INV22

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA

A digital era for transport

solutions for society, economy and environment

European Road Safety Policy: Towards Evidence-Based Decision Making, Especially for Vulnerable Road Users

A quiz on the EU projects **SafetyCube** & **InDev**

Klaus Machata, KFV (Chair)

Hosted and organised by:
Austrian Ministry for Transport, Innovation and Technology
AIT TOMORROW TODAY
austriatech
Co-organised by:
European Commission
Together with:
ACARE
alice
CEDR
ECTP
ERRAC
ERTRAC
EFRA
WATERBORNE

VIENNA 2018

TRA TRANSPORT RESEARCH ARENA

A digital era for transport

solutions for society, economy and environment

Evidence-based road safety in the EU: from Policy to R&I

Ingrid Skogsmo, European Commission - DG RTD

Hosted and organised by:

Austrian Ministry for Transport, Innovation and Technology

AIT TOMORROW TODAY

austriatech

Co-organised by:

European Commission

Together with:

ACARE

alice

ECTP

ERRAC

ERTRAC

WATERBORNE

Since when does Horizon 2020 include dedicated calls on automated road transport?

a) That has still to happen

b) Since 2016

c) Since 2010

Improve Road Safety – A European policy objective

…halving road deaths by 2020

… move close to zero deaths and serious injuries by 2050

… It is only on the basis of detailed knowledge about the performance of different parts of the system that activity can be focused where it is most effective in reducing deaths and serious injuries…

MG-3.4-2014 - Traffic safety analysis and integrated approach towards the safety of Vulnerable Road Users

- **Developing an in-depth understanding of road accident causation for all road users**, covering all aspects of road safety (vehicle, driver and infrastructure) together with appropriate actions for their prevention and mitigation. This shall include methods for conducting a comprehensive assessment of socio-economic costs related to road accidents, taking into consideration secondary costs related to congestion, material damage, vehicle uptime etc. as a basis for robust cost-benefit analysis of safety countermeasures at a transport system level.

- Research will fill knowledge gaps at both European and national levels, and take into account regional differences. …
- Expected impact: Research in this area will contribute to delivering essential knowledge for the design and implementation of an efficient strategy …. Overall, research will contribute to the achievement of the European policy objective of halving road deaths by 2020, and, in the longer term, to the Transport White Paper's "Vision Zero" objective.

Road Safety in Horizon 2020

Accidentology

Vulnerable Road Users

Distraction

EU-Africa road safety

Influence of behaviour in Transport Safety

Protection of all road users in crashes

Human Factors in Transport Safety

Safety in an evolving road mobility environment

2014	2015	2016	2017	2018	2019

Automated Road Transport

Safety & end user acceptance

Support for networking activities &

impact assessment for road automation

!Data!

!Data!

methodology

LEARN BY DOING!

!Data!

TARGETS!

!Data!

KNOWLEDGE BASE!

KPIs!

evidence based

IMPLEMENTATION!

Safe systems approach!

Indicators!

measurements

KNOWLEDGE SHARING

!Data!

Management by objectives!

IMPACT ASSESSMENT

New ways to address known challenges!!

… It is only on the basis of detailed knowledge about the performance of different parts of the system that activity can be focused where it is most effective in reducing deaths and serious injuries…

!Data!

!Data!

… and the correct answer?

Since when does Horizon 2020 include dedicated calls on automated road transport?

a) That has still to happen

b) Since 2016

c) Since 2010

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

Contact

Ingrid.skogsmo@ec.europa.eu

VIENNA 2018

A digital era for transport

solutions for society, economy and environment

The potential of road safety performance indicators in road safety management

Rune Elvik, Institute of Transport Economics, Norway

Hosted and organised by:

Austrian Ministry for Transport, Innovation and Technology

AIT TOMORROW TODAY

austriatech

Co-organised by:

Together with:

ACARE alice ECTP ERRAC ERTRAC EFRA WATERBORNE

What is percentage of motor vehicles complying with speed limits today in Norway?

a) 48.6 %

b) 59.9 %

c) 61.4 %

d) 41.1 %

The potential of road safety performance indicators in road safety management

- What is a road safety performance indicator?
  - Any risk factor that influences the number and/or severity of crashes and that can be influenced by road safety policy
  - Examples: mean speed, seat belt wearing, drinking and driving
- How can a road safety performance indicator be used in road safety management?
  - Set at a target value for it and use that to determine what actions you must take to reach the target value

… and the correct answer?

An illustration

- By 2022, 70 % of motor vehicles should comply with speed limits (in Norway)
- What is percentage of motor vehicles complying with speed limits today?
  - A) 48.6 %   **B) 59.9 %**   C) 61.4 %   D) 41.1 %

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

Contact

Rune Elvik, Institute of Transport Economics,
Gaustadalleen 21, 0349 Oslo, Norway
re@toi.no

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

New ways in evidence-based decision-making: The SafetyCube project

Prof. Pete Thomas, Loughborough University, UK

Hosted and organised by:
Austrian Ministry for Transport, Innovation and Technology
AIT TOMORROW TODAY
austriatech
Co-organised by:
European Commission
Together with:
ACARE
alice
CEDR
ECTP
ERRAC
ERTRAC
EFRA
WATERBORNE

What does DSS stand for?

a) Desperately Silent Statistics
b) Decision Support System
c) Dynamic Speed Substitution
d) Double Standards in Safety

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

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?
- and if I have a combination of problems …

… then use SafetyCube DSS to have the answers

SafetyCube DSS Users

- **Public Authorities**

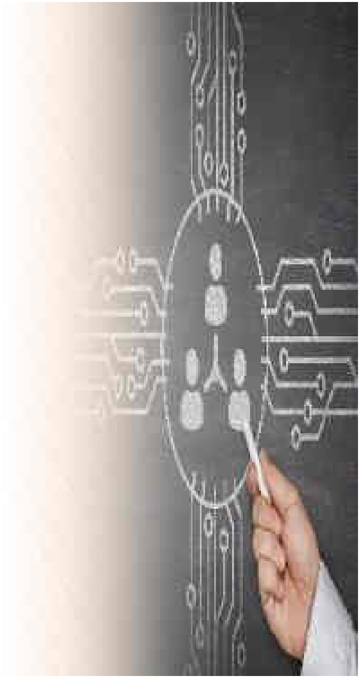
  local, regional, national, European and international
- **Industry**

  Infrastructure, Vehicle, Insurance, Technology
- **Research Institutes, Experts**
- **Non Governmental Organisations**
- **Mass Media**
- **Everyone**

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

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**

… and the correct answer?

