SafetyCube

Development of a road safety Decision Support System for road infrastructure

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SafetyCube project

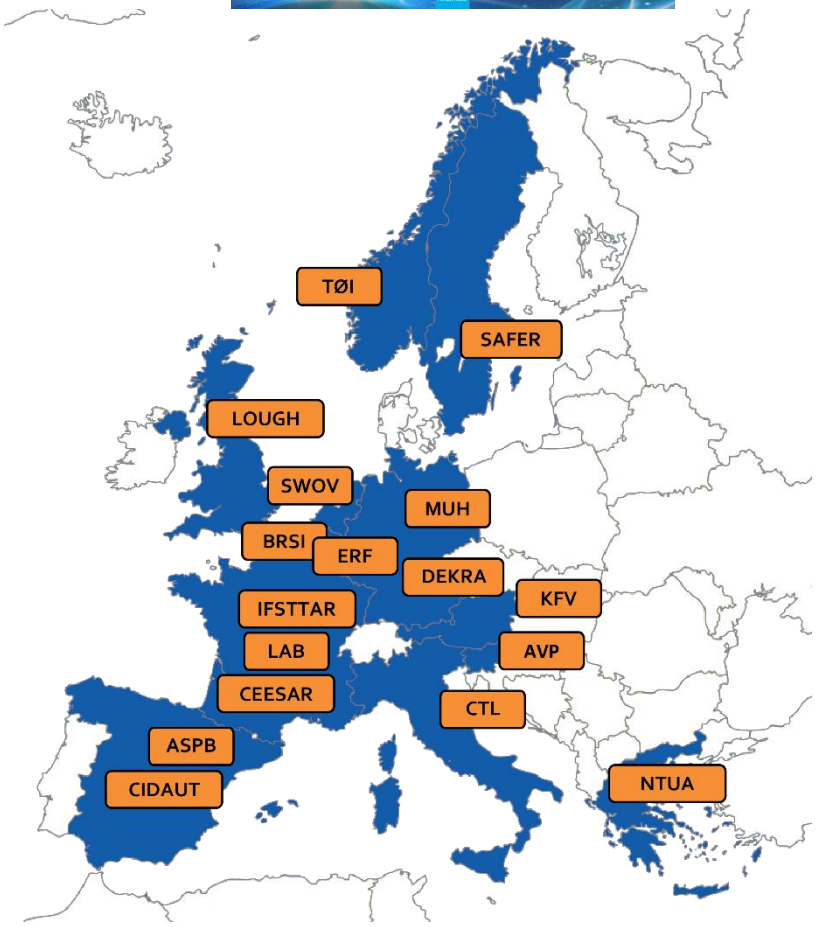
Funded by the European Commission under the Horizon 2020 research framework programme

Coordinator: Pete Thomas, Loughborough University

Start: May 2015

Finish: April 2018

17 partners from 12 EU countries



SafetyCube concept and vision

- Problem
  - ***Evidence based road safety policies*** *are becoming more usual and there is much better availability of national data and state of the art knowledge*
  - *Effective road safety policies* ***need good information*** *about accident risk factors and about measures*
- SafetyCube will meet this need by generating new **knowledge about accident risk factors and the effectiveness of measures** relevant to Europe, to be integrated in a European Road Safety Decision Support System (DSS)

SafetyCube DSS Objectives

The SafetyCube DSS objective
is to provide the European and Global road safety community
a user friendly, web-based, interactive Decision Support Tool
to properly substantiate their road safety decisions
for the actions, measures, programmes, policies and strategies
to be implemented at local, regional, national,
European and international level.

The main contents of the SafetyCube DSS concern:

- road accident risk factors and problems
- road safety measures

- best estimate of casualty reduction effectiveness
- cost-benefit evaluation
- all related analytic background

Special focus is given to linking road safety problems with related countermeasures.

Road infrastructure topics in the SafetyCube DSS

Nearly 60 risk factors and 100 measures in more than 15 infrastructure areas - motorways, rural and urban roads - road segments and junctions -

Road infrastructure 'hot topics'

