


CEDR Call 2013 Safety

Highlights from PRACT, EUSight and ESReT

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The CEDR Transnational research programme

- developed to fulfil the common interests of the national road administration members of CEDR;
- follows the path traced by the ERA-NET ROAD project, a Coordination and Support Action funded by the 7th Framework Programme of the European Commission, concluded in December 2011;
- goal to develop a platform and collaboration in research areas of common interests (**all the results are PUBLIC**).





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The CEDR Transnational research programme

Covers several areas

Call 2013

- A. Ageing Infrastructure Management
- B. Traffic Management
- C. Safety**
- D. Energy Efficiency
- E. Roads and Wildlife

For more info on the other areas www.cedr.eu





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The CEDR Transnational research programme

SAFETY

- 1st call in 2012 (SAVeRS, ASAP, BROWSER);
- 2nd call in 2013 (PRACT, EUSight, ESReT);
- 3rd call in 2016 (projects still to be selected – topics: work zones, driver distraction, safe road sides, VRU)

Funded by Netherlands, Germany, UK and Ireland

For more info on the other calls www.cedr.eu





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PRACT - Predicting Road Accidents - a Transferable methodology across Europe





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With the support of:








ANB25 Committee







Project Manager: Elizabeth Mathie, Highways England - UK

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Objectives








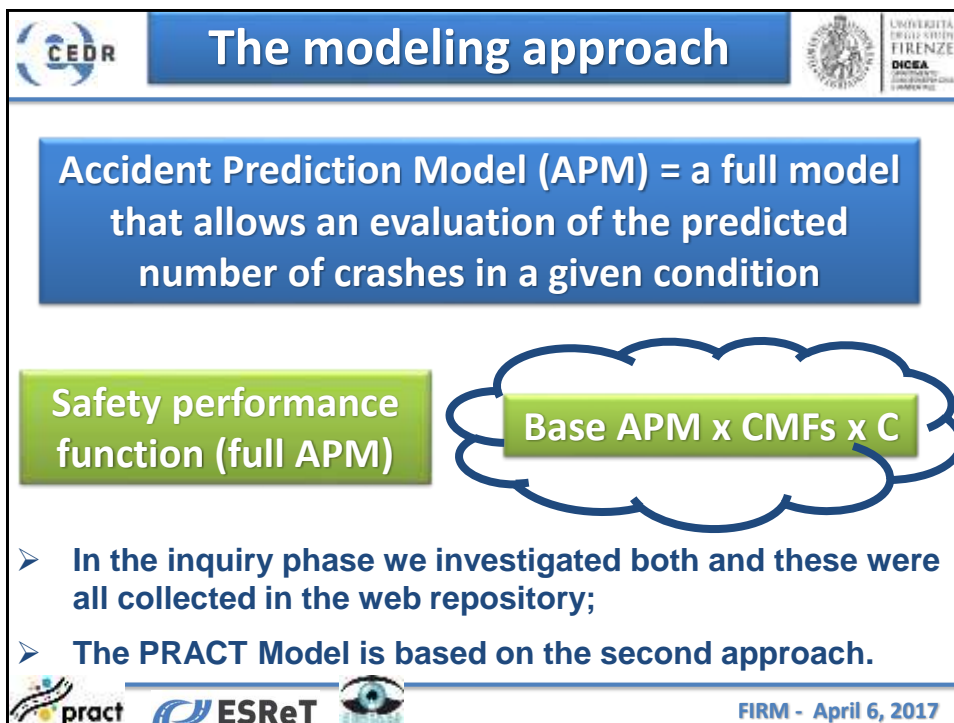
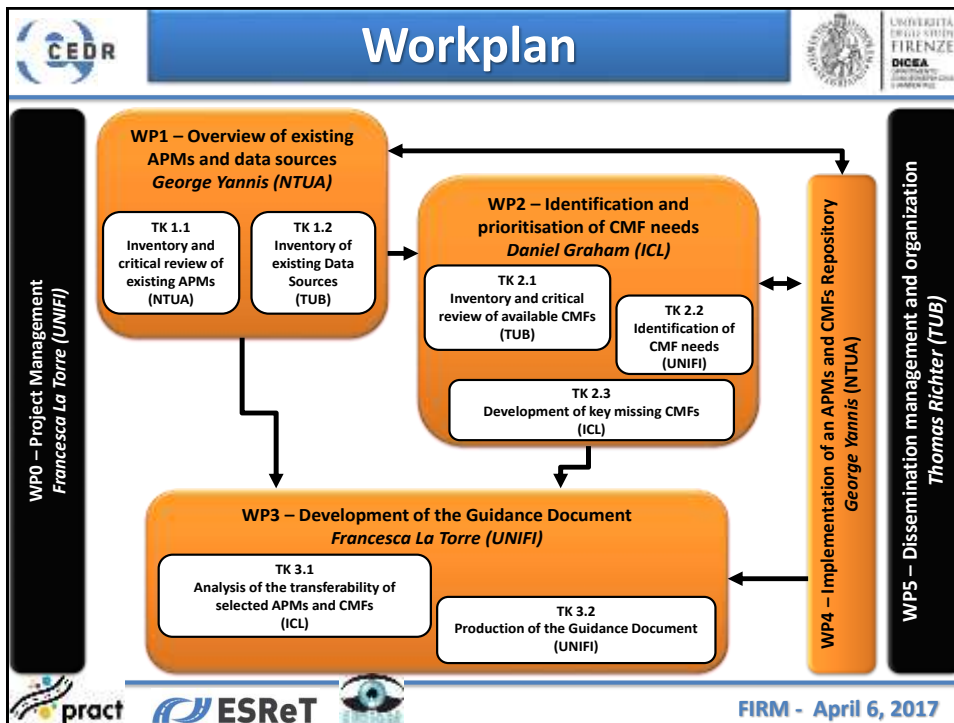
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The PRACT project is aimed at **developing a practical guideline and a user friendly tool** that will allow the different road administrations to:

- **adapt the basic APM function to local conditions** based on historical data;
- **identify the CMFs that could be relevant** for the specific application;
- **verify if the selected CMFs are transferable** to the specific condition;
- **apply the calibrated model** to the specific location to be analysed.

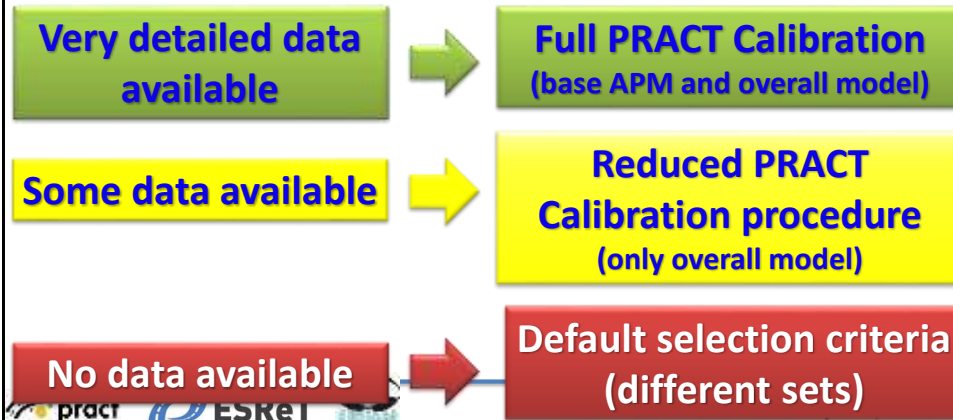





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The progressive application approach

As far as different countries, as well as different designers within a country, have different level of expertise and different data availability, the system need to be structured with different possible application levels.






The Guideline



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 Civile e Ambientale

CEDR Transnational Road Research Programme
Call 2013: Safety

Funded by Germany, Ireland, UK
 and Netherlands







CEDR
 Confederation of European
 Road Designers





PRACT
Predicting Road Accidents -
a Transferable methodology across
Europe




Guideline for the implementation of
accident prediction models on
freeways and rural two lane roads


Deliverable D3
 June, 2016


With the support of:



The Guideline



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Accident prediction models structures

- Analysed scenario
- Models functions
- Base SPF
- CMFs


Development of the transnational APMs for freeways and two-lane two-ways rural roads

- Data collection
- Modeling base SPFs
- Modeling full APMs
- GoF evaluation


CMF Transferability checks

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The Guideline



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Appendix 1 - Minimum level of exposure of road segments

Appendix 2 - Generalised Linear Models (GLM) used for modelling SPF base




Appendix 3 - Details on methodology to develop SPF base

Appendix 4 - Evaluation of the goodness-of-fit

Appendix 5 - Speed section control CMFs (Updated version of the table presented in PRACT deliverable D2)

Appendix 6 - RHR evaluation

Appendix 7 - Data template for collecting information on road segments

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The Tool



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Microsoft Excel - PRACT_beta_unrestricted_24.xlsx

CEDR Transnational Road Research Programme
Call 2013: Safety


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and Netherlands



Freeways

Two-lane two-ways

AMF/CMF Repository (web link)



V06a24_05-06-2016



NOTE: this tool is intended as a support to the designers and the decision makers but is not intended to replace the necessary designers expertise in conducting an accident analysis.

The PRACT team assumes no responsibility for any decision taken according to the PRACT Tool output.

