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Core Road Safety Concepts for Managers

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Objectives and Outline

Objectives

The objective of this presentation is to introduce Road Safety Managers to the key concepts related to **theory and practice of evidence-driven decision making** based on appropriate data and analyses, and the related fundamentals of road safety impact assessment

Outline

- Basic Global Road Safety Facts (2)
- Key Road Safety Policy Concepts (5)
- Evidence-driven safety & necessary data (16)
- Road safety data analyses (11)
- New Road Safety Data (8)
- Road Safety Impact Assessment (11)
- Concluding Remarks (1)

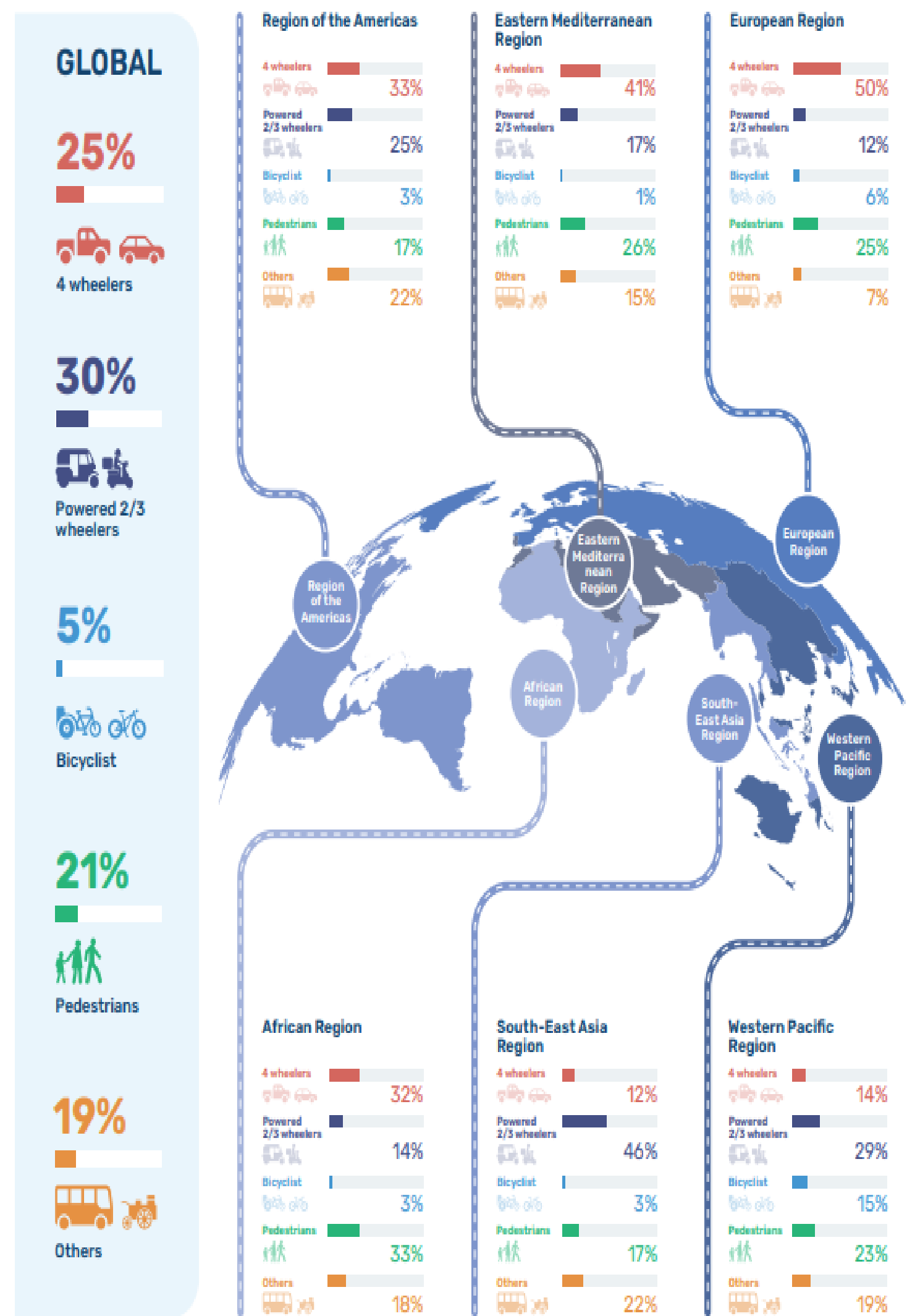


Basic Global Road Safety Facts

Road Safety Worldwide

Source: WHO 2023

- Road crashes is a major societal problem with an estimated **1.19 million** road traffic deaths in 2021.
- Road traffic injuries are the **leading cause of death** for children and young adults **aged 5-29** and are the 12th leading cause of death when all ages are considered.
- More than half of all road traffic deaths involve **vulnerable road users**: pedestrians, cyclists and motorcyclists.
- **Nine in 10 deaths** occur in low- and middle-income countries, while people in low-income countries continue to face the highest risk of death per population.
- A very **large disparity** of road safety performance is observed between Regions, in terms of fatalities per million population with Europe best performing (70 / EU:43) and Africa least performing (190)



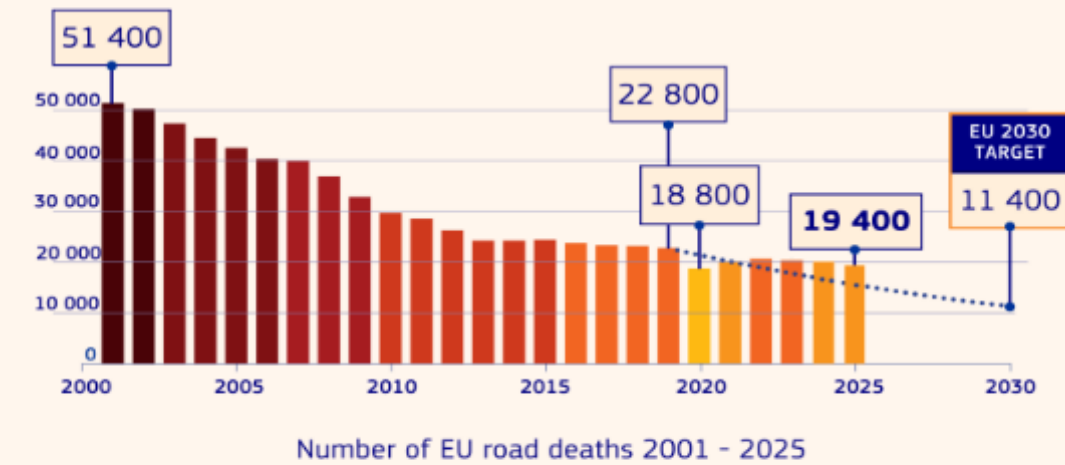
Road Safety in the European Union (EU)

Source: European Commission

- **Europe** is the best performing region in terms of fatalities per population (43) with **19,400** road deaths in 2025.
- Sweden and Denmark had the **safest roads** in 2025 as in previous years, with low fatality rates of 20 and 23 deaths per million inhabitants, respectively.
- Even though 70% of road crashes occur inside urban areas, 50% of all road traffic deaths are recorded **outside urban areas**.
- For every fatality, an estimated five people are seriously injured.
- Within **urban areas, vulnerable road users** (pedestrians, cyclists and users of powered two-wheelers and personal mobility devices) represent **70%** of total road deaths.

EU target: halving road deaths by 2030

Too many lives are still lost on EU roads.



