Best Practice Guidelines on Road Safety Inspection

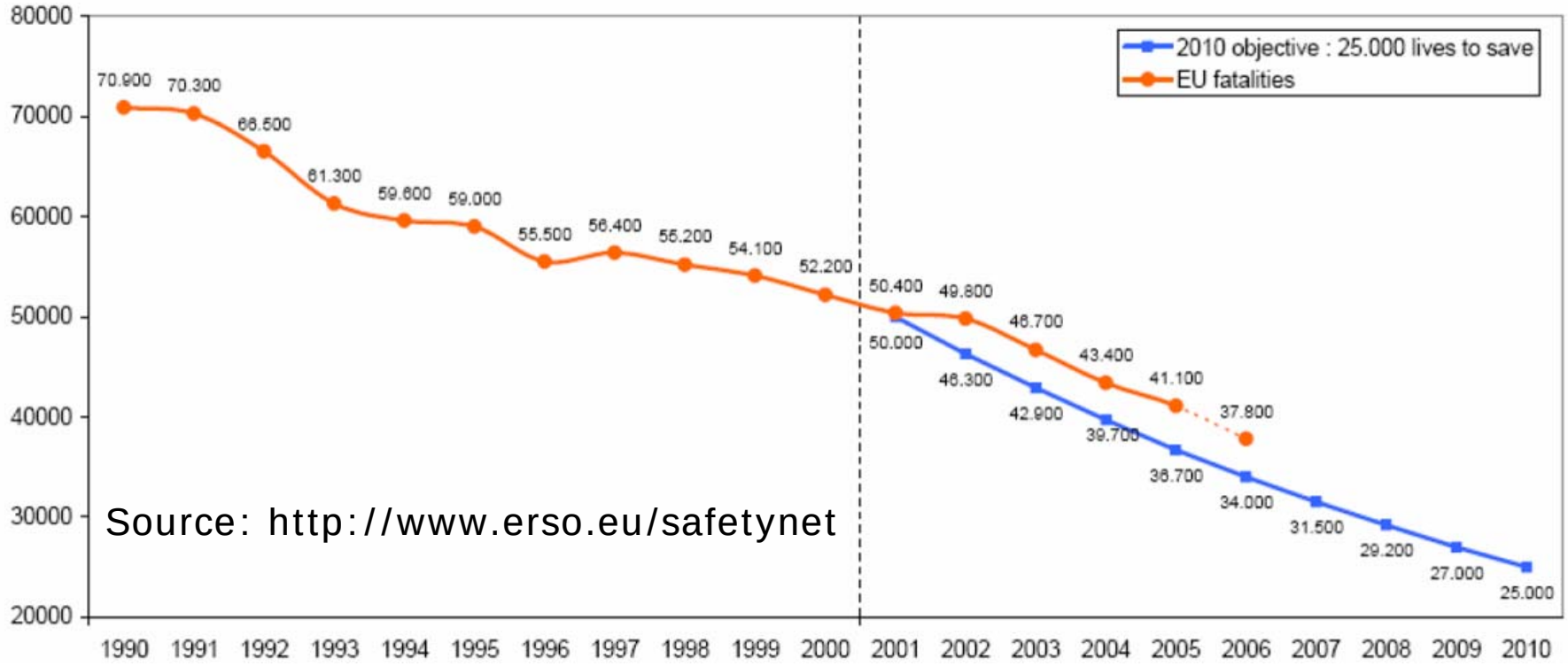
Christian Stefan

- Austrian Road Safety Board (KfV)
- Project Manager Road Safety Economics
- Christian.stefan@kfv.at

KfV
Kuratorium für Verkehrssicherheit

Road accident fatalities in the EU-25

- Several papers by the EC concerning road safety
- Objective: -50% fatalities by 2010



STREP Ripcord-Iserest

- Road Safety Impact Assessment and Accident prediction Models
- Road Design and Road Environment
- Road Safety Audit (RSA)
- Road Safety Inspection (RSI)
- Black Spot Management and Safety Analysis of Road Network

STREP Ripcord-Iserest

http://www.ripcord-iserest.com/

Common understanding of RSI

- no record of high accident numbers
- RSI should be carried out periodically
- on the already existing road network

The purpose of Safety Inspections ….