Prior to applying the tool for an accident evaluation of a site the user should read the PRACT Guideline

This is the PRACT Tool version beta 24 for Workshop (23.06.2016)

Run PRACT Tool

Close

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[illegible]


[illegible]

The Tool


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DELL'EDILIZIONE

CMFs

Caratteristiche generali degli espositivi (di cui in rosso)		Caratteristiche tecniche espositivi			
	Espositivo	Stazione	Dimensioni (in espositivi)	Espositore	
Resistenza (N/m²)	ES01	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES02	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES03	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES04	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES05	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES06	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES07	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES08	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES09	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES10	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES11	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES12	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES13	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES14	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES15	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES16	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES17	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES18	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES19	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES20	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES21	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES22	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES23	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES24	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES25	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES26	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES27	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES28	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES29	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES30	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES31	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES32	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES33	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES34	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES35	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES36	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES37	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES38	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES39	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES40	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES41	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES42	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES43	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES44	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES45	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES46	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES47	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES48	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)	ES49	1000 (N/m²) (rosso)	1.000	10	10
Resistenza (N/m²)	ES50	1000 (N/m²) (rosso)	1.000	10	10
Carica (N/m²)					



The Tool



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Full Model


Calculate crashes in actual conditions (full model)			
GERMANY			
	Calibration Coefficient	Predicted (crashes per year per direction)	corresponding base model
Fatal+injury SINGLE Vehicle	1.577	0.100	GERMANY
Fatal+injury MIA Vehicle	0.938	0.215	GERMANY

Add a new set of calibration coefficients

Delete a set of calibration coefficients




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CMF Transferability

Available features in this configuration (not needed)	Enterprise Multiple Systems		Radio Linky checks	Standard CMF's	Radio CMF's
	Standard Database	Servers			
Available CMF's					
Personal name	0	---	Standard	Radio Linky	Radio CMF's
Area code	0	---	Standard	Radio Linky	Radio CMF's
Inside shoulder width	0	---	Standard	Radio Linky	Radio CMF's
Shoulder width	0	---	Standard	Radio Linky	Radio CMF's
Shoulder slope	0	---	Standard	Radio Linky	Radio CMF's
High volume	0	0	Standard	Radio Linky	Radio CMF's
Area changes	---	---	Standard	Radio Linky	Radio CMF's
Outside shoulder width	---	The CMF is applicable to 70 km/h	Standard	Radio Linky	Radio CMF's
Shoulder width zone	0	The CMF is applicable to 70 km/h	Standard	Radio Linky	Radio CMF's
Shoulder clearance	0	The CMF is applicable to 70 km/h	Standard	Radio Linky	Radio CMF's
Shoulder length	0	The CMF is applicable to 70 km/h	Standard	Radio Linky	Radio CMF's
Suburban	---	---	Standard	Radio Linky	Radio CMF's
Highway/express lane	---	---	Standard	Radio Linky	Radio CMF's
Urban speed control	0.00	---	Standard	Radio Linky	Radio CMF's
			Standard		



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ESReT

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The Repository




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GLOSSARY

Accident Prediction Model (APM) or Safety Performance Function (SPF): an equation used to estimate or predict the expected average accident frequency at a location, as a function of traffic volume and road infrastructure characteristics (e.g. number of lanes, type of median, traffic controls). In PRACT repository, APFs are divided in two types: Regression Equation Models and SPMS CMFs Models (see also respective definitions in the glossary).

Average Annual Daily Traffic (AADT): the counted (or estimated) total traffic volume in one year divided by 365 days/year.

Before – After Study: the evaluation of implemented safety measures in terms of crash reduction, by comparing frequency or severity of crashes before and after implementation, that often result in the development of CMFs. There are several different types of before – after studies – see also Naïve Before-After Study, Before-After with Comparison Group Study, Empirical Bayes Before-After Study, and Full Bayes Before-After Study.

Before-After with Comparison Group Study: a type of before-after study, in which a group of untreated sites that are similar in relation to the treated site is used to control for changes in crash frequency not influenced by the treatment. For the approach to give unbiased estimates, treatment implementation must be random (e.g. a blanket treatment applied to all sites) rather than related to accident rates and reference sites must have similar characteristics to the treatment sites, including accident rates in the before period.

Crash Modification Factor (CMF) or Function, or Accident Modification Factor: the relative change in accident frequency due to a change in one specific condition when all other conditions and site characteristics remain constant. CMF is the ratio of the expected accident frequency after a modification or measure is implemented to the observed





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ESReT

European Safety Review Tool








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Project Manager: Forbes Vigors, TII - Ireland






<https://esret.eu>




ESReT System Rationale






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The **European Directive 2008/96/EC on Road Infrastructure Safety Management** requires road authorities to **undertake road safety impact assessments, road safety audits, identification of high accident concentration sections and safety inspections on the trans-European road network.**




```


graph LR
    A[Identify high priority road sections] --> B[Visit sites and collect data]
    B --> C[Assess high risk road sections]
    C --> D[Develop treatment programme]
  
