SAFETY PERFORMANCE EVALUATION

How do we develop the best methods for predicting and assessing real-world vehicle and traffic safety? In this research area we focus on the development of innovative methods to manage and analyse field data and assessment procedures for safety performance using data from both real and virtual environments.

This research area includes e.g.:

- Accident data analysis
- Naturalistic driving studies
- Field operational tests
- Method development
- Standardisation for data recording,
  data sharing and other general aspects of data analysis

SAFETY PERFORMANCE EVALUATION

Key highlights Stage 4

- SAFER partners have **fully embraced the data-driven scenario-based validation and analysis methodology** for active safety technologies and automated driving functions as well as for analytical prediction of future residual crashes, including pre-crash scenarios, which prepares for the opportunity to provide science-based input to the regulatory development.

- SAFER partners have **further refined a world class competence regarding management and analysis of FOT and NDS data**. SAFER's large database with NDS and FOT data is used for research and development of driver behaviour models used in simulation studies. Related to database management, a GRPR adaptation, data secured for future projects and new business models is being developed.

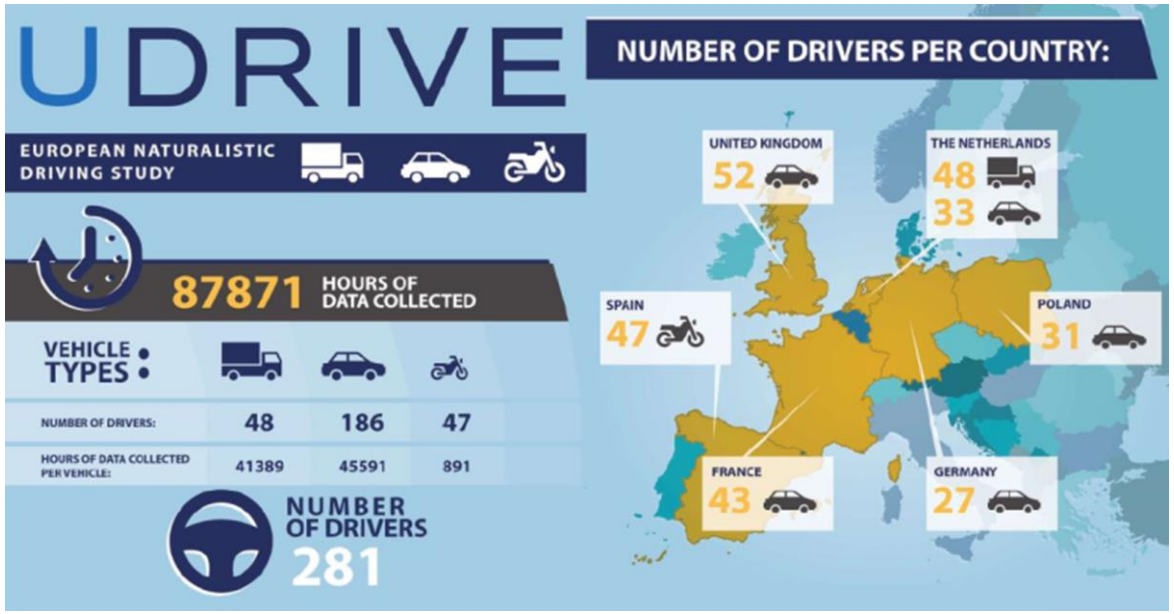
- SAFER partners have gained **new insights from several projects**, e.g. UDRIVE, SafetyCube, L3Pilot, E-Frame, CARTRE and ARCADE.

UDRIVE

eUropean naturalistic Driving and Riding for Infrastructure & Vehicle safety and Environment

The UDRIVE database constitutes a very rich and detailed set of naturalistic driving data. Between January 2015 and May 2017 almost **100.000 hours** of data were collected from three different vehicle types (cars, trucks and powered two-wheelers) in six European countries. All data - including **video data showing views of the driver and the surroundings of the vehicle, as well as vehicle data and GPS data for extraction of road attributes** – has been collected continuously to bring knowledge in the various research areas well beyond the current state-of-the-art.