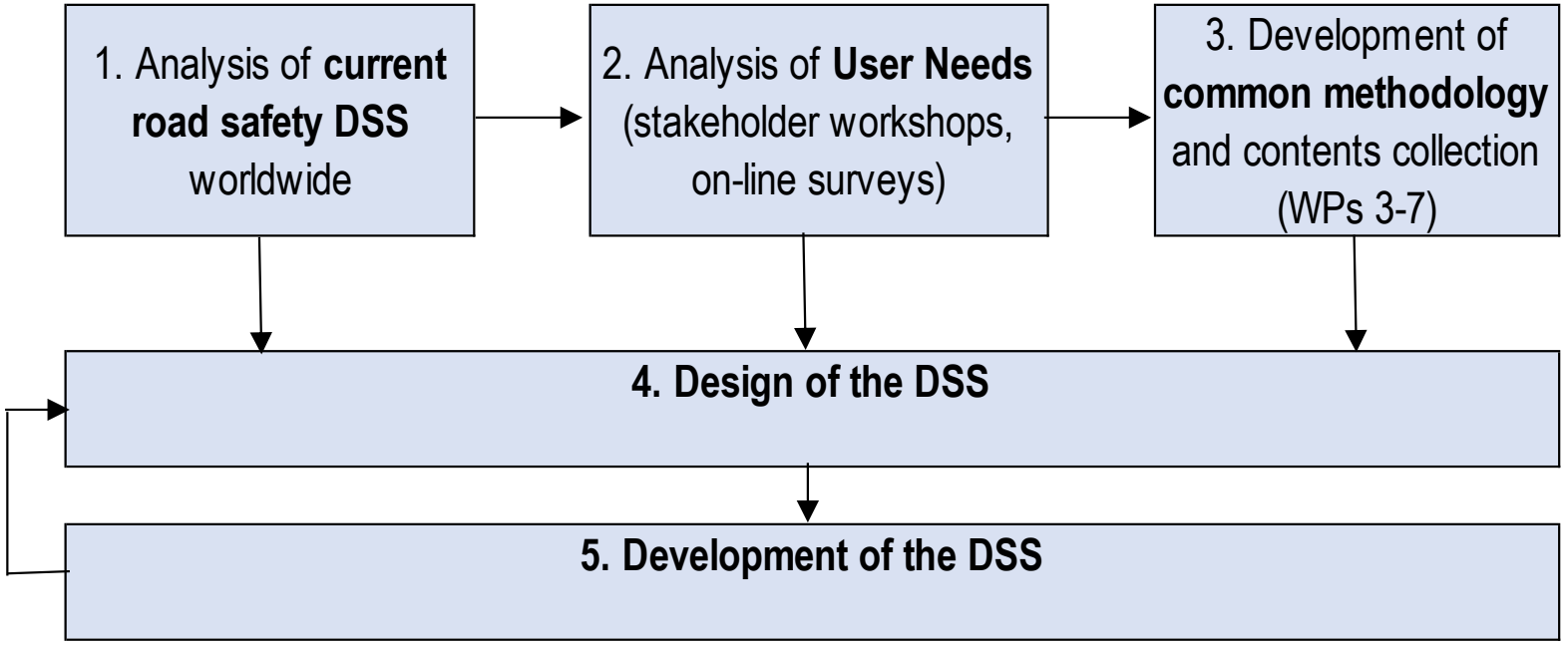
1. **Self-explaining and forgiving roads**: Removing obstacles, Introduce shoulder, Alignment (horizontal / vertical), Sight distance, Traffic signs, Raised crossings / intersections

2. **Urban road safety measures**: Pedestrians / cyclists, Upgrade of Crossings, New crossings, Junctions / roundabouts treatments for VRU, Visibility

3. **Road safety management**: Quality of measures implementation, Appropriate speed limits, Enforcement, Availability of cost-effectiveness data, Workzones

4. **ITS applications**: ISA, Dynamic speed warning, ADAS and active safety with V2I, VMS

SafetyCube DSS Development Methodology



Testing, Pilot Operation, User Training and future continuous Maintenance will follow.

Current Road Safety DSS Worldwide

- Crash Modification Factors Clearinghouse (www.cmfclearinghouse.org)
  by NHTSA (USA) - **5.151 CMF** on infrastructure only - on going

- Road Safety Engineering Kit (www.engtoolkit.com.au)
  by Austroads (Australia) - **67 treatments** on infrastructure only

- PRACT Repository (www.pract-repository.eu)
  by CEDR (Europe) - **889 CMF and 273 APM** on infrastructure only – high quality

- iRAP toolkit (toolkit.irap.org/)
  by iRAP - **58 treatments** (43 on infrastructure)

- Safety Performance Factors Clearinghouse (spfclearinghouse.org)
  by Tatum Group LLC, Dr. Andrew Kwasniak (USA) - **few SPF** – subscribers only

SafetyCube DSS Users

- **Public Authorities**
  local, regional, national, European and international
- **Industry**
  Infrastructure, Vehicle, Insurance, Technology
- **Research Institutes**
- **Non Governmental Organisations**
- **Mass media**

The SafetyCube DSS is intended to have **a life well beyond the end of the SafetyCube** research project. Furthermore, it will be developed in a form that can readily be incorporated within the existing European Road Safety Observatory of the European Commission DG-MOVE.

SafetyCube DSS User Needs

- SafetyCube stakeholders' consultation Workshops
  - Brussels, Jun 2015
  - Ljubljana, Oct 2015
  - Brussels (WP5-Infrastructure), Feb 2016
  - Hague (WP7-Serious Injuries), May 2016
  - Brussels, Sep 2016
- SafetyCube on-line survey
- Consolidated Table of user needs

SafetyCube DSS Design Principles

- A **Modern** web-based tool
- High **Ergonomy** interface
- **Simple** structure
- Powerfull **Search** Engines
- Fully **Documented** information
- Easily **Updated**

SafetyCube DSS Website Design Principles

- A strong **web address**
  e.g. www.safetycube-dss.eu

- **Consistent design** throughout all tools
  (unique visual identity, colors, design, messages, etc.)

- Modern and **ergonomic** design
  [multimedia (photos and videos) wherever possible]

- Allow for **updates**
  - feedback from the users
  - feedback from visits traffic monitoring

