



TRANSPORT  
RESEARCH  
CENTRE



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FOR THE FUTURE

# Forgiving roadsides

PIN Talk 9 April 2024

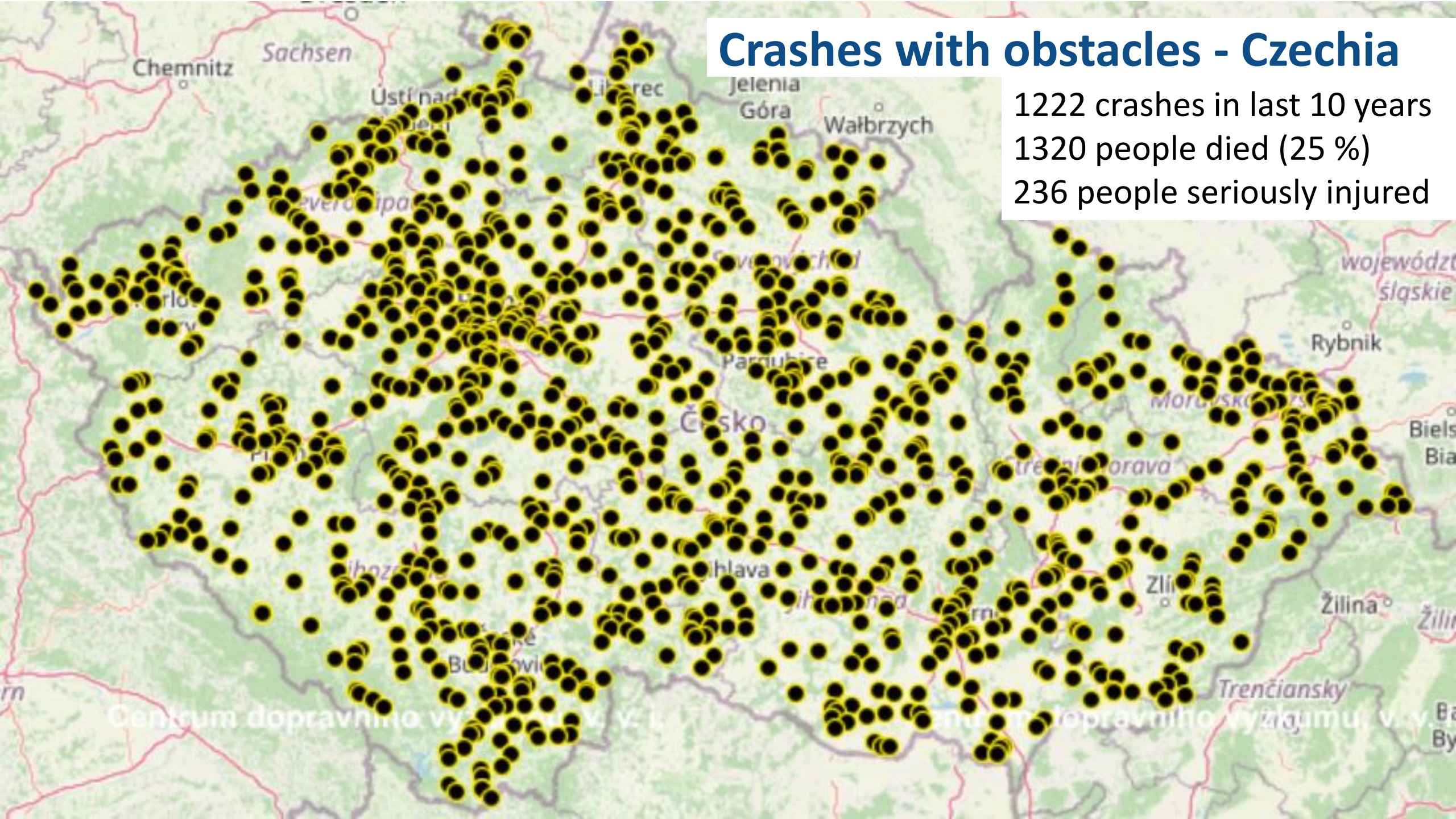
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Director of Research, Development and Knowledge Transfer



# Crashes with obstacles - Czechia

1222 crashes in last 10 years  
1320 people died (25 %)  
236 people seriously injured





