



6th European Transport Research Conference
MOVING FORWARD:
Innovative Solutions for Tomorrow's Mobility

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USE OF ACCIDENT PREDICTION MODELS IN ROAD SAFETY MANAGEMENT - AN INTERNATIONAL INQUIRY

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MINISTRY
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Instytut Badawczy
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Conférence Européenne
des Directeurs des Routes
Conference of European
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ECTP
INNOVATIVE BUILT
ENVIRONMENT

PROJECT INFORMATION

**CEDR Transnational Road Research Programme
Call 2013: Safety**

funded by Germany, Ireland, UK
and Netherlands



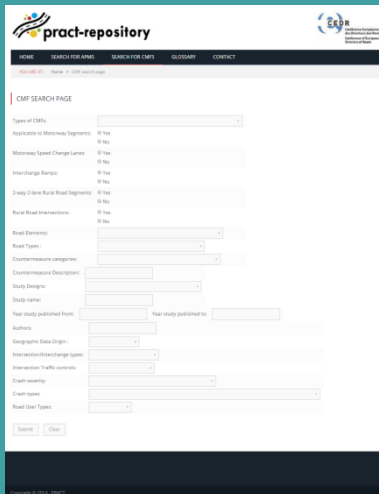
PRACT Predicting Road Accidents - a Transferable methodology across Europe



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pract-repository

HOME SEARCH FOR ITEMS SEARCH FOR CMPS GLOSSARY CONTACT

SEARCH FOR CMPS

CMPS SEARCH PAGE

Type of CMPS:

Application to Motorway Segments: Yes No

Motorway Speed Change Lanes: Yes No

Interchange Ramps: Yes No

Single 3-lane Rural Road Segments: Yes No

Road Road Intersections: Yes No

Road Elements:

Road Types:

Counter-measure categories:

Counter-measure description:

Study Design:

Study Name:

Your study published from: Year study published to:

Authors:

Geographic Data Origin:

Intersection/Interchange Types:

Intersection Traffic Control:

Crash severity:

Crash Types:

Road User Types:

<http://www.pract-repository.eu/>



**Predicting Road Accidents - a Transferable
methodology across Europe**

Home The Project Work programme Partners Results Project Library Publications Links Impressions

PROJECT NEWS:

[PRACT repository now online](#)
[www.pract-repository.eu](#)

PRACT (Predicting Road Accidents - a Transferable methodology across Europe) is a project funded by the National Road Authorities of Germany, Ireland, UK and Netherlands within the Conference of European Directors of Roads (CEDR) 2013 Transnational Research Programme - Safety.

The project aims at developing a European accident prediction model structure for motorways and higher ranked rural roads that could be applied to different European road networks with proper calibration. An important product of the PRACT project will be the establishment of a European Accidents Prediction Models (APMs) and Crash Modification Factors (CMFs) web repository with an open access database and guidance for their application and transferability on the European road networks.



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INNOVATIVE BUILT
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PRESENTATION STRUCTURE



- Literature Review
 - Highway Safety Manual and Related Literature
 - Literature on APM development
 - Web-based CMF databases and Road Safety Toolkits
- Questionnaire Survey Methodology
- Questionnaire Survey Results
- Conclusions



HIGHWAY SAFETY MANUAL & RELATED LITERATURE



- Predictive method for estimating the expected average crash frequency.
- Safety Performance Functions (SPFs) developed for specific facility types and "base conditions".
- Crash Modification Factors (CMFs) account for differences between the base conditions and local conditions of the considered site.
- Calibration Factor (C) accounts for differences between the road network for which the models were developed and the one for which the predictive method is applied.

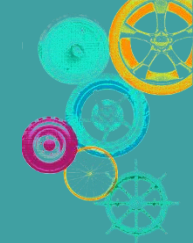
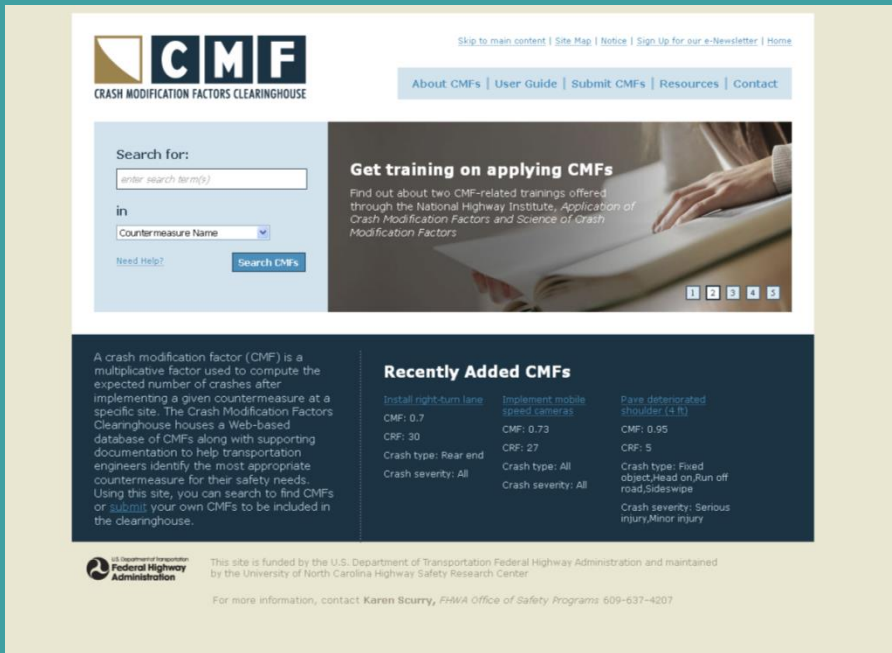