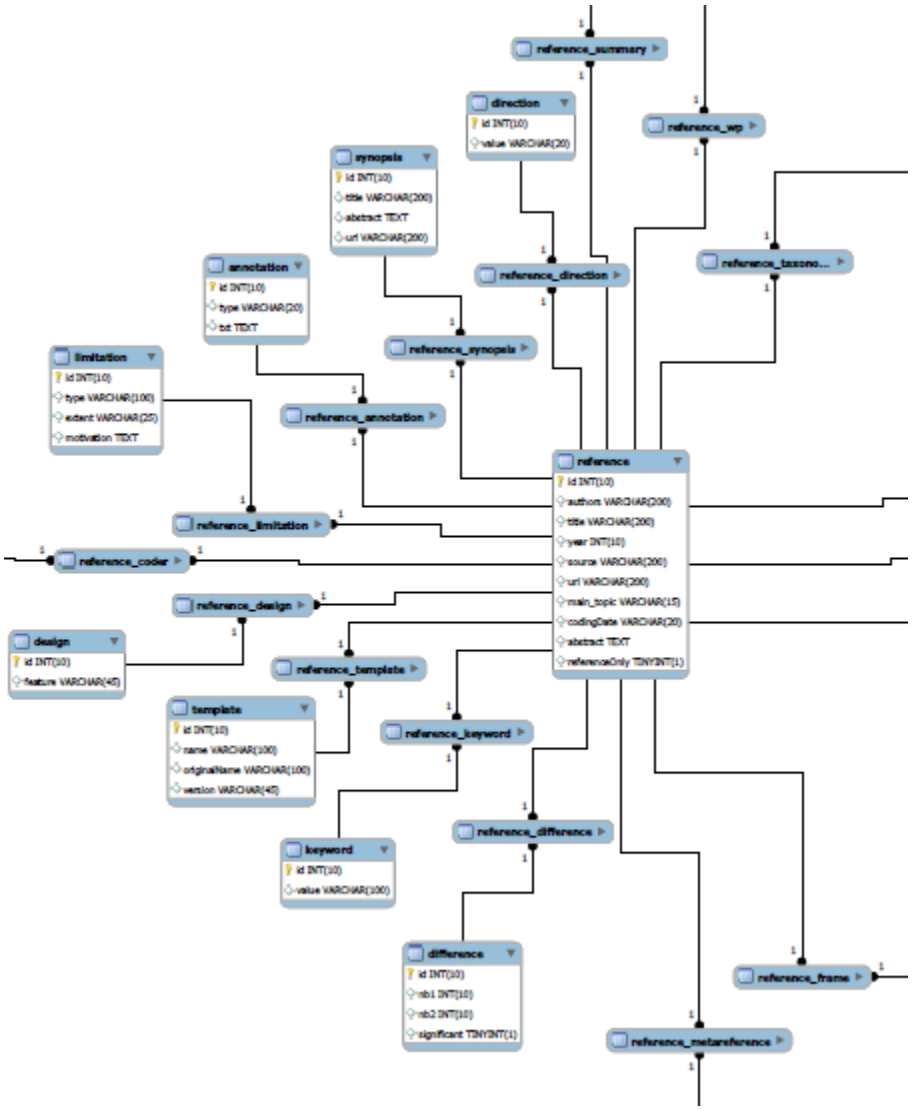
- Develop a robust **promotion policy**, during and after the project (newsletter, twitter, etc.)

SafetyCube DSS Search Engine

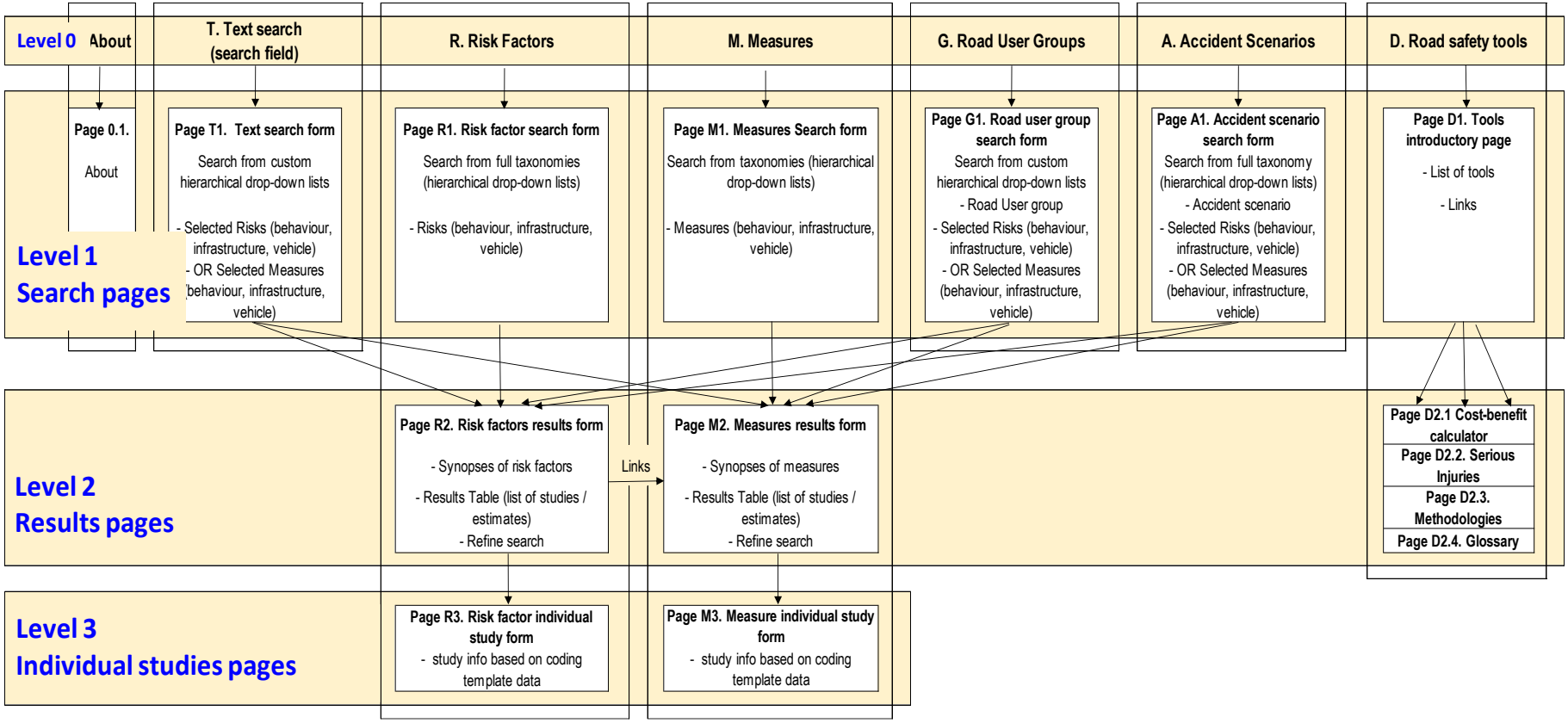
- Fully **linked** search
  - *search a road safety problem alone or through the measures*
  - *search a measure alone or through the road safety problems*
  - *search for risks and measures related to specific road user groups or crash types (accident scenaria)*
- Fully **detailed** search
  - *search by any parameter in each data table (road safety problems, measures)*
- Fully **flexible** search
  - *adjust and customize search according to results*
- Fully **documented** search
  - *access background information at any stage (links, etc.)*

Relational Data Base

- The templates of **coded studies** will undergo a thorough checking and debugging process
- The templates are eventually stored in a **relational database**, which will serve as the back-end of the DSS
- Front-end DSS results will be retrieved through **queries** on the back-end database (DSS search engine).