# ROAD TRAFFIC FATALITIES IN THE EU IN 2021

by road user and (other) 'main vehicle'  
involved in the crash

## IN A COLLISION WITH...

32,6 %

FATALITIES		PEDESTRIAN	BICYCLE	MOPED	MOTORBIKE	CAR	LORRY (<3.5T)	HEAVY GOODS VEHICLE (>3.5T)	BUS OR COACH	OTHER VEHICLE/ UNKNOWN	NO OTHER VEHICLE INVOLVED	TOTAL
PEDESTRIANS		●	29	16	115	2 328	416	391	97	162	●	3 554
CYCLISTS		7	45	6	26	838	183	199	30	77	426	1 837
MOPED RIDERS		0	1	7	6	232	42	27	5	20	175	515
MOTORCYCLISTS		10	8	8	91	1 386	231	207	13	85	1 197	3 236
CAR OCCUPANTS		18	6	4	21	2 504	625	1 392	115	298	3 900	8 883
LORRY (<3.5T) OCCUPANTS		1	0	1	0	124	62	250	10	32	262	742
HEAVY GOODS VEHICLE (>3.5T) OCCUPANTS		1	1	0	0	40	11	192	2	13	153	413
BUS OR COACH OCCUPANTS		3	0	0	0	6	7	12	4	14	74	120
OTHER/UNKNOWN		2	3	2	4	169	34	52	4	27	300	597
<b>TOTAL</b>		<b>42</b>	<b>93</b>	<b>44</b>	<b>263</b>	<b>7 627</b>	<b>1 611</b>	<b>2 722</b>	<b>280</b>	<b>728</b>	<b>6 487</b>	<b>19 897</b>

# Secondary roads – road safety challenges

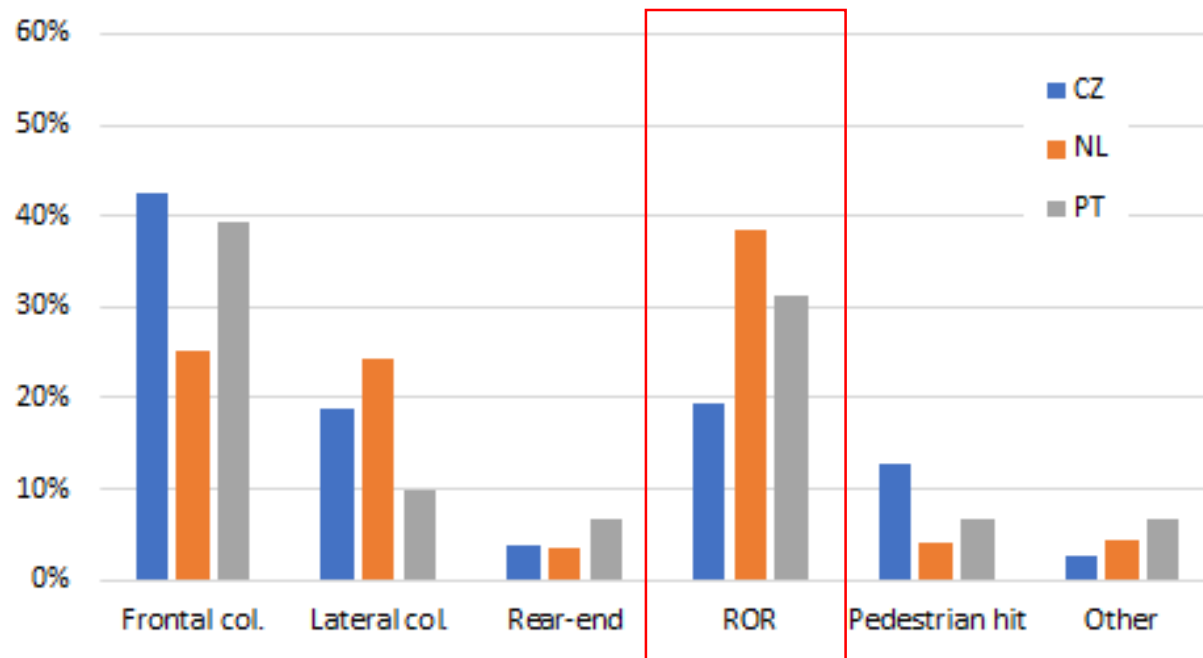
Position paper (To be released in mid-May)