LITERATURE ON APM DEVELOPMENT



- **RIPCORD-iSEREST Research Project (2005-2008)**
 - APMs for 2-lane 2-way rural roads,
- **RISMET Research Project (2011)**
 - APMs for rural intersections,
- Turner et al. (2012): 2-lane 2-way rural roads in New Zealand,
- Caliendo et al. (2007): four-lane motorways in Italy,
- Montella et al. (2008): motorways in Italy,
- Cafiso et al. (2010): 2-lane 2-way rural roads in Italy, etc.



The screenshot shows the FHWA CMF Clearinghouse website. At the top, there is a navigation bar with links: Skip to main content | Site Map | Notice | Sign Up for our e-Newsletter | Home. Below this is a secondary navigation bar: About CMFs | User Guide | Submit CMFs | Resources | Contact.

The main content area features a search section on the left with a search box (placeholder: enter search term(s)), a dropdown menu for 'Countermeasure Name', and a 'Search CMFs' button. To the right of the search section is a featured article titled 'Get training on applying CMFs' with a sub-headline 'Find out about two CMF-related trainings offered through the National Highway Institute, Application of Crash Modification Factors and Science of crash Modification Factors'. The article includes a photo of hands looking at a document and social media icons.

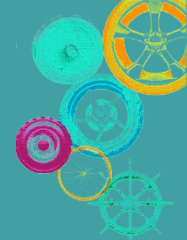
Below the search and featured article is a 'Recently Added CMFs' section. It contains a table of entries:

Install right-turn lane	Implement mobile speed cameras	Pave deteriorated shoulder (4 ft)
CMF: 0.7	CMF: 0.73	CMF: 0.95
CRF: 30	CRF: 27	CRF: 5
Crash type: Rear end	Crash type: All	Crash type: Fixed object, Head on, Run off road, Sideswipe
Crash severity: All	Crash severity: All	Crash severity: Serious injury, Minor injury

At the bottom of the page, there is a footer with the Federal Highway Administration logo and text: 'This site is funded by the U.S. Department of Transportation Federal Highway Administration and maintained by the University of North Carolina Highway Safety Research Center. For more information, contact Karen Scurry, FHWA Office of Safety Programs 609-637-4207'.

- <http://www.cmfclearinghouse.org>
- Includes 5,378 CMFs
- Directly related to the Highway Safety Manual (AASHTO, 2010)
- Detailed background information on presented CMFs is available

AUSTROADS ROAD SAFETY ENGINEERING TOOLKIT




Austroads **arrb GROUP**

Austroads Road Safety Engineering Toolkit

- Home
- Search
- Crash type
- Safety deficiency
- Treatment type
- Road users
- Road safety investigation
- Safe System hierarchy of
- Case study submission
- Contact ARRB

Treatment type: Warning signs

Description

Warning signs may be used to alert motorists where visibility is obscured due to reduced sight distance (for example by adverse horizontal alignment), or there is a higher chance of encountering an unexpected hazard (such as children on the road), or where a significant decision point lies in advance. This has the effect of raising driver awareness of a potential conflict or a decision. Standard sized signs will typically be used, but in some instances where warranted (for instance in high speed environments, and/or where there are high volumes of vehicles), larger signs could be considered. In some exceptional cases, highly visible backing boards may be used.

Warning signs can be used in a variety of situations including providing warning for:

- hazardous curves (often used in association with a speed advisory sign)
- intersections or railway crossings
- traffic control (e.g. signals or 'Stop' sign)
- vulnerable road user warning (for instance children or elderly road users)
- lane narrowing or merges
- roadworks or warning of adverse road surface conditions
- animals on the roadway.

Benefits

Warning signs provide the following benefits:

- provides advance warning of a hazard to a motorist
- raises driver vigilance at hazardous locations
- low installation cost
- can reduce vehicle speed
- conveys a simple clear meaning to the motorist

Implementation issues

Warning signs should be placed so as to be visible to motorists. They should be positioned at sufficient distance from the hazard to ensure drivers have adequate time to take necessary action (e.g. to slow down).

Consistency is required in the application of these signs, and a route based approach should be used.

While they are intended to act as a warning, it should also be remembered that the posts, placed along the roadside, represent an object with which an errant vehicle can collide. Positioning of posts to minimise damage and injury is an important consideration when implementing this treatment. Frangible posts should always be used.

Enhanced warning signs (for instance over-sized or with a high visibility backing board) may be necessary in some situations, particularly where the hazard is unexpected (for instance in situations where curves are sharper than anticipated or after a long straight section of roadway). The misuse or overuse of these signs could potentially reduce their effectiveness in critical locations.