SafetyCube DSS Structure



Home Page Main Menu (About - Search - Tools)

Three Levels of Search (Search - Results pages - Individual study pages)

Two Interlinked Search Streams (Risk Factors – Road Safety Measures)

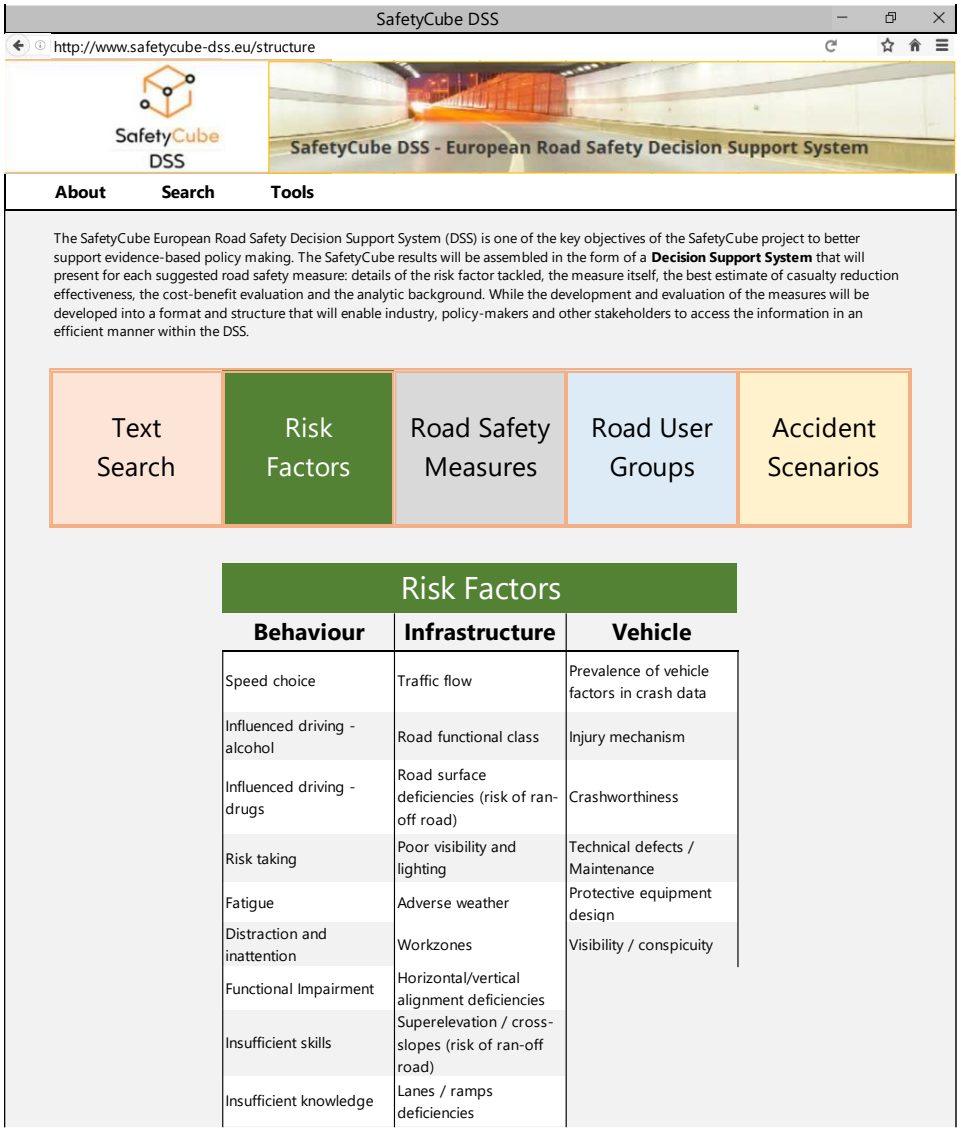
SafetyCube DSS Homepage (Entry Points)

- **ABOUT** SafetyCube
  Basic Information about SafetyCube and the DSS
- **SEARCH**
  - **Text** search (key-words)
  - **Risk Factors**
    (Risk factors search engine)
  - **Road Safety Measures**
    (Measures search engine)
  - **Road User Groups**
    (Risk factors and Measures search engines)
  - **Accident Scenarios**
    (Risk factors and Measures search engines)
- **TOOLS**
  Background information, resources and methodology, including extensive glossary

Risk Factors Search Parameters

Three categories of taxonomy fields

- Categories (3)
  road user, infrastructure, vehicle
- Topics (57)
  e.g. roadside deficiencies, distraction inside vehicle, inappropriate speed
- Specific risk factors (175)
  e.g.no clear-zone, mobile phone, too fast / too slow



Measures Search Parameters

Three categories of taxonomy fields

- Categories
  road user, infrastructure, vehicle
- Topics
  e.g. formal tools to address road network deficiencies, speed regulation
- Specific measures
  e.g. road safety audits, lower speed limits

