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V4SAFETY project

The use of data for prospective safety assessment

Event: Sister Projects Webinar #2
Location: Zoom
Date: 30/01/2024

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Vehicles and VRU Virtual eValuation of Road Safety
October 2022 – September 2025

Objective

Vehicles and VRU Virtual eValuation of Road Safety

Road fatalities in the EU over time

51,400 in 2001

22,800 in 2019

20,600 in 2022

11,400 target for 2030

18,800 in 2020

Source: CARE (EU database on road crashes) — Number of fatalities — EU 2030 target
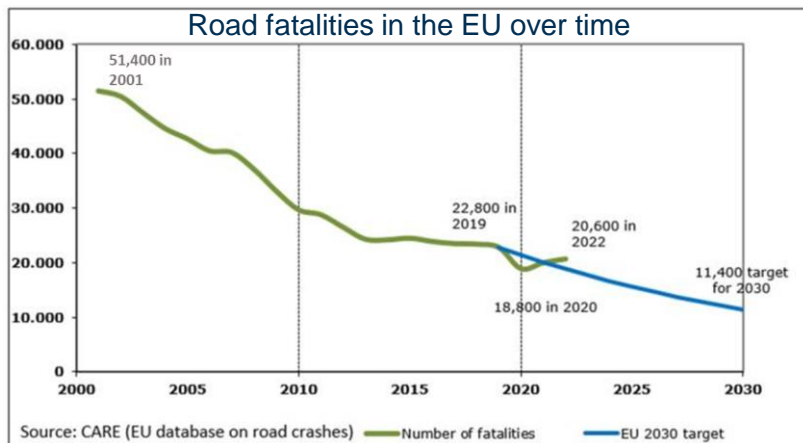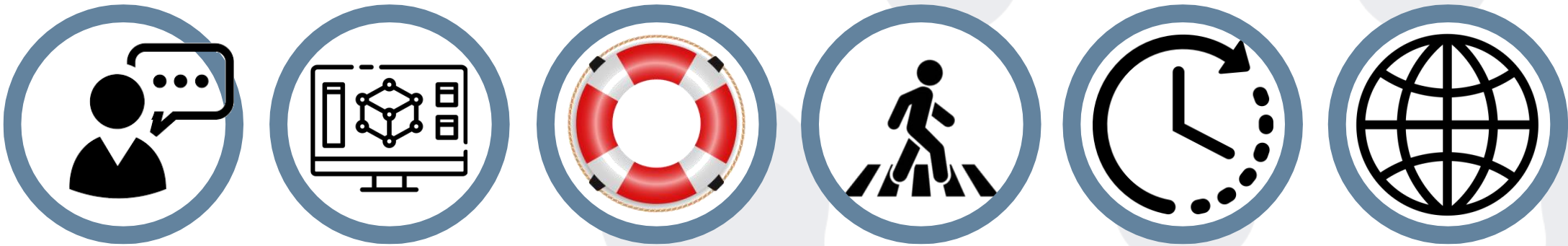
V4SAFETY takes a vehicle perspective

In-vehicle safety solutions, e.g.

- Autonomous Emergency Braking
- Automated Lane Keeping System
- Driver nudging HMI

Infrastructure solutions, e.g.

- Speed bumps
- Cycling lane indicating tarmac
- Road layout (separated cycling lanes)

Regulatory solutions, e.g.