Care should be taken to ensure advisory speed signs or advance warning signs are appropriate for the site. Speed limit signs and advisory speed signs showing different speed values from one another should not be placed where drivers can read both at the one time. Installers are advised to follow the guidelines set out by the relevant state road authority for determining the appropriate advisory

Pictures



Image 1 of 10

Crash reduction effectiveness

- 40% - Speed advisory signs
- 25% - Curve warning signs
- 30% - Bridge warning signs
- 15% - Guidance signs
- 20% - Variable message signs
- 35% - Vehicle activated signs

Cost Rating

Cost Rating: \$

Treatment life

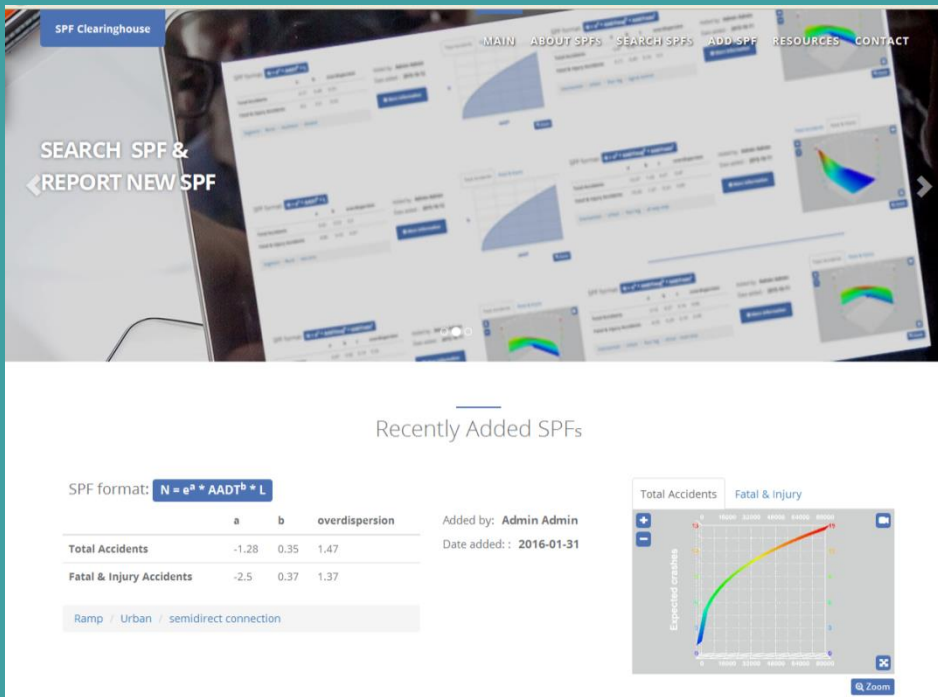
★★★★

Other treatments to consider

- All-RED time extension
- Traffic signals operation review
- Tiers bases
- Signal display visibility improvements
- Skid resistance improvements
- Traffic signals coordination
- Convert angle parking to parallel

- <http://www.engtoolkit.com.au>
- 67 treatments are included
- Searchable database according to:
 - Treatment type/ name,
 - Crash type,
 - Safety issue,
 - Road user group
- Detailed background information on included CMFs generally not available

SPF CLEARINGHOUSE

SPF Clearinghouse

SEARCH SPF & REPORT NEW SPF

MAIN ABOUT SPFS SEARCH SPFS ADD SPF RESOURCES CONTACT


SPF format: $N = e^a * AADT^b * L$

	a	b	overdispersion
Total Accidents	-1.28	0.35	1.47
Fatal & Injury Accidents	-2.5	0.37	1.37

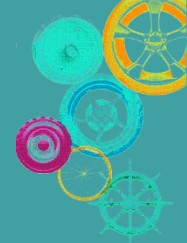
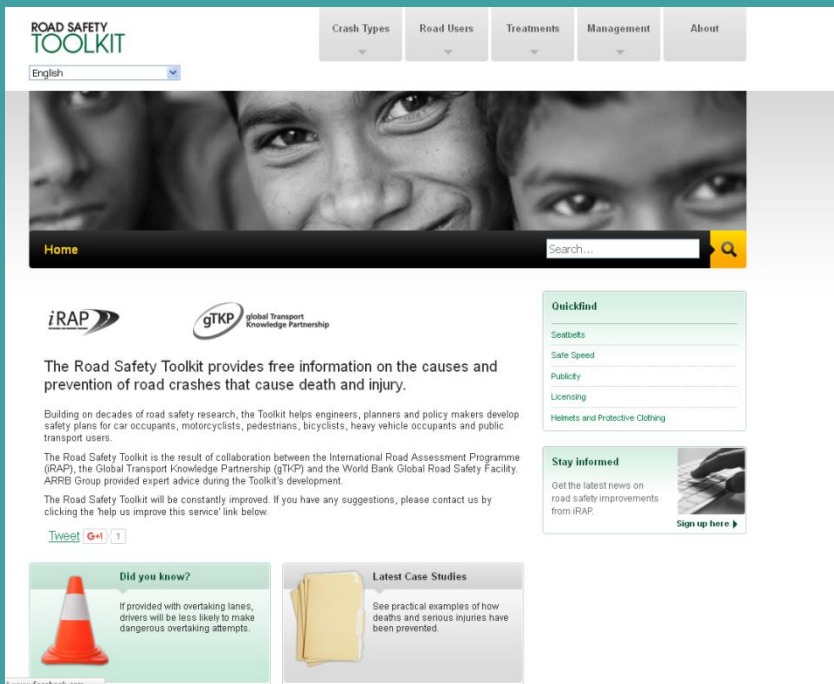
Added by: Admin Admin
Date added: 2016-01-31