Risk Factors results parameters

Search results

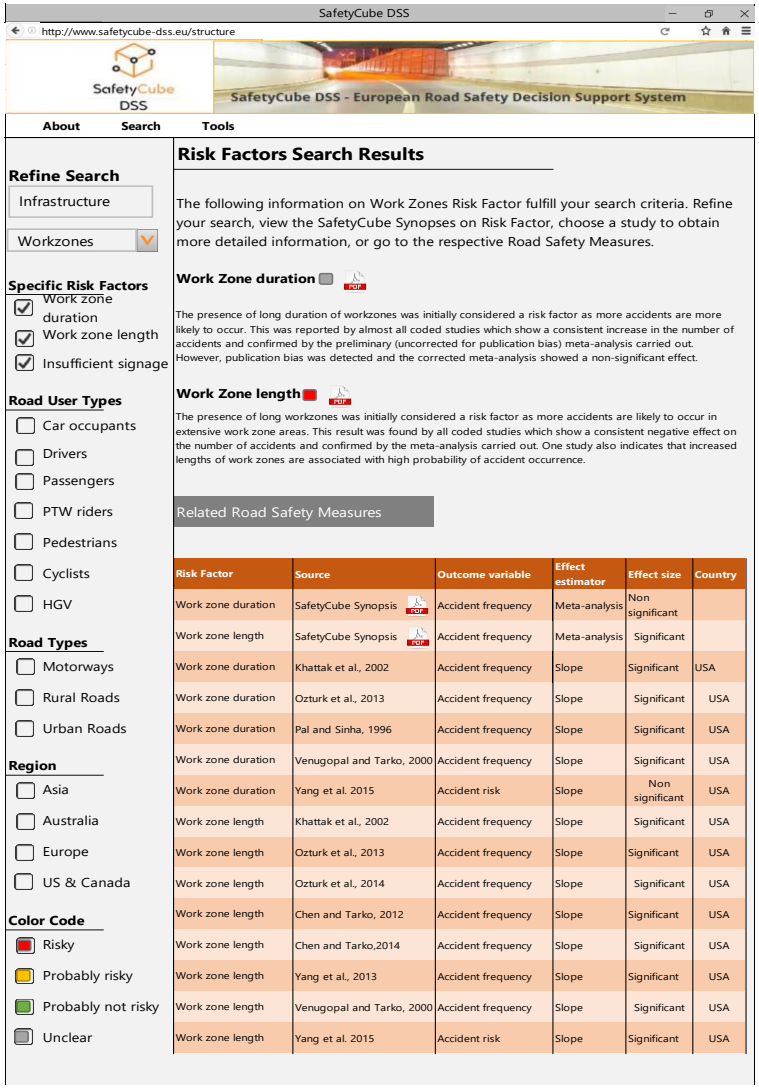
- Short summaries of syntheses (meta-analyses) available
- Table listing the available synopses, meta-analyses and other studies
- Table columns concern main study characteristics (design, outcome variable, effect type and size, country, year etc.)

Refine search

- Specific risk factor
- Search filters:
  - Road user types: All, car occupants, drivers, passengers, PTW riders, pedestrians, cyclists, HGV.
  - Road types: All, motorways, rural roads, urban roads
  - Region / Country: EU, EU countries (all names), US and Canada, Australia, Asia.
  - "Colour code": Risky, probably risky, unclear, probably not risky

Links to related measures

- Go to measures search page, where the list of related measures is displayed as a pre-filled search



Individual study results

Title, author, source, abstract

- Link to URL for full-text download (depending on Institute permissions)

Study design info

- Country
- Research Method, Design, Sample N
- Control group, Risk Group
- Modifying Conditions

Study results:

- Table listing the effects reported in the study
- Table columns concern main study / effect characteristics (outcome variable, effect type, size and confidence intervals, statistical significance)

SafetyCube synopses

Syntheses on risk factors / measures

Summary (2 pages)

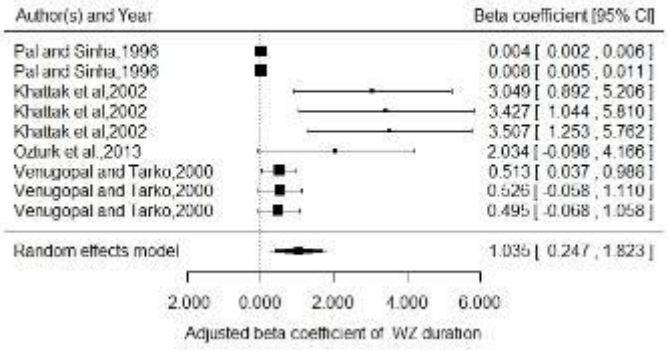
- Effect of risk factor / measure and ranking (colour code)
- Risk / safety effect mechanisms
- Risk / safety effects size, transferability of effects

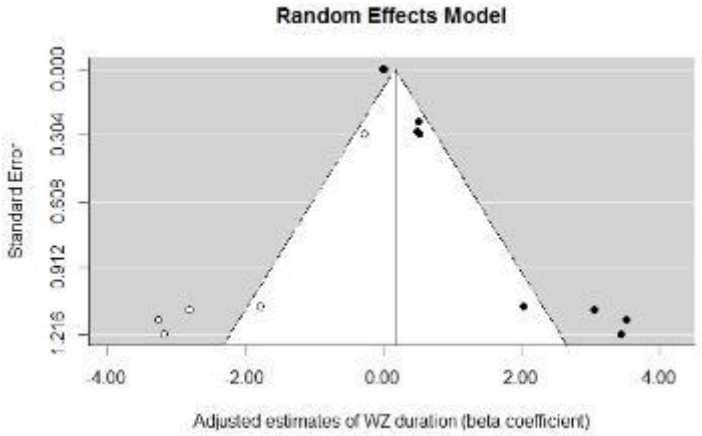
Scientific overview (4-5 pages)