```


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ESReT System Rationale



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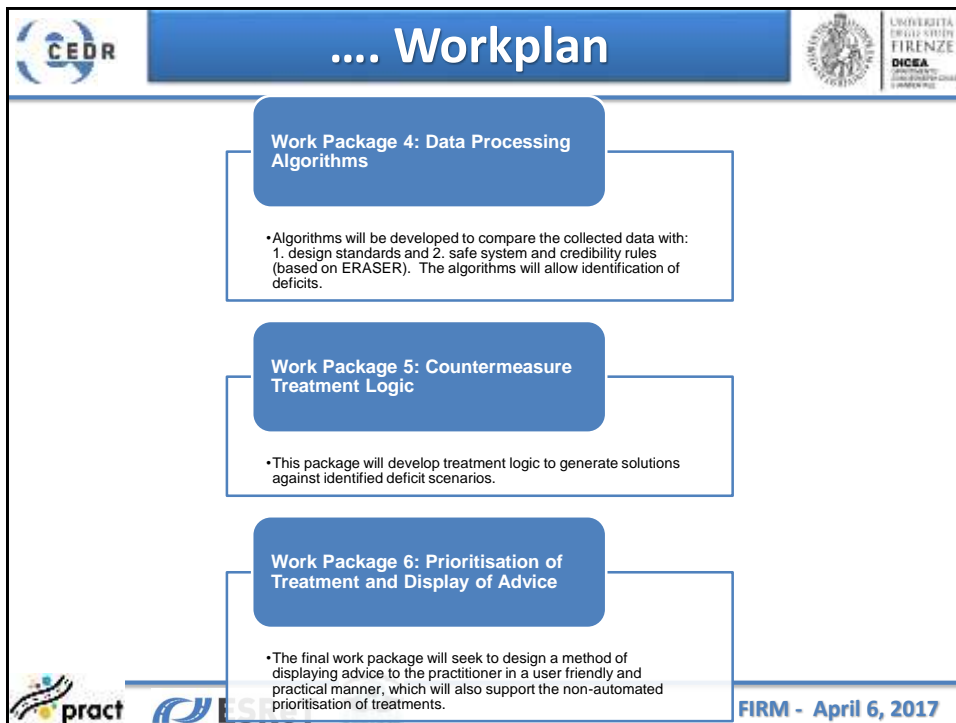
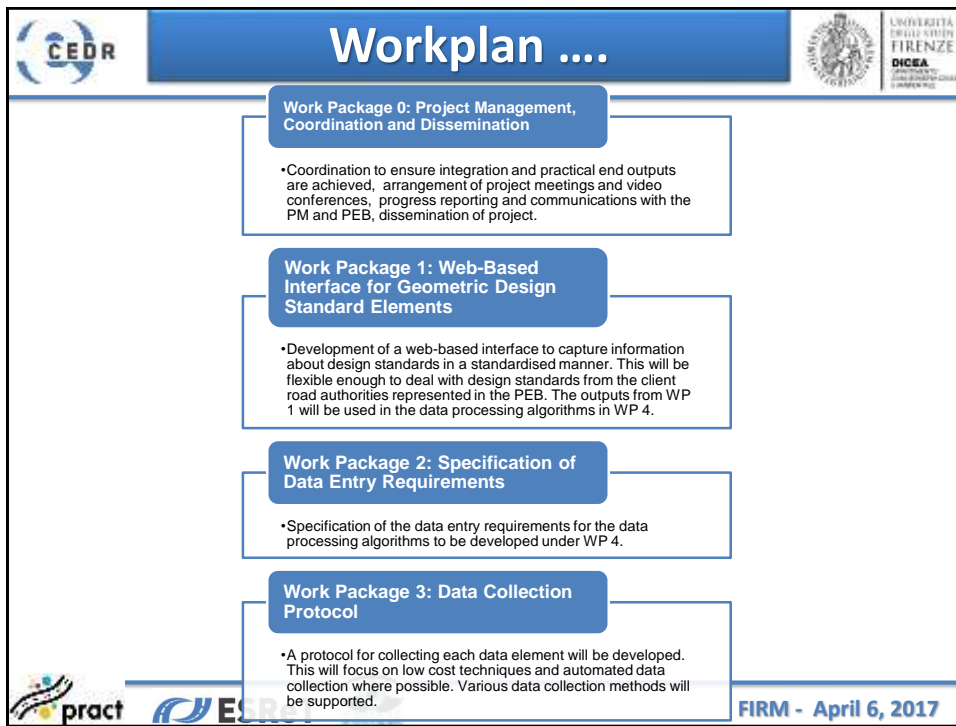
graph LR
    A[Identify high priority road sections] --> B[Visit sites and collect data]
    B --> C[Assess high risk road sections]
    C --> D[Develop treatment programme]
  
```


Road sections that have a high concentration of accidents should be **evaluated by expert teams** through **site visits.**

This project aims **to provide a tool to support road authorities in undertaking this task.**






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ESReT web tool



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- **User management**
- **Design standards**
- **Project management**
- **Road safety analysis**






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ESReT web tool



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Run Safety Check

Rule Name	30km/h	40km/h	50km/h	60km/h	70km/h	80km/h	90km/h	100km/h	110km/h	120km/h	130km/h
Median Type	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Clear Zone (Median)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Clear Zone (Roadside)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Intersection Type	Pass	Pass	Pass	Pass	Pass	Fail (Incorrect)	Fail (Incorrect)	Fail (Incorrect)	Fail (Incorrect)	Fail (Incorrect)	Fail (Incorrect)