ROR = run-of-road crashes

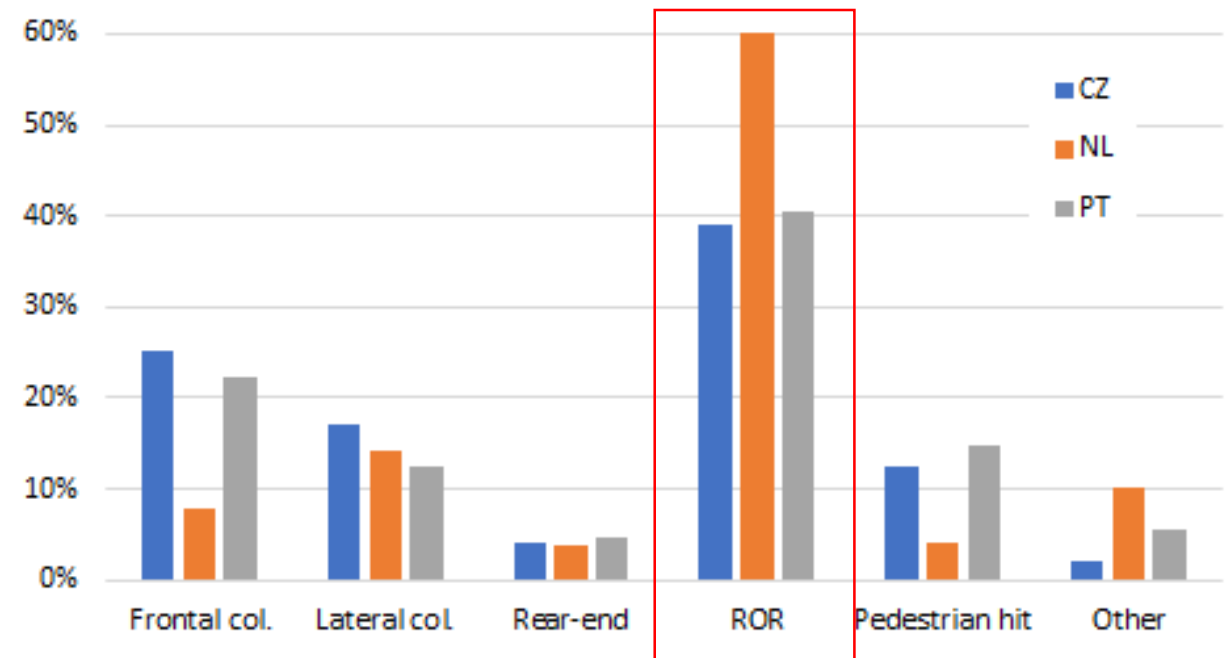


**FERSI**  
Road Safety Research

### Primary interurban - fatal events



### Secondary interurban - fatal events

































EfficientLine 2

T61 ML 400









**HAŠIČI PŘÍSTROJ**  
kapacita 1,5 kg  
10 bar

1. Opatřit pojištěm.
2. Naměřovat na oheň. Stisknout páku vstříčku.

HA B C

CE mark





We don't even  
punish convicted  
murderers with  
death

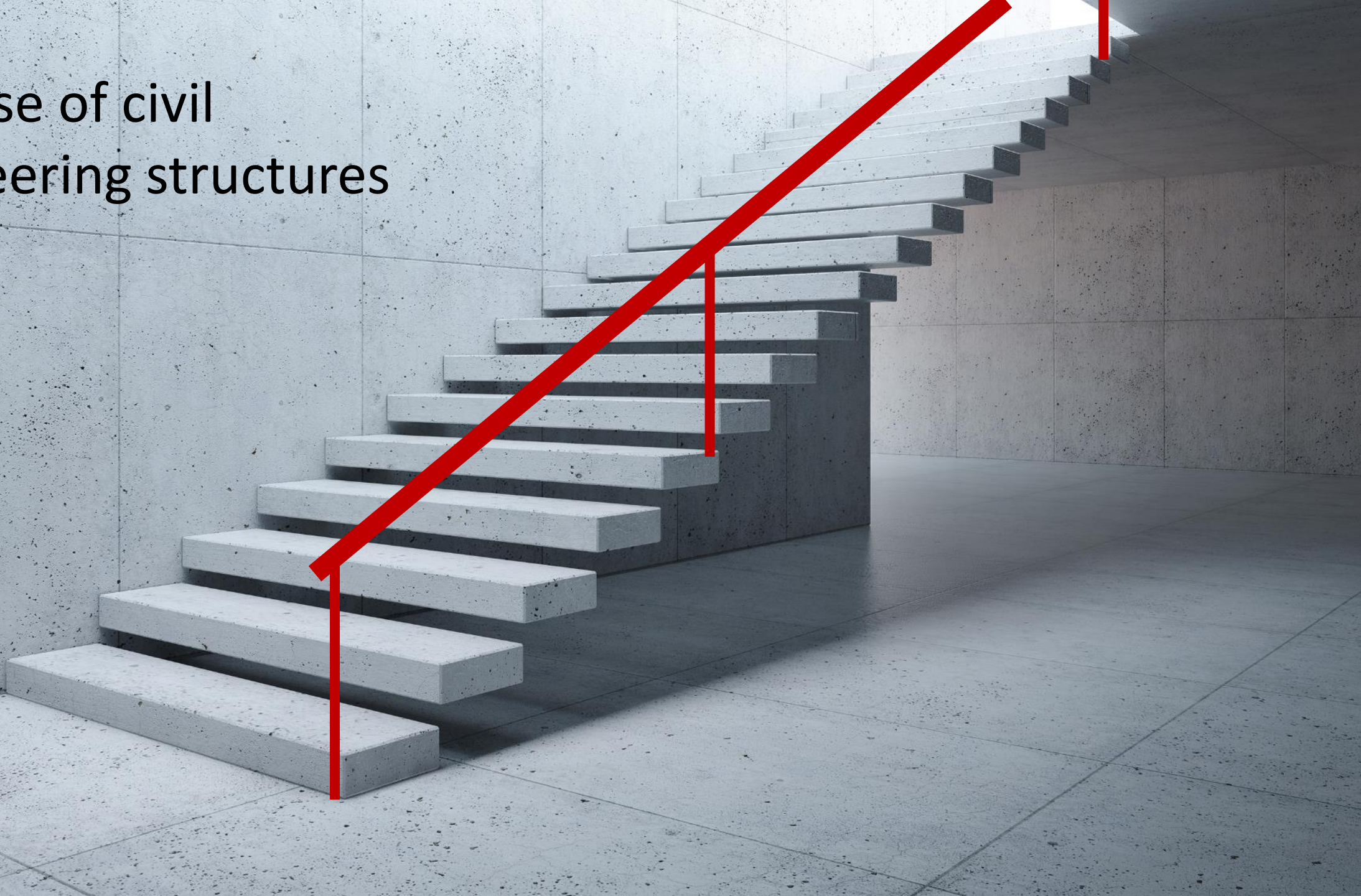




So why are we punishing a mistake behind the wheel with death?



Safe use of civil  
engineering structures







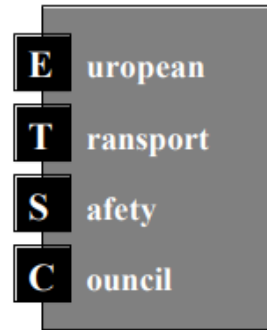


# We know the answers

Why

What

How



1998

## FORGIVING ROADSIDES

### 1. Introduction

Collisions between vehicles leaving the road and unforgiving roadside objects such as trees, poles, road signs and other street furniture are a major road safety problem internationally. Such collisions contribute to between 18 and 42 per cent of fatal accidents in several EU countries. They are typically single vehicle accidents often involving young drivers, excess or inappropriate speed, the use of alcohol or driver fatigue. A further problem with street furniture arises where accidents are caused through visibility restrictions due to poor siting of off-road objects.

Research and experience indicate that the siting and design of off-road objects can play a major role in reducing such collisions and the severe consequences that are typically associated with



