SafetyCube

The SafetyCube Methodology

SafetyCube final conference Vienna, 22 March 2018

Co-funded by the Horizon 2020
Framework Programme of the European Union

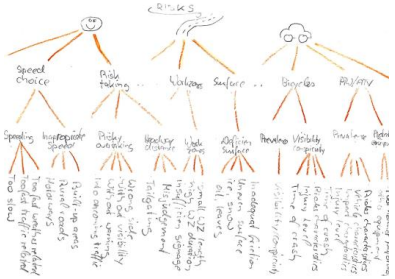
SafetyCube DSS

Road Safety
Decision **S**upport **S**ystem

→ **Risks**

→ **Measures**

Taxonomy



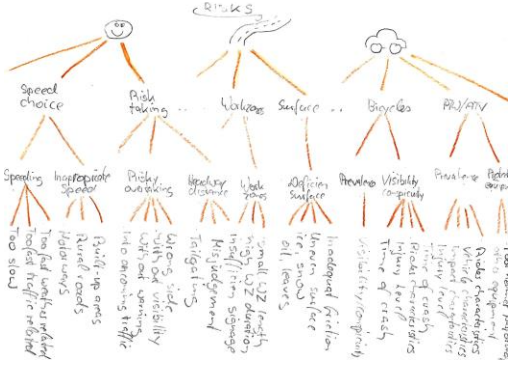
Repository

Synopsis

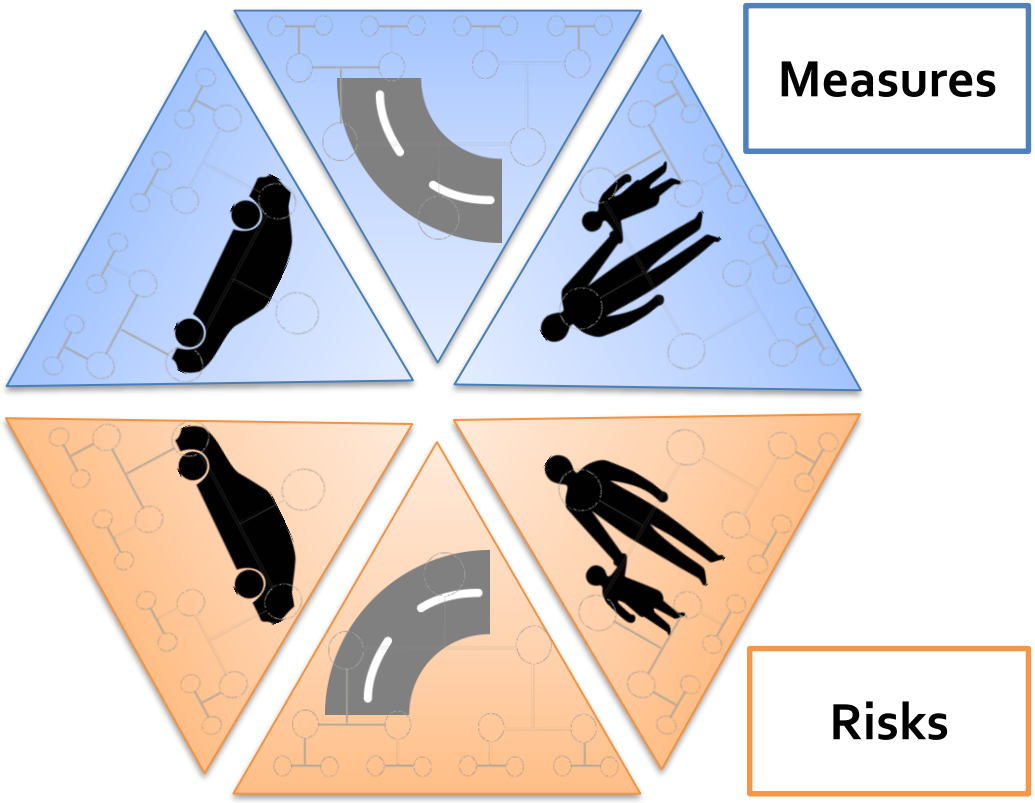
Prioritisation

1. Taxonomy

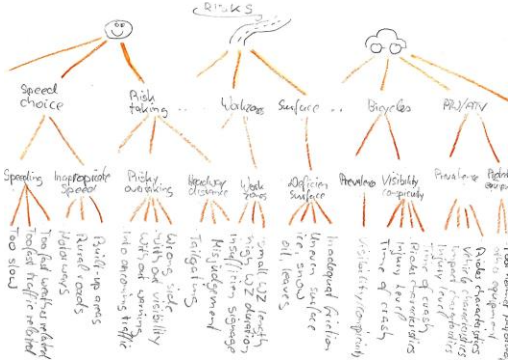
Taxonomy



- Risks & Measures
- 3 main AREAS
  - *Behaviour*
  - *Infrastructure*
  - *Vehicle*
- Hierarchical