Results: https://results.udrive.eu/



SHORT FACTS

Project title: UDRIVE - eUropean naturalistic Driving and Riding for Infrastructure & Vehicle safety and Environment

Project type: Project

Research area: Safety performance evaluation

Financier(s): EU

Partner(s): SAFER JRU (Chalmers, Epsilon, VTI, TØI, Volvo Car Corporation), AB Volvo

UDRIVE

eUropean naturalistic Driving and Riding for Infrastructure & Vehicle safety and Environment

RESEARCH TOPICS & RESULTS

Research topics ranged from **risk assessment methods** and studies of **secondary task behaviour** through better understanding of the interactions between drivers and vulnerable road users. Examples of findings:

- European drivers spend **10% of their driving time on secondary tasks**, and 4% of hand-held mobile phone usage, such as typing or calling.
- There is an increase in phone usage when the vehicle is idle or driving slow.
- Truck drivers are distracted for even longer periods of time: the data shows they **spend nearly 20% of driving time distracted**, mostly on **food** and **telephones**.
- Nearly **3%** of driving time is spent on the **visual-manual use of the mobile phone, such as reading and writing** text messages.

THE VALUE

Naturalistic driving data can be used to gain insight into driver behaviour and develop diversified and targeted safety measures. But people from different countries with other cultural backgrounds express different behaviours. Therefore, a European dataset is extremely valuable because it enables us to compare driver behaviour between not only Europe and the U.S., but also between the different countries within Europe. **Insights gained from the UDRIVE data can help develop tailored and targeted policy measures, and provide new scientific insight to support the development of automated driving**.

SafetyCube DSS

European Road Safety Decision Support System

The SafetyCube DSS is the European Road Safety Decision Support System, which has been produced within the European research project SafetyCube, funded within Horizon 2020, 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.

SHORT FACTS

Project title: SafetyCube

Project type: Project

Research area: Safety performance evaluation

Financier(s): EU

Partner(s): SAFER JRU (Chalmers, VTI), TØI

Period: 2015-05-01 - 2018-04-30

Project No: C39

L3 PILOT

The European research project L3Pilot tests the viability of automated driving as a safe and efficient means of transportation. The focus will be on large-scale piloting of SAE Level 3 functions, with additional assessment of some Level 4 functions. The functionality of the systems will be exposed to variable conditions on public roads, including cross-border routes. The technologies being tested cover a wide range of driving situations, including parking, overtaking on motorways, and driving through urban intersections. The **tests will provide valuable data for evaluating technical aspects, user acceptance, driving and travel behaviour,** as well as impact on traffic efficiency and safety.