## Forgiving roadsides design guide



November 2012



# Road is an important part of the road safety management system

Behaviour

People do mistakes

Road design

Must give space for correction of an error

Roadside

Must give space for safe slow down and stop

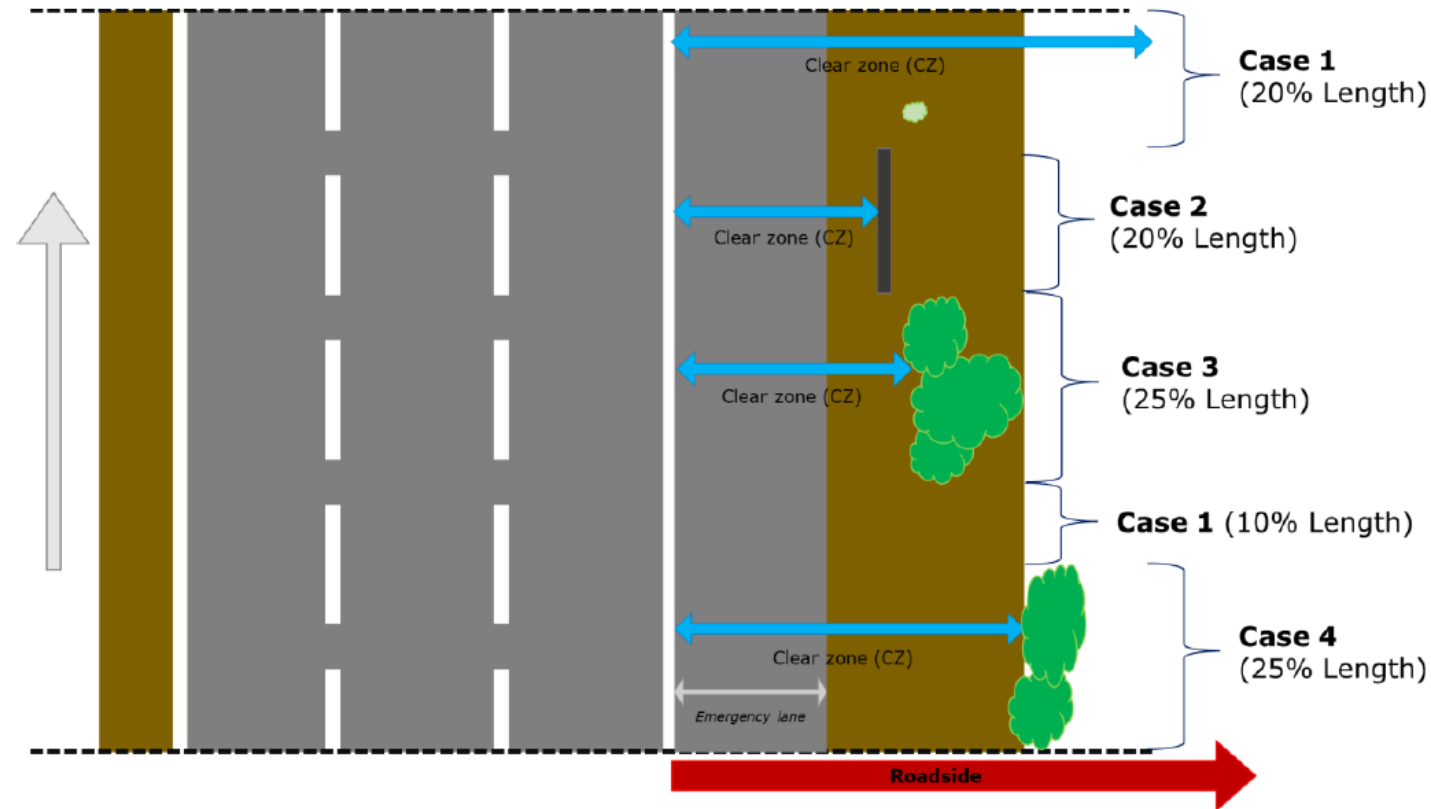


# European Level

## Expert Group on Road Safety Infrastructure (EGRIS)

Network Wide Road Safety Assessment - Methodology and Implementation Handbook

! Point obstacles are not important within the scope of network-wide assessment.




**Figure 3.6:** Example of varying roadside. Clear zone width is indicated (per case) with blue arrows. Two types of obstacles are illustrated: the first one in gray color and the second one in green color.