What does DSS stand for?

a) Desperately Silent Statistics
b) Decision Support System
c) Dynamic Speed Substitution
d) Double Standards in Safety

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

Contact

Pete Thomas, p.d.thomas@lboro.ac.uk

VIENNA 2018

TRA TRANSPORT RESEARCH ARENA

A digital era for transport

solutions for society, economy and environment

Economic evaluation of road safety measures

Wouter Van den Berghe, VIAS, Belgium

Hosted and organised by:

Austrian Ministry for Transport, Innovation and Technology

AIT Austrian Institute of Technology TOMORROW TODAY

austriatech

Co-organised by:

European Commission

Together with:

ACARE

alice

CEDR

ECTP

ERRAC

ERTRAC

EFRA

WATERBORNE

Which of the following 4 measures in road safety has the highest benefit-to-cost ratio?

- ❑ Section control
- ❑ Alcohol interlock program
- ❑ Dynamic speed limits
- ❑ Autonomous Emergency Breaking

Some of the issues to be considered…

Effectiveness

Target group

Penetration rate

Monetary valuation of avoided crashes and victims

Side effects

Assesssing benefit/cost ratio

Time horizon

Implementation costs

Annual costs

Transferability across countries

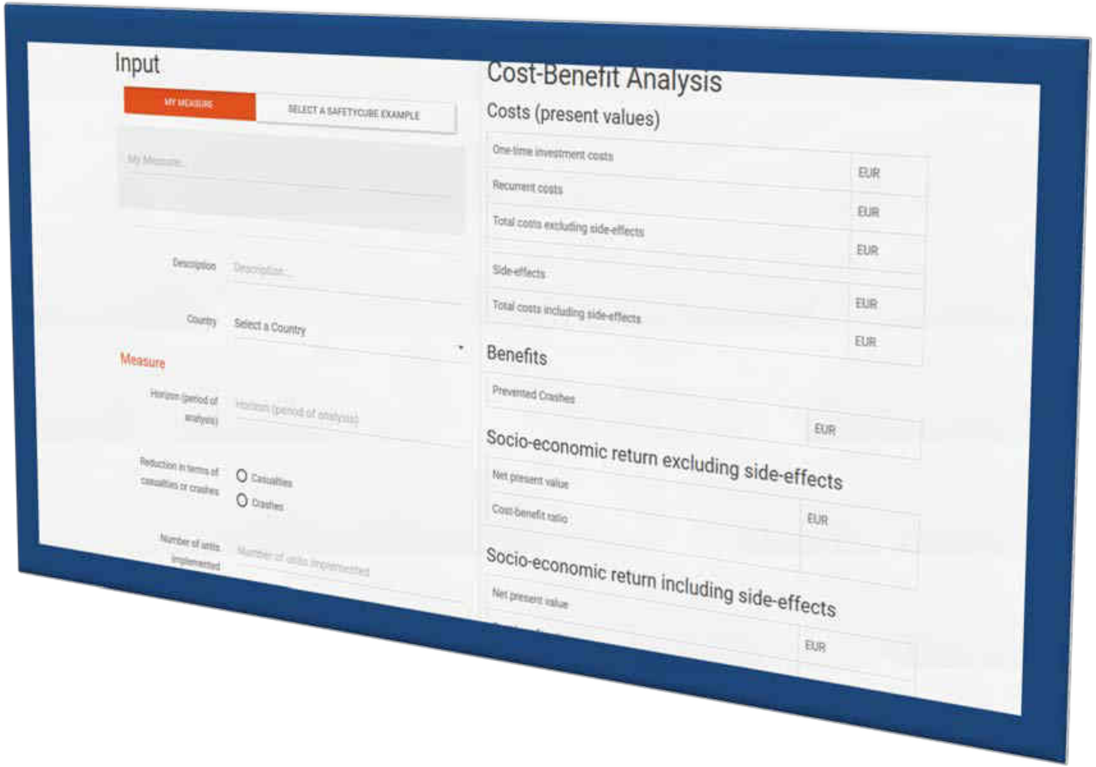
Validity over the years

The SafetyCube approach

- Development of an algorithm and system that
  - can be used for all kinds of measures
  - takes into account all factors
  - can use different types of effectiveness data
  - can be used across countries
  - uses standardized crash costs data for all EU countries

- Use the E³ *(Economic Efficiency Evaluation)* calculator on the DSS website
  - https://www.roadsafety-dss.eu → Tab "**Calculator**"
  - get guidance on the methodology
  - read existing worked-out examples (over 36 already available)
  - adapt existing examples or make a CBA from scratch !

User interface



Explanation

CBA: Road lighting

Annelies Schoeters, Vias institute, October 2017

CBA Autonomous Emergency Br (city, inter-urban)

Reakka Krishnakumar, CEESAR, September 2017

Cost-benefit analysis
Red light cameras

Charles Goldenbeld, SWOV, and Stijn Daniels, VIAS institute, September 2017

Cost-benefit analysis
Alcohol Interlock Program

Annelies Schoeters, Vias institute, September 2017

https://www.roadsafety-dss.eu/#/calculator

Getting back to the basic facts

	Costs	Effects
❑ Section control	€€€	++++
❑ Alcohol interlock programme	€€	+++
❑ Dynamic speed limits	€€€€	+++
❑ Autonomous Emergency Breaking	€	+

… and the correct answer?

Which of the following 4 measures in road safety has the highest benefit-to-cost ratio?

	B/C ratio
❑ **Section control**	**19.5**
❑ Alcohol interlock program	10.9
❑ Dynamic speed limits	1.1
❑ Autonomous Emergency Breaking	1.2

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

Contact

Wouter Van den Berghe, VIAS, Belgium
Wouter.VandenBerghe@vias.be

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

Measuring the Road User

The challenges of quantifying human related risk factors and measures

Susanne Kaiser, Austrian Road Safety Board (KFV), Austria

Hosted and organised by:
Austrian Ministry for Transport, Innovation and Technology
AIT TOMORROW TODAY
austriatech
Co-organised by:
European Commission
Together with:
ACARE alice CEDR ECTP ERRAC ERTRAC EFRA WATERBORNE

Which of the following road user related risk factors was prioritized by stakeholders as pressing issue to tackle?