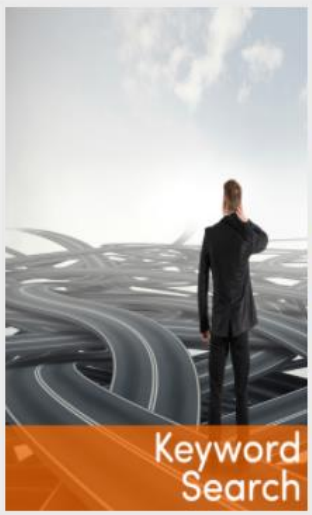


Taxonomy - DSS



- Backbone of DSS
- Finding risks & measures
- Linking risks to measures

- Additional entry points:
- Road user groups
- Accident categories



2. Repository

Repository Literature Search

Literature search
- Lit. data base
- Key words
- Other sources
- # records identified

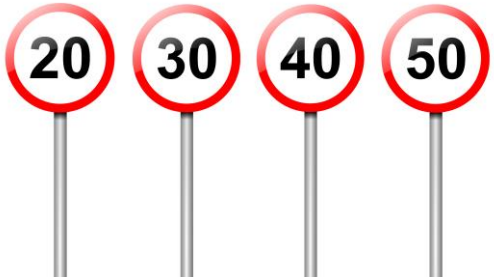
Screening abstracts
- Evaluate
- # relevant records

Full text download
- Download pdf
- Enter in list of papers

Evaluation full text
- Exclusion criteria
- Priority for coding

Repository Evaluation of Studies

- Methodology
  - *Design*
  - *Type of results*
- Conditions
  - *Country*
  - *Road user type*
  - *Road type*
  - *Traffic conditions*
  - *Crash severity*
- Tansferability

