

# SafetyCube – the European Road Safety Decision Support System



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[www.roadsafety-dss.eu](http://www.roadsafety-dss.eu)

#roadsafetydss



# A short movie...



<https://www.youtube.com/watch?v=Y-mVUde3knU>

# SafetyCube project

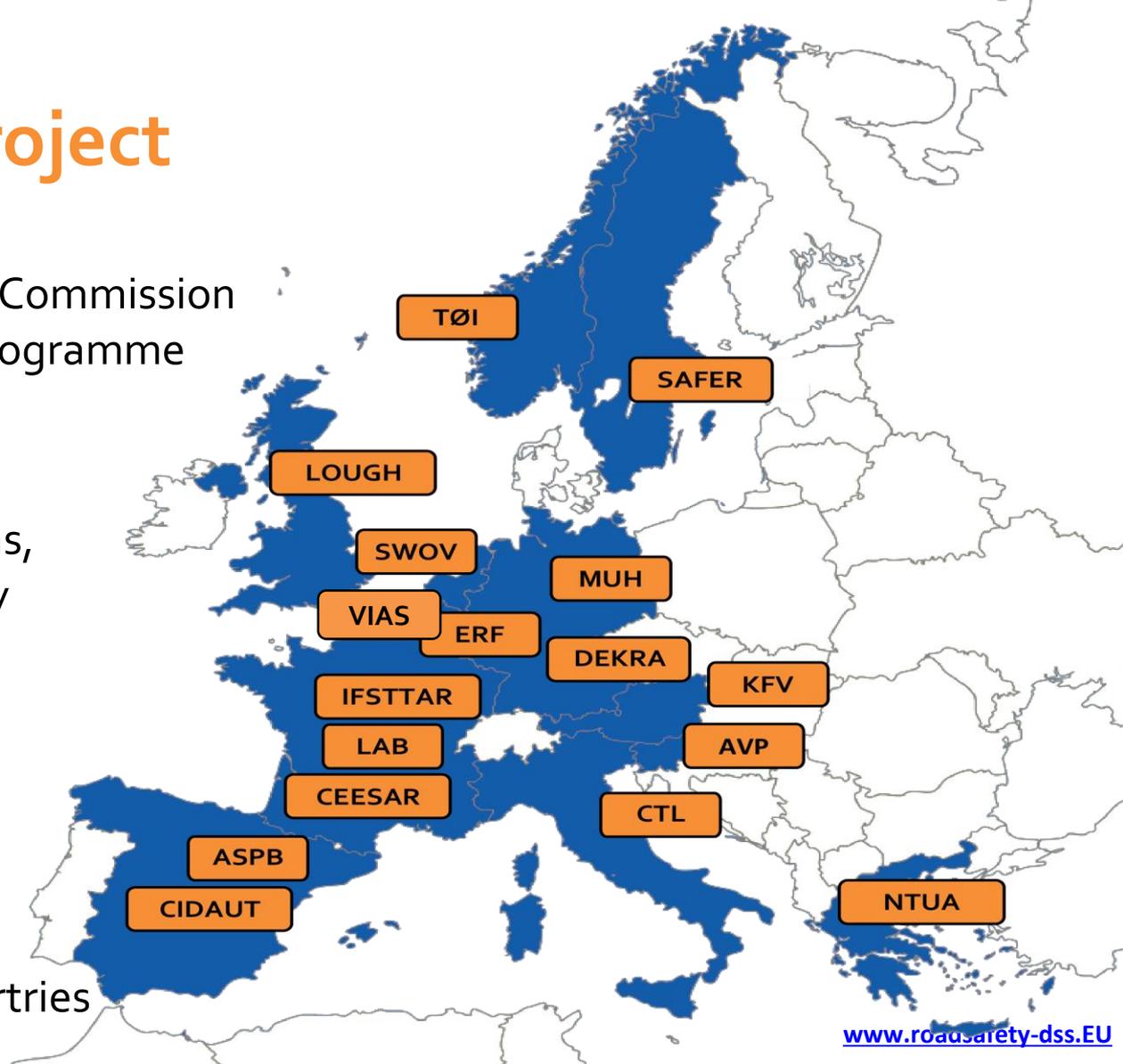
Funded by the European Commission  
Horizon 2020 research programme  
Budget €5.8 million