A) Tailgating

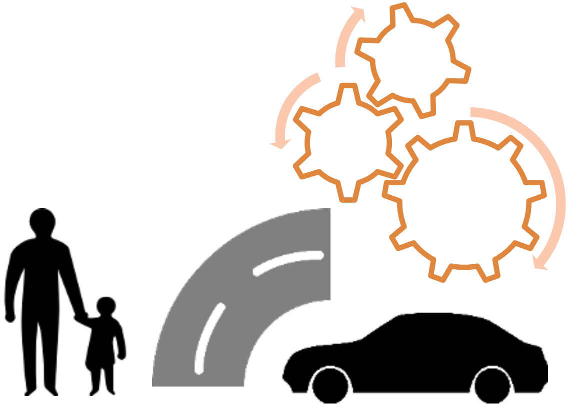
B) Fatigue

C) ADHD

Common objective

Estimating safety effects of risk factors and measures related to

- Road users
- Road infrastructure
- Vehicles



Risks and measures in the DSS

Behavior

- Speed choice
- Driving under the influence of alcohol
- Driving under the influence of drugs
- Risk taking
- Fatigue
- Distraction and inattention
- Functional impairment
- Insufficient skills
- Insufficient knowledge
- Emotions and stress
- Misjudgement and observation errors
- Traffic rule violations
- Personal factors
- Age
- Diseases and disorders

Behavior

- Law and enforcement
- Education and voluntary training or programmes
- Driver training and licensing
- Fitness to drive assessment and rehabilitation
- Awareness raising and campaigns

- **450+** considered **individual studies**
- **~50 synopses** on human related risk factors and measures

Challenges involved

- Observation vs. inference of risk factors
- Confounding and interacting risk factors
- Actual contribution to accidents occurrence of risks and measures

To be considered

Importance of

- alternative safety performance indicators (SPI)
- contextual information provided in synopses
- further research and development of valid and reliable SPI


Awareness raising and campaigns – Driving under the influence

Please refer to this document as follows: Eichhorn, A., Kaiser, S. (2017), Awareness raising and campaigns – Driving under the influence, European Road Safety Decision Support System, developed by the H2020 project SafetyCube. Retrieved from www.roadsafety-dss.eu on DD MM YYYY

Awareness raising and campaigns – Driving under the influence

1 Summary

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

… and the correct answer?

Which of the following road user related risk factors was prioritized by stakeholders as pressing issue to tackle?

A) Tailgating

B) Fatigue

C) ADHD

VIENNA 2018
A digital era for transport
solutions for society, economy and environment

Contact

Susanne Kaiser, KFV
susanne.kaiser@kfv.at

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

• The SafetyCube European Road Safety Decision Support System

Prof. George Yannis, NTUA, Greece

Hosted and organised by:
Austrian Ministry for Transport, Innovation and Technology
AIT TOMORROW TODAY
austriatech
Co-organised by:
European Commission
Together with:
ACARE alice CEDR ECTP ERRAC ERTRAC EFFRA WATERBORNE

How many studies have been coded in the DSS?

a) approx. 150

b) approx. 500

c) approx. 850

d) approx. 1300

SafetyCube DSS Knowledge Wealth

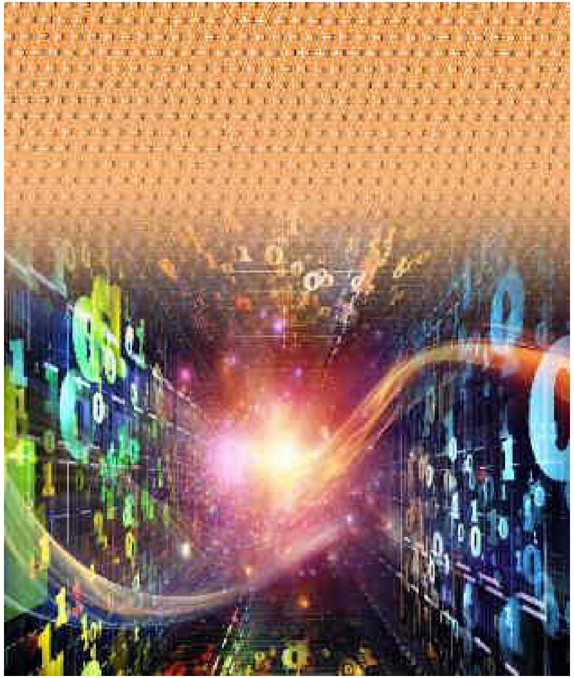
SafetyCube DSS will eventually include
by April 2018:

- 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

SafetyCube DSS Search Pages

DSS Search through five entry points:

- **Keyword** search (all database keywords)
- **Risk factor** search (taxonomy)
- **Measures** search (taxonomy)
- **Road User Groups** (database keywords related to each group)
- **Accident Categories** (under development)

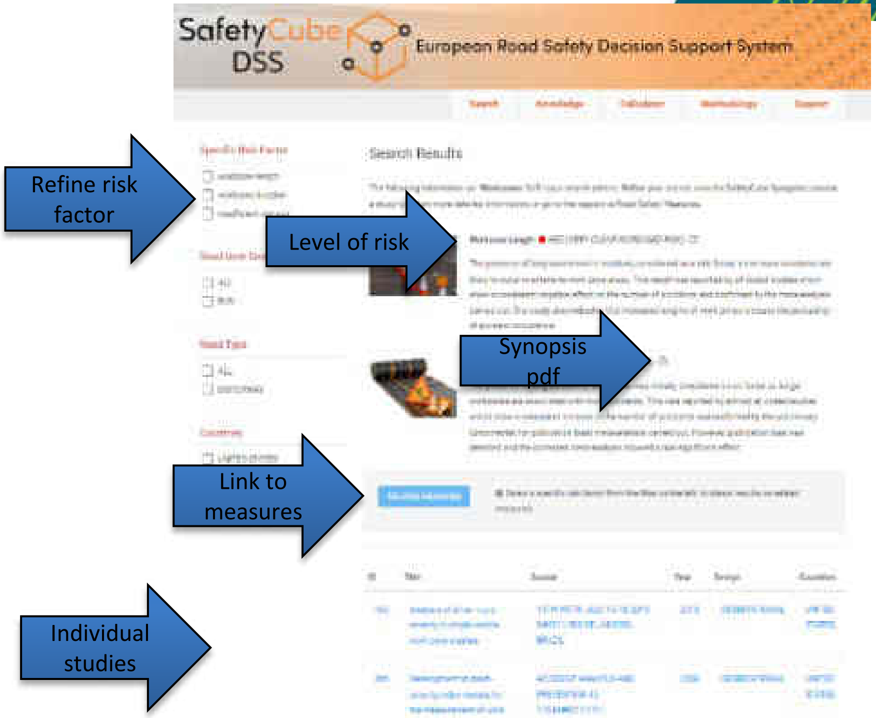
The Search Structure

- **Search**
  (5 entry points)
- **Results pages**
  (Introduction, Colour codes, Synopses, Coded studies)
- Individual **Studies** pages
  (Disaggregate level, detailed effects listed, some studies not in synopses)