- identifying hazardous conditions, faults and deficiencies
- improve traffic safety standards on existing roads

The spatial problem of RSI

Basic idea: check existing road network in periodic time intervals

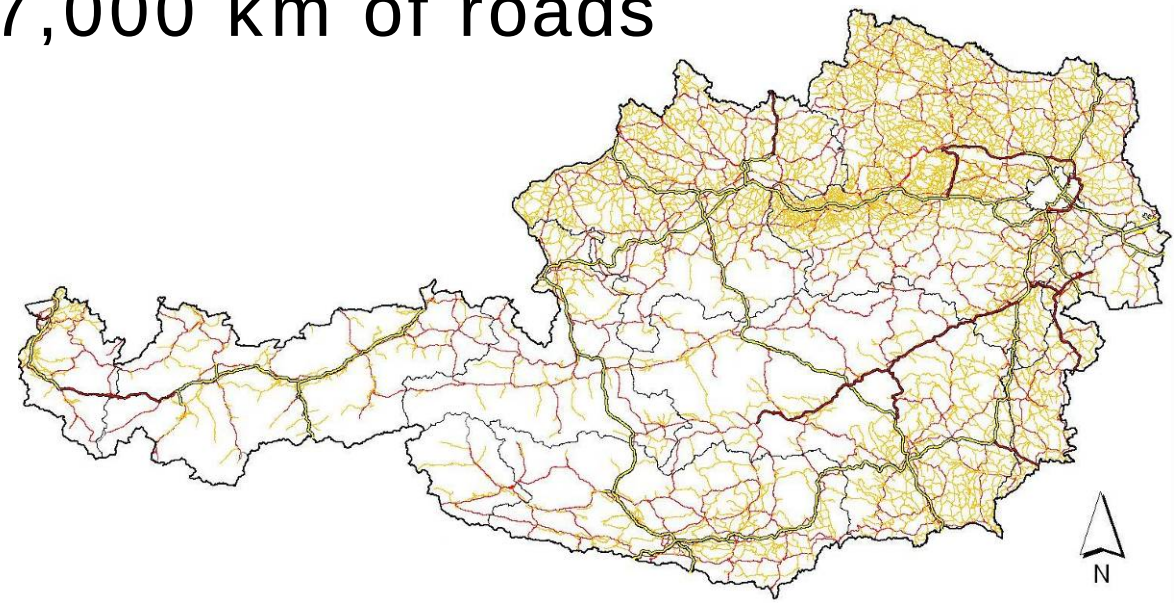
Road network consists of thousands of kilometres (small percentage are motorways)

The spatial problem of RSI

Austria

- 2,000 km motor- and expressways
- 35,000 km roads of federal states
- 80,000 km in-town streets

Total: 117,000 km of roads



The spatial problem of RSI

Is it feasible to inspect the whole network in periodic time intervals of 2-4 years?

Different types of Safety Inspections

Periodic
Road Safety Inspection

Ad-hoc
Road Safety Inspection

Different types of Safety Inspections

Periodic RSI

Periodic RSI	• road signs • road markings • traffic devices • hazards at the carriageway • road-side environment	Motorways, major roads, federal-state roads, district council roads	every 2 years
		Municipal roads and minor roads	every 4 years

Different types of Safety Inspection

Dedicated RSI

Night-time RSI	• road signs • road markings • traffic devices • road layout • lighting of crossing points	Motorways, major roads, federal trunk roads, federal-state roads, district council roads	every 4 years
Railway crossing inspection	Road signs and traffic devices in connection with level crossings	all roads	every 4 years
Tunnel inspection	• road signs • road markings • traffic devices • lighting	all roads	every 4 years
Destination-sign inspection	Destination signs	all roads	every 4 years
Inspection of other road signs and traffic devices	Road signs and traffic devices not covered by other RSI	all roads	every 4 years

Different types of Safety Inspections

Ad-hoc RSI

Ad hoc road-safety inspection	Selected road signs and traffic devices	all roads	as required