Accession Frequency	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Access Frequency	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Pedestrian Crossing	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Footpath / Sidewalk	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Pedal Cycle Facility	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Hover with the mouse over Fail to see the reason for the fail.



Treatment Options

What for crash type? Run off road


Notes Failed

Lane width


Treatment Type	Costs	Estimated Safety Effect
Widen lane(s)	Medium	25-40%
Introduce/improve delineation	Low	10-25%
Introduce/replace stops	Low	10-15%
Reduce speed limits by 10kph	Low	2% (high speed roads) - 10% (lower roads)




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EUSight - European Sight
Distances in perspective



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TNO innovation
for life



SWOV
RIJSCHE OUVERSCHIED
LABORATOIRE VERKEER



TRL



ARCADIS
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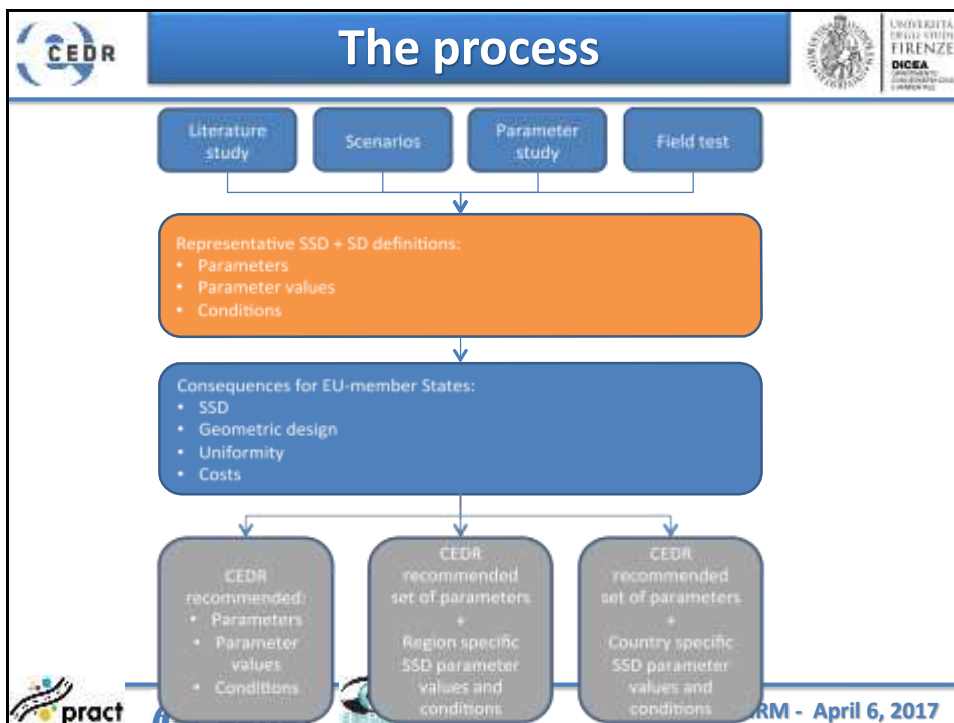
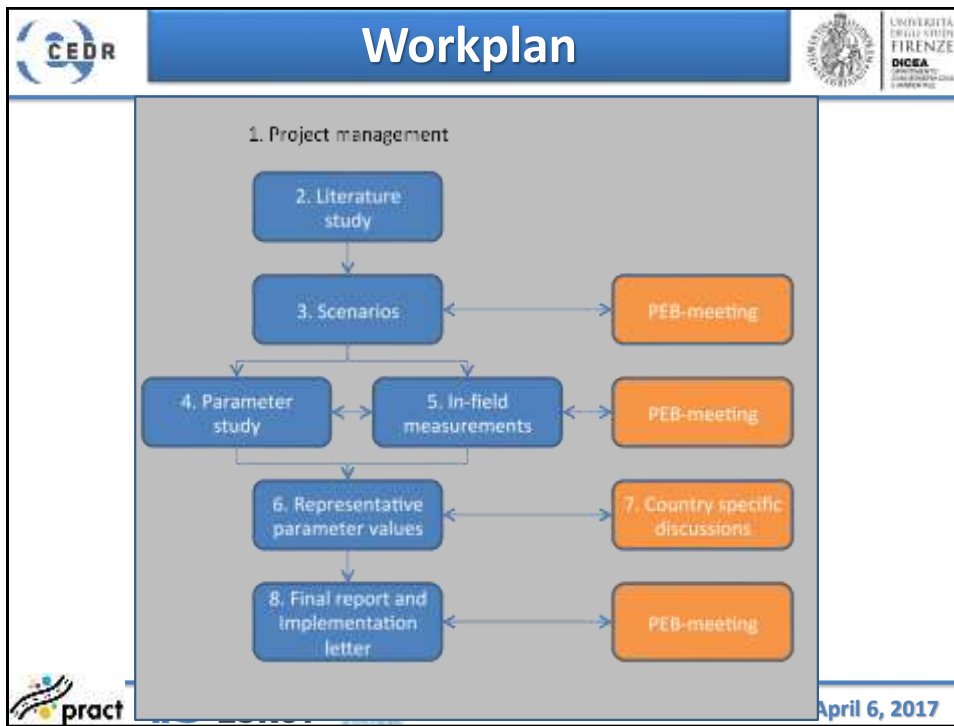
Prof. R. Weber

Coordinator Niels Beenker, ARCADIS, Netherlands
e-mail: niels.beenker@arcadis.nl

Project Manager: Gerald Uittenboger, RWS, Netherlands



www.eusight.nl





Countries considered




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- Denmark
- France
- Germany
- Ireland
- Netherlands
- Switzerland
- UK










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Parameters' variability evaluation

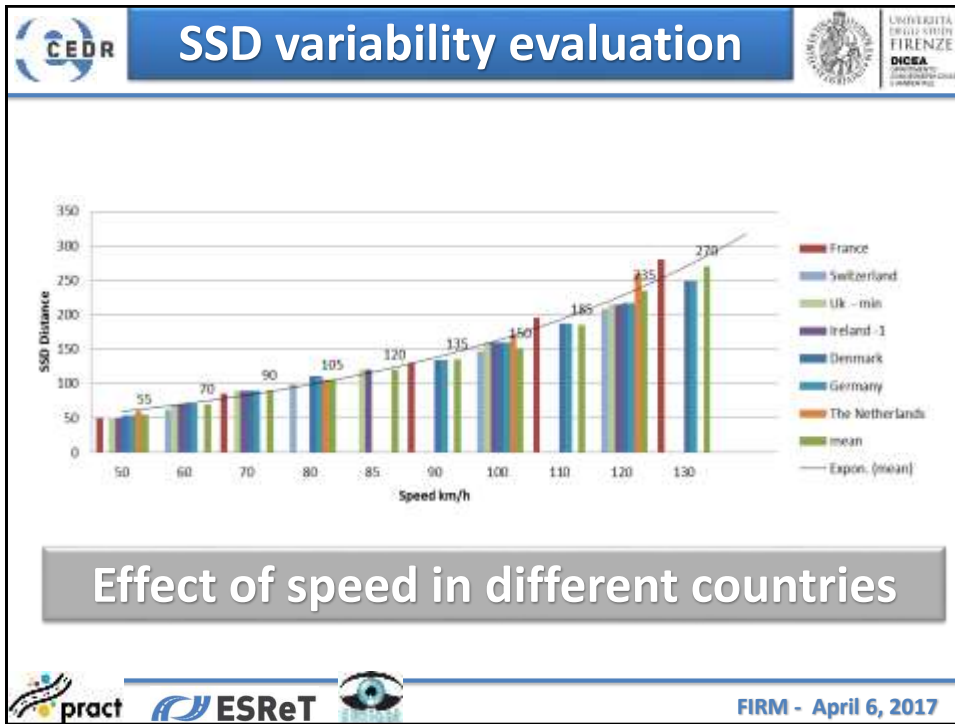


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Parameter	Best case	Guideline	Worst case
Lane width	3.75 m wide	x	vehicle width
Lateral position driver	far		close
Object	1st visible brake light	0.5m box on the road / 1st visible brake light	0.5m box on the road