- **Links** between Risk Factors
  Information about which risks can be remedied by which types of measures

VIENNA 2018 TRA
A digital era for transport
solutions for society, economy and environment

SafetyCube DSS Results Pages



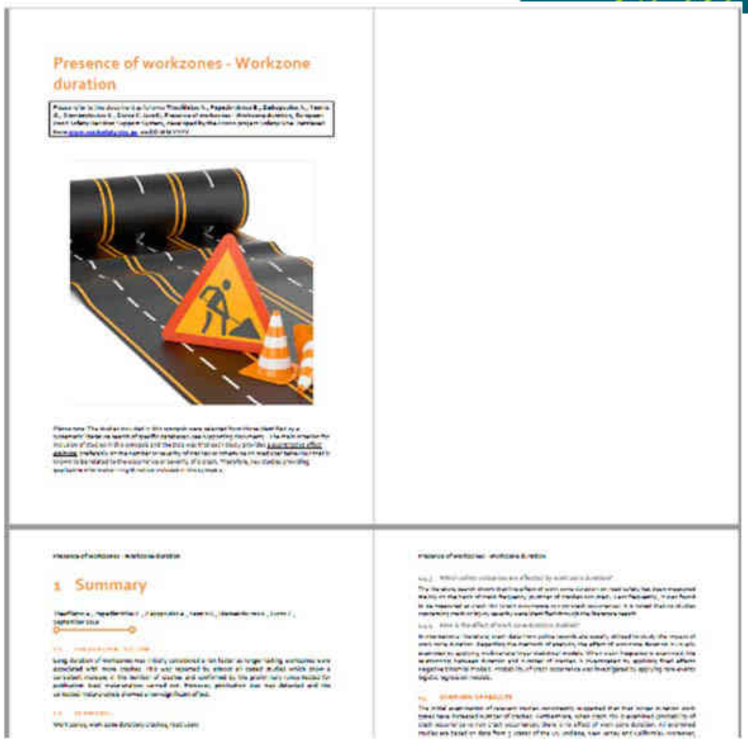
SafetyCube Synopses

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
- Analysis results: Meta-analysis/Vote-count analysis/Qualitative analysis

Supporting document (3-10 pages)
- Literature search strategy and study selection criteria
- Detailed analyses



… and the correct answer?

How many studies have been coded in the DSS?

a) approx. 150

b) approx. 500

c) approx. 850

d) approx. 1300

VIENNA 2018
A digital era for transport
solutions for society, economy and environment

Contact

George Yannis, geyannis@central.ntua.gr

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA

A digital era for transport

solutions for society, economy and environment

Surrogate safety measures - theory, application, examples

Aliaksei Laureshyn

Lund University (Sweden)

InDeV

Hosted and organised by:

Austrian Ministry for Transport, Innovation and Technology

AIT TOMORROW TODAY

austriatech

Co-organised by:

Together with:

ACARE

alice

ECTP

ERRAC

ERTRAC

EFRA

WATERBORNE

Why is it so difficult to make safety analysis based only on accidents?