Source: EU CARE database on road crashes and national sources

Road deaths by country

EU average for road deaths decreased from 51 in 2019 to 43 in 2025

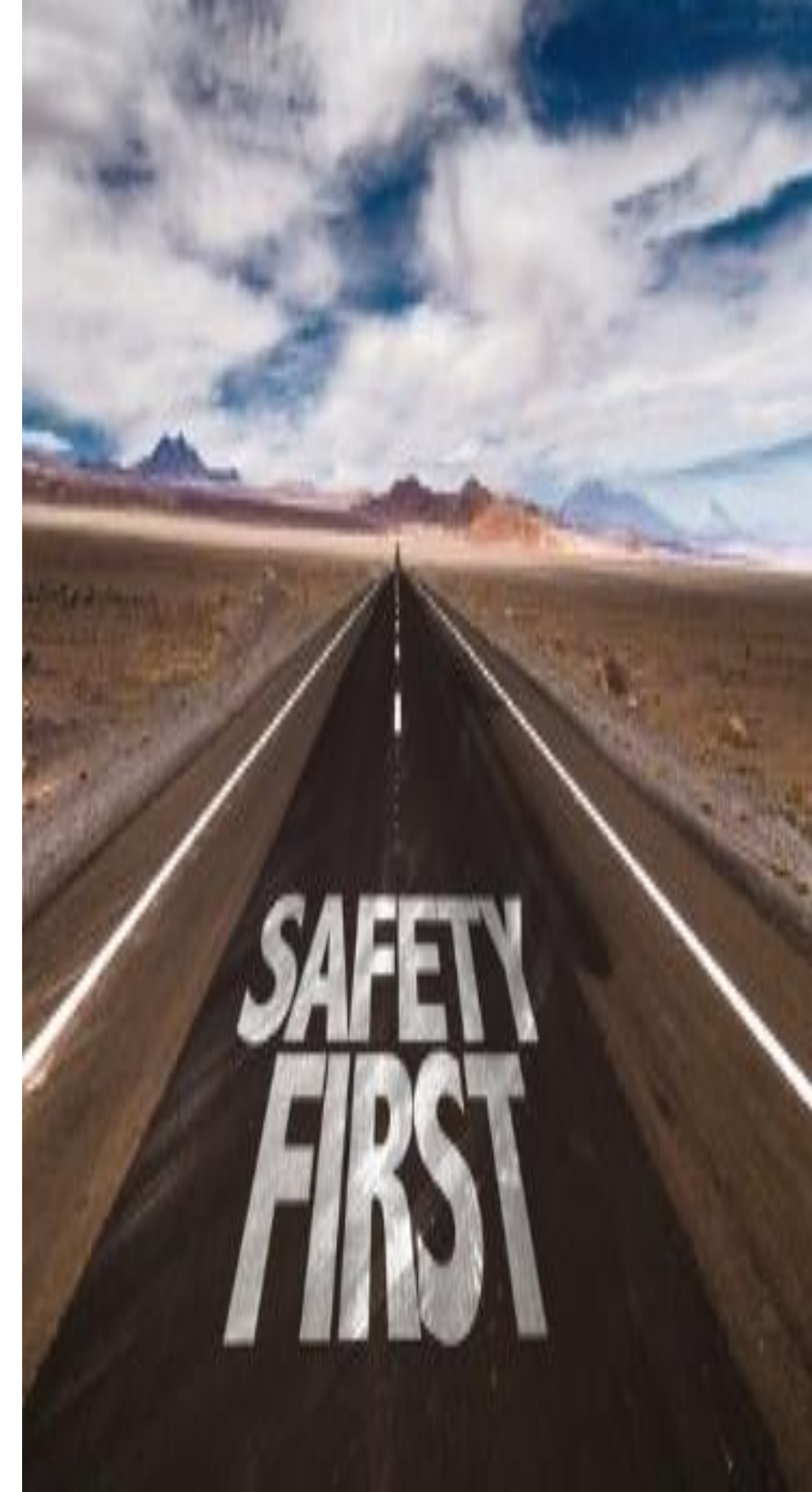


Source: EU CARE database on road crashes and national sources *2024 data

Key Road Safety Policy Concepts

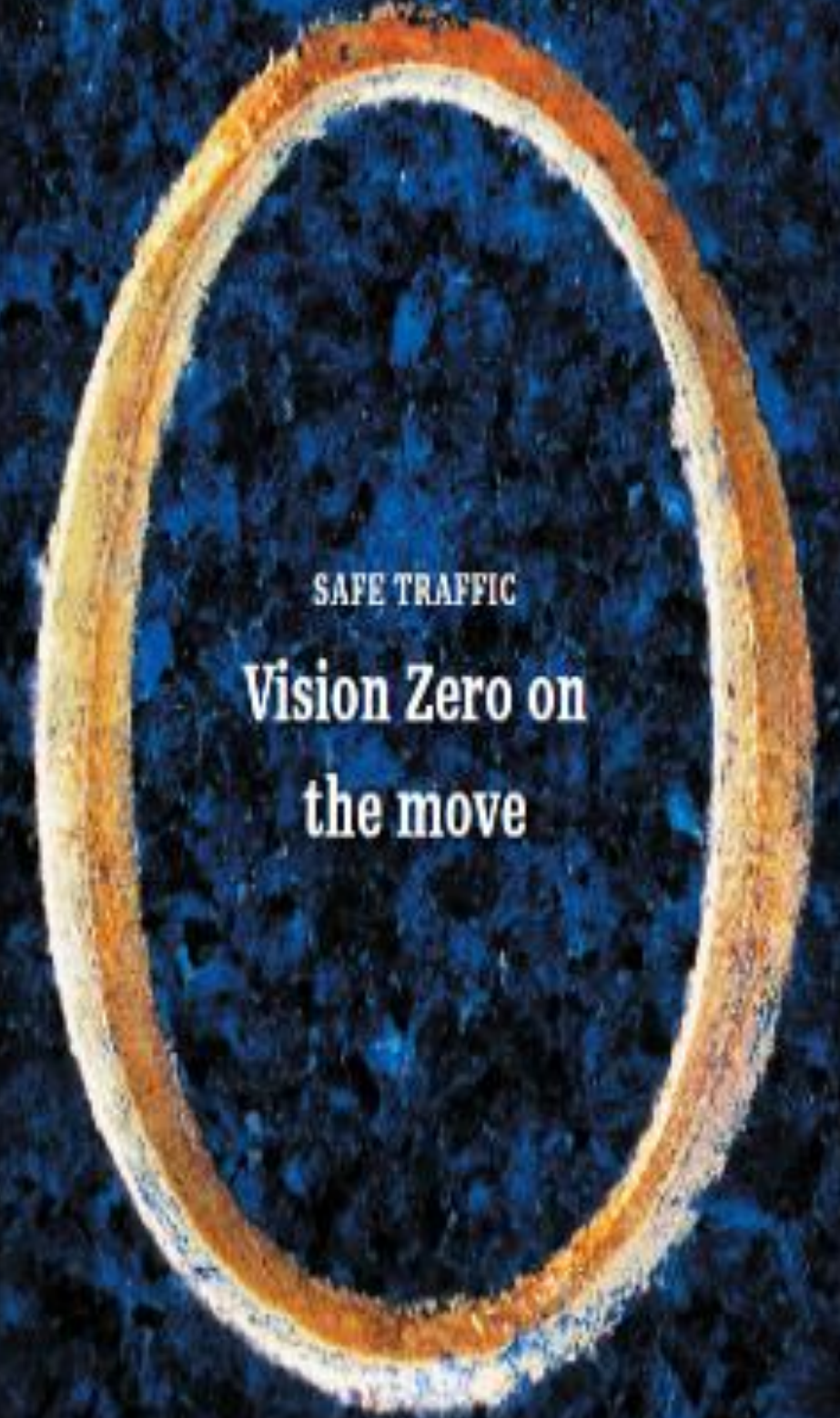
The Safe System Approach

- Aims to develop a road transport system better **able to accommodate human error**, through complementary policies, programmes, actions and measures for all system components: road user behaviour, road infrastructure & traffic, vehicle and management at all levels.
- Governmental Authorities with a role in determining the safe functioning of the transport system are incorporated in **comprehensive management** and communication structures.
- Relies on strong economic analyses to understand the scale of the trauma problem and **apply direct investments** to achieve the greatest potential benefit to society.
- Safety management decision making is aligned with **a broader societal decision making** to meet economic goals and human and environmental health goals, and to create a safe commercial transport environment.



The Vision Zero Concept

- A traffic safety policy developed in Sweden (1997), expressing an **ethical imperative to eliminate death and serious injury** from the transport system.
- **Responsibility** for crashes and injuries is shared between the providers of the system and the road users.
 - the **road user** remains responsible for following basic rules
 - the **system designers and enforcers** are responsible for the functioning of the system
- When road users make errors or fail to follow the rules, the **responsibility reverts to the system designers** to ensure that these failings do not result in death or serious injuries.
- The **components of the road transport system** (incl. road infrastructure, vehicles and restraint systems) must be designed so that they are **linked to each other**. The amount of energy in the system must be kept below critical limits by ensuring that speed is restricted.



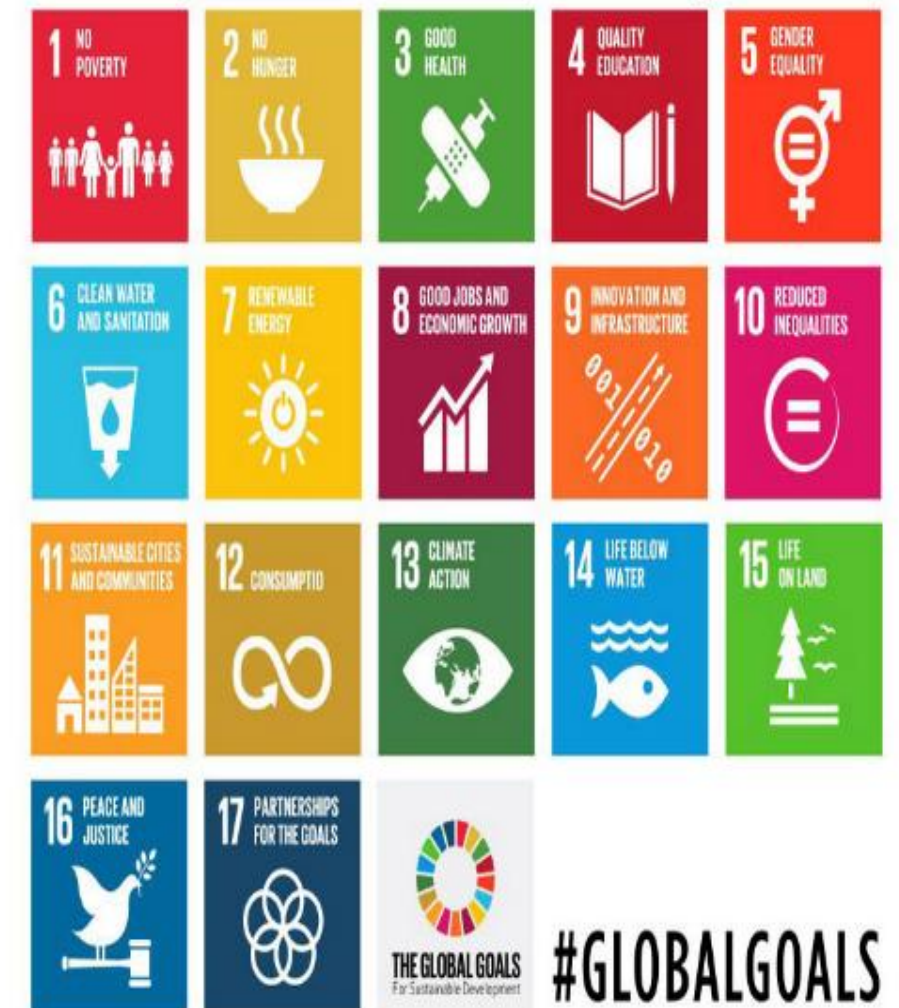
UN Decade for Action – Pillars



UN Sustainable Development Goals

- In 2015, the United Nations General Assembly adopted a series of SDGs as part of the 2030 Agenda for Sustainable Development.
- Target 3.6: By 2030 (updated in 2021), **halve the number of global deaths and injuries** from road traffic crashes.
- Target 11.2: By 2030, provide access to **safe, affordable, accessible and sustainable transport systems for all**, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

THE GLOBAL GOALS For Sustainable Development



Road Safety Strategies and Targets

- Within the national transport, mobility and road safety policies, specific **multi-annual road safety strategies** are adopted – usually for 5 or 10 years.
- These strategies set **quantitative targets** for the number of fatalities and serious injuries (e.g. EU 50% for both) and often set targets for specific safety performance indicators (speeding, seat belt and helmet wearing, etc.).
- Road safety programmes, actions and measures are set with **specific priorities**, covering all road safety pillars.
- Very often road safety strategies are accompanied by **road safety action plans**, which include implementation modalities: priorities, timelines, budgets, competencies, monitoring progress.



Evidence-driven safety & necessary data

Why evidence-driven safety? (1/2)

- Road Safety is a typical field with high risk of **important investments not bringing results**.
- Absence of **monitoring** and accountability limits seriously the effectiveness of the measures and ultimately the road safety performance.
- Decision making in road safety management is highly dependent on appropriate and **quality data**.
- Very often we look where the data are and **not where the problems and solutions are**.



Why evidence-driven safety? (2/2)

- The **policy making cycle**
 - Vision and strategy;
 - Problem identification;
 - Target Setting and priority setting;
 - Development of measures;
 - Establishing and implementing the programme;
 - Monitoring of and evaluation of outcomes.

The use of high-quality road safety data is involved in each stage

- **Necessity** to:
 - Consolidate and organize existing data
 - Make data and information available
 - Provide a complete tool
 - (analyses, methodologies, benchmarking tools)
 - Support road safety decision making at all stages



Critical Questions on Road Safety

- Which are the current and future challenges of **road crash data analysis**?
- How critical are **data and evidence-based** decision making?
- What is the role of **high-quality road safety data**, as well as of appropriate analysis methodologies?
- How critical is the efficient **assessment of measures**?
- How to link statistical analyses (**correlation**) and the interpretation of their results (**causation**) to policy support?
- Is the analysis of **road user behavior** the key for the establishment of the links between crash causes and impacts?



The 'Pyramid' of Road Safety Data Analysis



What to Measure?

- **Crash Data & Severity**
- **Risk Exposure Data**
- **Road Safety Performance Indicators**
- **Socio-economic indicators**

Do we have the data we need?

Do we need the data we have?



Critical Data Properties

- Crash data are transformed to meaningful risk indicators, only if they are combined with **exposure data** (crash per km driven, per traffic characteristics, per time, etc.).
- Crash causalities are revealed when crashes are correlated with **safety performance indicators** (behaviour, infrastructure, traffic, vehicles).
- The **evaluation of safety measures** effectiveness provides valuable information, necessary for matching problems with solutions.
- Analysis of **high-resolution data** reveals hidden and critical crash properties.



