEM	PTW tools for road safety management New definition of "seriously injured" Protective clothing (research, promotion, European standards on protective clothing)

4.3. Legislation Needs

KNOWLEDGE on PTW SAFETY	Prepare a legislative proposal which sets up the right framework for data collection in Member States, defining a common data collection strategy which includes improving accident reporting ○ harmonise **formats** and **headings**; ○ harmonised **classification of vehicles involved in an accident** ○ include **GPS coordinates** for accident location ○ include the following information for each vehicle involved in the accident: ▪ Point of impact (front left, front right, etc.) ▪ Angle of impact (0°, 45°, 90°, 135°…360°) ▪ Impact severity (light, medium, hard) ○ include pictures of the scene and damage to each vehicle involved. ○ and propose ▪ a harmonised way to measure the vehicle fleet ▪ common categories for the **type/frequency**

	/motivation of use for vehicles
ACCESS to PTWs	**Addressing training content / instructors' competence in a legislative framework** becomes an essential complement to the 3rd Driving Licence Directive (for PTWs), addressing: o Initial rider training o Instructors' training o Advanced riding courses o Use of driving simulators o Special training and education for returning bikers Harmonize and lower the minimum age Harmonize licencing requirements to a greater extent
INFRASTRUCTURE	Improve the periodic maintenance of roads => The EU directive on infrastructure should include provisions on road inspections for secondary roads. Infrastructure directive: The Directive for Infrastructure and Safety Management is currently being revised, including how to cater for the needs of PTWs. A good step forward would be for any EU money given to the motorways to include specific provisions for motorcycles. This would give a good example for secondary roads. Black spot monitoring would benefit from harmonisation throughout the EU (by means of legislation or other means).
INTELLIGENT TRANSPORTATION SYSTEM	Traffic management for PTW road safety. The EU should encourage and support the introduction of ITS taking specific account of PTWs (e.g. on-board collision avoidance technology in cars, vans and lorries which detect riders – V2V/V2I systems). Effective integration of vulnerable road users into traffic management systems: these include black spot management, incident management, ITS integration, road infrastructure design
COMMUNICATION on PTW SAFETY	
SAFE SYSTEM	Harmonize on-board collision avoidance technology for cars, vans and lorries

	Review existing transport legislative framework to integrate PTW safety elements Include PTWs in existing EU transport policy papers (e.g. White Paper on Transport policy, ITS directive, etc…)

4.4. Needs for Specific Actions

KNOWLEDGE on PTW SAFETY	Promote the use of the CADaS protocol at national level to have comparable data across Europe propose and include in CADaS o common age categories o common classification of the types of PTWs complement the CADaS protocol with specific data of relevance to accidents with PTWs, such as environmental aspects or vehicle details Cross information on injuries between Member States Enhance exposure and mobility data collection work between Member States Cross/compare existing knowledge between different EU countries Set up a strategic approach to PTW research needs Use iGLAD as the basis to set up a common European in-depth accident causation database.
ACCESS to PTWs	The type of bike chosen by riders provides a clear indication of their motives, the experience they seek and their concept of riding (when they can choose the bike). One implication is that **persuasive communications**, tailored to the motivational requirements of the average rider of each motorcycle type, could be provided when buying a motorcycle in an attempt to encourage safe riding behaviour. To train PTW users properly in the use of ABS and promote the widespread use thereof: the necessity of knowing how the Anti-lock Braking system (ABS) works: Training in ABS operation: Initial Rider Training, websites, Post-licence training programmes. The need for assistance during emergency braking: training and

	website informing riders on how to react in the case of emergency braking. - Benchmark and exchange best practices on training methods, content, and instructors' competence

INFRASTRUCTURE	- Need to find a way to motivate road engineers to use the infrastructure guidelines or make them mandatory.
	- *Motorcyclist Protection System Database*: further political support and dissemination activities would be required to further engage MPS manufacturers to feed the database and for road authorities to make use of it. http://www.mc-roadsidebarriers.eu/search-for-mps/
	- A civil engineering handbook would be a practical instrument for improving road safety for PTWs by just emphasizing the engineering items to be considered during the design and maintenance of infrastructure
	- Monitoring high-risk sites (black spots):
	  o involvement of the riders' community
	  o use of smart applications
	- Use of the ***pan-European Road Hazard report form for PTWs http://www.fema-online.eu/riderscan/IMG/pdf/ptw_black_spots_report_form.pdf***
	- Promote the use of minimum safety requirements (barriers, markings, passive support structures EN 12767) though this could be done in cooperation with CEDR.
	- Exchange best practices on the self-explaining roads concept
	- Disseminate the guidelines on roadside barriers for motorcyclists http://www.fema-online.eu/guidelines/Guidelines.pdf
	- Promote the infrastructure/PTWs website http://www.mc-infrastructure.eu/

INTELLIGENT TRANSPORTATION SYSTEM	- It is important to spread knowledge of these new systems to stimulate demand for them. - PTW users need to be trained properly in the use of ABS. Widespread adoption of ABS needs to be promoted: the necessity of knowing how the Anti-lock Braking system (ABS) works: Training in ABS operation: Initial Rider Training,

	websites, Post-licence training programmes. - The need of assistance during emergency braking: training and website to inform riders on how to react in case of emergency braking. - Define a test protocol through which the behaviour of the motorcycles (from a safety point of view) can be rated. The process would be similar to that for cars and the gaining of "stars" through crash tests defined in test protocols such as "EuroNCAP". (ROSA)
COMMUNICATION on PTW SAFETY	- Campaigns aiming at **increasing mutual recognition and acceptance** of road traffic systems - **Reaching riders in PTW dealerships**, as the type of bike chosen by riders provides clear information on their motives, the experience they seek and their concept of riding (when they can choose the bike). Such persuasive communications, tailored to the motivational requirements of the average rider of each motorcycle type, could be provided when buying a motorcycle in an attempt to encourage safe riding behaviour; - Increasing mutual recognition and acceptance among road users
SAFE SYSTEM	- European awareness campaigns based on shared values aiming at **increasing mutual recognition and acceptance** of road traffic systems - The identification of a **general baseline for European awareness campaigns for PTWs**, to be further adapted in line with national/regional/local PTW safety patterns; - **Reaching riders in PTW dealerships**, as the type of bike chosen by riders provides clear information on their motives, the experience they seek and their concept of riding (when they can choose the bike). Such persuasive communications, tailored to the motivational requirements of the average rider of each motorcycle type, could be provided when buying a motorcycle in an attempt to encourage safe riding behaviour; - **Enhance stakeholders' dialogue**; increase communication between authorities and riders ; the European Union could provide added value by stimulating positive national debates on PTW safety, fostering dialogue between the motorcycling community and national road authorities; to this end, - **Sharing best practices and benchmarking** national strategies

	and specific road safety actions targeting PTW safety; - Develop awareness-raising campaigns based on shared values and topics easily adaptable at national level; - Develop in-depth expertise on EU PTW safety issues - Promote the use of efficient technology - Encourage research and technological developments for PTW safety - Support standardization work and efforts that rightly integrate PTW needs (infrastructure, definition of injuries, protective clothing, conspicuity, safety management, etc.)

30/04/2015