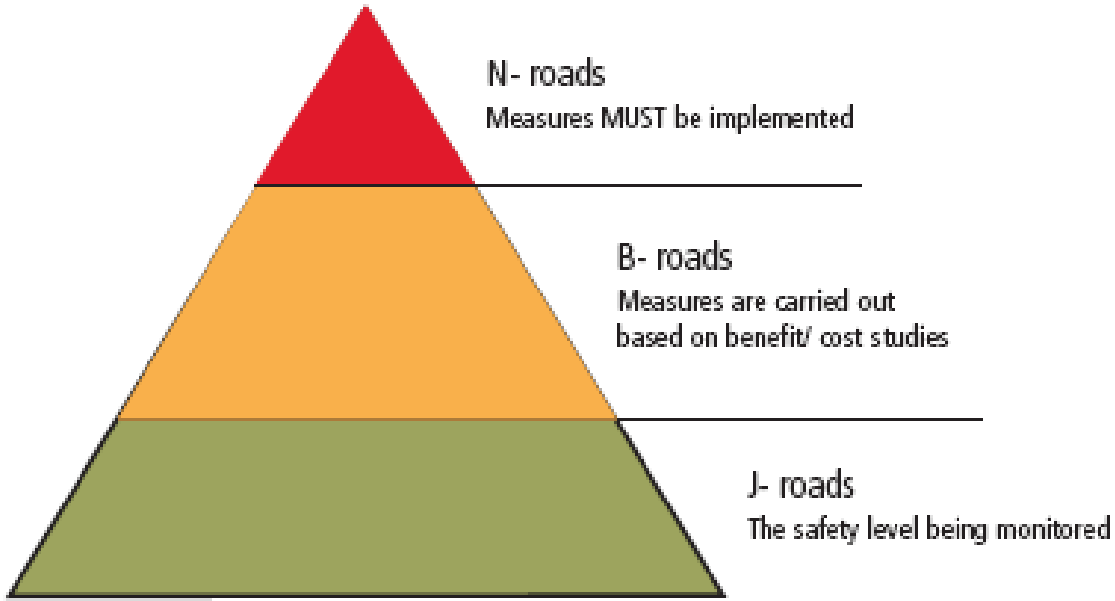
Use of accident data

- Preselection of roads due to safety record
- Norway: Expected Injury Severity Density (EISD)
- indicator of the number of injured road user per km of road and year
- estimated by means of Accident Prediction Models and Empirical Bayes method

Use of accident data

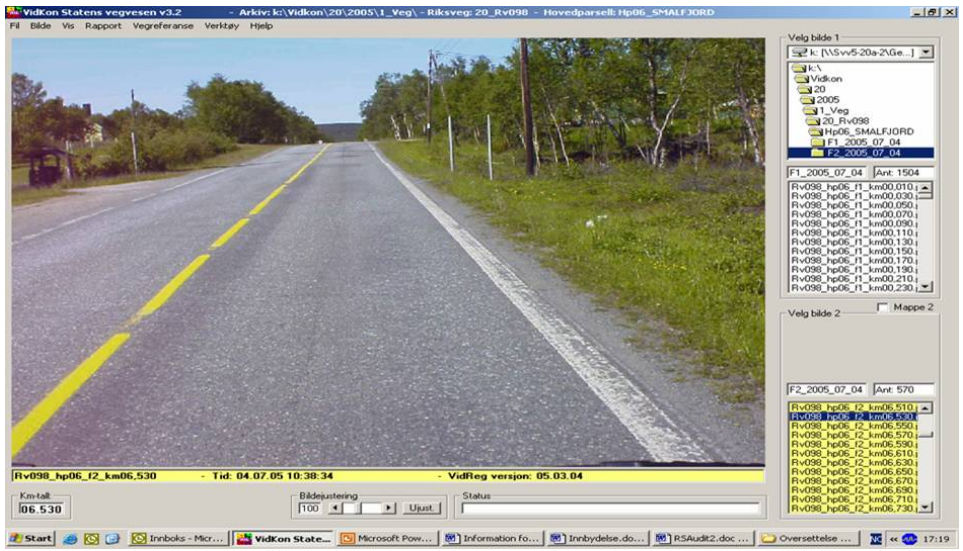
Roads classified into 3 groups

- Red roads (N): 10% worst roads
- Green roads (J): 50% safest roads
- Yellow roads (B): remaining 40% of roads