## European Level

### Expert Group on Road Safety Infrastructure (EGRIS)

Self-explaining  
Self-enforcing  
Forgiving roads

 Willingness to work in a  
broader context not only for  
the road and motorway  
network under Directive

## Scope of the activity

### *Geographical scope (Art. 1(2) + Art. 1(3))*

- *TEN-T Network*
- *Motorways*
- *Primary roads*
- *EU funded extra-urban roads*











# Typical road safety issues

„Surprising design“ – not expected curve or horizon

Shoulder – not sufficient width

Hard obstacles in the roads side – trees, poles, pillars

Barriers and Guardrails – terminals and the level of energy absorbance

Slopes – risk of roll over crashes

Road markings – missing or no rumble strips

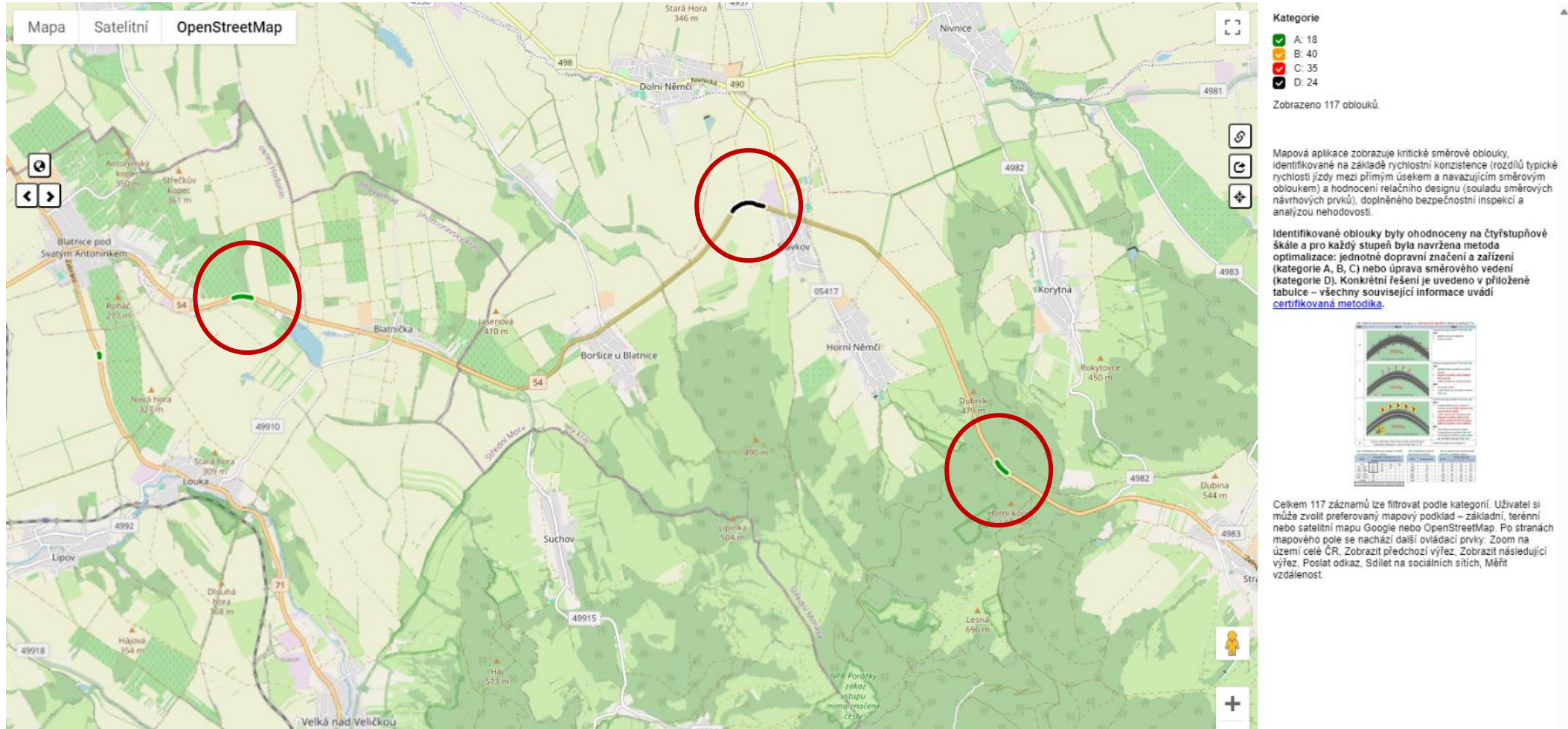




# Self-explaining roads

<https://doi.org/10.3141/2635-08>

Hypothesis: If the road is predictable, the driver does not have to change speed rapidly.



Mapa Satelitní OpenStreetMap

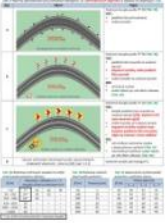
Kategorie

- A: 18
- B: 40
- C: 35
- D: 24

Zobrazeno 117 oblouků.