- Speed limit regulation
- Regulation on helmet use
- Vehicle placement on the road

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Resulting DRAFT deliverables

131 pages DRAFT

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Prospective Safety Assessment Framework – Method

Deliverable D2.2 – WP2 – PU

This project has received funding from the European Union under grant agreement No. 101075068

84 pages DRAFT

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Data Sources for Baseline Generation - Overview, Grading, and Recommendations

Deliverable D4.1 – WP4 – PU

This project has received funding from the European Union under grant agreement No. 101075068

106 pages DRAFT

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Baseline Generation for Prospective Safety and Effectiveness Assessment

Deliverable D4.2 – WP4 – PU

This project has received funding from the European Union under grant agreement No. 101075068

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V4SAFETY Simulation Framework

V4SAFETY Framework			
Definitions	**Users & Stakeholders**	**Examples**	**Formulate Conclusion**

Prepare Assessment		**Execute Simulation**		**Analyse Assessment**	
Define Evaluation Scope	Select Baseline Approach	Configure Simulation	Manage Simulation	Evaluate Safety Performance	
Prepare Data	Select Models	Simulate Baseline	Simulate Treatment	Analyse Cost / Benefit	Project the Results

Conduct Validation & Verification
Document Assessment

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Data use

- Data for baseline generation

- Data for test scenario generation

- Data for model and system development and use (parameters)