Vidkon inspection

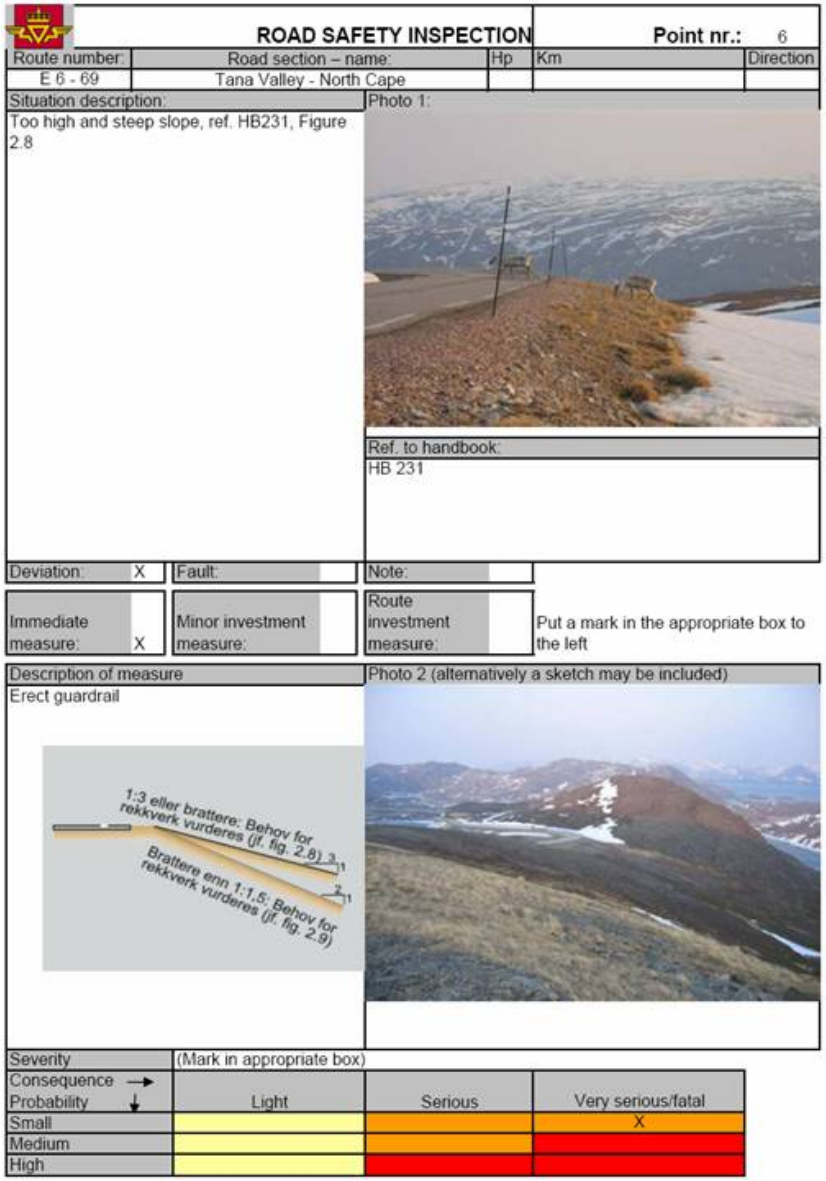
- On-site inspection before actual RSI
- 2 pictures (roadway/side area) every 20m
- Preliminary inspection in the office (overview over the section)
- Signing, markings, intersection types, etc.



Vidkon inspection

- Less time spent in traffic (increased safety)
- Inspections possible throughout the year (Summer/Winter)
- Chance to rewind tape/look once again at certain pictures again
- Team discusses situations in office

Standardized report forms



ROAD SAFETY INSPECTION — Point nr.: 6

Route number:	Road section – name:	Hp	Km	Direction
E 6 - 69	Tana Valley - North Cape			

Situation description: Too high and steep slope, ref. HB231, Figure 2.8

Photo 1:

Ref. to handbook: HB 231

Deviation:	X	Fault:		Note:	
Immediate measure:	X	Minor investment measure:		Route investment measure:	