Coordinator: Pete Thomas,  
Loughborough University

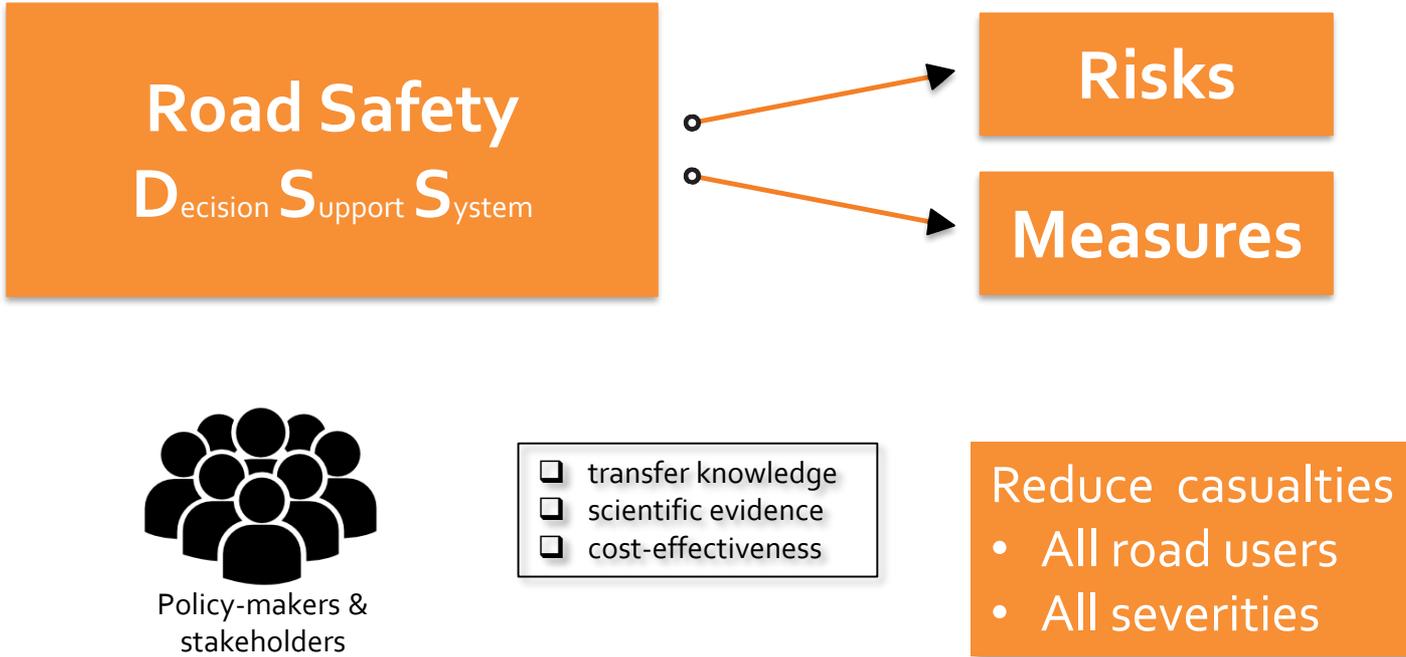
Start: May 2015

Finish: April 2018

17 partners from 12 countries



# SafetyCube primary objective



# 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.*

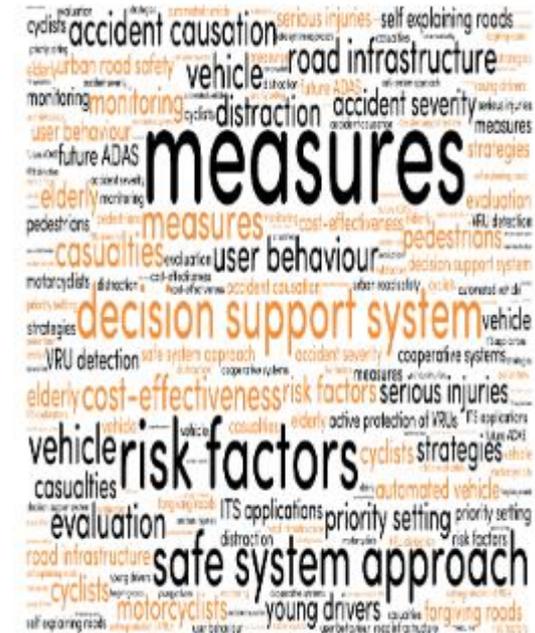
The main contents of the SafetyCube DSS concern:

- road accident risk factors and problems
- road safety measures
- best estimate of effectiveness
- cost-benefit evaluation
- Serious injuries
- all related analytic background



# Example questions addressed

- how important is my road safety problem?
  - what is the nature of that problem?
  - what solutions are usually proposed for my problem?
  - how efficient are the solutions proposed?
  - which is the most efficient solution?
- ... then use SafetyCube DSS to have the answers



# SafetyCube DSS Users

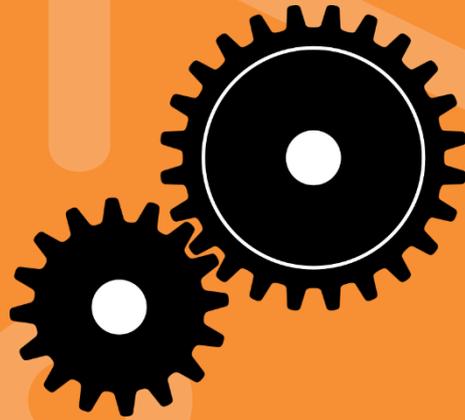


- **Public Authorities**  
local, regional, national, European and international
- **Industry**  
Infrastructure, Vehicle, Insurance, Technology
- **Research Institutes, Experts**
- **Non Governmental Organisations**
- **Media**
- **Everyone**

The SafetyCube DSS is intended to have **a life well beyond the end of the SafetyCube** research project.



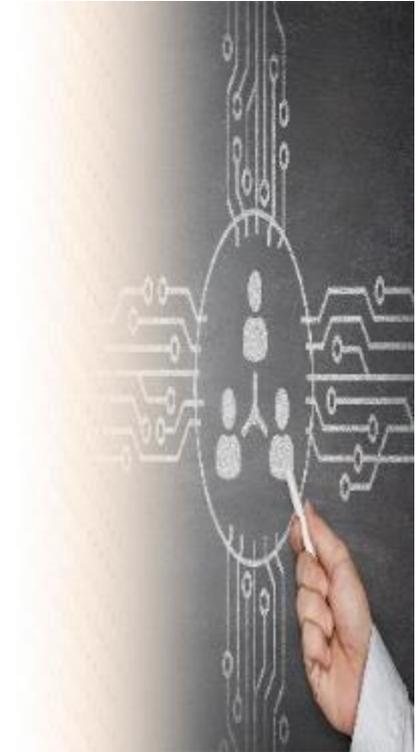
# Methodology



# SafetyCube Methodology



1. Consulting **stakeholders** to understand needs
  2. Creating **taxonomies** of risk factors and measures
  3. Exhaustive literature review and rigorous study selection criteria
  4. Use of a template for **coding studies**, to be introduced in the DSS back-end database
  5. Carrying out **meta-analyses** to estimate the effects of risk factors / measures.
  6. Drafting **Synopses** summarising results of risk factors / measures.
- **Systems approach:** links between infrastructure, user and vehicle risks & measures
  - Emphasis on risk factors and measures of **priority issues** (VRUs, ADAS, speed management, distraction, etc.)
  - Rigorous assessment of the **quality of the data / study methods**



# SafetyCube Synopses



## 211 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)

- Comparative analysis of available studies
- Meta-analysis/Vote-count analysis/Qualitative analysis