- Data for projection and scaling simulation results, cost-benefit analyses

- Data for additional performance metrics evaluation
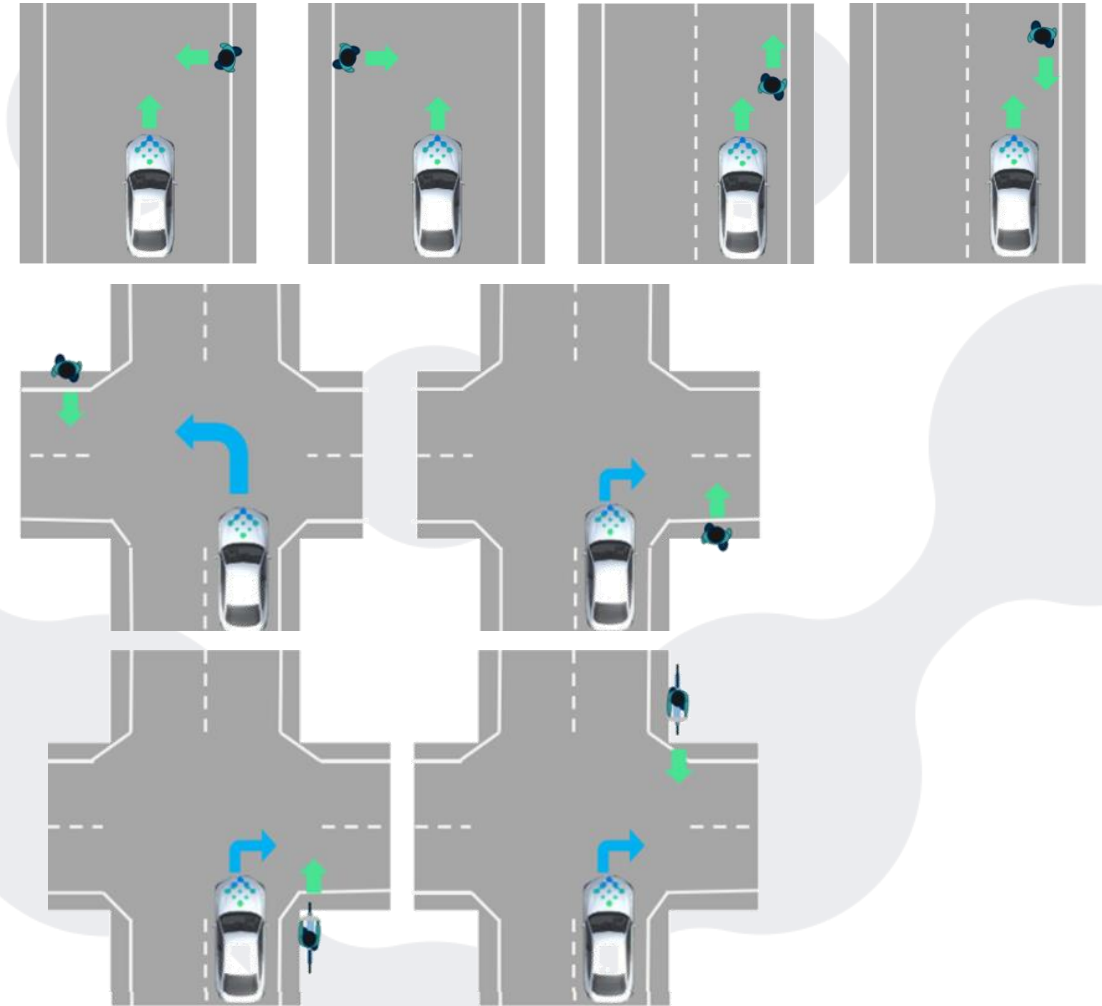
Setting up the baseline
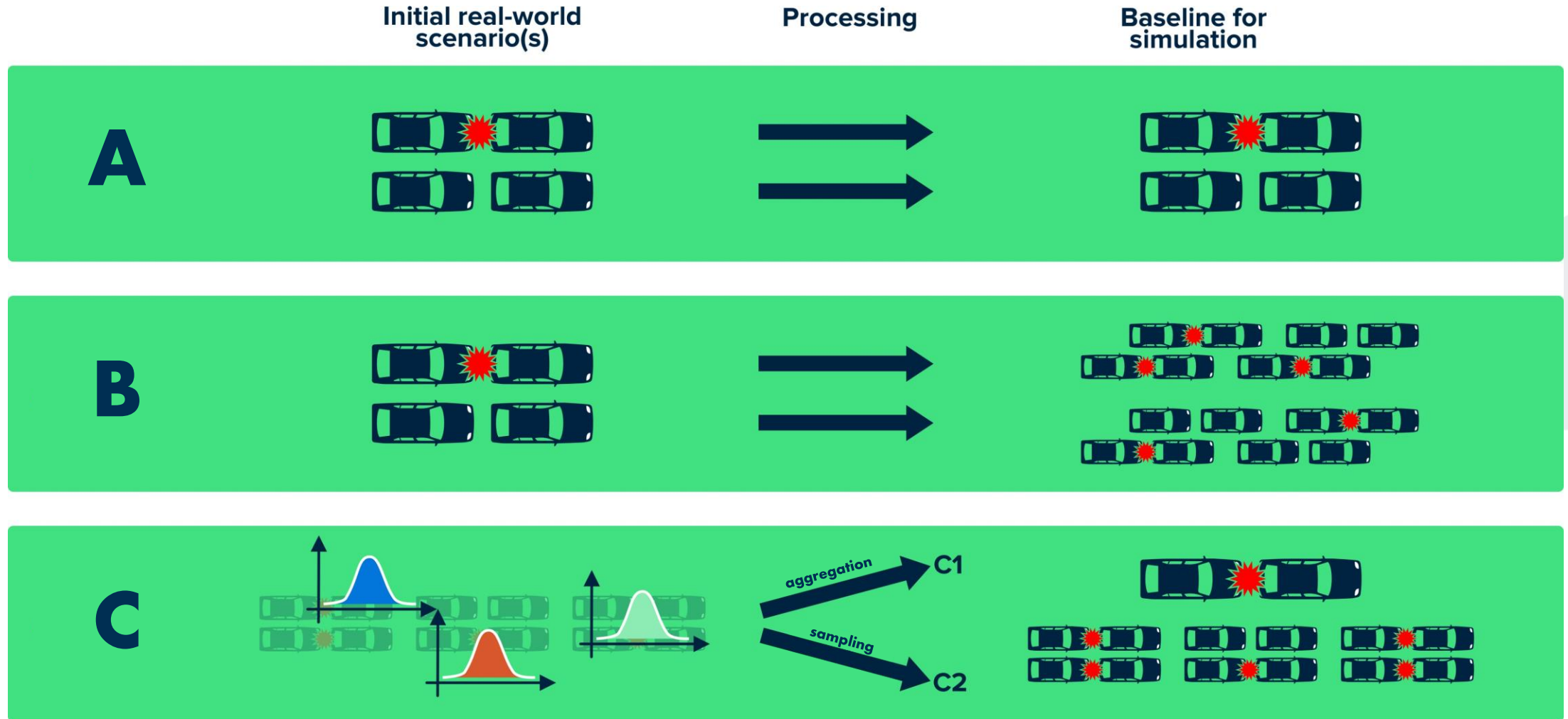
Baseline: a set of data without the technology under study, to be compared when performing prospective assessments of a technology's performance.