Put a mark in the appropriate box to the left

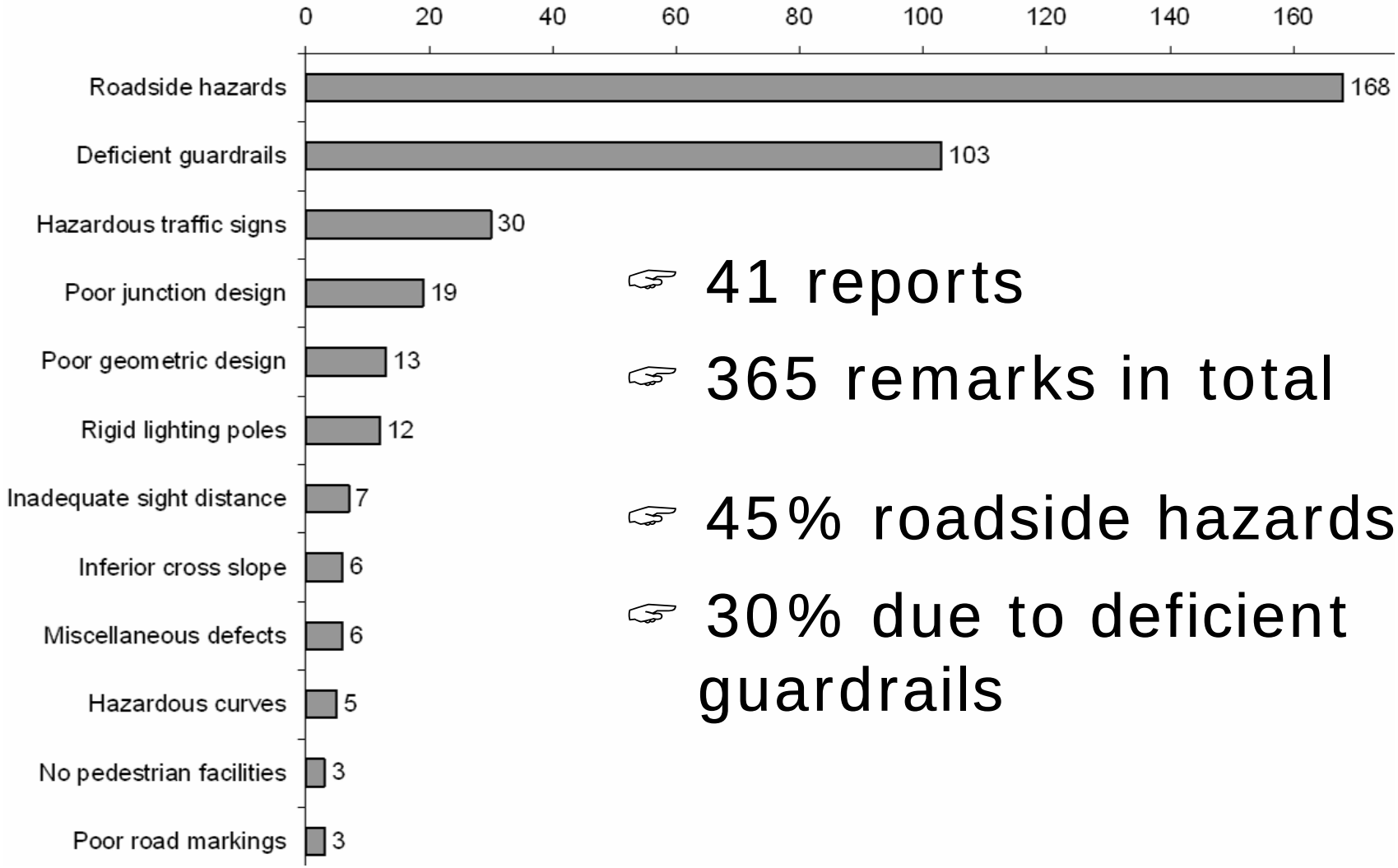
Description of measure: Erect guardrail

Photo 2 (alternatively a sketch may be included)

Severity (Mark in appropriate box)			
Consequence → / Probability ↓	Light	Serious	Very serious/fatal
Small			X
Medium			
High			