a. Accidents are rare and random

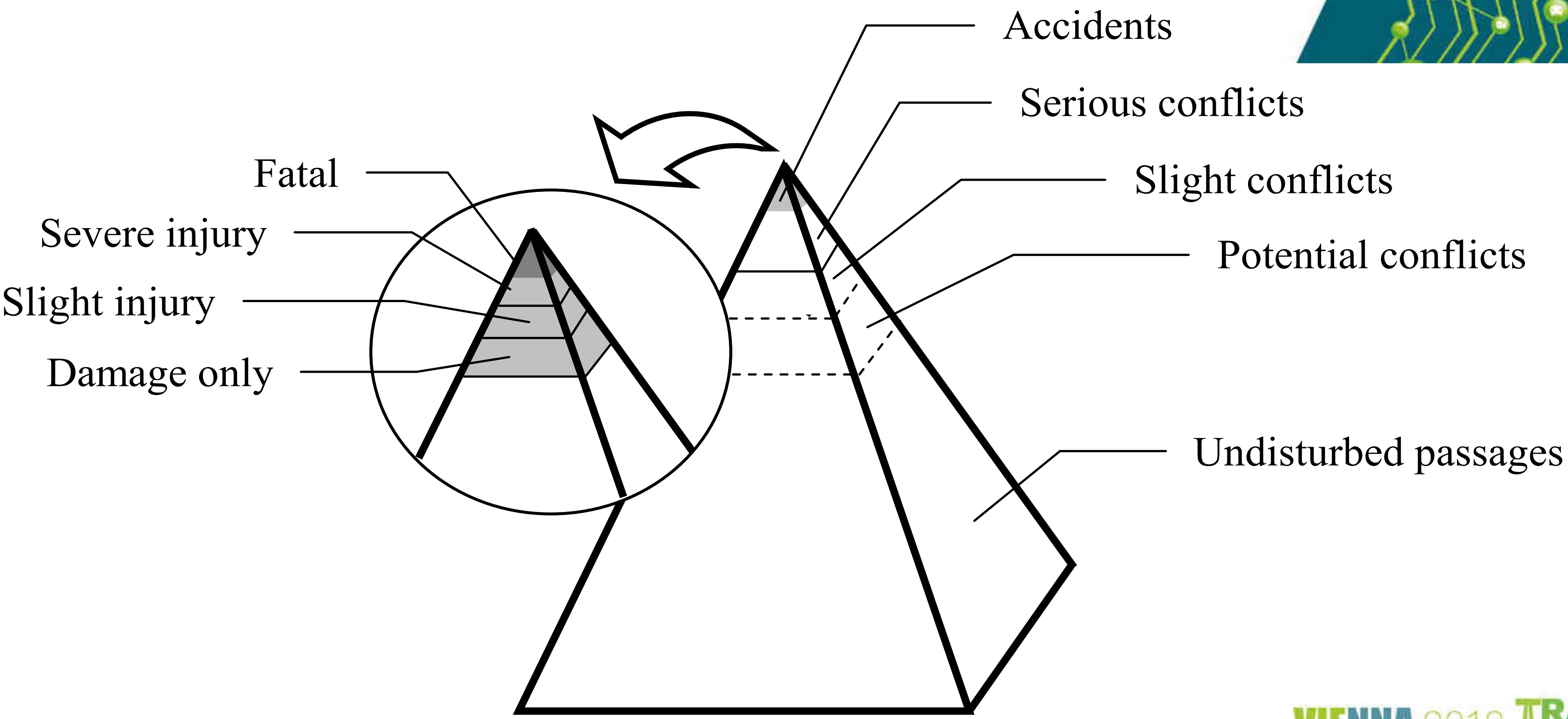
b. Accidents are under-reported

c. Accidents are not properly documented

d. All above-mentioned is true

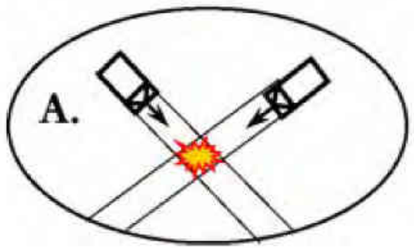
We don’t have enough evidence this is unsafe

Let’s wait for some more planes to crash…



Accidents
Serious conflicts
Slight conflicts
Potential conflicts
Undisturbed passages
Fatal
Severe injury
Slight injury
Damage only

How???



Time-to-Collision (TTC)

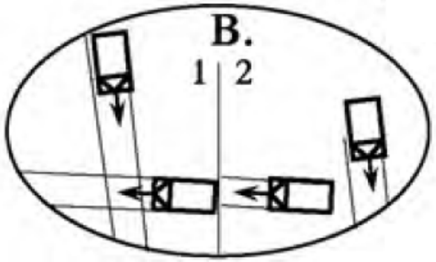
Time-to-Accident (TA)

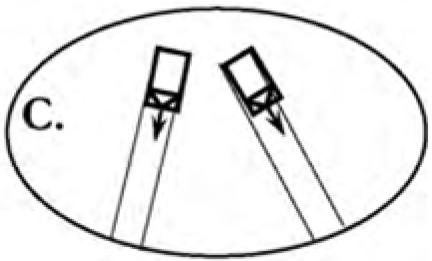
TTC_{min}

Post-Encroachment Time (PET)

Time Advantage (TA)

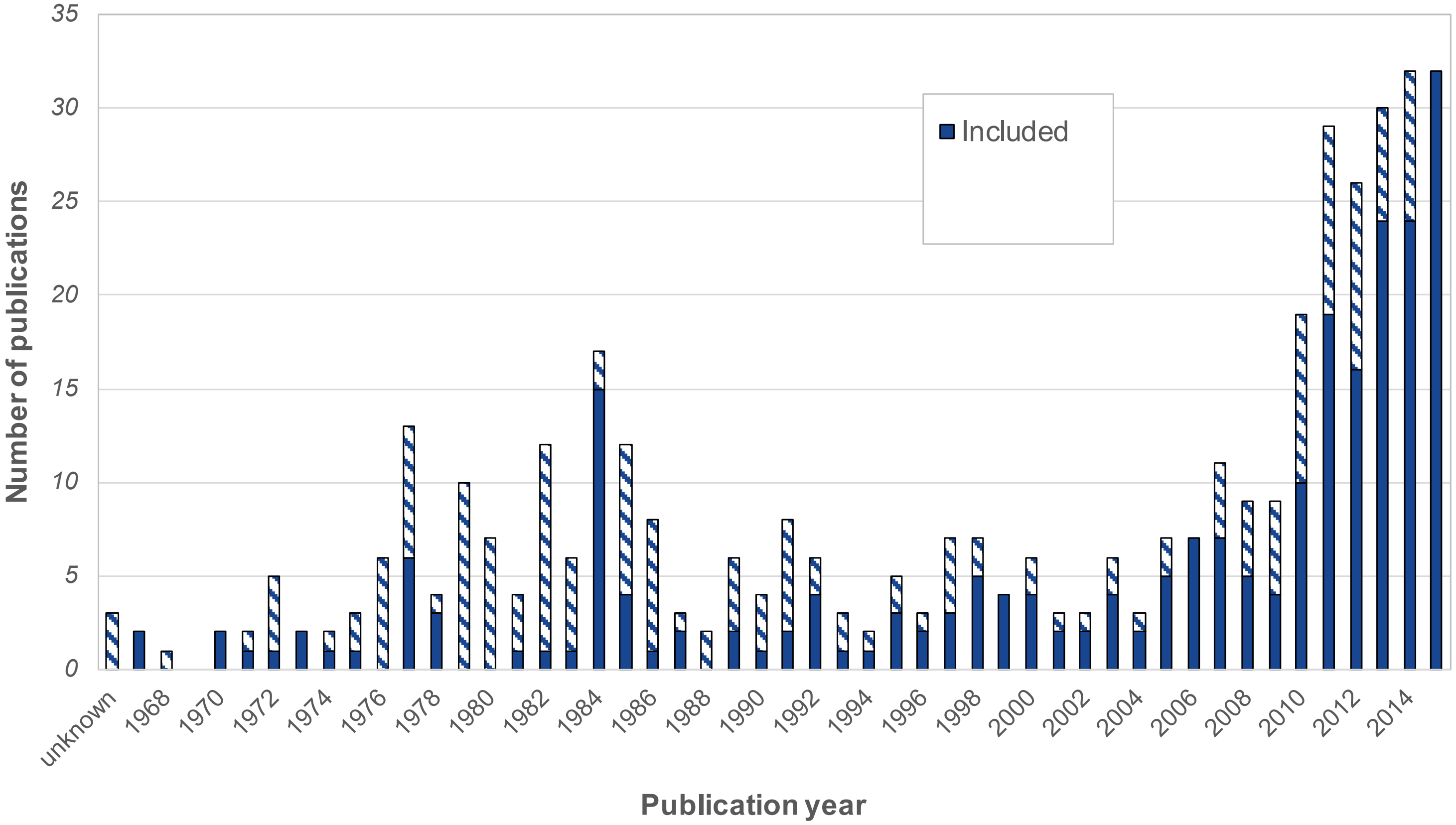
T_2





Evasive action-based

SSM publications



VIENNA 2018 TRA
A digital era for transport
solutions for society, economy and environment

… and the correct answer?