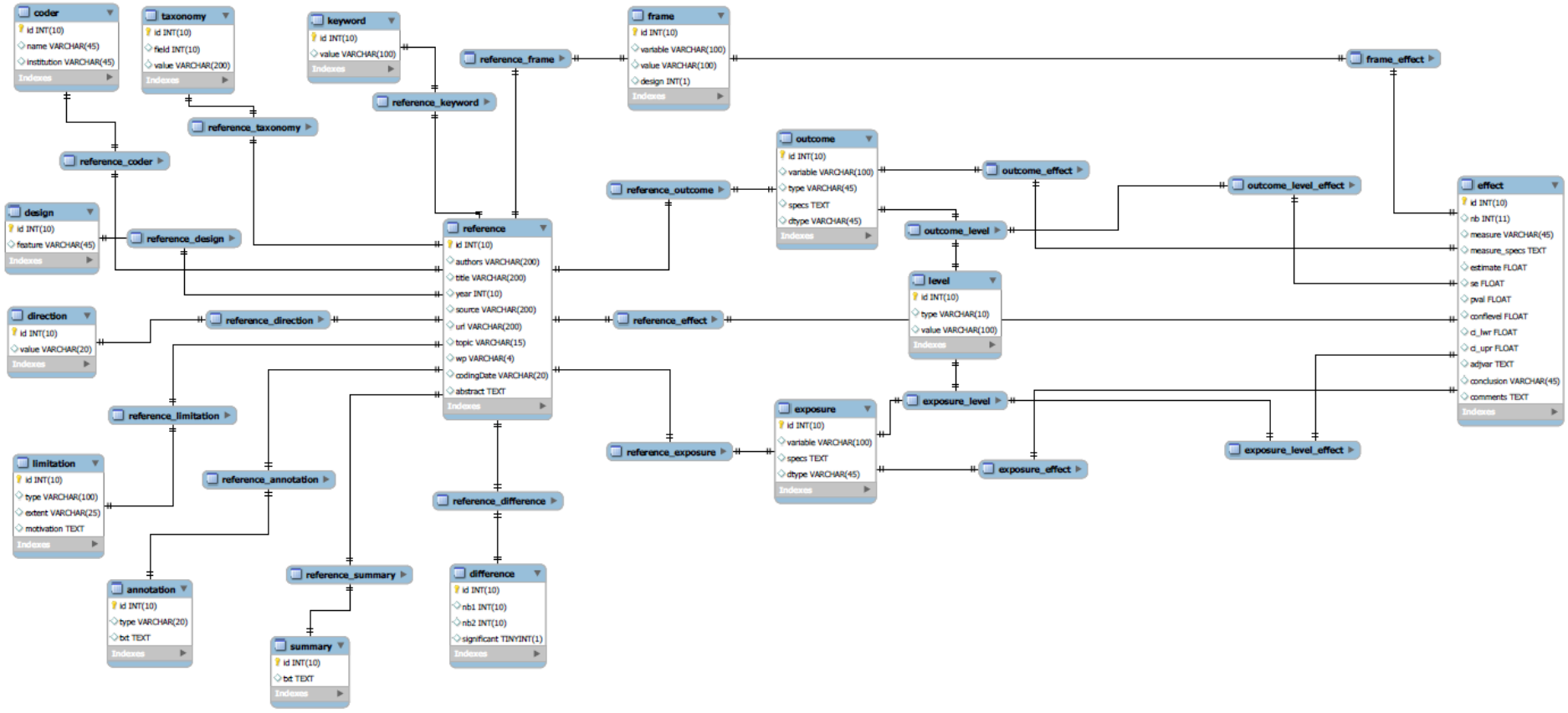


Repository
Coding template

Core info

Coder	*Name*	Focant Nathalie				
	Institution	BRSI				
	Date (dd/mm/yyyy)	20/05/2016				
Reference	*Authors*	Nathalie Focant, Martensen Heike				
	Title	Are there more accidents in the rain? Exploratory analysis of the influence of weather conditions on the number of road accidents in E				
	Year	2014				
	Source	BRSI report				
	URL					
Topic	*Risk factor or Countermeasure?*	Risk factor				
☐	*WP*	WP5				
☐	*Header 5 - Infrastructure element*	Road environment				
☐	*Header 6 - Risk factor*	Adverse weather				
☐	*Header 7 - Specific risk factor*	rain	snow / ice / low temperatu	wind		
☐						
☐						
	Abstract	Its purpose is to determine how "weather" conditions do or do not influence the daily occurrence of "injury"- and "fatal" "accidents" in E				
	Keywords	mean comparison				
Sampling frame	☐ *Countries*	Belgium				
☐	*Administrative Level*	National				
☑	*Road user profile - Modes*	Pedestrian	Cyclist	Car	LGV	HGV
☐	*Road user profile - Type*	All				
☐	*Road user profile - Subgroup*					
☐	*Road user profile - Age*	All				
☐	*Road user profile - Gender*	All				
☐	*Road network profile - Area*	All				
☐	*Road network profile - Segments*	All				
☐	*Accident severities*	Injury	fatal			
☐	*Injury severities*	All				
	Comments					
Design	*Features*	Observational				
	Direction	≠ Exposure -> ≠ Outcome				
	EXPOSURE DEFINITION	Rain	Snow	High winds	Cold	
	OUTCOME DEFINITION	Injury accidents	Fatal accidents			
	Total number of effects	56				
	Comments	Mean comparison				
Limitations / Potential sources of bias		*Extent*	*Motivation*			
	Experiments: Pre-trial group differences	Maybe a problem	Days with rain might differ from days without on characteristics other than the weather.			

Repository Database



3. Synopsis

Synopsis

- Key conclusion
- Overview
- Scientific summary
- Supporting background

- For risk-factors and counter-measures

Effect of traffic volume on road safety: ● *RED (RISKY)* -

Most of the reviewed studies find higher traffic volumes to be associated with a net increase in crashes. However, the crash increase is less than proportional to traffic volume increases, indicating a lower risk for each road user. The effect of traffic volume on crash occurrence appears to differ between crash types. The studies reviewed concern motorways

Congestion as a risk factor: ● *YELLOW (PROBABLY RISKY)* -

Some studies find congestion to be associated with adverse road safety outcomes, but this finding is not consistent across studies and conditions investigated. The effects might differ based on the crash types and/or congestion indicators considered. All reviewed studies concern motorways

Absence of access control: ● *RED (RISKY)* -

Absence of access control seems to have negative effects on road safety. More access points on road segments is mostly negatively associated with road safety, and a greater distance between an intersection and the nearest driveway (corner clearance) has positive effects on road safety.