- Comprehensive comparative analysis of available studies designs and results
- Analysis results
  - *Meta-analysis*
  - *Vote-count analysis*
  - *Qualitative analysis*

Supporting document (3-10 pages)

- Literature search strategy and study selection criteria
- Detailed analyses





Road User Group Search Parameters

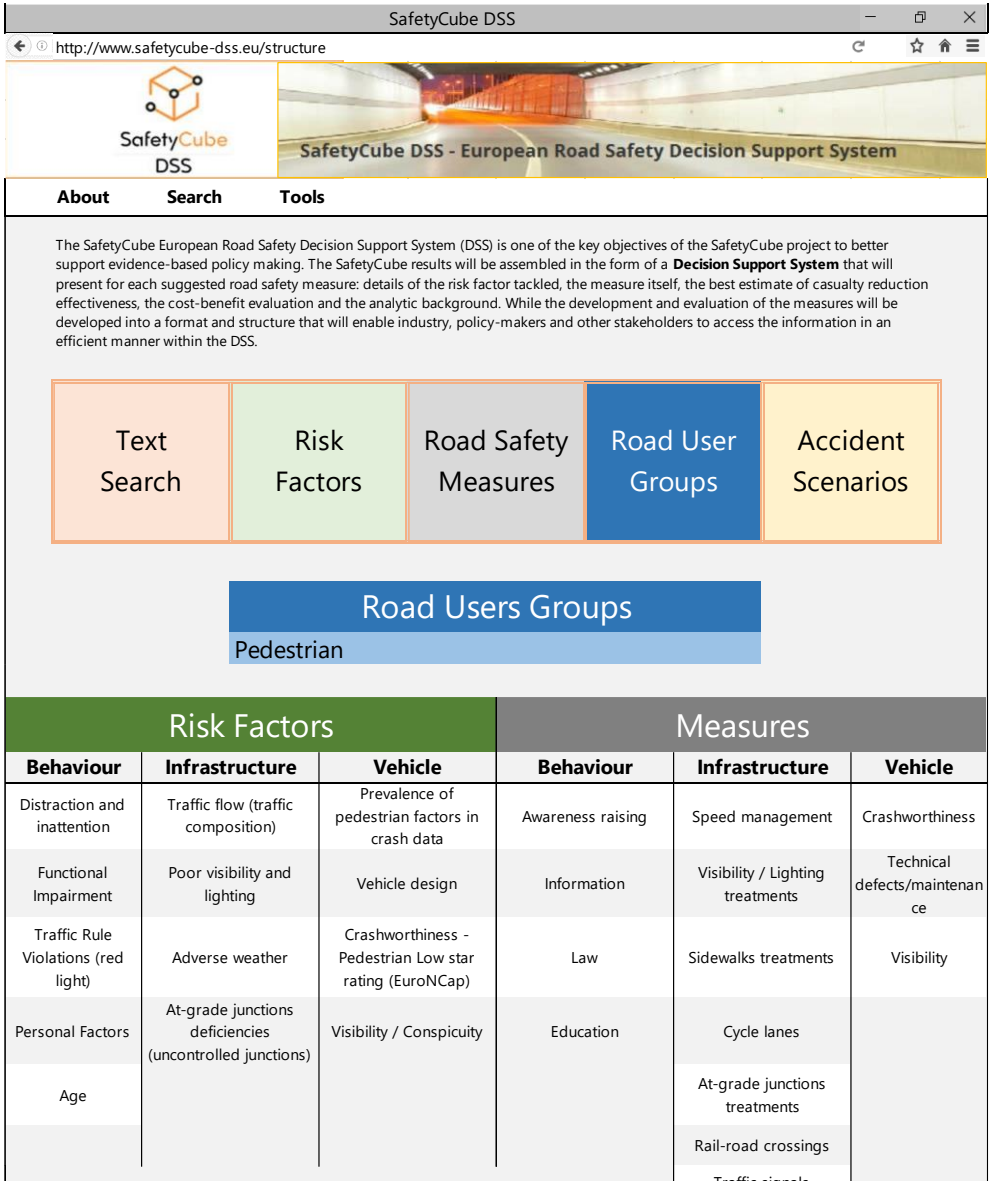
Road User Groups

- Pedestrian
- Bicycles
- Power Two Wheelers
- Passenger Cars
- Light Goods Vehicles
- Trucks / Bus

For each group, 3+3 categories of taxonomy fields

- Risks: road user, infrastructure, vehicle
- Measures: road user, infrastructure, vehicle