SHORT FACTS

Project title: L3Pilot

Project type: Project

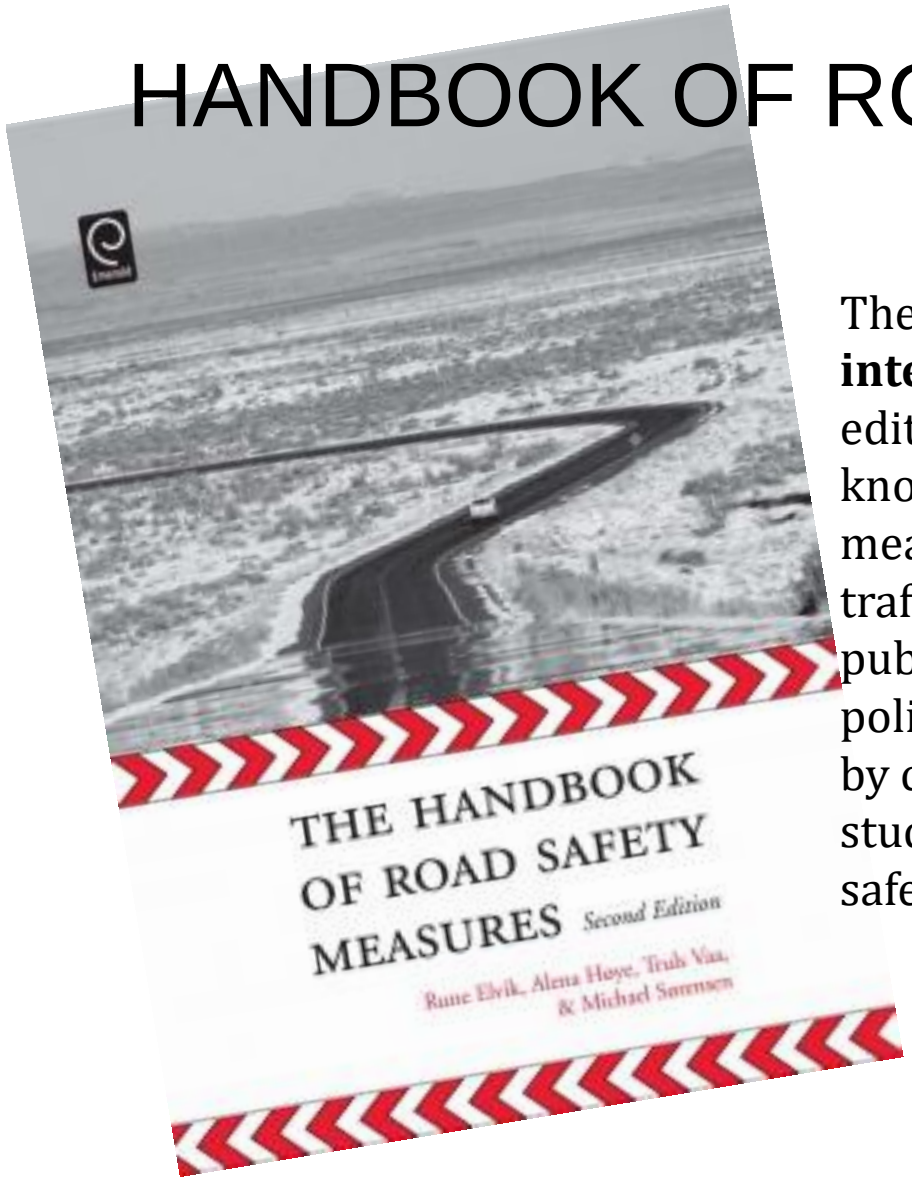
Research area: Safety performance evaluation

Financier(s): EU Horizon 2020

Partner(s): SAFER JRU (Chalmers, Trafikverket), Volvo Car Corporation, Autoliv, Other EU partners (see project description)

Period: 2017-09-01 - 2021-08-31

HANDBOOK OF ROAD SAFETY MEASURES



The Handbook of Road Safety Measures **summarizes international research on road safety**. The current edition gives state-of-the-art summaries of current knowledge regarding the effects of 142 road safety measures. It covers all areas of road safety including: traffic control; vehicle inspection; driver training; publicity campaigns; police enforcement; and, general policy instruments. The book is continuously updated by conducting new literatures reviews, including new studies in existing meta-analyses, and describing new safety measures.

SHORT FACTS

Project title: Handbook of Road Safety Measures

Project type: Associated project

Research area: Safety performance evaluation

Financier(s): Norwegian Public Roads Administration, Ministry of Transport and Communications

Partner(s): TØI - Institute of Transport Economics

Period: 1980-01-01 - 2020-01-01

CARTRE & ARCADE

Aligning Research and innovation for Connected and Automated Driving in Europe (ARCADE)

ARCADE is the continuation of **CARTRE** (SAFER project performed between 2016-2018) with the mission to coordinate consensus-building across stakeholders for sound and harmonized deployment of Connected, Cooperative and Automated Driving in Europe and beyond.

SAFER has taken on the role as task leader for the data sharing. Partners in the project is SAFER, Chalmers, Volvo Group and Lindholmen Science Park. The budget is 3 million Euro and the project will run between 2019-2021. There are 24 partners that will participate.