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Simulation structure
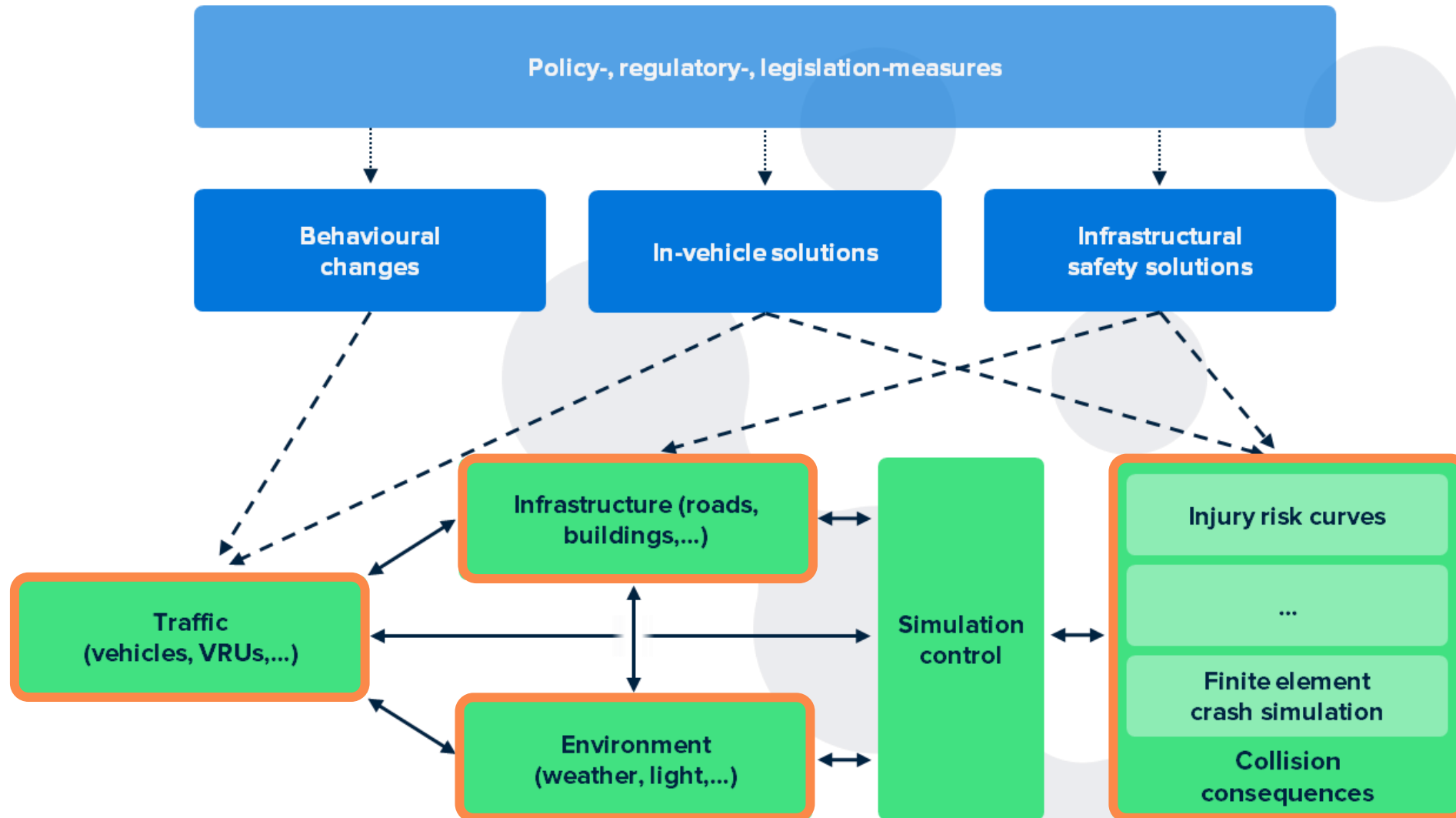
Simulation structure: aggregate of all components in a simulation including all blocks and models. Process steps outside the simulation (for example post processing) are not part of the simulation structure.