Answer D is correct!!!

a. Accidents are rare and random

b. Accidents are under-reported

c. Accidents are not properly documented

d. All above-mentioned is true

Accidents are rare, random, under-reported and not properly documented!

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

Contact

Aliaksei Laureshyn
aliaksei.laureshyn@tft.lth.se

VIENNA 2018
A digital era for transport
solutions for society, economy and environment

TRA TRANSPORT RESEARCH ARENA

TECHNICAL TOOLS FOR SAFETY DATA COLLECTION

Niels Agerholm
Aalborg University (Denmark)

InDeV

Hosted and organised by:
Austrian Ministry for Transport, Innovation and Technology
AIT TOMORROW TODAY
austriatech

Co-organised by:
European Commission

Together with:
ACARE alice CEDR ECTP ERRAC ERTRAC EFRA WATERBORNE

How often, on average, can you see a serious traffic conflict at an intersection in a “normal” European city?

a) Every hour

b) Once per day

c) Once per week

d) 1-2 times per months

RUBA

- Watchdog = Very simple but efficient
- Operates by defining region-specific detectors and rules

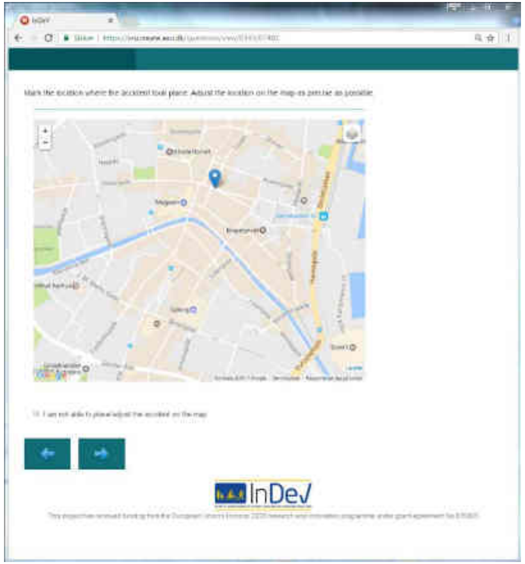
T-Analyst

- Conflicts and encounters
  - Cyclist/vehicle
  - Pedestrian/vehicle
- Trajectories
  - Time-based values

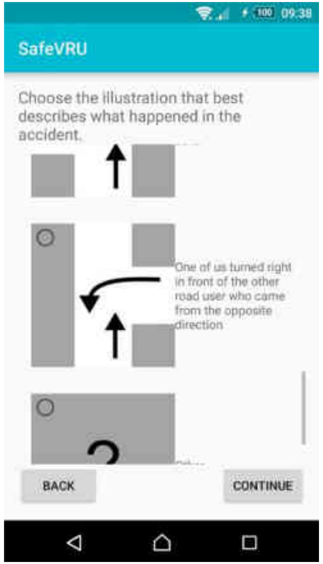
Naturalistic data from VRUs

- Questionnaires
  - Tool to generate questionnaires
  - Self-reporting of accidents via questionnarie (app & web)

Web



App (Android)



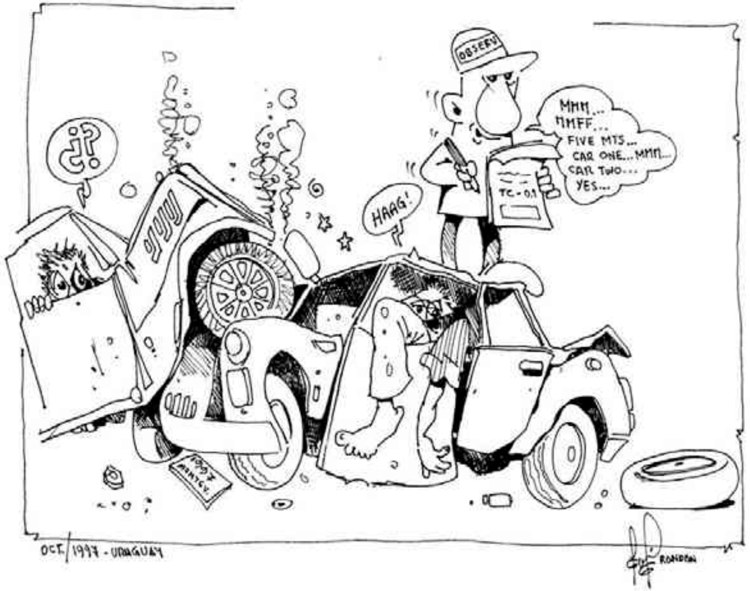
Naturalistic data from VRUs

- Automatic detections of accidents
  - Simulated accidents
    - Dummy and stuntman
  - Rule-based
    - Acceleration, jerks, rotation

	Detected	Not detected
Stuntman	23	12
Dummy	14	0

… and the correct answer?

Answer b) is correct!!!



1-2 conflicts per day.

Of course, it depends on the location, but nowadays conflicts are quite rare, too, and it is no longer possible to use human observers as in 1980s…

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

Contact

Niels Agerholm
na@civil.aau.dk

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA
A digital era for transport
solutions for society, economy and environment

VRU and Accident Costs

Anatolij Kasnatscheew
BASt, Germany

InDeV

Hosted and organised by:
Austrian Ministry for Transport, Innovation and Technology
AIT TOMORROW TODAY
austriatech
Co-organised by:
European Commission
Together with:
ACARE
alice
CEDR
ECTP
ERRAC
ERTRAC
EFRA
WATERBORNE

In how many countries is the specific value 'accident costs per VRU' calculated?