### Supporting document (3-10 pages)

- Literature search strategy and study selection
- Detailed analyses

<p><b>Presence of workzones - Workzone duration</b></p> <p>Please refer to the document in German: <a href="#">Thieme, M., Pappalardo, B., Bakopoulos, N., Tamm, B., &amp; Kretschmer, G. (2024). Presence of workzones - Workzone duration. In: Report from Safety Center Support to the German Federal Government. Available at: <a href="https://www.safetycenter.de/wordpress/wp-content/uploads/2024/07/Presen...">https://www.safetycenter.de/wordpress/wp-content/uploads/2024/07/Presen...</a></a></p>  <p><b>Abstract:</b> The studies included in this synthesis were selected from those identified to a systematic literature search of health databases (as reporting mechanism) using the inclusion criteria of road safety and the presence of workzones. The <b>abstracts</b> (referring to the number or quality of studies) or other factors (e.g. risk or harm) were used to be included in the synthesis or quality of studies. Therefore, the studies providing evidence in the meta-analysis are included in this synthesis.</p>	
<p><b>Presence of workzones - Workzone duration</b></p> <h3>1 Summary</h3> <p><b>Background:</b> <a href="#">Kretschmer, G., Pappalardo, B., Bakopoulos, N., Tamm, B., &amp; Thieme, M. (2024). Presence of workzones - Workzone duration. In: Report from Safety Center Support to the German Federal Government. Available at: <a href="https://www.safetycenter.de/wordpress/wp-content/uploads/2024/07/Presen...">https://www.safetycenter.de/wordpress/wp-content/uploads/2024/07/Presen...</a></a></p> <p><b>1.1. BACKGROUND / PURPOSE</b></p> <p>Using duration of workzones (not fully considered) as a risk factor as longer lasting workzones were associated with more crashes. This was supported by several other studies which show a consistent increase in the number of crashes and confirmed by the preliminary meta-analysis for qualitative data meta-analysis (not yet done). Therefore, preliminary meta-analysis and the selected meta-analyses showed a significant effect.</p> <p><b>1.2. OBJECTIVES</b></p> <p>The primary aim of this synthesis is to assess the effect of workzone duration on road safety.</p>	<p><b>Presence of workzones - Workzone duration</b></p> <p><b>1.1. WHICH SAFETY OUTCOMES ARE AFFECTED BY WORKZONE DURATION?</b></p> <p>The literature search shows that the effect of workzone duration on road safety has been measured mainly on the basis of crash frequency, number of crashes per road, crash frequency, crash rate. It is assumed that the crash frequency is a comprehensive measure. It is noted that no studies measuring crash rate or severity were included in this synthesis.</p> <p><b>1.2. HOW IS THE EFFECT OF WORKZONE DURATION STUDIED?</b></p> <p>In literature synthesis, meta-data from primary research are usually utilized to study the impact of workzone duration. Depending on the quality of primary data, the effect of workzone duration is usually examined by applying multivariate linear regression models. With a work frequency is examined, the relationship between duration and number of crashes is investigated by applying meta-analytic logistic binomial models. Inability of meta-analysis was investigated by applying meta-analytic logistic regression models.</p> <p><b>1.3. OVERVIEW OF RESULTS</b></p> <p>The initial presentation of research results (meta-analytic) reported that longer duration workzones have increased number of crashes / workzones, when such this is supported (positive) or of crash insurance in most crash outcomes, there is no effect of workzone duration. All analyzed studies are based on data from 3 years of the US, Indiana, New Jersey and California, combined.</p>

# SafetyCube Related Risks / Measures

- Linking based on a **dedicated model** categorizing risks
- Every Risk Factor (88) is **linked** to one or more Road Safety Measure(s) (175)
- Every Road Safety Measure (175) is **linked** to one or more Risk Factor(s) (88)
- A total of **762 links** between risk factors and measures

The screenshot shows the SafetyCube DSS interface. At the top, it says "SafetyCube DSS European Road Safety Decision Support System". Below this are navigation buttons: Search, Knowledge, Calculator, Methodology, and Support. The main content area is titled "Related Studies for 'poor visibility - darkness'" and includes a sub-header "The following measures are related to the risk factor you selected. Select a measure from the table below to see the available safetycube results." Below this is a table with four columns: Risk Factor, Intervention, Vehicle, and Post-travel Car.