Cost-benefit analysis

Benefits — In-vehicle safety systems — Costs
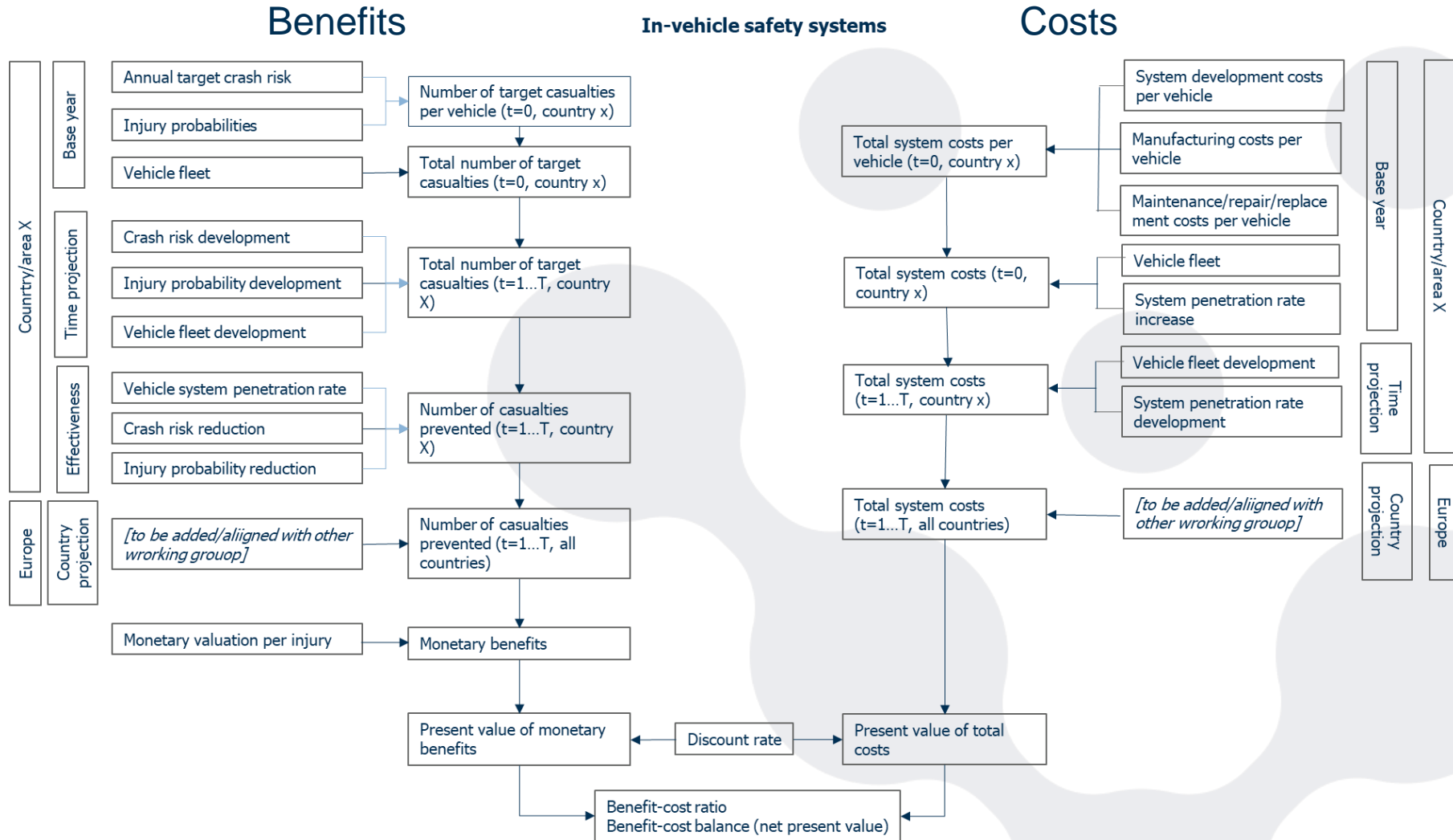
Cost-benefit analysis (CBA) is a method that considers the potential benefits and costs of the introduction of a safety solution to prioritize different options and evaluate a decision from the societal perspective. All costs and benefits are expressed in terms of money as much as possible. .