a) None

b) 2

c) 15

d) All countries

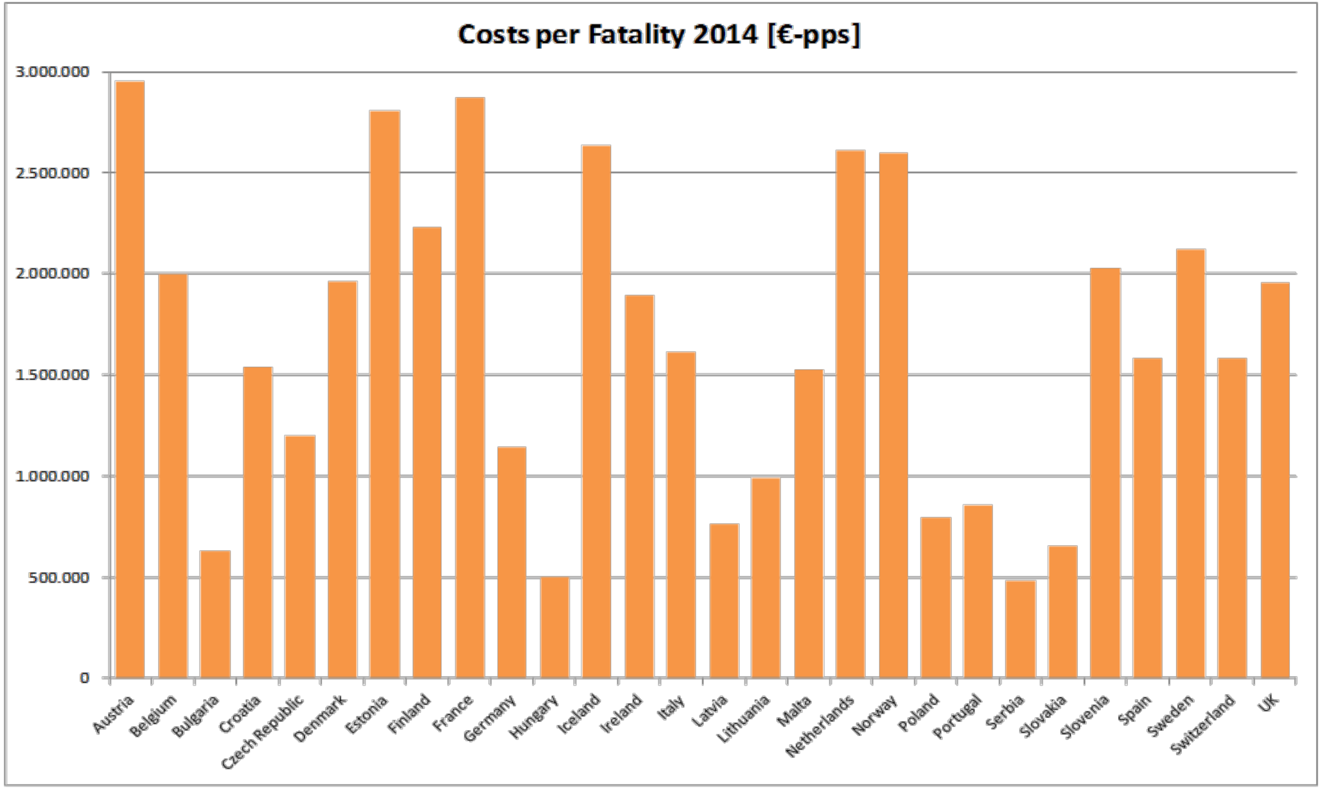
Components… and according methods

- Medical Costs
- Property Damage
- Administrative Costs

Restitution Costs

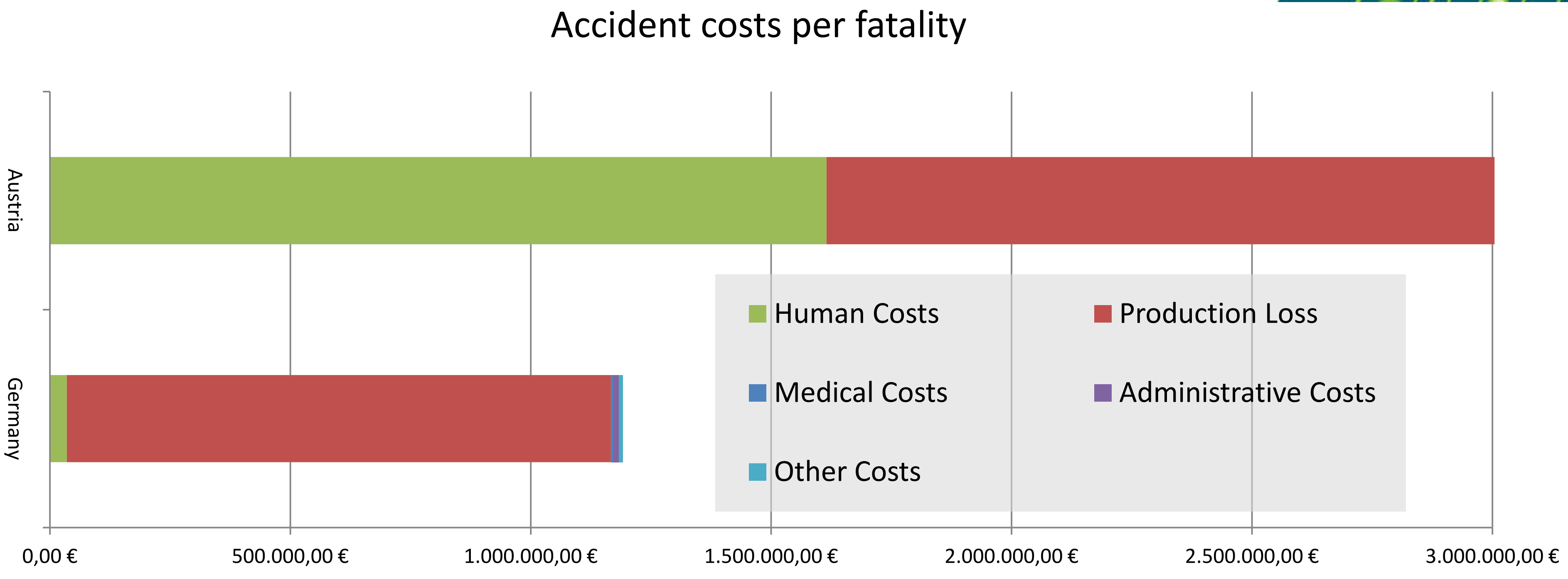
- Production Loss — Human-Capital-Approach
- Human Costs — Willingness-to-Pay Approach
- Other Costs — Different methods

Accident cost calculation in EU countries



Sources:
InDeV Deliverable 5.1 (2016)
(www.indev-project.eu);
SafetyCube Deliverable 3.2 (2017)
(www.safetycube-project.eu).

Methodologies in Austria and Germany



Are VRU considered in Accident Costs?

- Poland

Category	Unit costs (PLN), year 2014	
	General unit costs	VRU unit costs (pedestrians)
Fatality	1,913,909	1,308,473
Seriously injured	2,291,214	1,803,897
Slightly injured	27,107	31,889
Damage only	39,722	20,029
Average unit costs	993,934	795,540

Source: InDeV Deliverable 5.1 (2016) (www.indev-project.eu).