Crash data and Severity

Crash data

- Number of crashes, fatalities, serious injuries and slight injuries
- Breakdown by type of road user, road, vehicle, location, time-period, etc.
- Under-reporting (especially for slight injuries of single-vehicle crashes and vulnerable road users)
- For comparisons, common definitions are needed

Severity

- Refers to the severity of the crash
 - ratio of number of fatalities/serious injuries to total number of crashes / injuries
 - hospitals MAIS injury severity scale
- Varies significantly by road user type, road type and speed environment



Risk Exposure Data (1/2)

Overview

- Road traffic estimates
(road length, vehicle kilometres, and vehicle fleet)
- Road user at risk estimates
(person kilometres, population, number of trips, time in traffic, driver population)

Basic requirements

- Travel/mobility surveys for collecting of veh-km or persons-km data
- Traffic measuring systems established on the national and main interurban road network
- Common vehicle classification by all countries
- Common method for calculating veh-km from the traffic measurements



Risk Exposure Data (2/2)

- Population
- Driver population
 - Total number of active driver licences
 - Number of driver licences by licence group and by age group
- Road length
- Vehicle fleet
 - Total number of registered vehicles
 - Number of vehicles by vehicle type and by age group
- **Vehicle and pedestrian kilometres** (including PTW and micromobility)
- Person kilometres
- Time spent in traffic



Road Safety Performance Indicators (1/3)

Overview

- Simply counting crashes or injuries, is often an imperfect indicator of the level of road safety
- The number of road crashes and injuries, is subject to random fluctuations
- In order to develop effective measures to reduce the number of crashes/ injuries it is necessary to understand the **processes** (causation) that lead to crashes

Safety Performance Indicators can serve this purpose

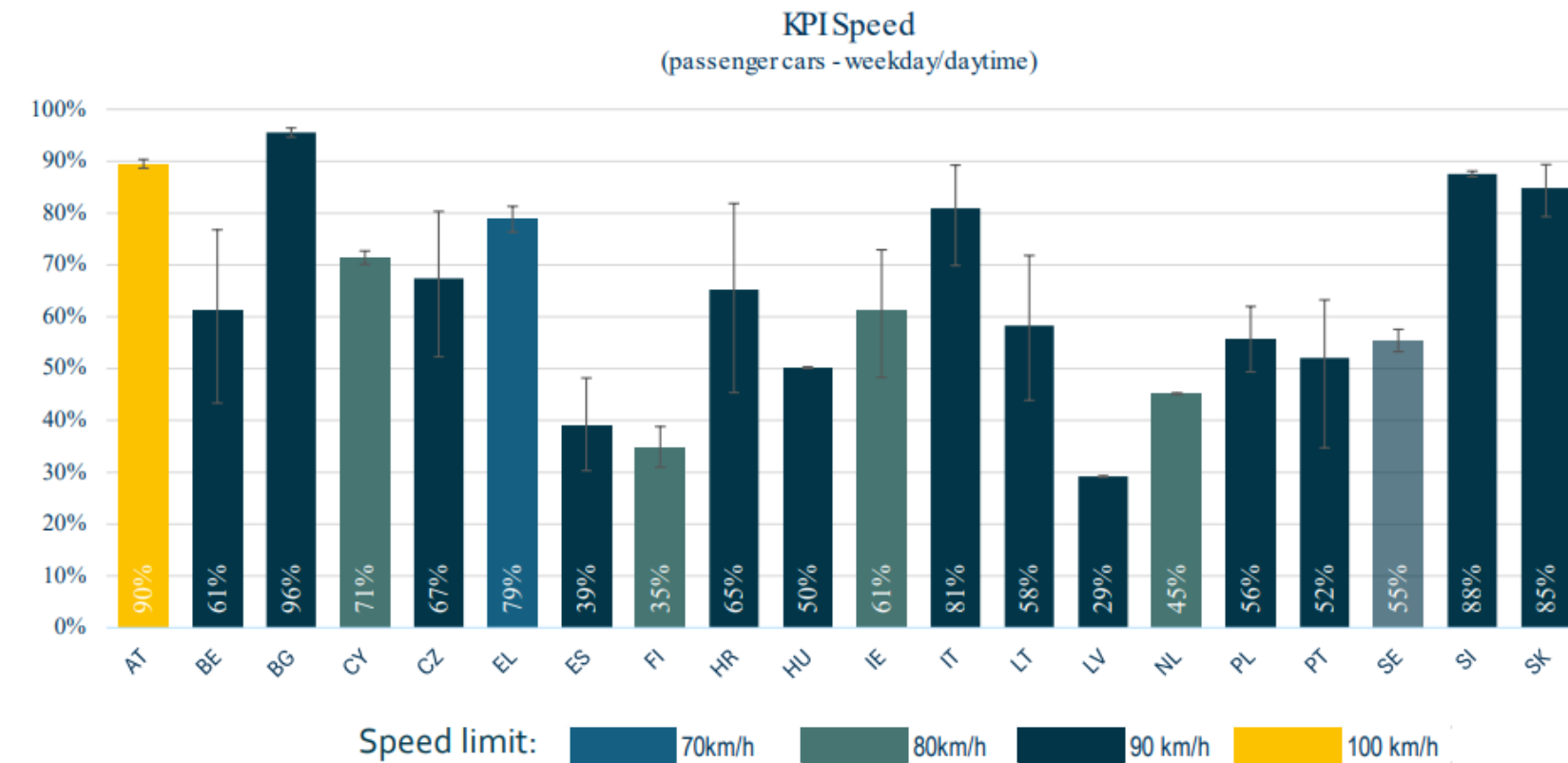


Road Safety Performance Indicators (2/3)

EU list of Road Safety KPIs

- Speeding
- Driving under the influence of alcohol and/or drugs
- Seat-belt and child restraint systems use
- Helmet use
- Driver distraction
- Vehicle fleet performance
- Infrastructure performance
- Post-crash care
- Share of 30km/h road lengths in urban zones
- Enforcement of traffic regulations
- Compliance with traffic regulations at crossings (Red light violation, Non-compliance at non-signalised intersections)

KPI Speed for rural roads



Road Safety Performance Indicators (3/3)

Why Use SPIs?

- Provide **more complete picture** of the level of road safety
- Able to **highlight the emergence of developing problems** at an early stage, **before** these problems show up in the form of crashes
- Provide a means **for monitoring, assessing and evaluating** the effectiveness of safety actions applied
- Utilize qualitative and quantitative information to help **determine a program's success** in achieving its objectives
 - Able to reflect unsafe operational conditions
 - More general than direct outputs of specific safety interventions



Driving Behaviour Data Collection

Roadside observations

Observers, cameras and other counting devices are used to record road user behaviour either continuously or with sampling.

On road experiments (real traffic or field trials)

Studies using instrumented test vehicles to gain greater insights into the factors that contribute to road user crash risk and the associated crash factors at specific conditions.

Naturalistic Driving Experiments

A research method for the observation of everyday driving behaviour of road users in real traffic conditions (instrumented vehicles, obd, telematics)

Driving Simulator Experiments

Examination of a range of driving performance measures in a controlled, relatively realistic and safe driving environment.

In Depth crash Investigations

In-depth crash data describe the causes of crashes and injuries and aim to reveal detailed and factual information from an independent perspective on what happens in a crash.

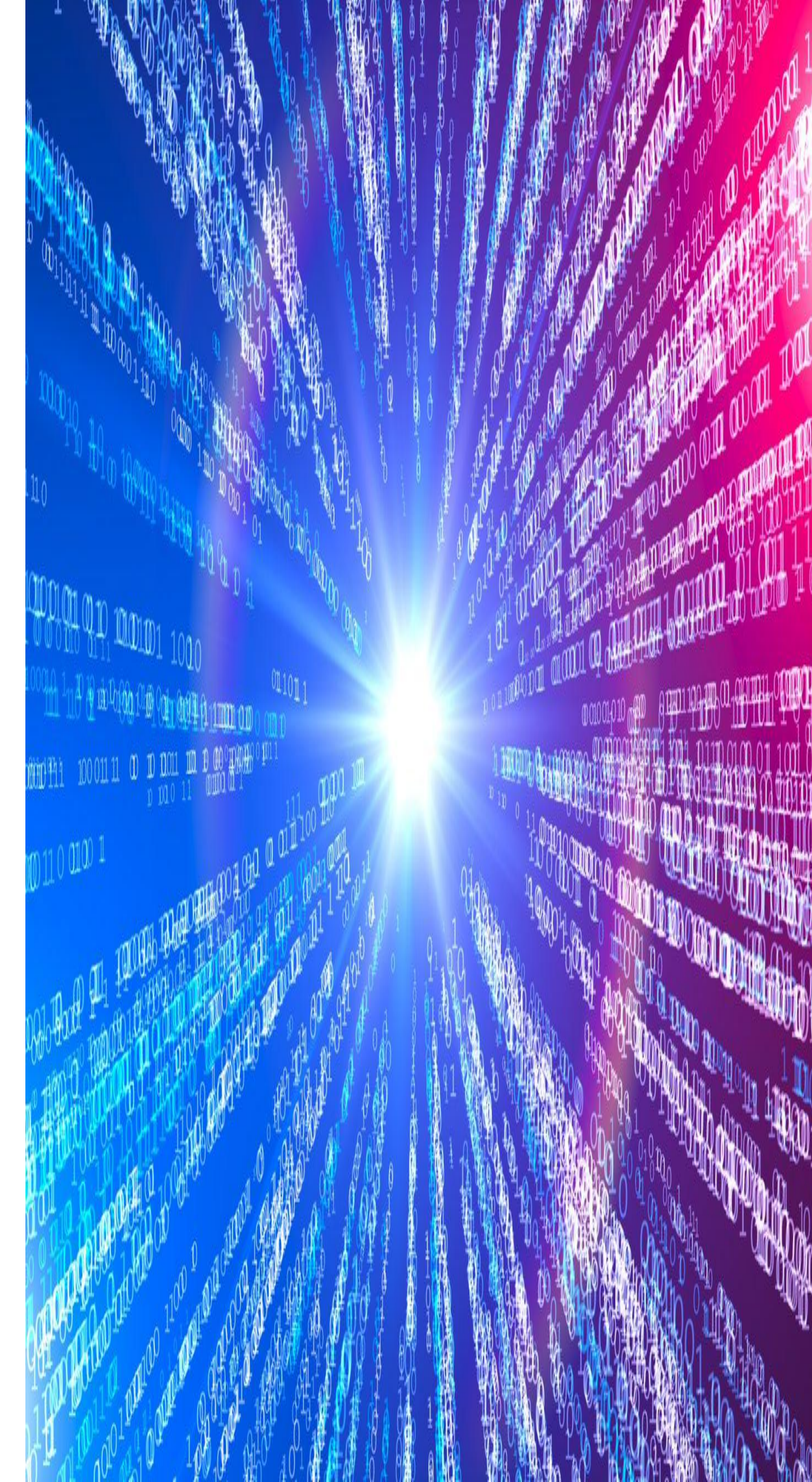
Surveys on Opinion and Stated Behaviour

In stated behaviour surveys, a reference questionnaire is built, based on a list of selected topics and a representative sample of population is interviewed.



Socio-economic data for road safety analysis

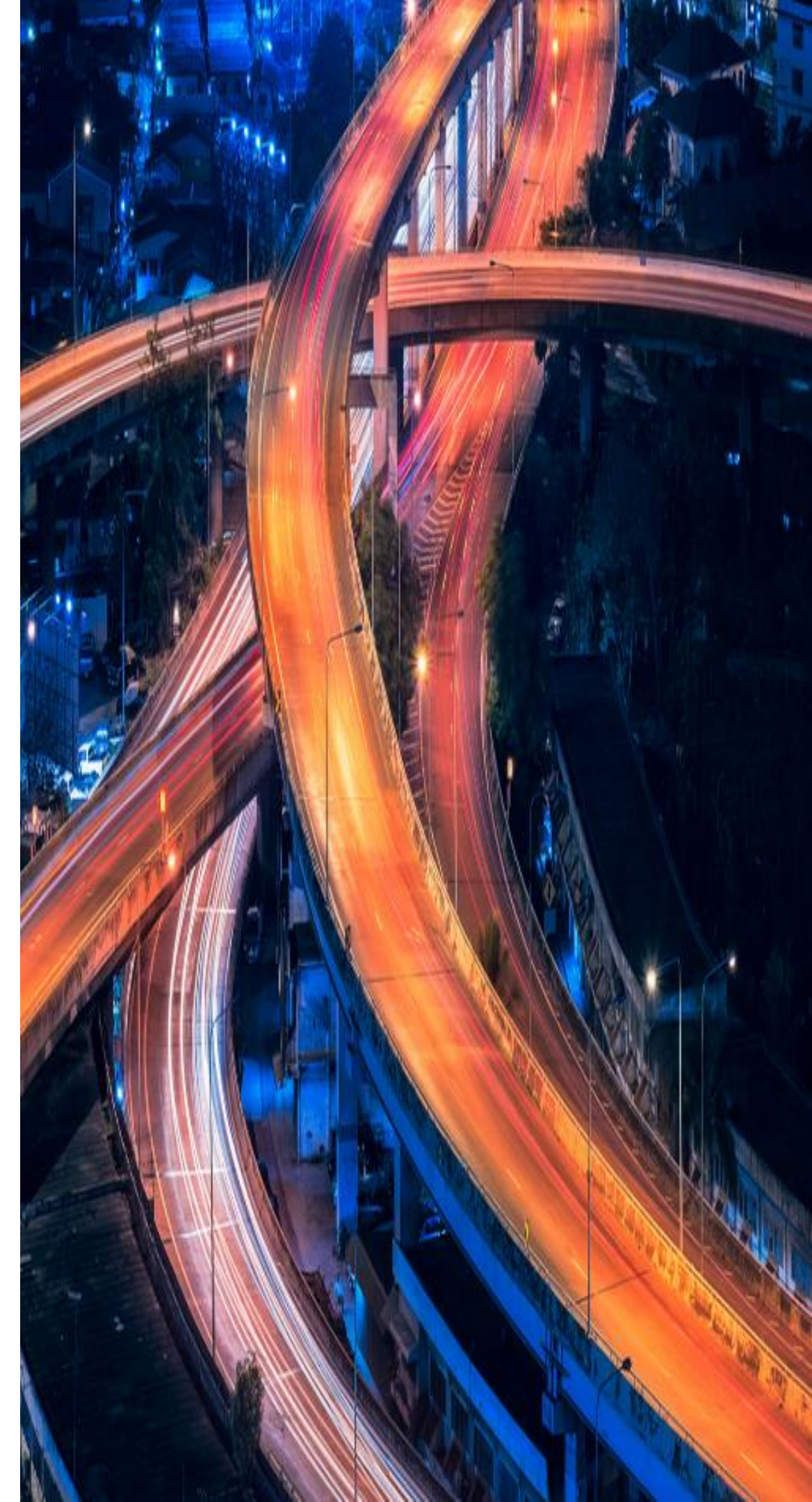
- **Population & demographics** (e.g., total population, population density, urban population)
- **Health indicators** (e.g., hospital beds and trauma centre availability, healthcare expenditure per capita)
- **Economic indicators** (e.g., GDP, income, etc.)
- **Road safety rules and regulations** (e.g., speed and BAC limits, etc.)
- **Enforcement and institutional framework** (e.g., number of breath tests, speed controls, etc.)