Data requirements

Primary data

- Reported crashes from the real world (German In-Depth Accident Study - GIDAS)
- Real-world driving data (NDS)
- Real-world experimental data (FOT)
- Exposure data (surveys/road observations: road user behaviour and attitude)
- Infrastructure data, incl. map data

Secondary data

- Scenario specific data (static & dynamic environment, conditions)
- Synthetic data – data modified by models
- Simulation supported data

Data requirements for different aspects in the V4SAFETY framework

|	V4SAFETY Framework												
	Define Evaluation Scope	Select Baseline Approach	Prepare Data	Select Models	Configure Simulation	Manage Simulation	Simulate Baseline	Simulate Treatment	Evaluate Safety Performance	Analyse Cost/ Benefit	Project the Results	Conduct V&V	Document Assesment
Data should allow the description of different road environments if relevant, e.g. urban, rural, motorway.	x	x	x	x									
Data should allow the description of conflicts between different types of traffic participants if relevant.	x	x	x	x									
Data should contain information about change of exposure (e.g. number of experienced conflicts per driven km) if relevant.	x	x	x						x	x	x		
Data should allow the utilization for concept evaluation or product validation and verification depending on assessment purpose.	x	x	x	x					x	x	x	x	
Data should allow the projection of results both spatial and temporal if relevant. Align with T6.2 & T6.3											x		
Data should allow the development, validation, and application of a suitable road user models if relevant.				x	x							x	
Requirements set on the data should be explained and input data should be explained.				x									x
General information about the data source and their application should be given in an understandable way to support correct usage.													x
Limitations of data and derived assumptions should be clearly documented as well as their impact on the generalizibility and applicability of the study.	x		x									x	x
General information should be given about the documentation of utilized data sources and types.													x
Data sources for model development and baseline generation should be documented.				x									x
Data should allow to model diversity of road user types if relevant, and should consider any bias of the data --> document it and describe consquences.				x									x
Data should support the formulated KPIs, e.g., if they are not derived directly form the simulation output.										x			
From the (existing/available) data sources the relevant ones should be identified to allow to model types of safety solutions.			x	x									
Data should allow the modelling of V2X technologies if relevant (HEADSTART project as reference).			x	x									
Appropriate data should be utilized for the assessment of higher levels of automated driving (beyond 'collision events').													
Maybe not a direct requirement, however, data source relevant terminology should be defined and explained.													x
Data should allow validation and verification on those levels relevant. Hoewever, there is a link to T2.4, where these aspects might be covered.												x	
Data selection should contain the required variability to enable a sensitivity analysis on relevant parameters/characteristics.												x	