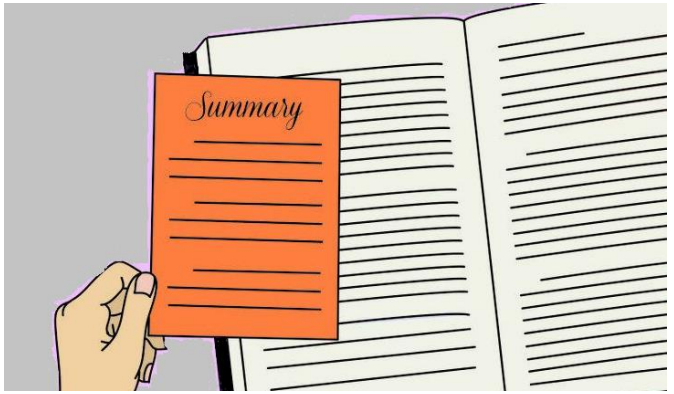
Occurrence of Secondary crashes: ● *YELLOW (PROBABLY RISKY)* -

The presence of a crash or an incident can contribute to the occurrence of additional (secondary) incidents or crashes. The prevalence of secondary crashes, and the factors contributing to their occurrence is unclear, as this varies between studies. The available literature concerns motorways in the United States

Risks associated with the distribution of traffic flow over arms at junctions: ● *GREY (UNCLEAR RESULTS)* -

There was an adequate number of studies investigating the risk factor 'distribution of traffic flow over arms at junctions', but it was rarely the main variable of interest included in the crash models. Furthermore, the risk factor was not expressed in a consistent way across the studies, resulting in an unclear picture of its overall effect.

Synopsis: colour code



Risk factor		Countermeasure	
Red	Results consistently show an increased risk when exposed to the risk factor concerned.	Green	Results consistently show that the countermeasure reduces road safety risk.
Yellow	There is some indication that exposure to the risk factor increases risk, but results are not consistent.	Light green	There is some indication that the counter measure reduces road safety risk, but results are not consistent.
Grey	No conclusion possible because of few studies with inconsistent results, or few studies with weak indicators, or an equal amount of studies with no (or opposite) effect.	Grey	No conclusion possible because of few studies with inconsistent results, or few studies with weak indicators, or an equal amount of studies with no (or opposite) effect.
Green	Results consistently show that exposure to the presumed risk factor does not increase risk.	Red	Results consistently show that this measure does NOT reduce road safety risk and may even increase it.

4. Prioritisation

Prioritisation
Economic Efficiency Evaluation (E^3)

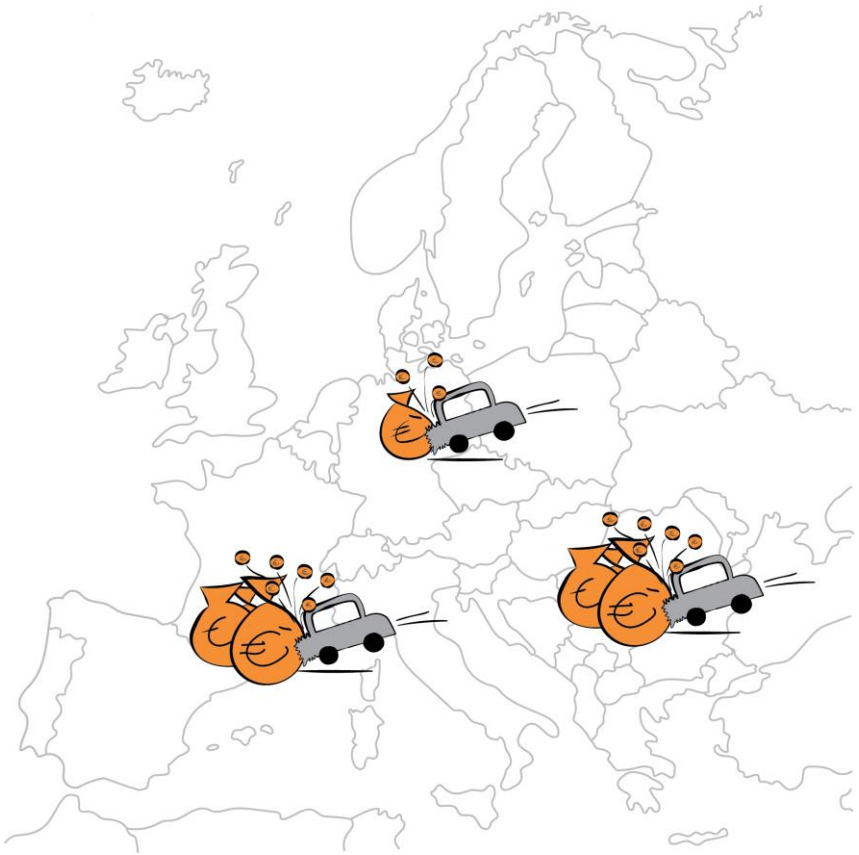
User input Info on measures	*Output E^3-calculator*	*SafetyCube input* Info per country
Effectiveness Saved crashes per unit *(fatal, serious, slight, pdo)*	*Cost Effectiveness Analysis* • *Costs per crash prevented (fatal, serious, slight, pdo)*	**Crash & casualty costs** *(fatal, serious, slight, pdo)*
Time horizon	*Cost Benefit Analysis* • *Net present value (benefits – costs)* • *Benefit-cost ratio (benefit / costs)*	Discount rate
Costs of measures		

E3-calculator
Economic efficiency evaluation

- SafetyCube examples
- User adapts SafetyCube example for own purposes
- Users' analysis starts from scratch.