Road safety data analyses

Macro- Meso- & Micro-scopic analyses

- **Macroscopic analysis** concerns the key road crash factors in order to support road safety policies and programmes and concern safety performance of the whole population, infrastructure and vehicles of a city, region, country, or worldwide.
- **Mesosopic analysis** is performed at network or road axis level, ranking road segments by safety performance and identifying hotspots, using crash rate analysis, and suggesting the necessary measures for crash reduction.
- **Microscopic analyses** is performed at specific locations using collision and condition diagrams, road safety audits, and video-based conflict analysis producing specific treatment recommendations for individual sites and/or specific crash types.
- The **higher the detail** of all the above data is (per type of road, user vehicle, per region/country, evolution in time, etc.), the more critical and hidden road safety properties are revealed and the higher the usefulness of the data is for the identification of the appropriate solutions.



Macro-scopic analysis (Country/Region level)

Purpose: assess overall road safety performance and guide national/regional strategy

Key activities:

- Monitoring trends in road fatalities and serious injuries over time
- Benchmarking national performance against comparable countries
- Identifying high-risk road user groups, vehicle types, and crash types
- Evaluating effectiveness of implemented road safety programmes

Methods:

- Fatality and injury rate analysis (per billion VKT, per capita, per vehicle)
- Safety Performance Indicators: seat belt use, speeding, drink-driving, etc.
- Statistical modelling: time-series, GLM, forecasting, etc.

Outcome: a prioritized list of network sections needing attention



Meso-scopic analysis (Network/Axis -Level)

Purpose: identify safety problems and priorities across an entire road network

Key activities:

- Network screening : ranking road segments by safety performance
- Identification of high-risk corridors and areas
- Benchmarking road segments against expected performance

Methods:

- Crash rate analysis (crashes per VKT by road type)
- Potential for Safety Improvement: compare actual vs. expected
- Empirical Bayes estimation : accounts for regression to the mean
- Star rating systems (e.g. network wide assessment, iRAP)

Outcome: a prioritized list of network sections needing attention



Microscopic Analysis (Site-Level)

Purpose: diagnose safety problems at specific locations (high risk sites)

Key activities:

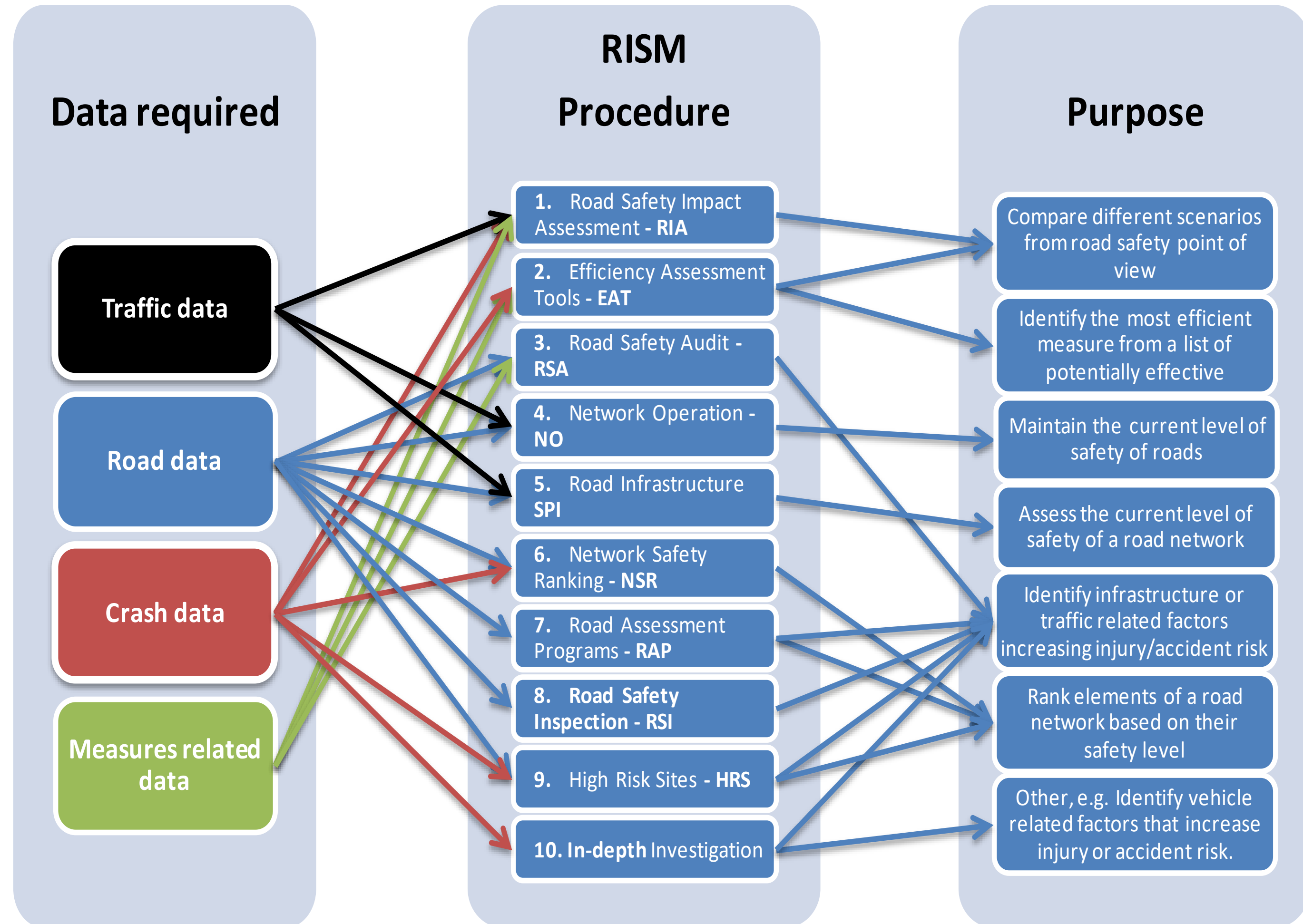
- Detailed crash pattern analysis at individual sites
- Road safety inspection / audit of the physical environment
- Identification of contributing factors at the site
- Selection and design of appropriate countermeasures

Methods:

- Collision diagrams : visualize crash patterns at intersections
- Condition diagrams : document road features and hazards
- Road safety audits : systematic review by independent experts
- Video-based conflict analysis : identify near-misses

Outcome: specific treatment recommendations for individual sites

Road Infrastructure Safety Management



Key road safety data analyses

- Country/Regions **comparisons**
- **Highlight** high-risk sites, **hierarchize** needs and plan necessary improvements
- **Before and after** studies to determine the impact of specific actions/measures
- Syntheses of **crash causes**
- Specific studies on project **feasibility** (alternative choices, etc.), **design** (e.g. geometric characteristics, signs, lighting, etc.) and **operation** (e.g. increased enforcement, parking ban) in order to improve road safety.
- Performing Road **expert's reports** on a particular crash.



Country/Regions comparisons

- Total number of fatalities allows for **initial comparisons** between countries
- Road safety performance may **differ** considerably with exposure or per crash type
- **Disaggregate data** can reveal hidden problems or patterns
- Authorities can resolve them with more focused interventions

Fatalities per million population: All EU countries

Fatalities per million population, 2023

Inside built-up area

Outside built-up area

Motorways

Single Vehicle Crash

Multi Vehicle Crash

Passenger Cars

Passenger Car - Inside built-up

Passenger Car - Outside built-up

Passenger Car - Single Vehicle Crashes

PTWs

PTWs - Inside built-up

PTWs - Outside built-up

PTWs - Single Vehicle Crashes

Pedestrians

Bicycles

Young people

Elderly people

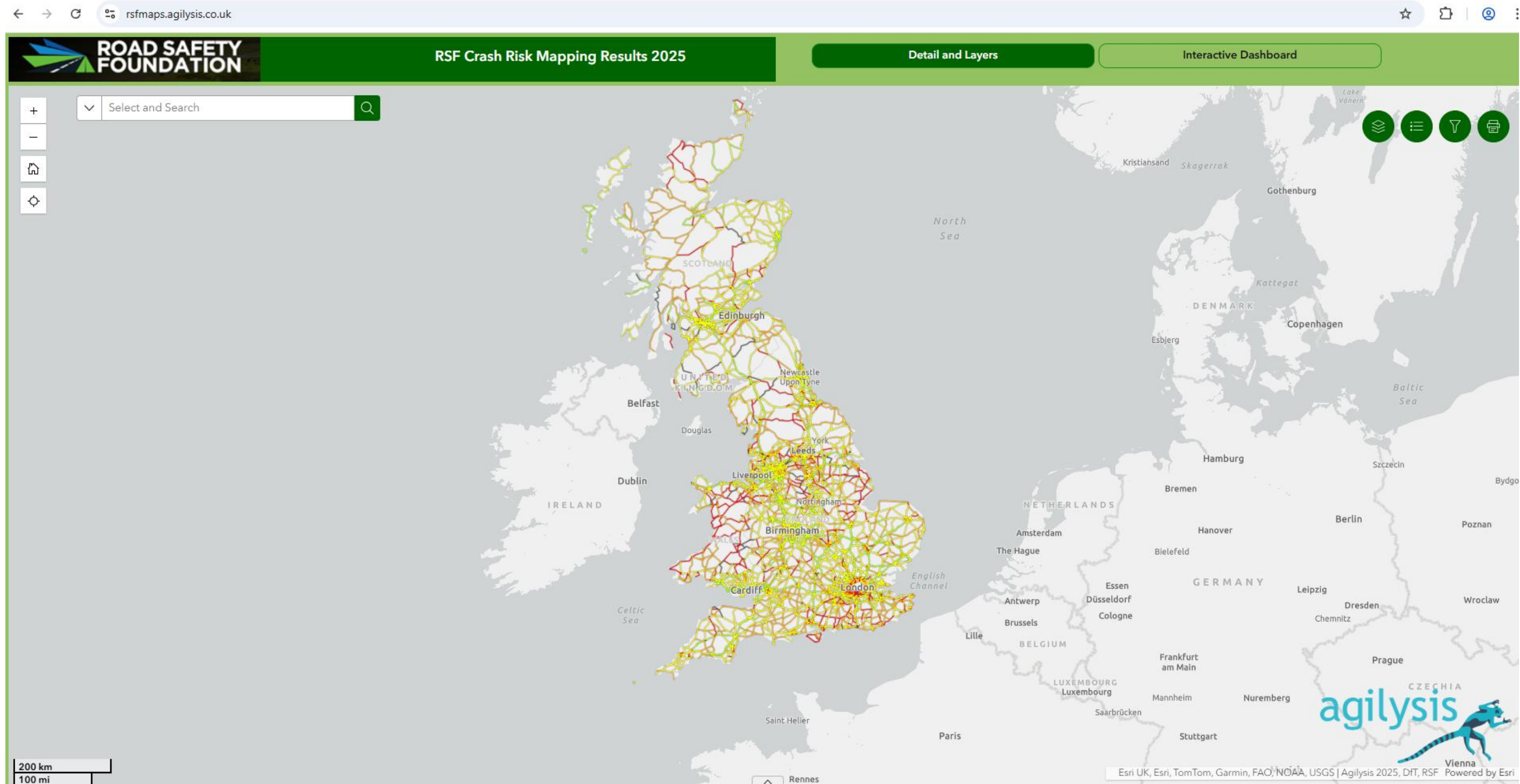


Date: November 2025, Sources: CARE, Processing: NTUA

2023 data for all EU countries except for Cyprus and Sweden (2022)

<https://www.nrso.ntua.gr/nrso-ec2/>

Crash Risk Mapping



Before and after – 30km/h speed limit

City-wide 30km/h speed limits led to **average reduction** in:

(meta-analyses of 70 studies from 17 cities)

- Fatalities by 37%
- Serious injuries by 38%
- Road crashes by 23%
- Emissions by 18%
- Noise by 2.5 db
- Fuel consumption by 7%
- Traffic congestion by 2%

The studies accounted also for all other changes which took place during the periods examined before and after.