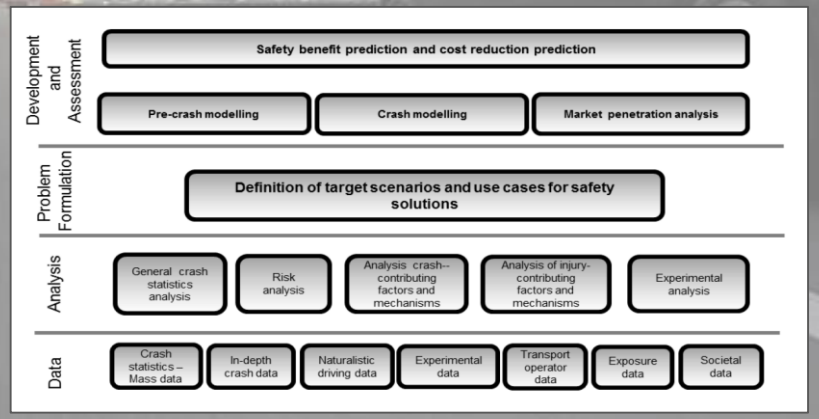
PROJECT TARGETS

- **Cooperation between all CAD stakeholders** (e.g. industry, research, member states, European Commission and international partners) from the different sectors.
- **Coordination of cooperation efforts between all programmes, initiatives** and **projects,** including national and European research programmes as well **international cooperation activities.**
- **Exchange of knowledge, lessons** and **experiences** from past and ongoing activities at national, European and international level.
- **Consensus building** on CAD **deployment scenarios** and **research needs** for connected and automated driving.

E-FRAME

The objective of this FFI project was to develop a **structured framework for traffic safety evaluation in an industrial context**. The resulting framework facilitates more efficient development of crash/injury countermeasures by identifying and focusing on the most important safety (crash) problems, providing a toolset for analyzing crashes and estimating the potential and actual effectiveness of safety systems and services and, finally, identifying the data sources needed to perform these analyses.

The framework did target not only severe accidents but also road accidents with property damage only as well as parking collisions. The developed safety evaluation framework will now be used to perform a cost-benefit analysis to understand the effectiveness of a system/service before its introduction in the market. E-FRAME was finished in 2016.



SHORT FACTS

Project title: EFRAME - Analysis Framework for Safety Systems and Services

Project type: Associated project

Research area: Safety performance evaluation

Financier(s): FFI

Partner(s): AB Volvo, Chalmers

Period: 2013-01-01 - 2016-01-01

Project No: 2013-01306

QUADRAE

As technologies for active safety and vehicle automation grow ever more complex, it becomes increasingly important to complement traditional methods **for testing these systems with virtual tests, based on computer simulations**.

SHORT FACTS

Project title: QUADRAE

Project type: Associated project

Research area: Road user behaviour

Financier(s): VINNOVA

Partner(s): Volvo Car Corporation, Autoliv, Chalmers University of Technology, VTI, Volvo Group

Period: 2016-01-01 - 2020-12-31

To achieve these goals, QUADRÆ will focus on well-defined test-cases, cooperate with industrial function developers and testers, adopt proven models from psychology and neuroscience, conduct experiments with human drivers, and use state-of-the-art databases of actual crashes.

PROJECT OBJECTIVES

- To develop and validate models of driver behavior that are needed in current and future simulation tools for virtual testing of active safety and automation.
- To investigate a number of prioritized scenarios with virtual tests, to estimate the safety benefit of a system, to tune system parameters, and/or to explore potential outcomes in scenarios where the system is active.
- To increase the methodological knowledge on how to best do virtual testing.

PROSPECT

PROSPECT (Proactive Safety for Pedestrian and Cyclists), is an EU research project, that finished in the end of 2018. The project aimed to **significantly improve the effectiveness of active VRU safety systems** compared to those currently on the market. The project covered the entire spectrum of in-depth accident analysis, naturalistic observations, sensor processing, modelling and situation analysis, human-machine interface (HMI), driver warning and vehicle control, testing equipment, functional tests, user acceptance, and benefit/effectiveness estimation.

The project contained five key objectives:

1. a better understanding of relevant VRU scenarios
2. an improved VRU sensing and situational analysis
3. advanced HMI and vehicle control strategies
4. four vehicle demonstrators, a mobile driving simulator and a realistic bicycle dummy demonstrator
5. testing in realistic traffic scenarios and user acceptance study.

The consortium included the majority of European OEM's, including Volvo Cars. The accident research was performed by Chalmers and VTI among other SAFER partners.

PROSPECT
Pedestrians and Cyclists