Risk Factor	Intervention	Vehicle	Post-travel Car
percentage of helmets, protective clothing and visibility	installation of road lighting	Licensed (category: passenger, adaptive, advanced drivers, ...)	Not applicable
	Improvement of existing lighting	Night vision Vehicle backup camera - reversing predictor or camera systems (L4+)	

## Countries

- CANADA
- NETHERLANDS
- UNITED KINGDOM
- UNITED STATES

## SafetyCube Synopses



### Installation of lighting & Improvements to existing lighting: ● ● ● ●

The vast majority of results show that the installation of road lighting and improvements to existing road lighting have favourable effects on the number of occurring crashes

ID	Title	Source	Year	Design	Countries
284	Relationship Between Roadway Illuminance Level and Nighttime Road Intersection Safety	TRANSPORTATION RESEARCH BOARD JOURNAL OF THE TRANSPORTATION RESEARCH BOARD, NO. 2145, PP. 9-15	2016	CRASH SECTIONAL	UNITED STATES
285	road lighting effects on Bicycle and Pedestrian Accident Frequency: case study in Montreal, Quebec, Canada	TRANSPORTATION RESEARCH BOARD JOURNAL OF THE TRANSPORTATION RESEARCH BOARD   BOARD, NO. 2595, PP. 39-54	2016	CRASH SECTIONAL	CANADA

# DSS links from risks to related measures



## Measures addressing “driving when tired”

The following measures are related to the risk factor you selected. Select a measure from the table below to see the available SafetyCube re

Behavior	Infrastructure	Vehicle
<a href="#">Fitness to drive, medical referrals</a>	<a href="#">installation of median</a>	<a href="#">Electronic Stability Control (ESC)</a>
<a href="#">Campaigns on fatigue</a>	<a href="#">increase median width</a>	<a href="#">Lane Departure Warning (LDW), Lane Keeping Assist (LKA) &amp; Lane Centering System</a>
	<a href="#">change median type</a>	<a href="#">Drowsiness and Distraction Recognition</a>
	<a href="#">implementation of rumble strips at centerline</a>	
	<a href="#">shoulder implementation (shoulder type)</a>	
	<a href="#">increase shoulder width</a>	
	<a href="#">change shoulder type</a>	
	<a href="#">safety barriers installation</a>	
	<a href="#">change type of safety barriers</a>	
	<a href="#">create clear-zone / remove obstacles</a>	
	<a href="#">increase width of clear-zone</a>	
	<a href="#">implementation of edgeline rumble strips</a>	

# DSS links from measures to related risks

- Risks addressed by “Emergency Braking Assistance Systems”

The following risk factors are related to the measure you selected. Select a risk factor from the table below to see the available SafetyCube results.

Behavior	Infrastructure	Vehicle
<a href="#">Headway distance</a>	<a href="#">secondary crashes</a>	<a href="#">Risk to be injured in rear impact</a>
<a href="#">Insufficient skills and operating errors</a>		
<a href="#">Observation errors</a>		
<a href="#">Elderly (65+)</a>		

# SafetyCube Tools for Prioritisation

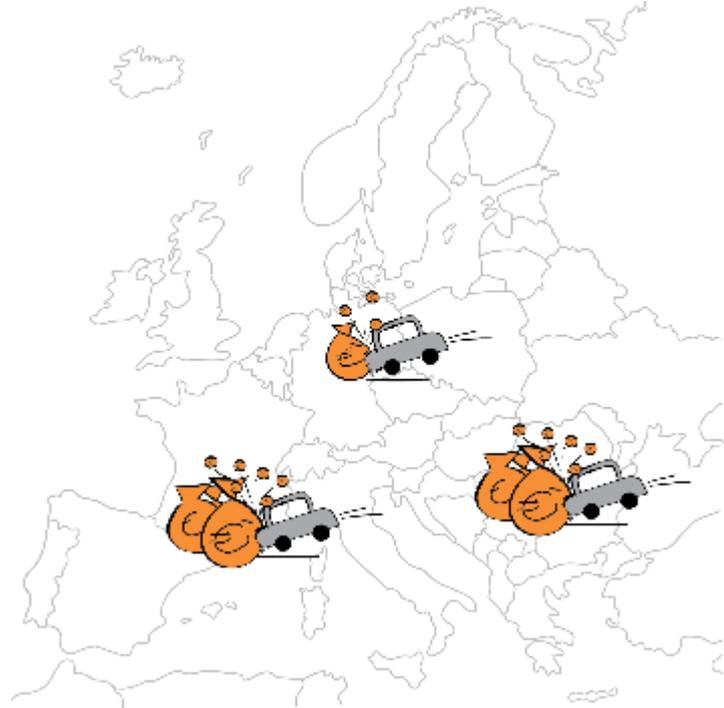


# E3-calculator

## Crash costs



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



# Serious injuries



# Serious injuries in SafetyCube

- Estimation of the number of MAIS<sub>3</sub>+ casualties
- Consequences of serious road injuries
- Costs related to serious road injuries
- Risk factors associated with serious road injuries