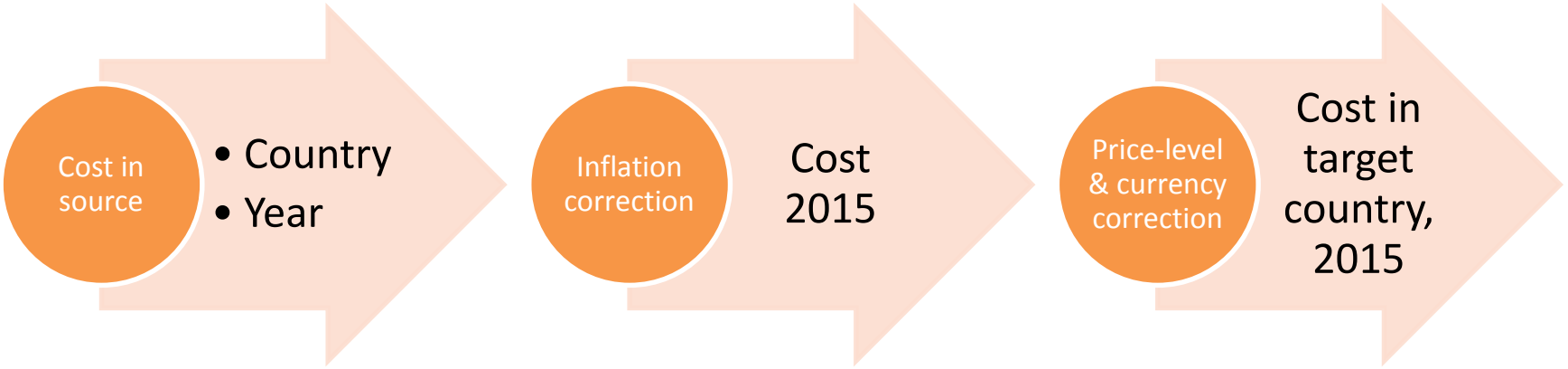
E3-calculator
Crash costs

- Based on SafetyCube crash-cost collection
  - *Countries' own reported values*
  - *Common methodology estimates per country*
  - *EU standardized cost*



E3-calculator
Costs of counter-measures

- Costs for counter-measures can be adjusted from one country to another, by means of *value transfer*.



SafetyCube E3 examples
Sensitivity analysis

- Low / high measure effect
  - *Lower CI*
  - *Upper CI*
- Low / high measure costs
  - *- 50%*
  - *+ 100%*
- Combined scenarios
  - *Worst case*
  - *Ideal case*

Table 1: Input values and BCR for the 'best estimate' scenario

Scenario	Input values	BCR
Best estimate	Crash reduction: 14% Implementation cost: €3,284,143 /100,000 tests Annual cost: €0.00 Affected nr. of casualties per year: Crashes: 304	7.3

Table 2: Sensitivity analyses

Scenario	Input values	BCR
Low measure effect	Crash reduction: 11%	5.7
High measure effect	Crash reduction: 18%	9.4
Low measure cost (-50%)	Implementation cost: €1,642,072 /100,000 tests Annual cost: €0.00	14.6
High measure cost (+100%)	Implementation cost: €6,568,287 /100,000 tests Annual cost: €0.00	3.7

Table 3: CBA for worst case and ideal case scenarios

Combined Scenario	Input values	BCR
Worst case	Crash reduction: 11% PDO only crashes reduction: 13% Implementation cost: €6,568,287 /100,000 tests Annual cost: €0.00	2.9
Ideal case	Crash reduction: 18% Implementation cost: €1,642,072 /100,000 tests Annual cost: €0.00	18.8

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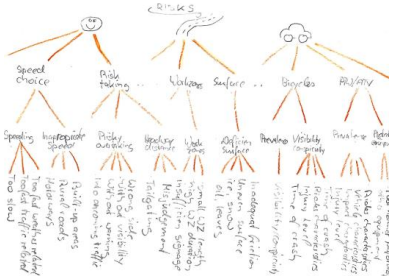

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Heike Martensen

SafetyCube Final Conference
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