Ramp / Urban / semidirect connection

Total Accidents Fatal & Injury



- <http://www.spfclearinghouse.org>
- Data gathered primarily on a voluntarily basis from users
- Detailed background information on included SPFs (sample size, study citation, statistical methodology etc.) generally not available

The screenshot shows the IRAP Road Safety Toolkit website. At the top, there are navigation tabs for 'Crash Types', 'Road Users', 'Treatments', 'Management', and 'About'. Below these is a language dropdown menu set to 'English'. The main header features a large image of people's faces and a search bar. Logos for IRAP and gTKP (Global Transport Knowledge Partnership) are displayed. A text block states: 'The Road Safety Toolkit provides free information on the causes and prevention of road crashes that cause death and injury.' Below this, it explains that the toolkit is based on decades of research and helps engineers, planners, and policy makers develop safety plans. A 'Quickfind' section lists categories: Seatbelts, Safe Speed, Publicity, Licensing, and Helmets and Protective Clothing. A 'Stay informed' section offers to send the latest news on road safety improvements from IRAP. At the bottom, there are two featured articles: 'Did you know?' (about overtaking lanes) and 'Latest Case Studies' (practical examples of preventing deaths and injuries).


- <http://toolkit.irap.org/>
- Includes 58 treatments (infrastructure, vehicle & user related)
- No CMFs included
- Rough assessment of each treatment's effectiveness using a four scale system (0-10%, 10-25%, 25-40%, 60% or more)

PRACT QUESTIONNAIRE CONTENTS




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PRACT
Predicting Road Accidents -
a Transferable methodology across Europe

Questionnaire



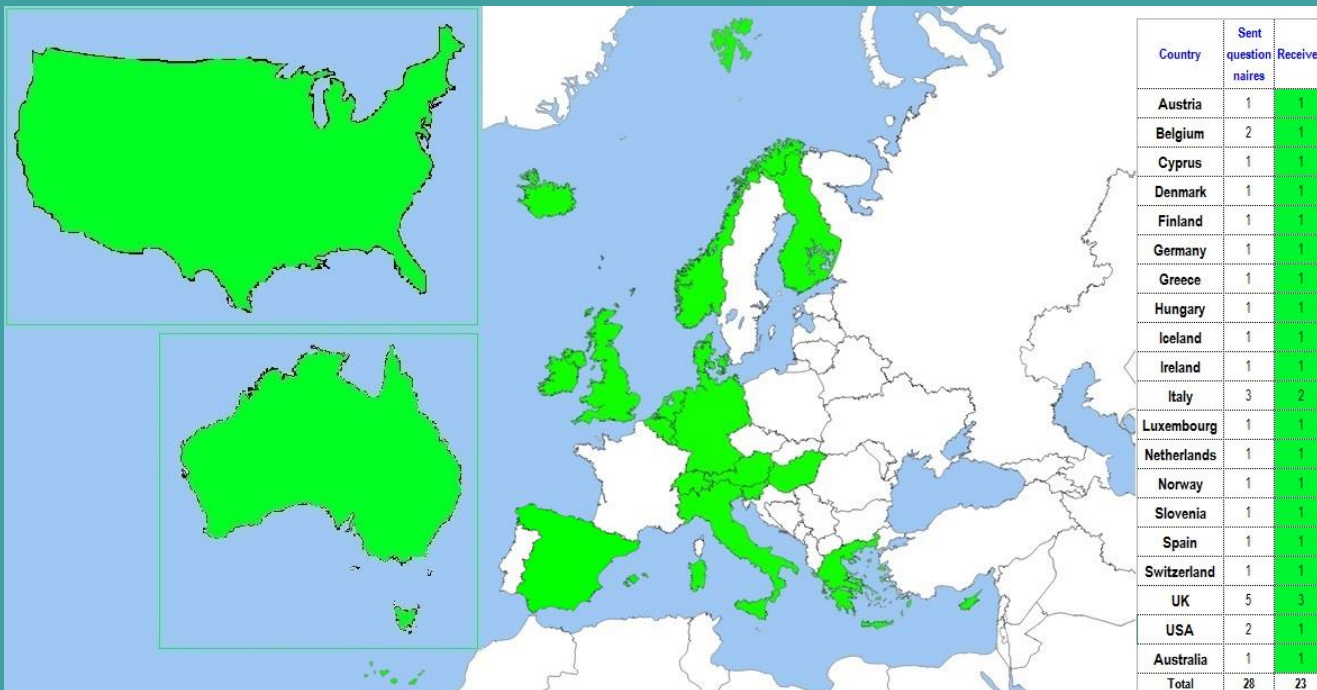
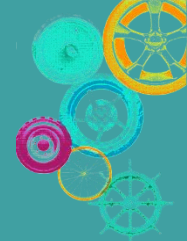
With the support of:



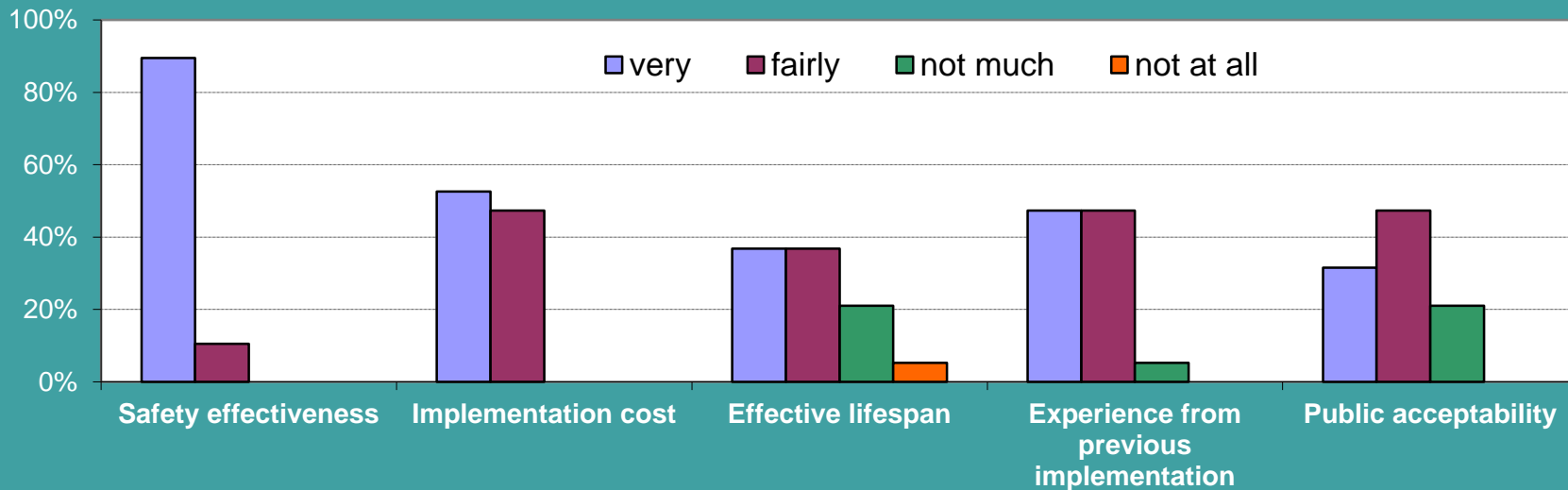
 www.practproject.eu

- Brief introductory part,
- **Part A** regarding the Decision Making Process,
- **Part B** regarding Data Sources,
- **Part C** regarding information on CMFs and road safety measures assessment
- **Part D**, aimed at gathering a summary of experience on road safety measures / CMFs

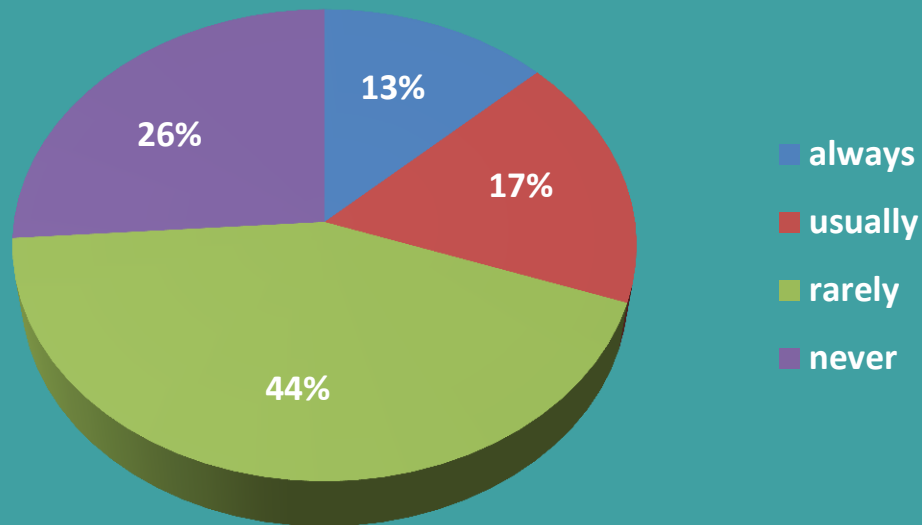
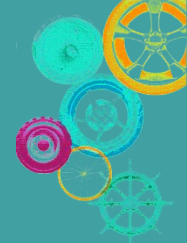
QUESTIONNAIRE SURVEY RESPONSES



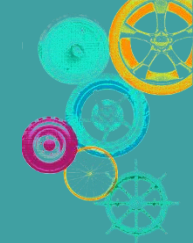
ASPECTS CONSIDERED DURING MEASURES ASSESSMENT