Mapová aplikace zobrazuje kritické směrové oblouky, identifikované na základě rychlostní konzistence (rozdílů typické rychlosti jízdy mezi přímým úsekem a navazujícím směrovým obloukem) a hodnocení relačního designu (souladu směrových návrhových prvků), doplněného bezpečnostní inspekcí a analýzou nehodovosti.

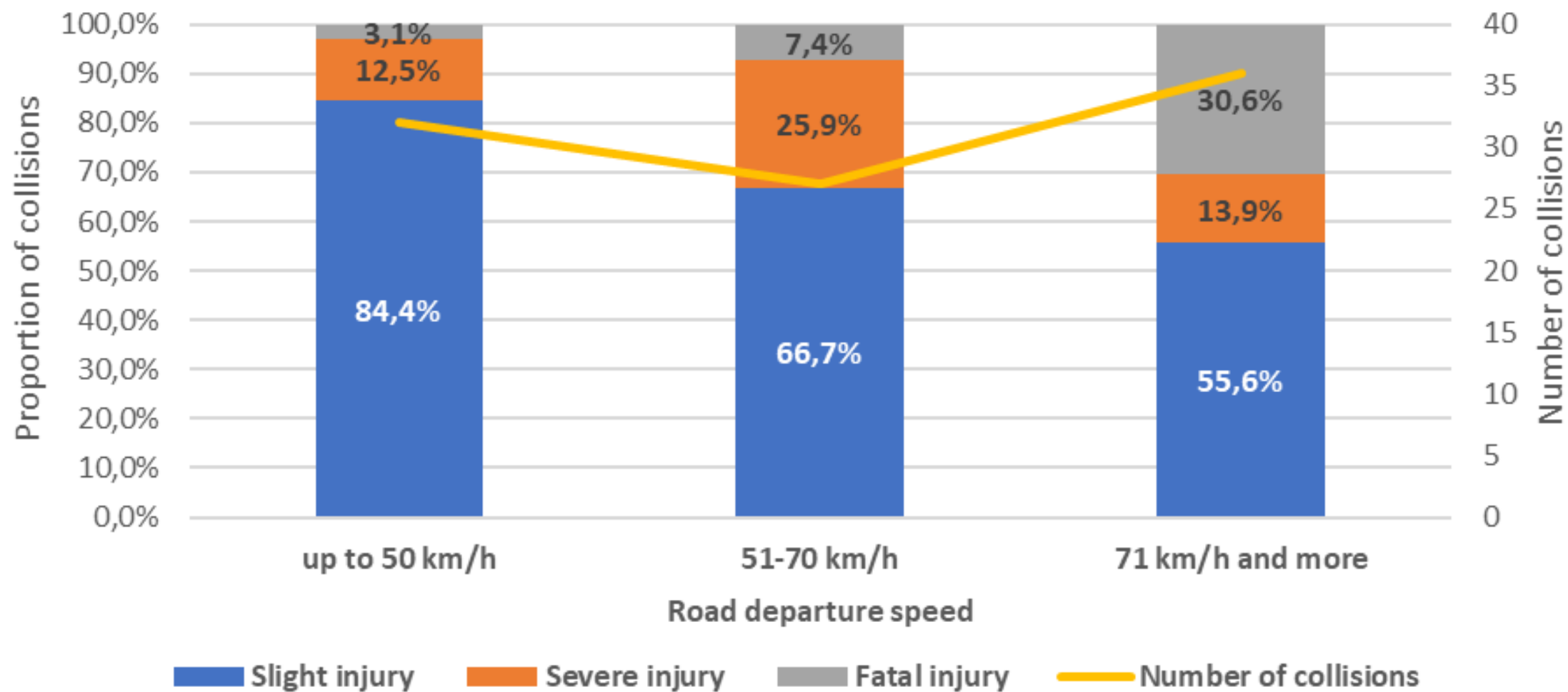
Identifikované oblouky byly ohodnoceny na čtyřstupeňové škále a pro každý stupeň byla navržena metoda optimalizace: jednotné dopravní značení a zařízení (kategorie A, B, C) nebo úprava směrového vedení (kategorie D). Konkrétní řešení je uvedeno v příložené tabulce – všechny související informace uvádí [certifikovaná metodika](#).