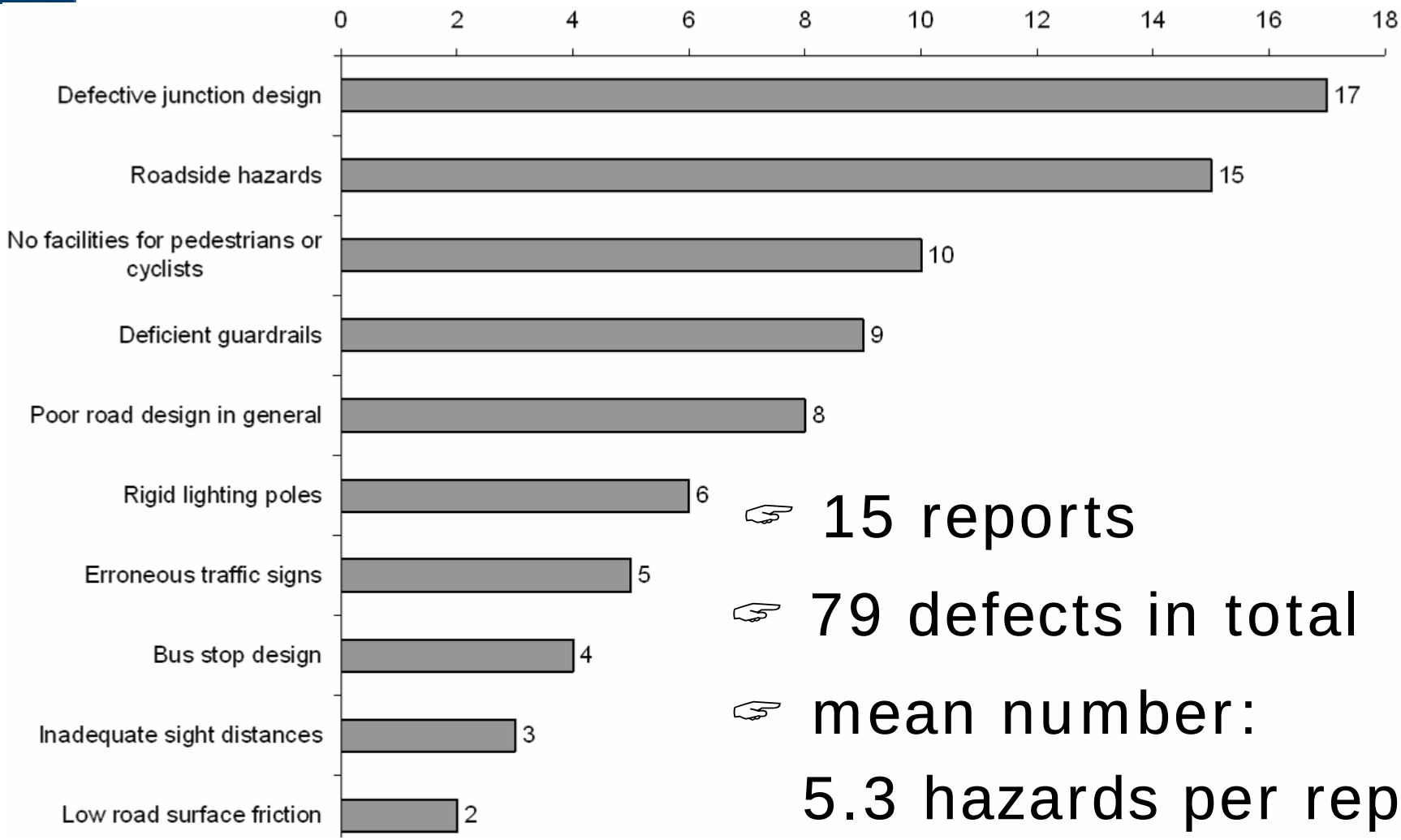
- Route number
- Main road section
- Kilometre post and direction
- Km-identification of findings (Spot/Sect.)
- Problem description
- Photo(s)
- Description of proposed measure

Defects identified by RSI - Rural



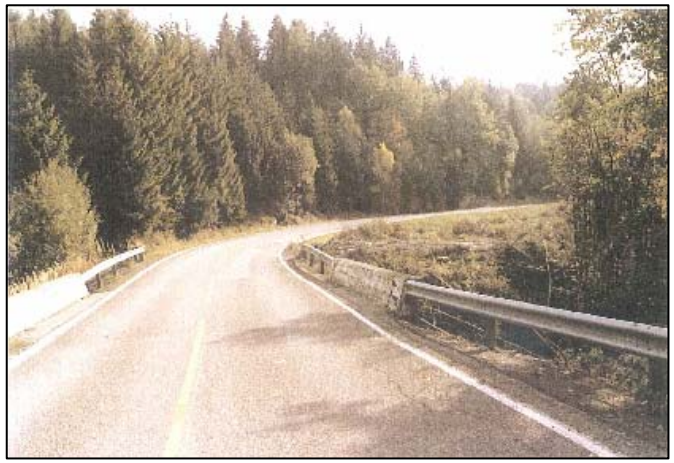
- 41 reports
- 365 remarks in total
- 45% roadside hazards
- 30% due to deficient guardrails