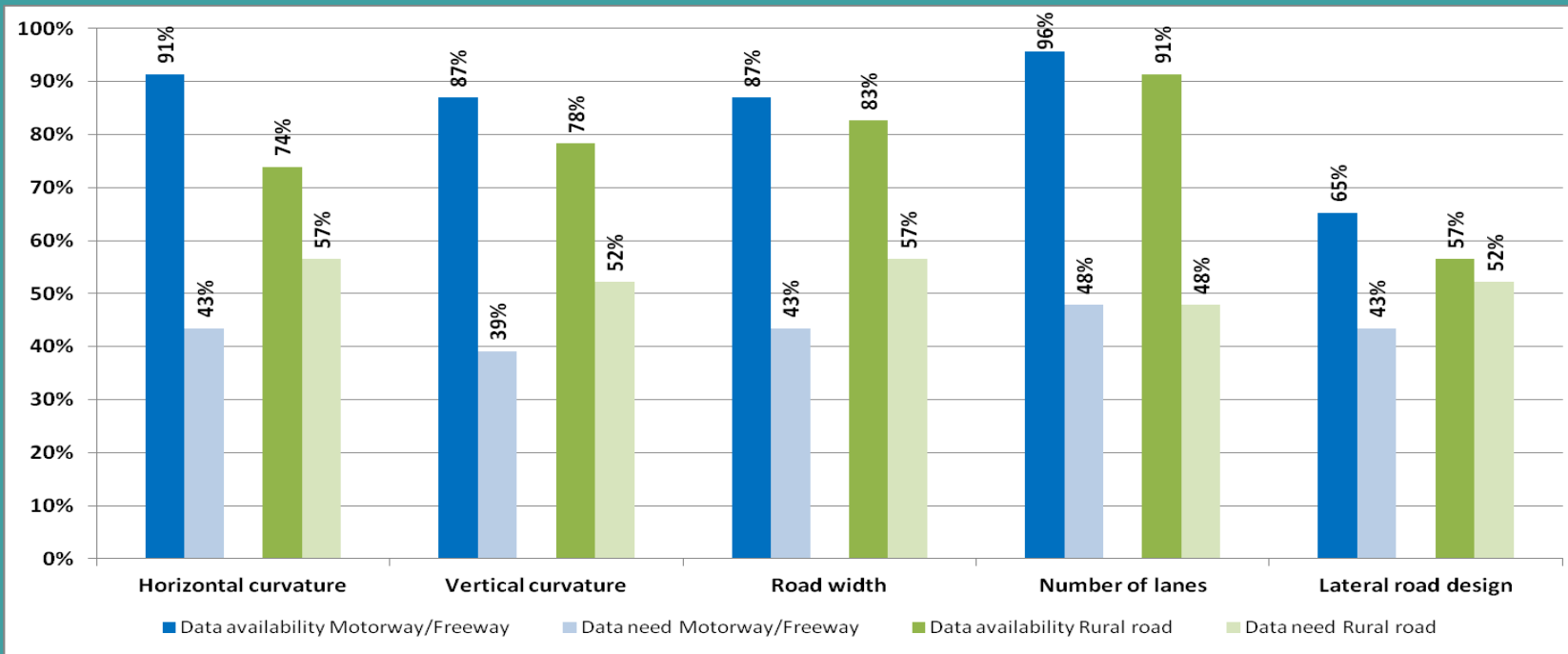
USE OF APMs AND CMFs DURING MEASURES ASSESSMENT