Driver eye height, truck	5th percentile	2.0 to 2.5 m	95th percentile
Driver eye height, car	95th percentile	1.0 to 1.1 m	5th percentile
(A)DAS	ABS	no (A)DAS	None
Road surface and condition	open asphalt (rain); closed asphalt (dry)	closed asphalt, wet	concrete, wet
Situational: traffic	low	low	high
Situational: construction	standard	-	tunnel
Situational: road configuration	long-distance motorway,	-	near city motorway,
Gradient	gentle up/down	-	steep up/down
Tyres	Typ A, new	-	Type B, 1.6 mm
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="width: 40%; text-align: left;">  <p style="color: white; font-weight: bold;">Safe</p> </div> <div style="width: 20%;"></div> <div style="width: 40%; text-align: right;">  <p style="color: white; font-weight: bold;">Unsafe</p> </div> </div>		
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="width: 40%; text-align: left;">  <p style="color: white; font-weight: bold;">High cost</p> </div> <div style="width: 20%;"></div> <div style="width: 40%; text-align: right;">  <p style="color: white; font-weight: bold;">Low cost</p> </div> </div>		

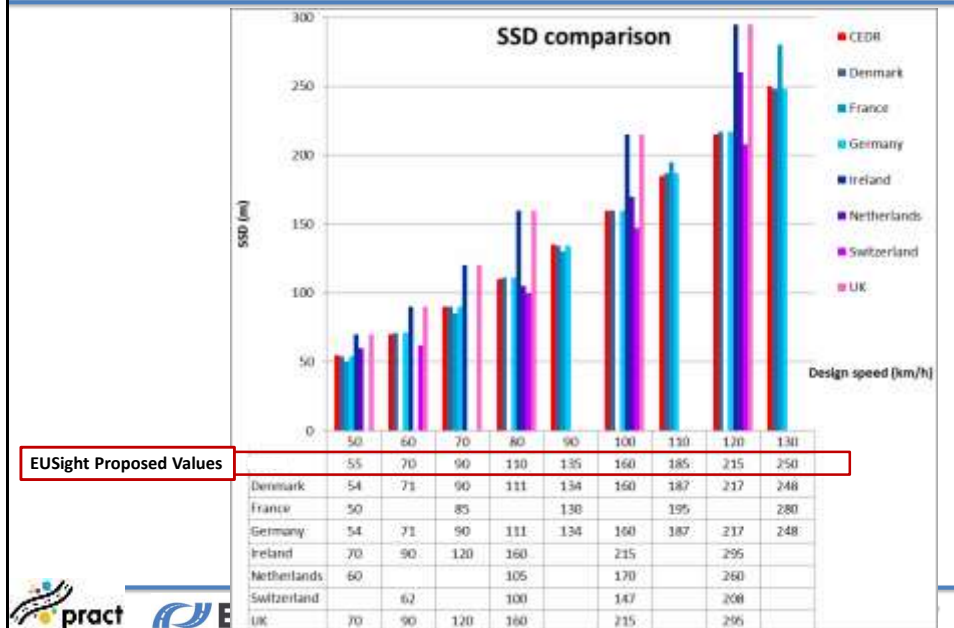
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Proposed calculation parameters' values	
SSD parameter variables	Recommended parameter value
Observation point position left curve (m) RHD countries (LHD countries)	1.33
Observation point position right curve (m) LHD countries (RHD countries)	1.3
Obstacle height (m)	0.5
Observed point height crest curve (m)	0.5
Observed point height sag curve (m)	0.5
(Resulting) coefficient of friction	0.377