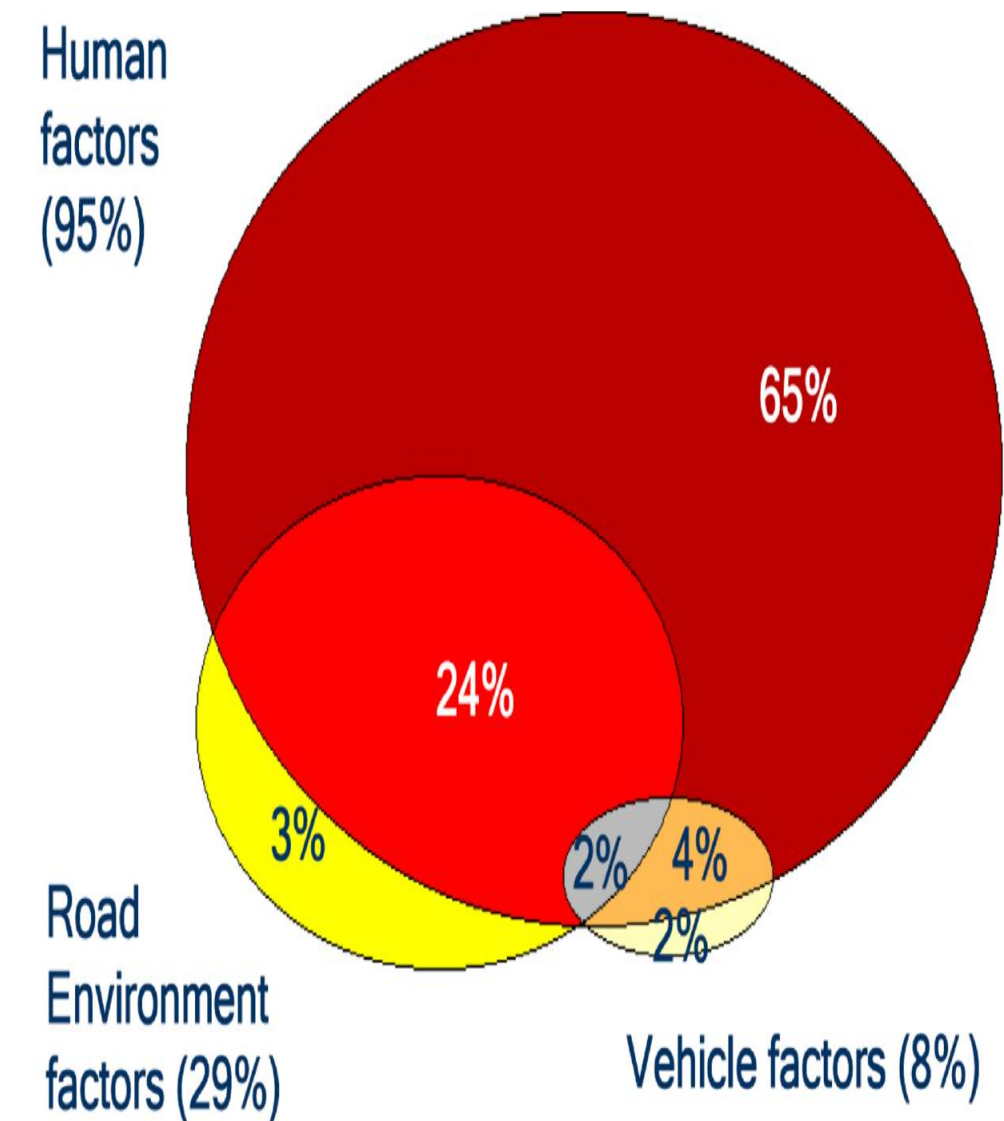
City	Safety			Emissions		Energy	Traffic
	Crashes	Fatalities	Injuries	CO ₂ , NO _x , PM	Noise	Fuel	Congestion
Bologna	-38%	-33%	-10%	-23%			-3%
Zurich	-16%	-25%	-20%		-1.7 dB		
Paris	-40%		-25%		-3 dB		
Münster			-72%	↓	↓	-12%	
Brussels	-10%	-55%	-37%		-2.5 dB	-10%	
Glasgow		-31%					
Helsinki	-9%		-42%				
Bilbao	-28%			-19%			-2%
Berlin	-10%			-29%	-3 dB		
London	-46%	-25%	-25%	-10%			
Grenoble	↓	↓	-50%				-9%
Edinburgh	-38%	-23%	-33%	-8%			-2.4%
Bristol		-63%					
Brighton			-45%				
Hove			-45%				
Warrington			-43%				
Graz	-12%		-20%	-25%	-2.5 dB		

Yannis, G., & Michalaraki, E. (2024). Review of City-wide 30 km/h Speed Limit Benefits in Europe Sustainability, 16(11), 4382

Syntheses of crash causes

- **Human factors** are the basic causes of road crash in 65-95% of road crashes (e.g., driver injudicious action, driver error or reaction, behaviour or inexperience, driver distraction or impairment, etc.).
- **Speeding** is a contributory factor in ~30% of fatal crashes, and a reduction of 10 km/h of the initial speed may result in ~50% reduction in fatal crashes.
- **Alcohol** is involved in ~25% of fatal crashes in Europe. The fatal crash risk of driving under the influence of drugs ranges between 1.3 and >5 times higher than that of a sober driver

European Commission (2024). Road safety thematic report – Main factors causing fatal crashes. European Road Safety Observatory. Brussels, European Commission, Directorate General for Transport.



Specific Studies - Pedestrian behaviour by computer vision

- **Detection & tracking**

- Object detection and classification (pedestrians, cyclists, vehicles)
- Consistent multi-frame tracking through occlusions
- Matching of detected and tracked objects across frames

- **Behavioural indicators**

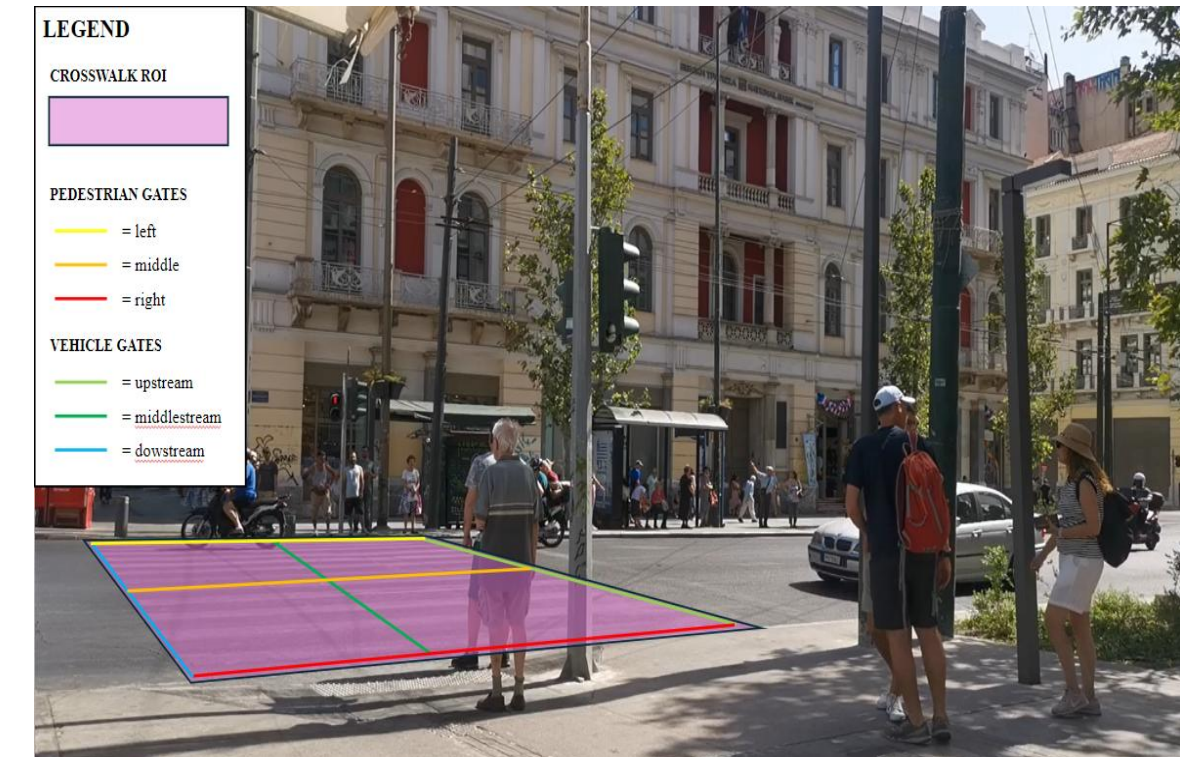
- Crossing location and trajectory
- Waiting time and gap acceptance behaviour
- Walking speed and direction changes

- **Compliance & conflict analysis**

- Traffic light status detection
- Identification of illegal/non-compliant crossings
- Time-to-Collision (TTC) with oncoming vehicles
- Near-miss and conflict event detection

- **Extracted KPIs**

- Pedestrian flow and volume counts
- Violation rates by time of day and location
- Conflict frequency and severity index
- Speed of pedestrians and interacting vehicles



New Road Safety Data

New Road Safety Data (1/2)

- **Mobile Data**
 - Smartphone sensor based data
 - Cellular network data
- **Vehicle On-Board Diagnostics Data**
 - vehicle data
 - driver data
- **Data from Cameras**
 - on-vehicle: looking inside and outside
 - on the road (traffic management)
- **Data from Vehicle Sharing Services**
 - cars
 - micromobility
- **Social Media Data**
 - available data
 - crowdsourcing