Defects identified by RSI - Urban



- 15 reports
- 79 defects in total
- mean number: 5.3 hazards per report

Removing sight obstacles



- cutting down trees/bushes
- improvement in sight distance
- mean speed, frequency of overtaking increases
- Drivers adapt behaviour
- Accident rate before: 0.31
- Accident rate after: 0.30
- not statistical significant

Guardrails

- Reduces number of fatal/injury accidents
- small effect on total number of accidents (not significant)

	Percentage change in probability of injury		
Accident severity	Types of accident affected	Best estimate	95% confidence interval
New guardrail along embankment			
Fatal injury	Running-off-the-road	-44	(-54, -32)
Any injury	Running-off-the-road	-47	(-52, -41)
Accident rate	Running-off-the-road	-7	(-35, +33)
Changing to softer guardrails			
Fatal injury	Running-off-the-road	-41	(-66, +2)
Any injury	Running-off-the-road	-32	(-42, -20)

Guardrails end treatment

- About 1.5% of drivers killed when striking a guardrail along the length of need
- 2-5% killed when striking guardrail end

	Car drivers by injury severity and treatment type			
Type of end treatment	**Not injured**	**Slight injury**	**Serious injury**	**Killed**
Results of Hunter, Stewart and Council 1993				
Guardrail (length of need)	294 (50.4%)	217 (37.3%)	63 (11.0%)	8 (1.4%)
Blunt end	60 (44.8%)	49 (36.5%)	22 (16.4%)	3 (2.2%)
Turned down end	51 (47.2%)	36 (33.4%)	16 (14.8%)	5 (4.6%)
Attached to back slope	11 (31.4%)	18 (51.4%)	6 (17.1%)	0 (0.0%)
Results of Gattis, Alguire and Natta 1996				
Exposed	99 (52.1%)	61 (32.1%)	21 (11.1%)	9 (4.7%)
Turned down end	177 (54.3%)	97 (29.8%)	42 (12.9%)	10 (3.1%)

Roadside safety treatment

- flattening of side slopes, removing fixed obstacles from the safety zone
- Flattening not always feasible, very costly
- Removing fixed obstacles: single-vehicle-off-the-road-accidents up to -44%

	Sideslope after				
Sideslope before	3:1	4:1	5:1	6:1	7:1 or flatter
2:1	2%	10%	15%	21%	27%
3:1		8%	14%	19%	26%
4:1			6%	12%	19%
5:1				6%	14%
6:1					8%

Summary of Safety Effects

- all estimates refer to injury accidents
- intervals due to local variation

Treatment	Accidents that are influenced	Expected accident reduction (%)
Removing sight obstacles	All accidents	0-5%
Flattening side slopes	Running-off-the-road	5-25%
Providing clear recovery zones	Running-off-the-road	10-40%
Guardrails along embankments	Running-off-the-road	40-50%
Guard rail end treatments	Vehicles striking guardrail ends	0-10%
Yielding lighting poles	Vehicles striking poles	25-75%
Signing of hazardous curves	Running-off-the-road in curves	0-35%
Correcting erroneous signs	All accidents	5-10%

List of elements included in a RSI

- Quality of traffic signs (necessity, correctly placed, legible in the dark)
- Quality of road markings (visibility, consistent with traffic sign)
- Sight distances/presence of permanent or temporary obstacles
- Presence of traffic hazards in the near surrounding (trees, exposed rocks, etc.)

List of elements included in a RSI

- Aspects of traffic operation (e.g. if road users adapt speed to local conditions)

Conclusions

- Inspections should be standardized (use of check lists)
- Elements to be included in RSI should be known to be risk factors
- Follow-up of inspections after some time (proposed measures implemented)

Conclusions

Thank you for your attention