<https://www.roadsafety-dss.eu/>

SafetyCube  
DSS



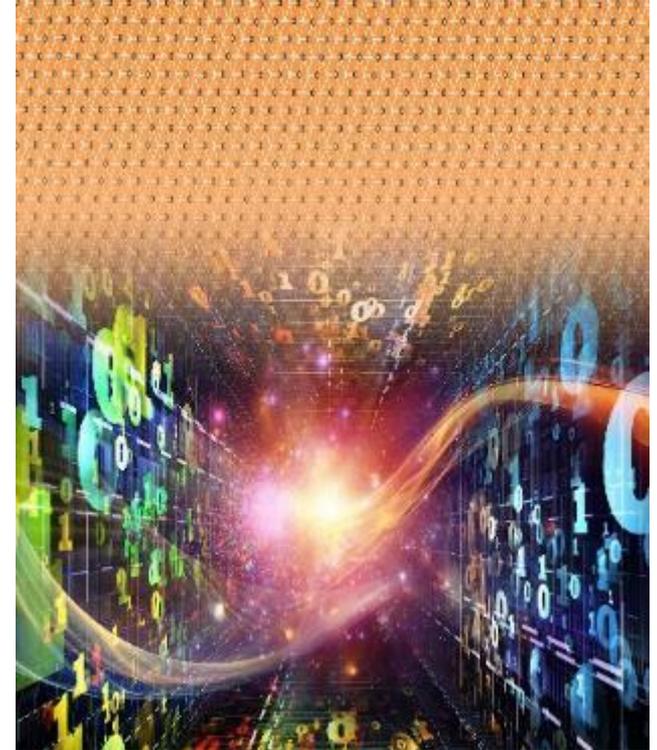
European Road Safety Decision Support System

# SafetyCube DSS Knowledge Wealth



SafetyCube DSS includes by April 2018:

- more than **1,250 studies**,
- with more than **7,500 estimates** of risks/measures effects on:
  - behaviour,
  - infrastructure,
  - vehicle, and
  - post impact care
- **211 Synopses**
- **36 cost-benefit analyses**



# SafetyCube DSS Menu

- **Search**  
Risk Factors & Measures
- **Knowledge**  
211 Synopses, Serious Injuries, Accident Scenarios
- **Calculator**  
Economic Efficiency Evaluation
- **Methodology**  
System documentation
- **Support**  
Contact, help, feedback



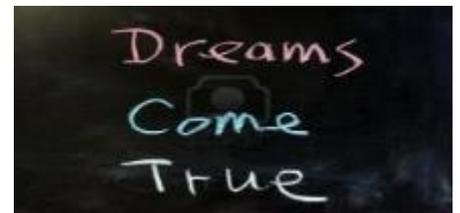
The background features a large, abstract geometric pattern in a lighter shade of orange. The pattern consists of interconnected lines and circular nodes, forming a complex, crystalline or molecular-like structure. The lines are thick and the nodes are circular, creating a sense of depth and connectivity.

**Conclusion & next steps ...**

# Delivering a long awaited powerful tool



- 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, constantly improved and enhanced



# SafetyCube – Required next steps



The **future operation** of the SafetyCube DSS concerns:

1. the uninterrupted operation of the current SafetyCube DSS
2. updates of the risk factors, measures and cost-benefit analyses (recent studies but also older ones)
3. possibility to receive, check and incorporate studies submitted by external experts and organizations and the respective quality control
4. a partnership of public and private organisations is being assembled to enable the DSS to continue



# SafetyCube - the European Road Safety Decision Support System



All deliverables of the project are available at

[www.Safetycube-project.eu](http://www.Safetycube-project.eu)

You are welcome to use the DSS at

[www.roadsafety-dss.eu](http://www.roadsafety-dss.eu)