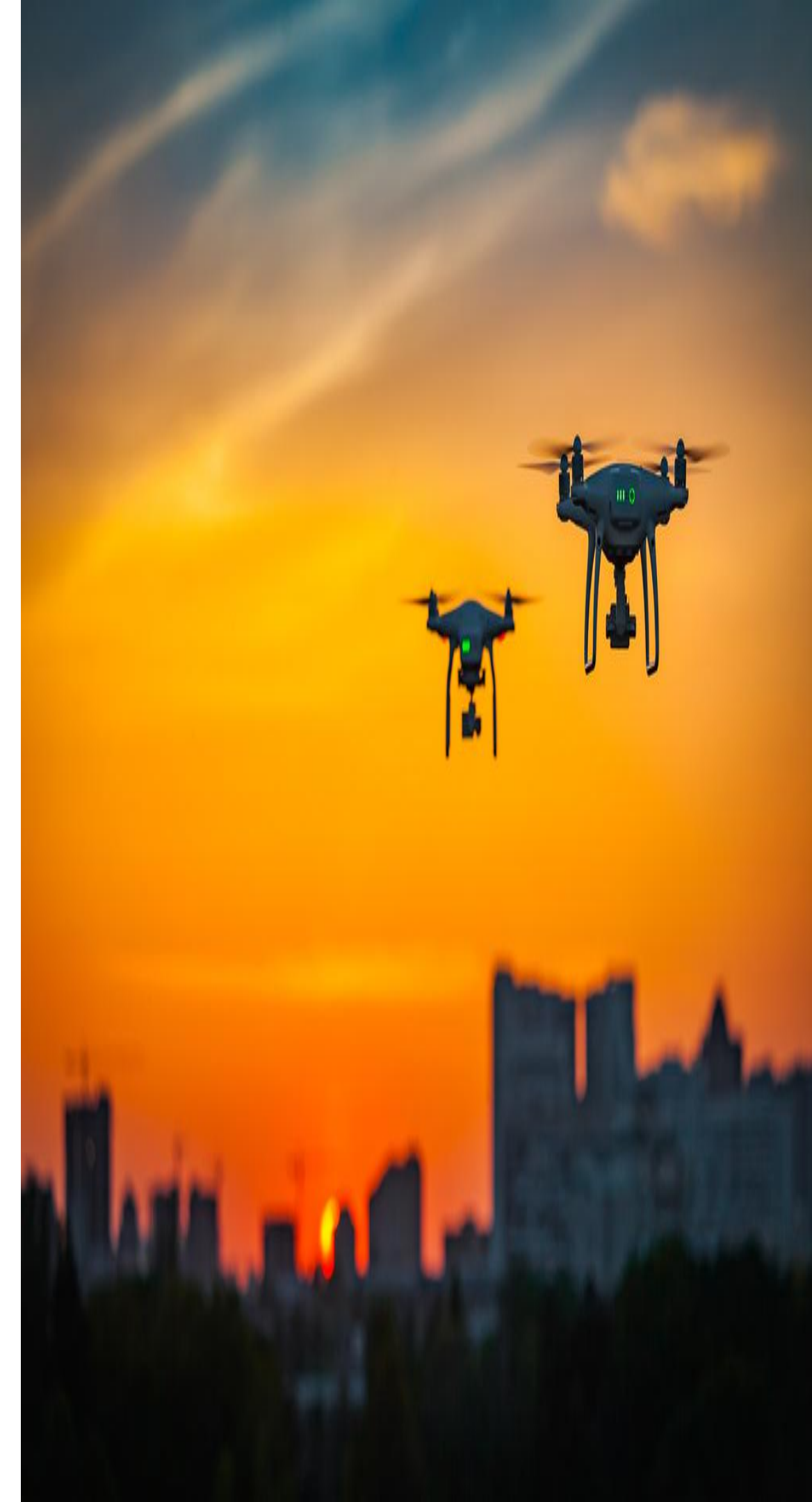
New Road Safety Data (2/2)

- Telematics
- Public Authorities sensor or traffic measurement data
- Private agencies sensor data
- Weather data
- Census data
- Digital map data
- Shared mobility data
- Research oriented data



Infrastructure Data

- **Automatic data collection** along the road network through:
 - instrumented floating vehicles
 - smartphones reporting information (hard braking, poor road surfaces, speed).
- **Active safety systems** can also be considered
 - ABS for anti-lock braking,
 - ESP for electronic stability control and
 - AEB for autonomous emergency braking.
- **Street imagery** can support the assessment of road safety performance (star-rating for roads).
- **Drones and satellites** could complement the range of data.
- **Cooperative ITS (C-ITS)** technology could enable vehicles not only to broadcast their position, but also to report on the system performance in real time.



Telematics

- A range of **telematics solutions** already exist for:
 - fleet management,
 - usage-based insurance,
 - eco-driving and
 - safe driving coaching.
- Provide measurable **Safety Performance Indicators** such as speeding, harsh braking, distraction, headway, and fatigue etc.
- **Smartphones** are becoming increasingly popular in those applications.
- **Limiting barriers** existed so far have been eliminated:
 - Mobile phone technology
 - High cost of:
 - In-vehicle data recording systems (e.g. OBD)
 - Data plans
 - Cloud computing
 - Low penetration rate of smartphones and social networks
- Current **technological advances** make it substantially easier for experts to collect and exploit data easier and more accurately through mobile phones.



VRU Data Crowdsourcing

- **Cyclists and Pedestrians** report:
 - safety problems (roads, behavior)
 - exposure (routes, traffic, etc.)
 - crash data (with injuries, material damage only)
 - star rating
- Not uniform nor systematic reporting practices though
- Feedback on **network safety performance**
 - useful for the cyclists
 - useful for the decision makers (all levels)
 - useful for business



Critical / Open Issues (1/2)

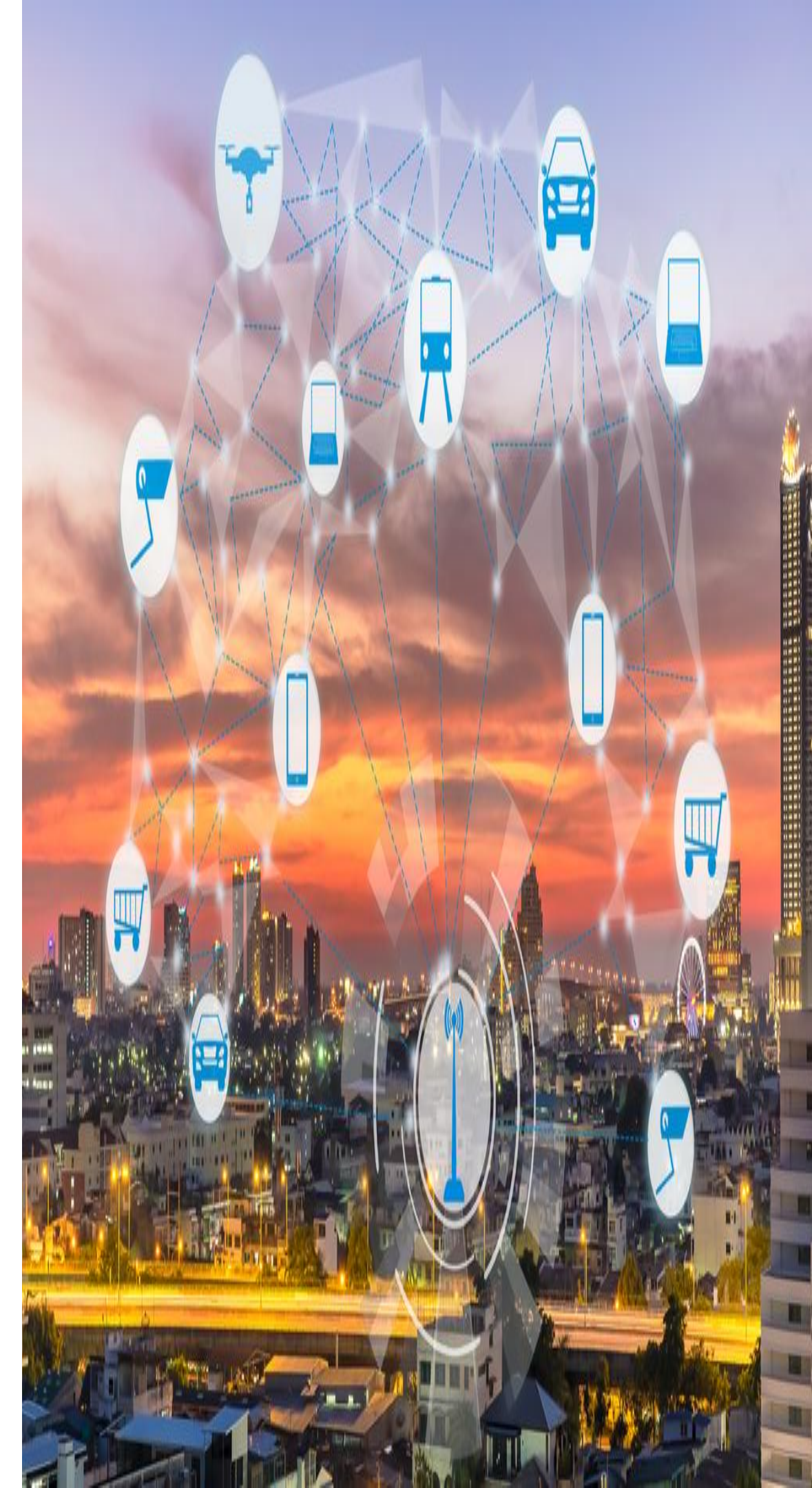
- **Punishment Vs Positive** Feedback (Incentives)
- **Regulatory** and **Voluntary** Data
- Secure **anonymisation** might increase penetration (e.g. blockchain)
- **Ownership** of data
- **Exploitation** of data (charging schemes)
- **Sharing** of safety data (EU legislation)



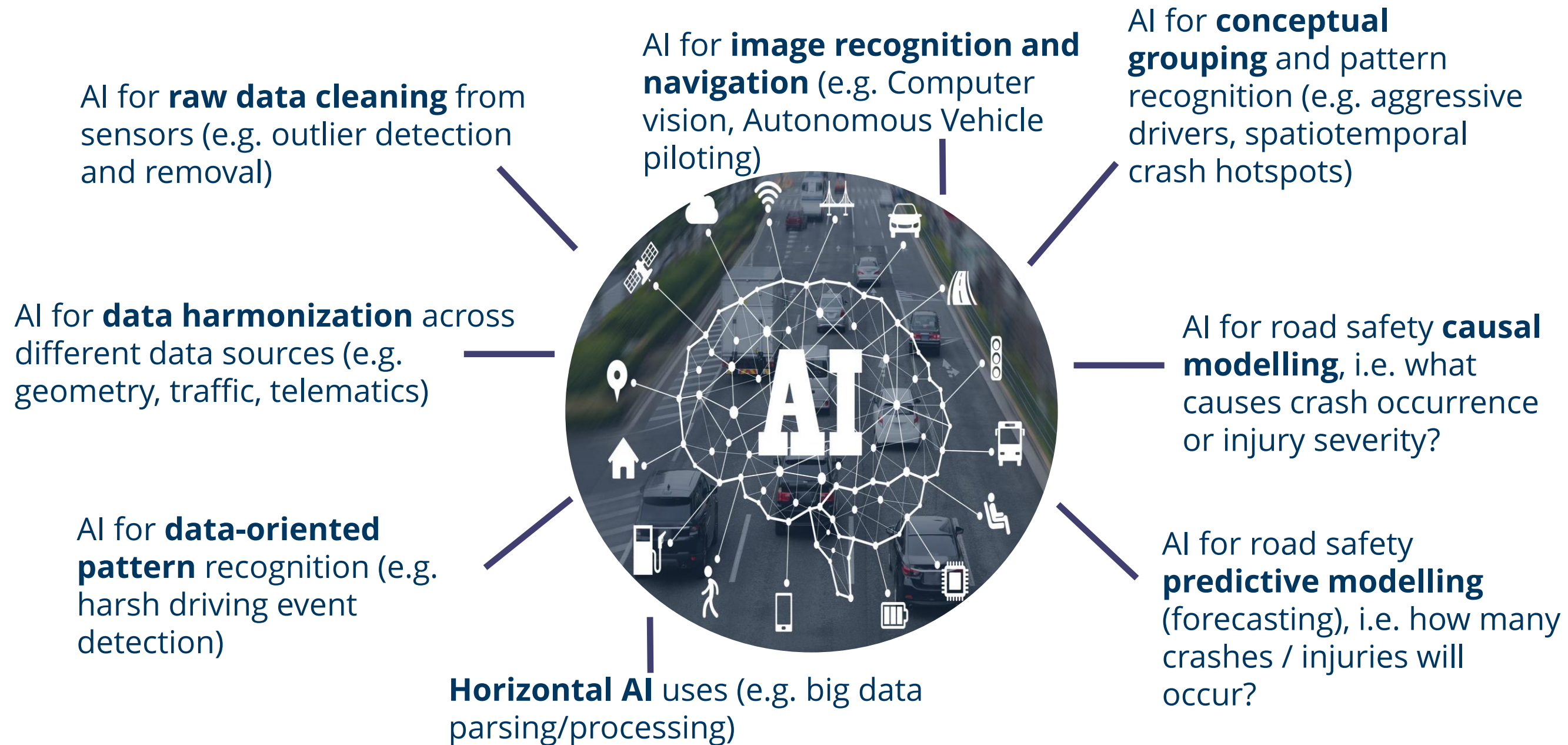
Critical / Open Issues (2/2)

- **Harmonisation and compatibility** of:
 - data
 - metrics
 - data collection methodologies
 - data processing methodologies
- Define proper and properly the **KPIs**
- **Clean** properly the data
- **Linking** KPIs with respective interventions
- Define **safety policy focus** (behavior, VRUs, infrastructure, traffic)
- Control **in-vehicle distraction** devices

Big data might lead to big issues without proper expertise!