- Topic
- Specific risk factor / measure



Accident Scenario Search Parameters

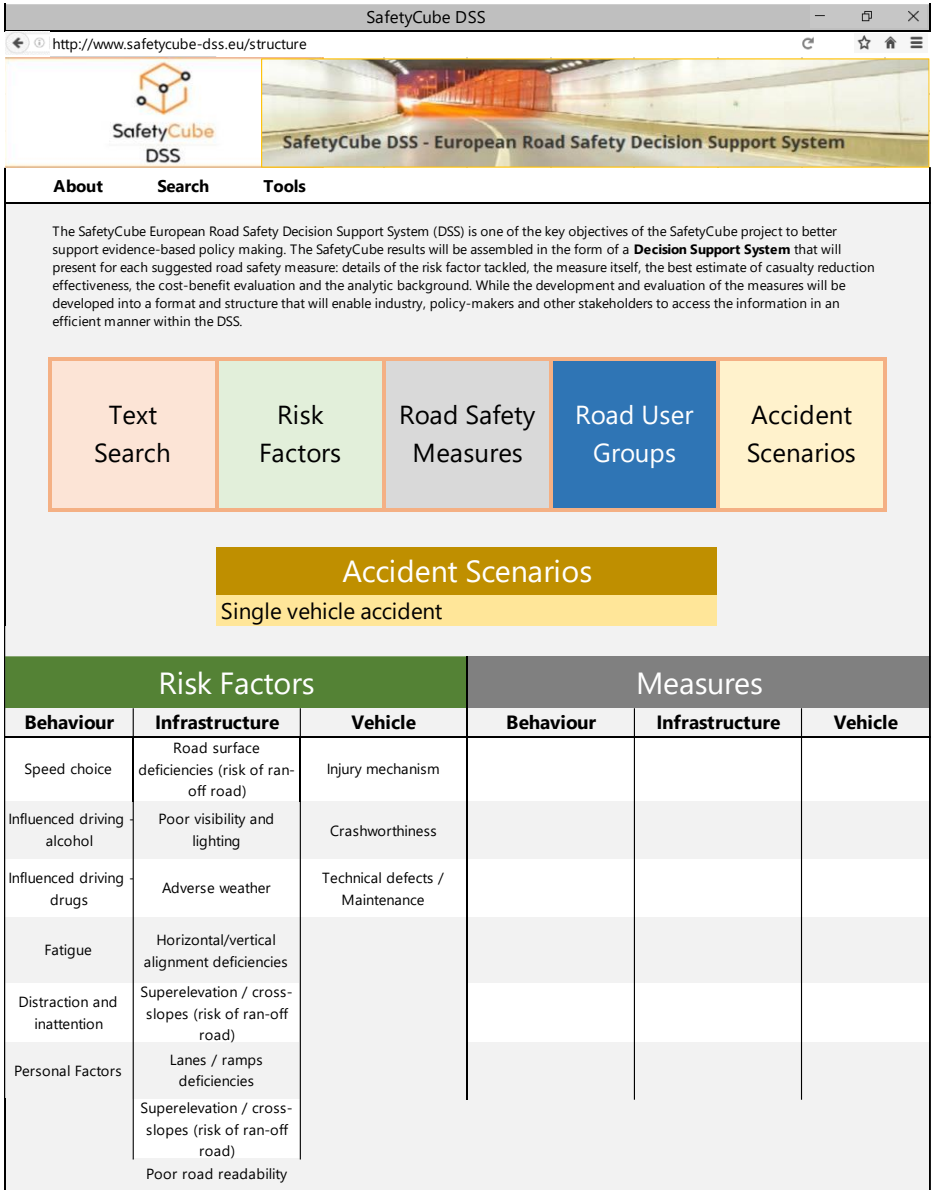
Accident scenarios

- Pedestrian accident
- Bicycle accident
- Single vehicle accident
- Head-on collisions
- Rear end collisions
- Junction accident – no turning
- Junction accident – turning
- Railway level crossing

For each scenario, 3+3 categories of taxonomy fields

- Related Risks: road user, infrastructure, vehicle
- Related Measures: road user, infrastructure, vehicle

- Topic
- Specific risk factor / measure



Text Search Parameters

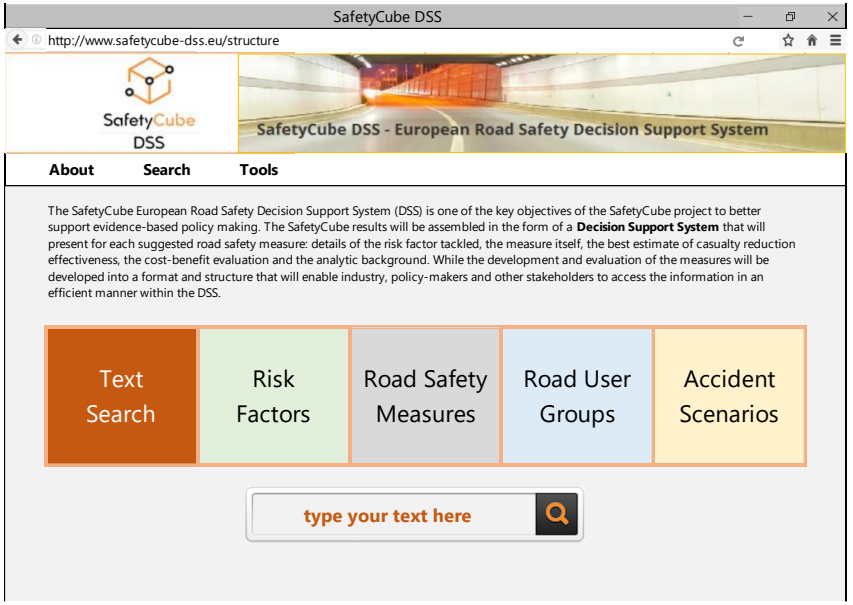
Key-word search

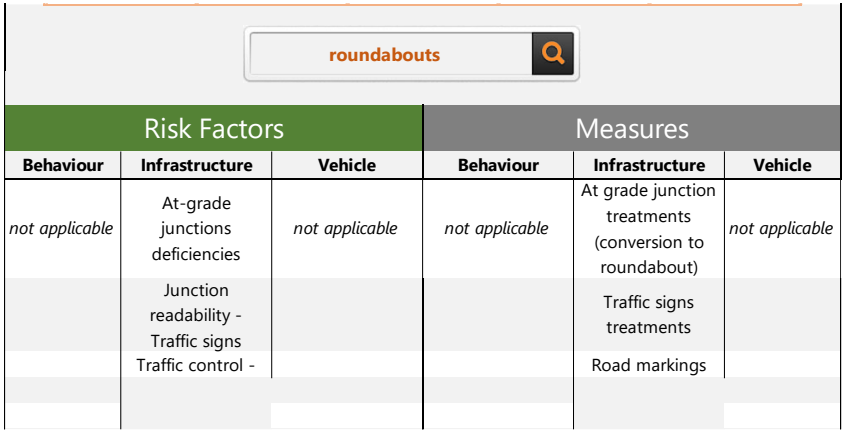
- Auto-complete field among all key-words in the database