Celkem 117 záznamů lze filtrovat podle kategorií. Uživatel si může zvolit preferovaný mapový podklad – základní, terénní nebo satelitní mapu Google nebo OpenStreetMap. Po stranách mapového pole se nachází další ovládací prvky: Zoom na území celé ČR, Zobrazit předchozí výřez, Zobrazit následující výřez, Poslat odkaz, Sdílet na sociálních sítích, Měit vzdálenost.



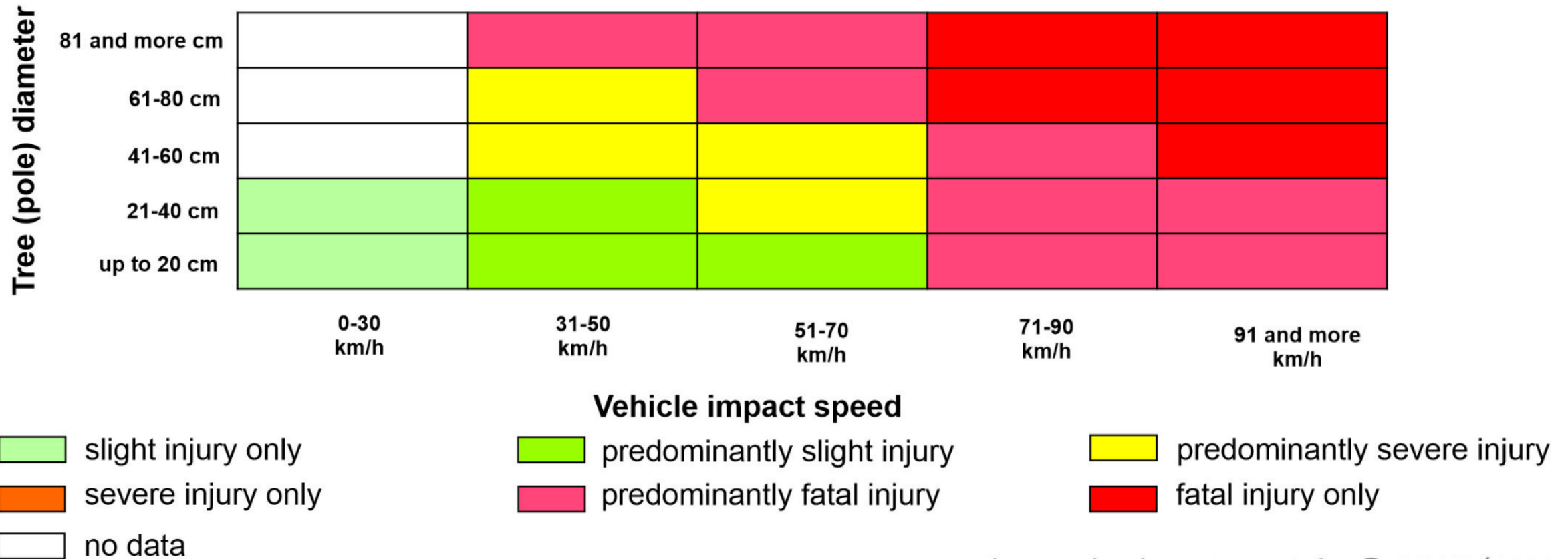
## Severity of injuries based road departure speeds in fixed object collisions



data source: vyzkumnehod.cz; Copyright © BESIP/CDV



# Severity of vehicle occupants' injuries based on tree (pole) diameter and impact speed



source: vyzkumnehod.cz; Copyright © BESIP/CDV



# Recommendations to achieve EU goals

## Action

- Invest in more self-explaining roads to get lower number of mistakes of drivers
- Eliminate the obstacles
- Install guardrails to prevent from crash with hard obstacles

## Administration

- Set guardrails as a mandatory equipment without exceptions wherever they should protect road users (by law, design standards are not compulsory in all EU member states)
- Unify the design standard in Europe (EN standards are used for all other different types of civil engineering constructions and materials)

## Research

- Prevent vehicles from run of the road with electronic systems and automation in vehicles
- Innovative guardrails – higher level of energy absorbance, new systems for the terminals (safer, easy to maintenance, cost effective)
- Innovative traffic sign posts (new materials)
- New materials with improved parameters for easier orientation of the drivers





# Thank you for your attention

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