- Sweden

Per serious injury	SEK 4,700,000
Per single bicycle accident (CBA guidelines)	***SEK 600,000***
Per single pedestrian accident (CBA guidelines)	***SEK 400,000***
Per slight injury	SEK 230,000
Per property damage only	SEK 15,000

… and the correct answer?

In how many countries is the specific value ‘accident costs per VRU’ calculated?

a) None

b) 2

c) 15

d) All countries

Contact

■ M.Sc. Anatolij Kasnatscheew
Section U2 – Accident Analysis and Safety Concepts, Road Safety Economics
Federal Highway Research Institute (BASt)
Bruederstrasse 53, D-51427 Bergisch Gladbach
Phone +49 2204 43-3207, Fax +49 2204 43-3250
kasnatscheew@bast.de, www.bast.de
www.indev-project.eu

VIENNA 2018

A digital era for transport

solutions for society, economy and environment

TRA TRANSPORT RESEARCH ARENA

Handbook of VRU study methods

Prof. Dr. Brijs, Kris

Hasselt University (Belgium)

InDeV

Hosted and organised by:

Austrian Ministry for Transport, Innovation and Technology

AIT TOMORROW TODAY

austriatech

Co-organised by:

Together with:

ACARE

alice

CEDR

ECTP

ERRAC

ERTRAC

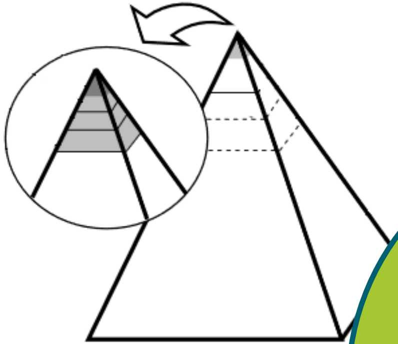
EFRA

WATERBORNE

What is the pyramid of Hydén?

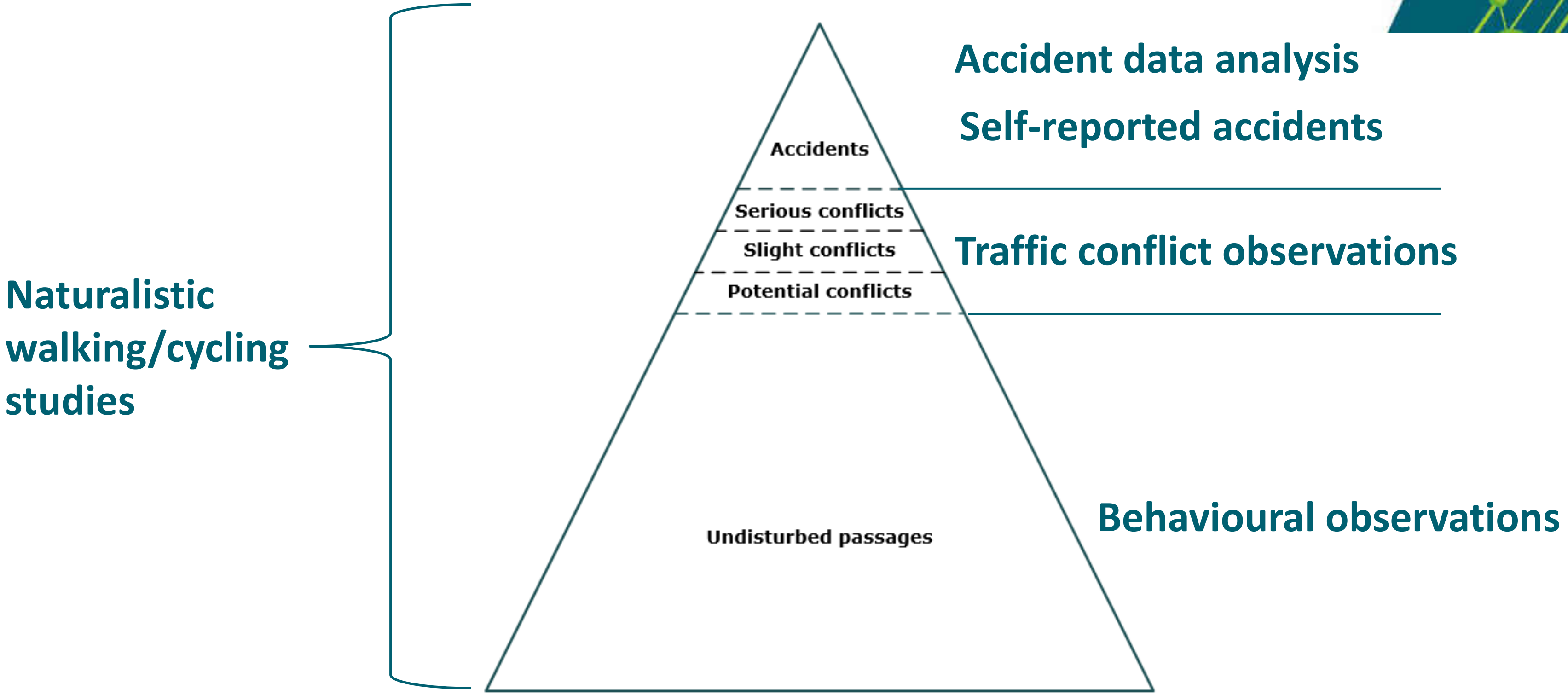
A)

B)



C)

D)

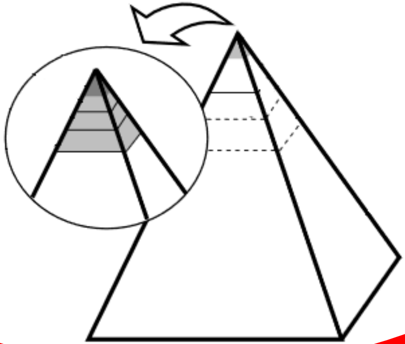

Naturalistic walking/cycling studies
Accidents
Serious conflicts
Slight conflicts
Potential conflicts
Undisturbed passages
Accident data analysis
Self-reported accidents
Traffic conflict observations
Behavioural observations

… and the correct answer?

Answer B is correct!

A)

B)



C)

D)

VIENNA 2018 TRA TRANSPORT RESEARCH ARENA

A digital era for transport

solutions for society, economy and environment

Prof. Dr. Kris Brijs

kris.brijs@uhasselt.be

… please add up your correct answers!

VIENNA 2018 A digital era for transport
solutions for society, economy and environment
TRA TRANSPORT RESEARCH ARENA

And the winner is …