For each key-word, 3+3 categories of taxonomy fields

- Related Risks: road user, infrastructure, vehicle
- Related Measures: road user, infrastructure, vehicle

- Topic
- Specific risk factor / measure



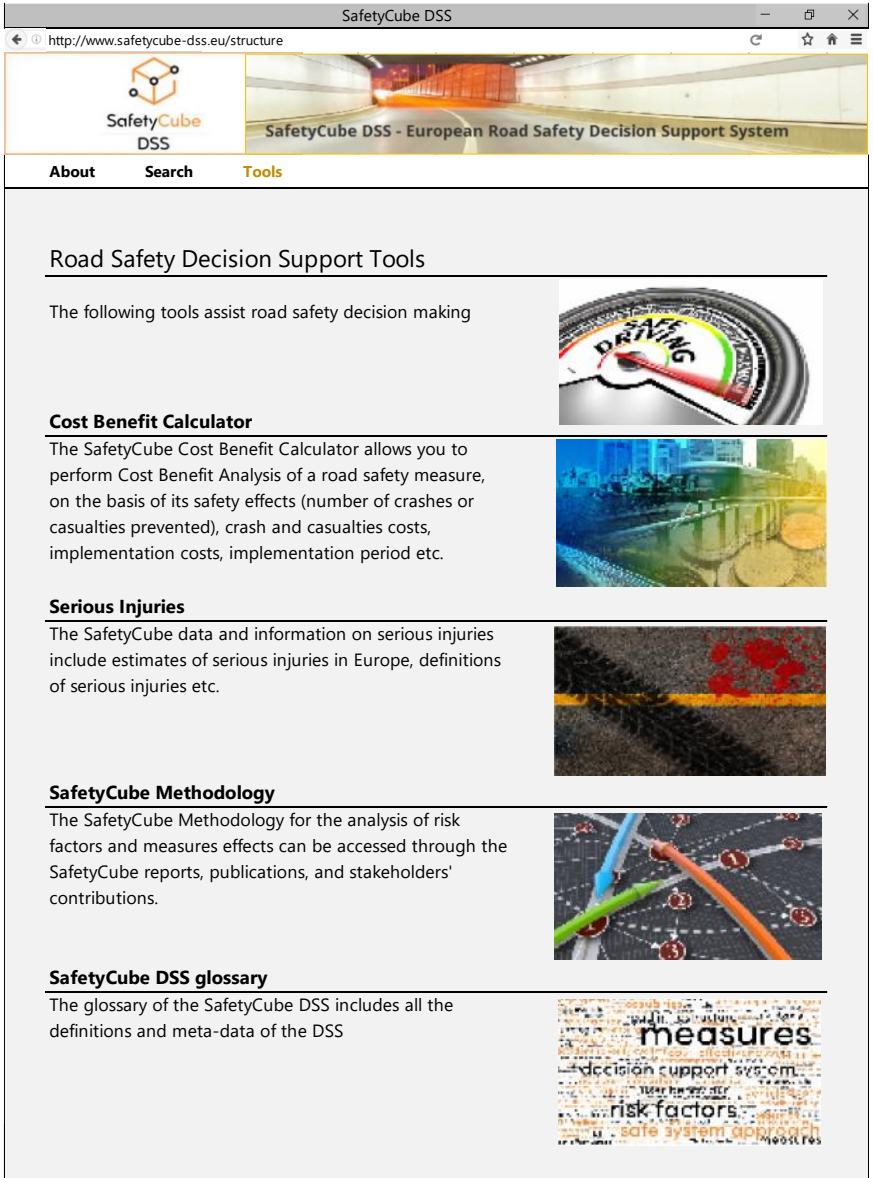


Risk Factors			Measures		
Behaviour	**Infrastructure**	**Vehicle**	**Behaviour**	**Infrastructure**	**Vehicle**
not applicable	At-grade junctions deficiencies	*not applicable*	*not applicable*	At grade junction treatments (conversion to roundabout)	*not applicable*
	Junction readability - Traffic signs			Traffic signs treatments	
	Traffic control -			Road markings	

SafetyCube Tools pages

Links to SafetyCube tools

- Cost Benefit Calculator
- Serious Injuries
- SafetyCube Methodology
- SafetyCube Glossary
- …



SafetyCube DSS Development Next steps

- Development of the **static DSS** (Wire Frames)
  - *Completed*
- SafetyCube DSS **Development phase**
  - *between September and December 2016*
  - *including all risk factors (~3.500 effects from 600 studies) and several measures*
- SafetyCube DSS **Pilot Operation**
  - *starting early 2017*
- SafetyCube DSS **Opening**
  - *Starting mid 2017*
- Continuous **Enhancement and Update**
  - *Starting on April 2018 (end of SafetyCube project)*

Example questions addressed

- how important is my road safety problem?
- who else is having similar problems?
- what solutions are usually proposed for my problem?
- how efficient are the solutions proposed?
- which is the most efficient solution?
- and if I have a combination of problems …

… then use SafetyCube DSS to have the answers

SafetyCube DSS
Delivering a long waited powerful tool

- The SafetyCube DSS is a powerful Road Safety Decision Support Tool:
  - long waited,
  - full of scientific evidence,
  - user friendly, web-based and interactive

- SafetyCube DSS is the first integrated road safety support system **developed in Europe**

- SafetyCube DSS **offers for the first time** scientific evidence on:
  - risks and not only measures
  - risks and measures not only on infrastructure
  - a very large number of estimates of risks and measures effects
  - links between risks factors and measures

- SafetyCube DSS aims to be **a reference system** for road safety in Europe and worldwide, constantly improved and enhanced

SafetyCube

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