Artificial Intelligence for Road Safety



Road Safety Impact Assessment

The Need for Efficiency Assessment

- Need to make sure that the **limited funds available are used effectively.**
- A synthesis of diverse evaluation results allows for more **universal understanding** and application of safety effectiveness measures.
- The **narrower the efficiency assessment results distribution**, the larger is the probability that policy decisions are correct.
- Efficiency assessment allows more **rapid adoption and dissemination** of new safety measures.
- Efficiency assessments are the **basis for evidence-based safety policies.**



Efficiency Assessment Tools

- **Tools:** [European Commission SafetyCube DSS](#), [iRAP software \(ViDA\)](#), [FHWA's Interactive Highway Safety Design Module \(IHSDM\)](#)
- **Handbooks:** [Highway Safety Manual](#), [R. Elvik Handbook of Safety Measures](#), [PIARC Road Safety Manual](#), [SUPREME Handbook](#), etc.
- **Challenges for transferability:**
 - Lack of a uniform understanding of the value, importance and usage of CMFs in road safety decision making.
 - Need to assess the particularities of setting, context, and implementation features of a specific measure.



Methods for Prioritizing Measures (1/3)

Cost-Effectiveness Analysis (CEA)

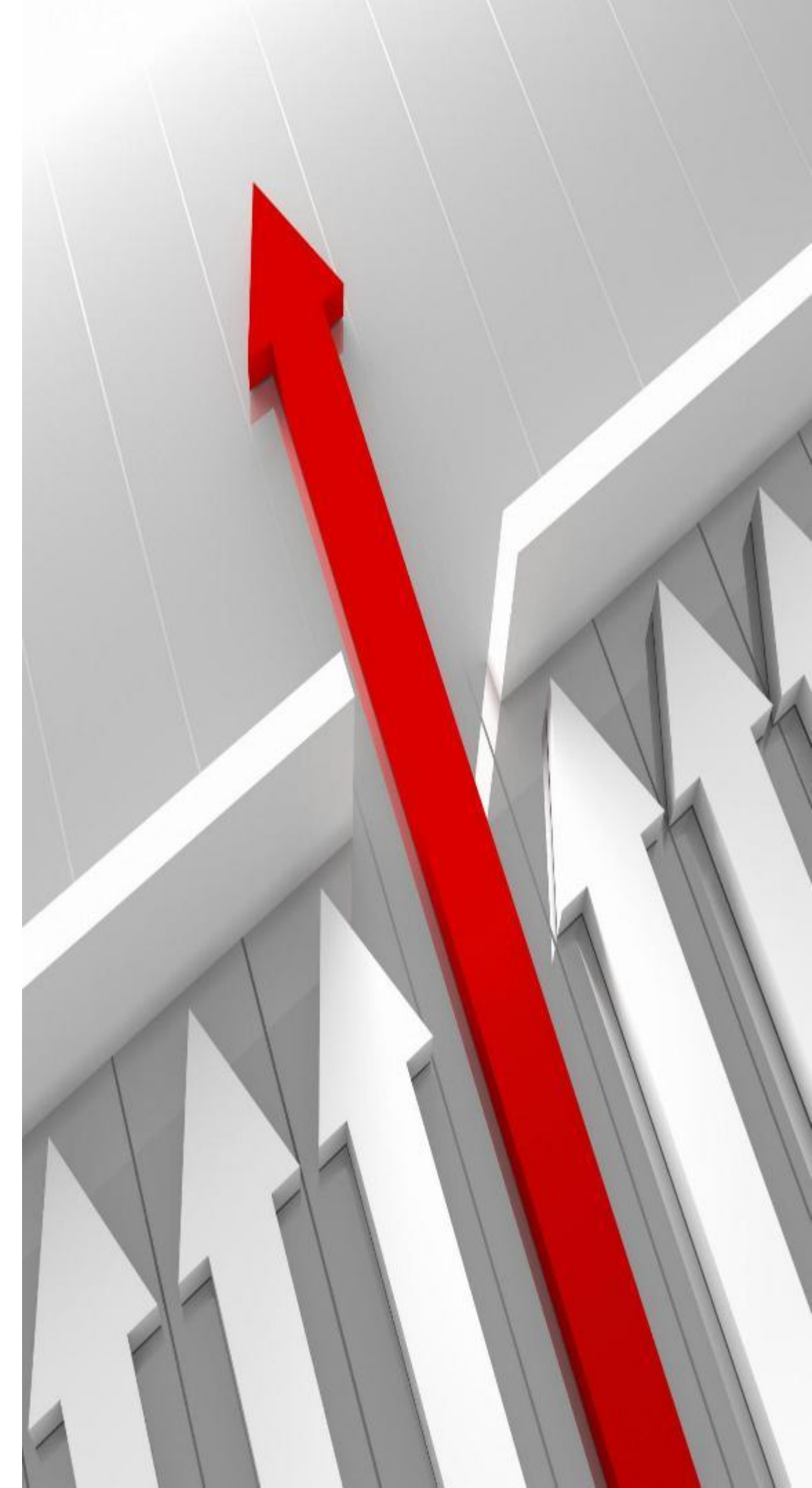
Number of crashes prevented by the measure/
unit cost of implementing the measure

Benefits

- less information is necessary
- not necessary to have an estimation of the monetary value of a crash

Limitations

- economic evaluation regarding only one outcome of the measure
- not possible to account for different crash severity levels or different policy fields (environment, mobility)



Methods for Prioritizing Measures (2/3)

Cost-Utility Analysis (CUA)

Measures impact expressed by:

Quality Adjusted Life Years (QALY)

Fatalities assessed by Years of Life Lost (YLL)

Injuries assessed by Years Lived with Disability (YLD)

CUA calculates the cost per QALY

Benefits

- possibility to account for different crash severity levels

Limitations

- not possible to account for different policy fields (environment, mobility)



Methods for Prioritizing Measures (3/3)

Cost-Benefit Analysis (CBA)

Monetary values are assigned to each type of benefit that results from the measure. Sum of benefits is then compared to the measure costs. Ranking based on:

1. Net Present Value (NPV) = Benefits – Costs
2. Benefit-Cost Ratio (BCR) = Benefits / Costs

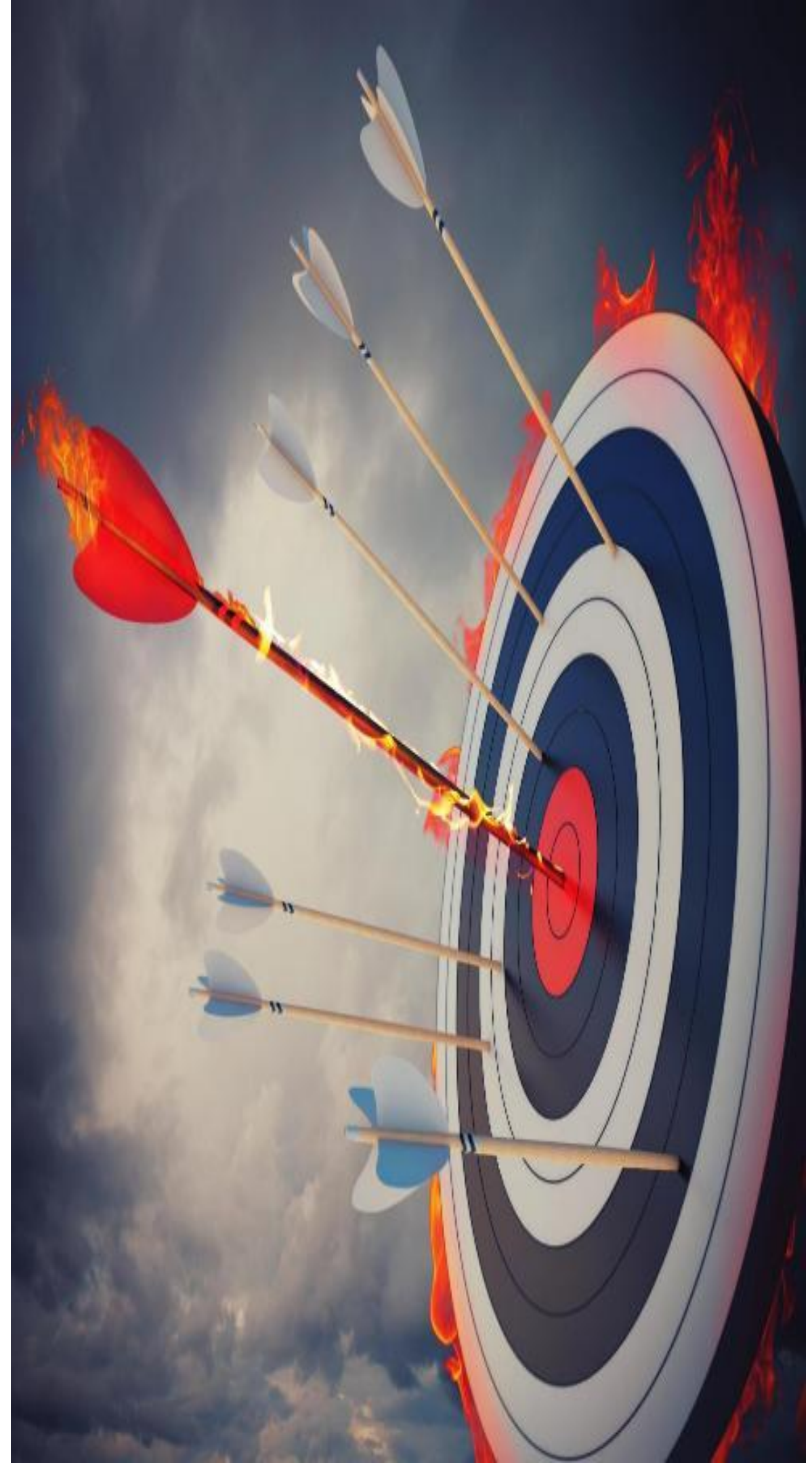
(If BCR > 1, measure is cost-effective)

Benefits

- possibility to account for different crash severity levels and different policy fields (environment, mobility)
- determines right balance between safety and other objectives