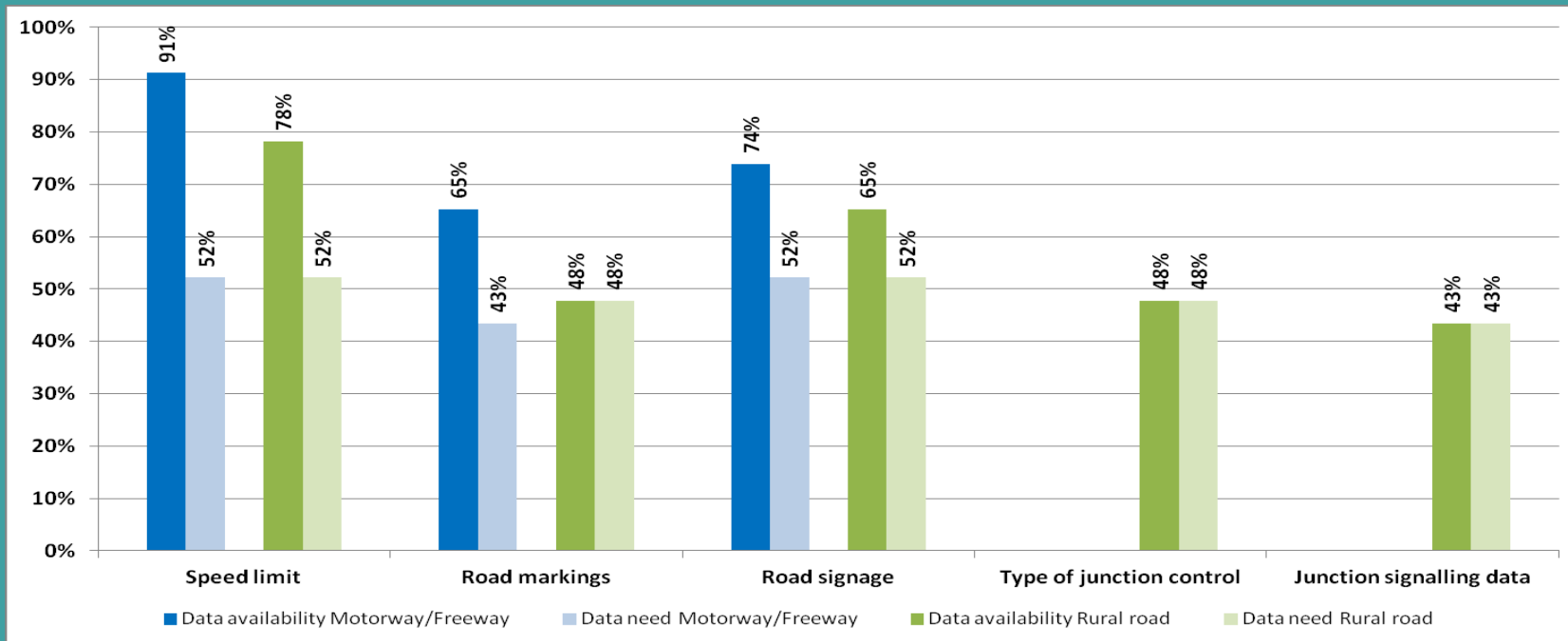
APPLICABILITY CRITERIA OF THE CMF/MEASURE ASSESSMENT



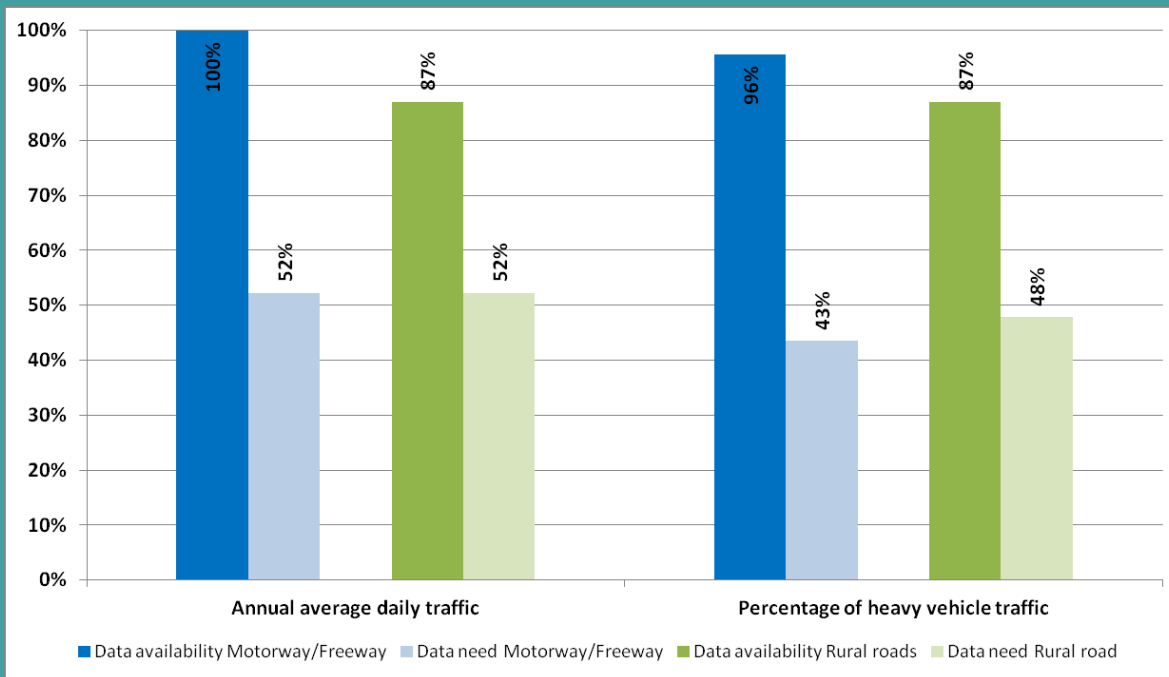
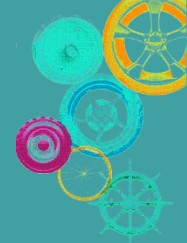
ROAD DESIGN DATA AVAILABILITY & NEED