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Data quality & quantity

Quality

- Accuracy
- Consistency
- Completeness
- Continuity
- Timeliness

Quantity

- Volume
- Detailedness

Real-world scenarios

Known scenarios

ODD
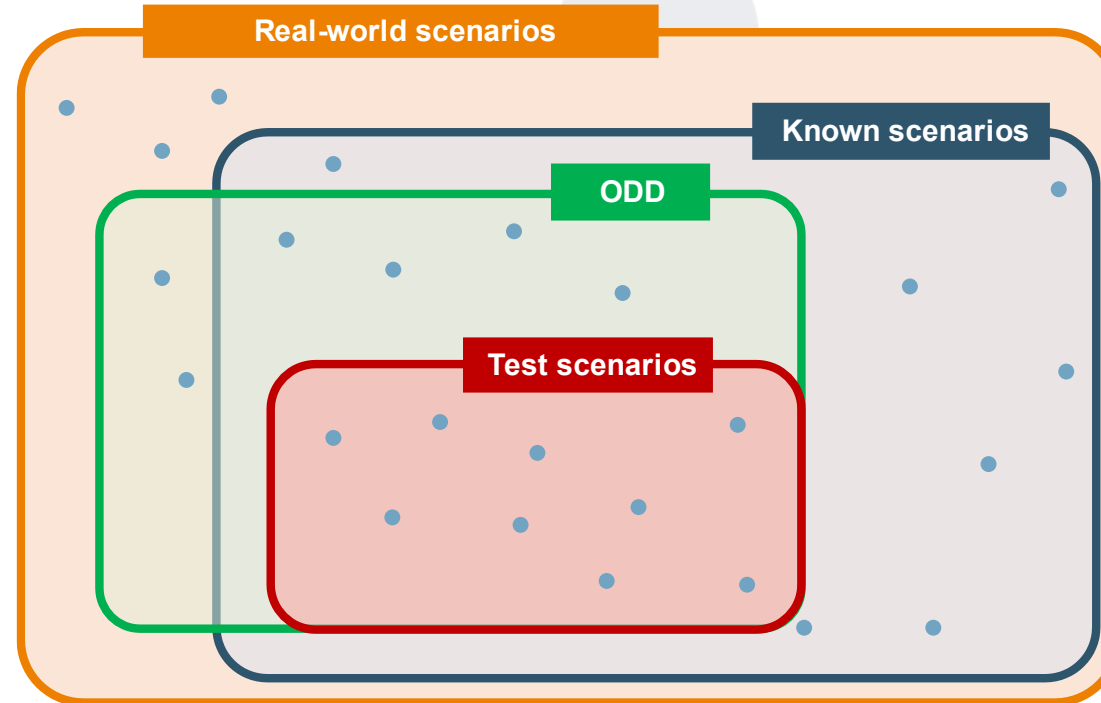
Test scenarios

- Concrete scenario
- Set of all possible scenarios
- Set of identified/known/recorded scenarios
- Set of scenarios within the ODD
- Set of test scenarios

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Data sets considered

Origin:	Description:	Access:
GIDAS — GERMAN IN-DEPTH ACCIDENT STUDY	In-depth accident data from on-site collection Sampling and weighing to meet federal statistics	License required, limited access
TASC	Traffic Accident and Scenario Community Large coverage by interpretation of police records	V4SAFETY partners in TASC
CARE	Community database on road accidents Annual data on road accidents for Member States	Limited access (national authorities)
LAB	Accident data for France	Limited access
inD	Drone collected dataset for four intersections in Germany – intersection scenarios	Free for non-commercial use (via LevelXData)
V4SAFETY partner in-house datasets	Proprietary data of V4SAFETY partners, e.g. TNO StreetWise scenario database	Limited access

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Discussion

- Eight use cases identified to demonstrate the developed prospective safety assessment framework.

- Current discussions focus on data availability and data requirements.

- The V4SAFETY partners do not foresee the generation of a new dataset; data usage will be documented and published.

- Recommendations on data for road safety improvement.

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