Tangential or braking coefficient of friction	0.377
Driver eye height Horizontal alignment (m)	1.10
Driver eye height Crest curve (m)	1.10
Driver eye height sag curve (m)	1.10 (2.5 truck)
Perception-Reaction Time (s)	2.0
Deceleration rate (m/s ²)	4.0

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Proposed calculation parameters' values



XLS tools

EUSight

CEDR
Conférence Européenne des Directeurs des Routes
Conférence of European Directors of Roads

This spreadsheet is developed within the CEDR Transnational Road Research Programme, call 2012: Safety. The EUSight project is part of the CEDR safety call 2012 and contains a detailed examination of stopping sight distance parameters and the impact on geometric road design.

With this spreadsheet road designers can calculate (minimum) road design dimensions according to the recommendations of the EUSight project:

- Stopping sight distance (see tab 'SSD')
- Minimum horizontal curve radius (see tab 'Vertical')
- Minimum horizontal curve radius, given the position of a roadside sight obstructing object (see tab 'Horizontal, curve')
- Minimum distance of sight obstructing object in a horizontal curve, given the radius of the horizontal curve (see tab 'Horizontal, distance')

The version 'SSD tool 1407', is applicable for left hand side driving countries, the version 'SSD tool 1945' can be used for right hand driving countries.

Cells in this spreadsheet have a color based function:

- Default parameter values, EUSight recommendation
- Input parameter values
- Output parameter values (from spreadsheet calculation)