Limitations

- requires more input than CEA, CUA



Indicative CBA Results of Infrastructure Safety Measures

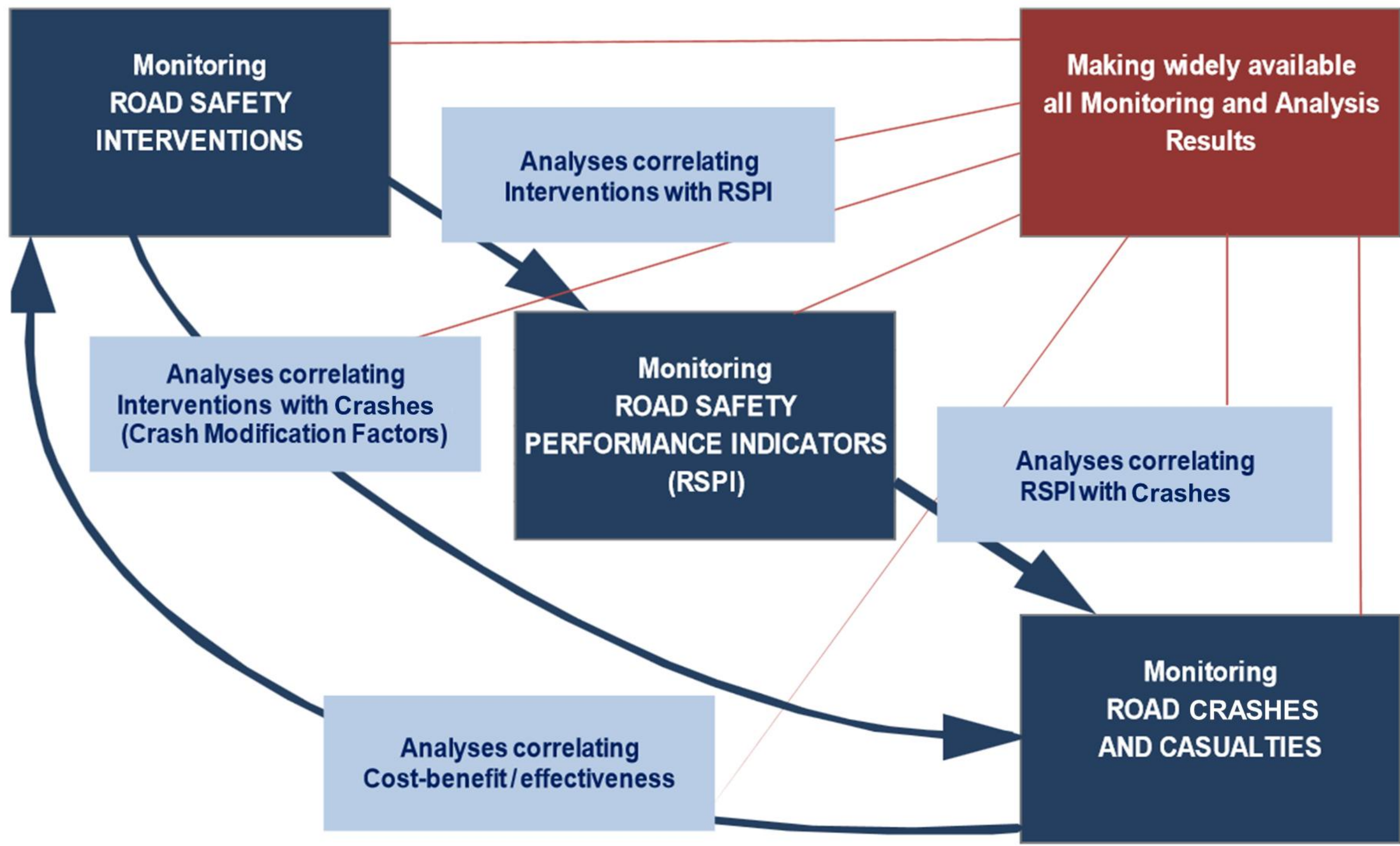
Measure	Unit of analysis	Benefit-to-cost ratio (best estimate)	Net Present Value (in EUR EU-2015 PPP)	Total costs per unit of analysis (in EUR EU-2015 PPP)	Break-even measure cost (in EUR EU-2015 PPP)
Road safety audits - Light measure addition	1 km	21.7	€ 1 641 482	€ 79 189	€ 1 720 671
Road safety audits - Heavy measure addition	1 km	2.9	€ 1 121 380	€ 599 291	€ 1 720 671
High risk sites treatment	1 location (intersection)	16.1	€ 869 803	€ 57 561	€ 927 363
Dynamic speed limits	1 km	1.1	€ 31 548	€ 490 192	€ 521 739
Section control	1 km	19.5	€ 2 834 895	€ 152 913	€ 2 987 808
Installation of speed humps	1 area	18.2	€ 3 234 711	€ 187 953	€ 3 422 665
Implementation of 30-zones	1 area	1.6	€ 66 038	€ 110 226	€ 176 265 ¹
Installation of lighting & Improvement of existing lighting	1 km	0.7	€ -24 888	€ 85962	€ 61073
Implementation of rumble strips at centreline	1 km	9.1	€ 7950	€ 987	€ 8938
Installation of chevron signs	1 location (curve)	2.7	€ 875	€ 504	€ 1379
Channelisation	1 location (intersection)	8.4	€ 1 452 858	€ 196 061	€ 1 648 919
Automatic barriers installation	1 location (level crossing)	0.05	-€ 197 399	€ 208 698	€ 11 299
Installation of traffic calming schemes	1 area	0.4	-€ 392 061	€ 612 633	€ 220 572
Installation of traffic calming schemes (b)	1 area	0.2	-€ 4 199 122	€ 5 389 225	€ 1 190 103
Road surface treatments	1 location (intersection)				€ 1 123 604
Winter maintenance	1 km	6.0	€ 2 609	€ 519	€ 3128
Safety barriers installation	1 km	19.5	€ 1 339 933	€ 72 314	€ 1 412 247
Convert junction to roundabout	1 location (intersection)	9.2	€ 3 749 171	€ 455 122	€ 4 204 293
Traffic signal installation	1 location (intersection)	1.1	€ 8 731	€ 98 285	€ 107 016
Traffic signal installation - highways	1 location (intersection)	3.7	€ 559 388	€ 206 874	€ 766 263

Indicative CBA Results of Road User Safety Measures

Measure	Unit of analysis	Total costs per unit of analysis (in EUR EU-2015 PPP)	BCR Best estimate	NPV (in EUR EU-2015 PPP)	Break-even measure cost
Law and enforcement – General police enforcement of speeding	One area of enforcement with a total length of 88 km.	€5,856,879	1.0	€122,489	€5,979,369
Law and enforcement – DUI checkpoints, selective and random breath testing	DUI testing for 100,000 drivers for a year	€3,284,143	7.3	€20,732,246	€24,007,389
Law and enforcement – seatbelt wearing	One country, increase of seatbelt enforcement by factor 2	€5,173,139	1.4	€2,030,188	€7,077,153
Fitness to drive assessment and rehabilitation – Alcohol interlock	Participation of a serious offender in an alcohol interlock programm	€3,068	10.9	€131,281,642	€32,130
Education – Hazard perception training	One harzad perception training	-	-	€120,155	€120,155
Law and enforcement – Red light cameras	One red light camera on an intersection, 253 implemented units	€109,400	3.7	€71,491,929	€388,358
Fitness to drive assessment and rehabilitation – Mandatory eyesight test	One visual mandatory eyesight test and treatment if necessary and possible	€47	0.5	-2,782,968	€24
Education and voluntary training – Child pedestrian training	One child pedestrian training	€574,689	2.6	€935,422	€1,510,111
Awareness raising and campaigns – Child restraint	One nationwide booster seat programme 4-8-years old	€463,980	4.6	€1,671,196	€2,135,176
Awareness raising and campaigns – Drink-driving	One drink-driving advertising campaign	€862,157	2.1	€932,113	€1,794,270

[European Commission SafetyCube Decision Support System](#)

From Data Monitoring and Analysis to Policy Support



SafetyCube DSS



European Road Safety Decision Support System

[Search](#)[Knowledge](#)[Calculator](#)[Methodology](#)[Support](#)

The SafetyCube DSS is the European Road Safety Decision Support System, which has been produced within the European research project SafetyCube, funded within the Horizons 2020 Programme of the European Commission, aiming to support evidence-based policy making. The SafetyCube Decision Support System provides detailed interactive information on a large list of road accident risk factors and related road safety countermeasures. The SafetyCube DSS fact-sheet is available for download [here](#). A Quick Guide on using the SafetyCube DSS, with instructions on how to browse the system, make a search and further refine the results, is available for download [here](#). A full webinar on the SafetyCube DSS is available [here](#).

Introductory Video: 




Introductory Video: 




Introductory Video: 



Introductory Video: 



Introductory Video: 



Introductory Video: 

SafetyCube (Safety CaUsation, Benefits and Efficiency) is a research project funded by the European Commission under the Horizons 2020, the EU Framework Programme for Research and Innovation, in the domain of Road Safety. The project started on May 1st, 2015 and will run for a period of three years.



Home > Calculator



Calculator

The calculator for Economic Efficiency Evaluation (E3) of road safety counter measures allows to combine information about the effectiveness of a measure (i.e. the percentage of crashes or casualties prevented) with the costs of this measure. The calculator also integrates updated information of crash-costs in the European countries, allowing to express all costs and benefits of a measure in monetary values and conducting cost benefit analysis. Select one of the SafetyCube cost benefit analyses examples, or perform a cost benefit analysis with your own input data. A Guide for using the SafetyCube DSS calculator is available for download [here](#).

All figures and estimates refer to euros for year 2015.

Input

MY MEASURE SELECT A SAFETYCUBE EXAMPLE

My Measure...

+ ADD SCENARIO REMOVE SCENARIO

Description Description... Country Select a Country

Measure

Horizon (period of analysis) Horizon (period of analysis)

Cost-Benefit Analysis

Costs (present values)

	Scenario 1
One-time investment costs	EUR
Recurrent costs	EUR
Total costs excluding side-effects	EUR
Side-effects	EUR
Total costs including side-effects	EUR

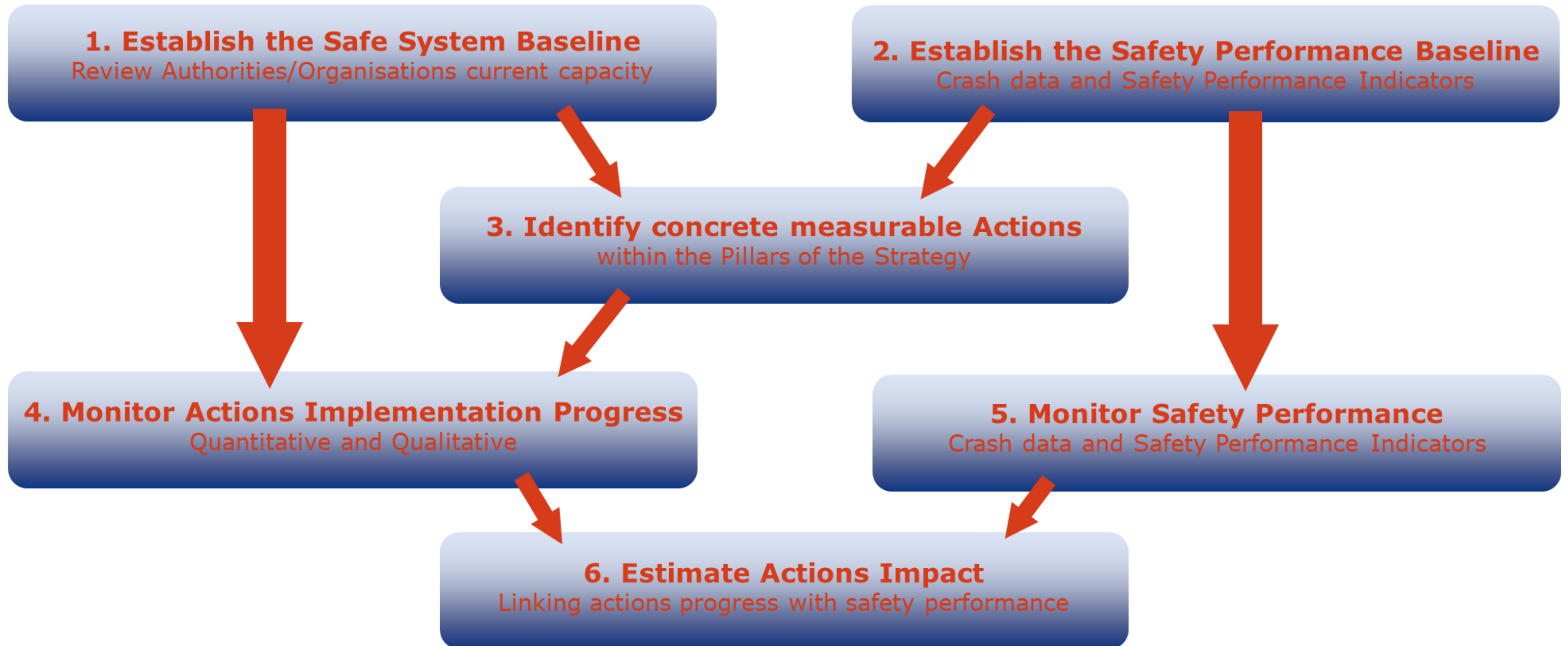
Benefits

Prevented Crashes / Casualties	EUR
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Socio-economic return excluding side-effects

Net present value	EUR
Benefit-Cost Ratio	

Monitoring Strategy Implementation Progress



Concluding Remarks

THANK YOU!

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