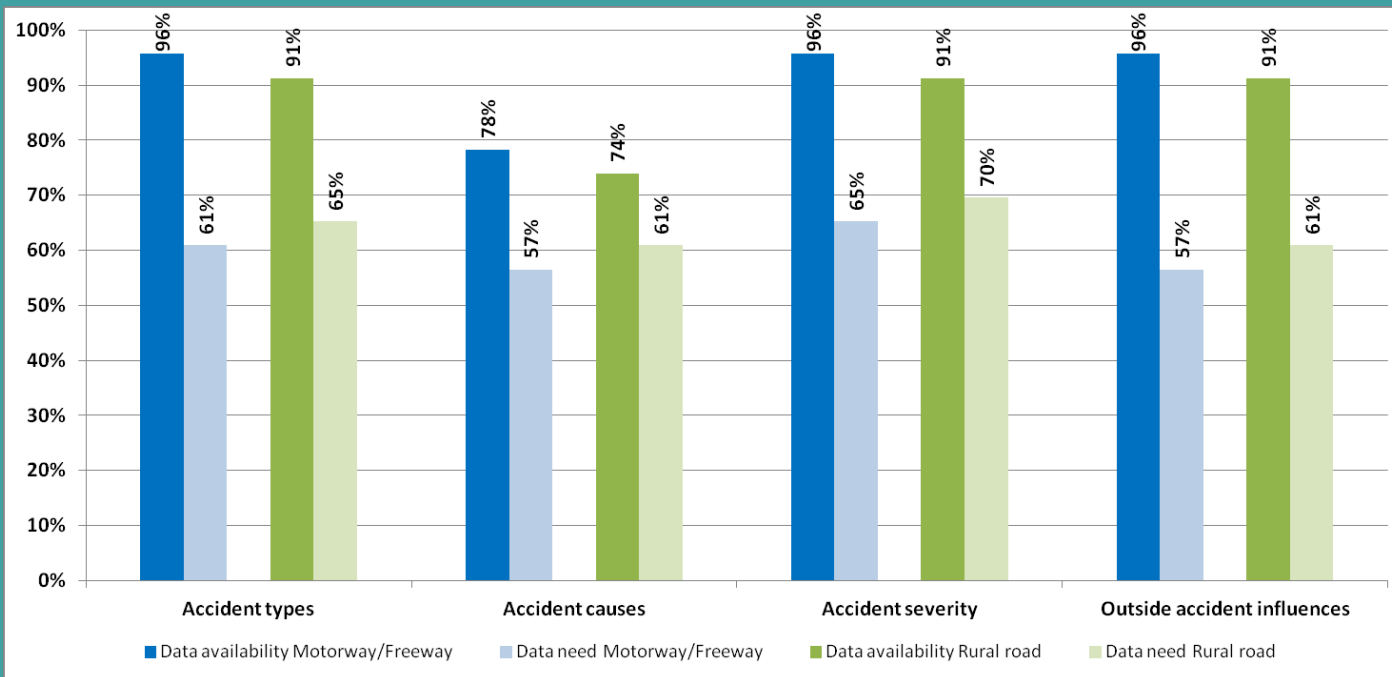
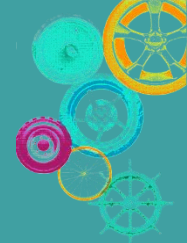
ROAD OPERATION DATA AVAILABILITY & NEED



TRAFFIC DATA AVAILABILITY & NEED



ACCIDENT DATA AVAILABILITY & NEED



SUMMARY OF EXPERIENCE ON ROAD SAFETY MEASURES / CMFs

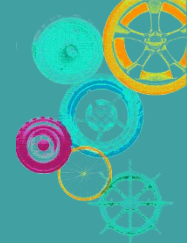


<i>MOTORWAYS & DIVIDED FREEWAYS (without at grade intersections)</i>	NEED		AVAILABILITY		TRANSFERABILITY	
	HIGH	LOW	HIGH	LOW	HIGH	LOW
Countermeasure - CMF						
Realignment (of road segments)	18.8%	81.3%	26.7%	73.3%	54.5%	45.5%
Rectangular rapid flashing beacons	21.4%	78.6%	7.1%	92.9%	45.5%	54.5%
Dynamic feedback speed signs	33.3%	66.7%	40.0%	60.0%	63.6%	36.4%
Landscaping and vegetation	35.3%	64.7%	14.3%	85.7%	63.6%	36.4%
Audible road markings	47.1%	52.9%	35.7%	64.3%	81.8%	18.2%
Sight distance and sight obstructions	61.1%	38.9%	21.4%	78.6%	63.6%	36.4%
Animals and wildlife related safety treatments	25.0%	75.0%	15.4%	84.6%	30.0%	70.0%
Advanced warning devices/signals/beacons	62.5%	37.5%	26.7%	73.3%	72.7%	27.3%
High friction treatments (including anti-skid/slip)	73.3%	26.7%	42.9%	57.1%	63.6%	36.4%
Skid resistance (in general)	64.7%	35.3%	40.0%	60.0%	63.6%	36.4%
Effects of Friction on Motorcycle Crashes	21.4%	78.6%	15.4%	84.6%	36.4%	63.6%
Variable message signs	58.8%	41.2%	43.8%	56.3%	63.6%	36.4%

Complete tables are available at: <http://www.practproject.eu/>



CONCLUSIONS



- The review of international literature indicates significant advances in the field of accident prediction modeling.
- Generally, high levels of data availability were reported, particularly for motorways.
- However, most National Road Administrations (NRAs) still do not systematically use such methods during decision making.