By modifying the input parameters only, the user can calculate stopping sight distance related road design geometrics.

Background information about the parameter values used in this spreadsheet, is included in the following reports:

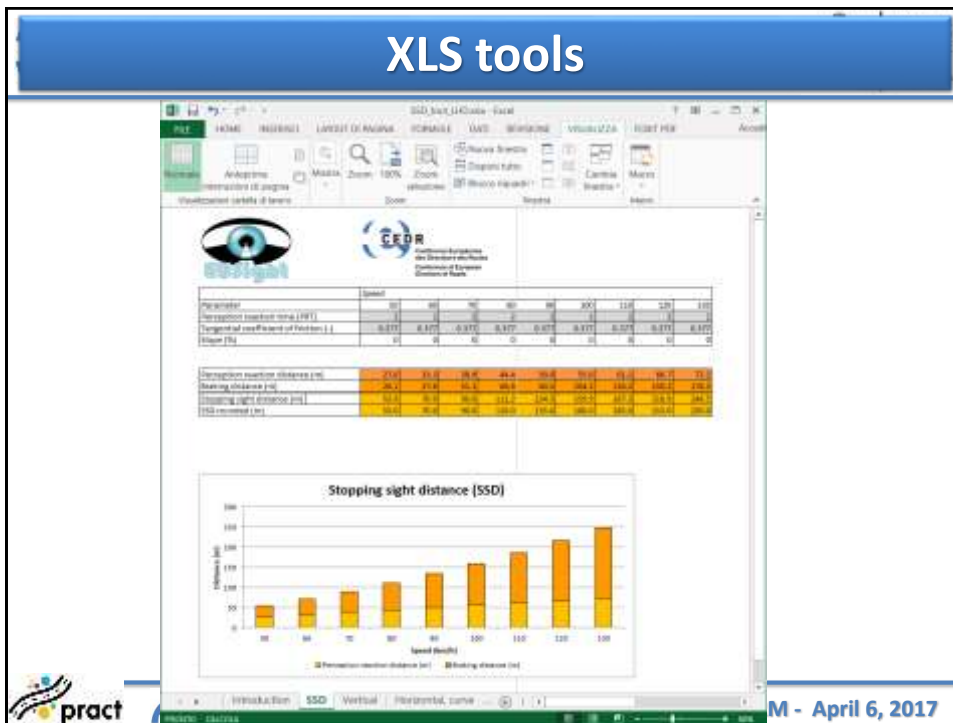
- European Sight Distances in perspective - EUSight, Representative parameter values study, Deliverable No D6.1, June 2013
- European Sight Distances in perspective - EUSight, Final report, Deliverable No D6.2, February 2016

The reports can be downloaded from: www.EUSight.eu
betty.k.fennell@cedr.eu

More information?

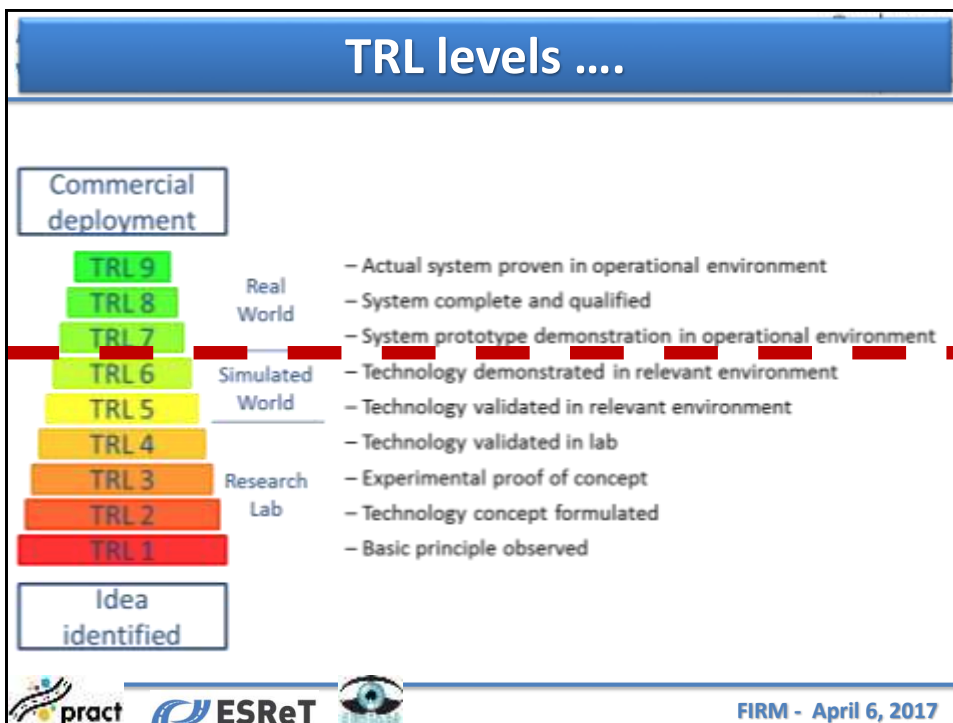
Introduction | SSD | Vertical | Horizontal, curve | Horizontal, distance | Graphs

XLS tools



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TRL levels



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TRL levels

What work would still be necessary for the project to reach a TRL level of 9?

- **Dissemination** @ National Level for practitioners and NRAs (in PRACT 4 local events were conducted in NL, UK, Ireland, Germany).
- **Champions (level 7)**: NRAs that start implement these results in their standards (as in CEDR Safety call 2012 – Ireland for WZ Now spreading the good practice).



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Expected impact



Understand and increase the effectiveness of safety interventions



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Expected impact



Uniformity in SSD safety conditions in
EUROPE (especially in the TERN network)
and **minimization of construction costs**

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FIRM - April 6, 2017