



Twin-Safe: Advancing Road Safety Through Twinning

Summary of Deliverable 4.2

# **Workshop materials on Safe System Approach - Best practice examples and applications of Human Factors**

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## Document summary

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## Glossary and abbreviations

Word / Abbreviation	Description
FTTS	University of Zagreb, Faculty of Transport and Traffic Sciences
HU	Hasselt University
LU	Lund University
TWIN-SAFE	The project on the topic of Advancing Road Safety Through Twinning
CERTS	Centre of Excellence for Road Traffic Safety at FTTS
WP	Work package
K2	Swedish Knowledge Centre for Public Transport
SMoS	Surrogate Measures of Safety
TTC	Time-to-Collision
PTE	Post-Encroachment Time
IMOB	Transportation Research Institute
LMICs	Low- and Middle-Income Countries

## Summary

The TWIN-SAFE project aims to establish the Faculty of Transport and Traffic Sciences University of Zagreb (FTTS) as a leading centre for multidisciplinary road safety research, education, and innovation. This will be achieved through strategic partnerships with Lund University and Hasselt University through TWIN-SAFE project, and by significantly strengthening the Centre of Excellence for Road Traffic Safety (CERTS), founded in January 2023. CERTS aims to bring together leading road safety experts from academia, the public sector, and industry, creating a dynamic ecosystem of collaboration using the "Q-helix" model. This collaborative environment will drive the development of innovative solutions and significantly enhance road safety.

CERTS envisions becoming a nationally influential and internationally recognized entity deeply involved in all aspects of Croatian road safety, providing innovative solutions globally. Its mission is to serve as a scientific research platform, conducting applied research in partnership with domestic and international public and private entities. This will integrate scientific research into a comprehensive Safety System Approach (SSA), expanding existing knowledge and generating new, practically applicable knowledge to positively impact all facets of road safety. The primary goal, aligned with its vision and mission, is the comprehensive improvement of road safety in Croatia and the European Union. Using an interdisciplinary approach, CERTS will actively support the Vision Zero and Safe System Approach to enhance national road safety.

To achieve these goals, the TWIN-SAFE project's fourth work package, "Empowering the Centre of Excellence for Road Traffic Safety," is dedicated to boosting the further development of CERTS and FTTS research capacities and expertise. The objectives of this work package include: increasing researcher expertise in Human Factors and the Safe System Approach; fostering collaboration and knowledge exchange through seminars and workshops; expanding and enhancing the Road Safety Summer School curriculum; and developing strategic joint PhD research topics.

First task of the WP4 is focused on increasing the knowledge on the Vision Zero and Safe System Approach concepts and introduce it in all the ongoing/future research activities for further integration into the EU traffic safety policies. Therefore, two training workshops have been organized on the aforementioned topics. The core concept of the first workshop revolved around exploring the Safe Systems Approach to road safety and the principles and consequences of Human Factors, while the second workshop was focused on international best practice examples and applications of Human Factors in different areas of road safety (e.g., in education, enforcement, engineering). The workshop was organised from 9<sup>th</sup> to 11<sup>th</sup> December 2024, in Lund (Sweden) by Lund University.

During the first day of the workshop, project team visited the Swedish Knowledge Centre for Public Transport (K2). K2 fosters collaboration between researchers, industry, and public transport authorities. Through presentations showcasing K2's structure and activities, the TWIN-SAFE project team gained valuable insights into building and managing a successful collaborative ecosystem focused on research and education. This provided a practical model for CERTS, demonstrating how effective partnerships between academia, industry, and public sector stakeholders can be established and maintained to achieve shared goals. Observing K2's operational model offered the TWIN-SAFE team concrete examples of best practices for fostering knowledge exchange and translating research into practical applications within the road safety domain. Also, the project team visited specialised driving simulator laboratory established within the research project *SUPERSAFE - SURrogate measures for SAFE autonomous and connected mobility* which is led by Carmelo D'agostino from Lund University.

A workshop on grant writing, part of WP5's task "5.2 Develop and implement a training program on grant writing and funding strategies", was held on the second day. This workshop was combined with

a *Vision Zero/Safe System Approach* session, providing participants with information on Horizon Europe funding opportunities and best practices in grant writing. Through group work, the team collaboratively developed road safety research ideas suitable for future funding calls. The session also introduced the team to the "Driving Urban Transition" calls, a program in which Croatia can participate from the start of 2025.

During the third day, researchers from Lund University presented the development of research behind surrogate measures of safety (SMoS). The core idea centres on identifying and quantifying near misses or traffic conflicts as surrogate measures of safety. Various methods for analysing video footage were explored, including manual observation using established techniques like the Swedish Traffic Conflict Technique and automated AI analysis. The presentation delved into the definition and measurement of SMOs, examining different definitions and the quantification of severity using metrics such as Time-to-Collision (TTC), Post-Encroachment Time (PET) etc. Moreover, the session discussed the limitations of such approach, including the generation of false positives and challenges in differentiating between exposure and risk. Approaches to validating SMOs as safety indicators were discussed, involving comparisons with crash data and the consideration of infrastructure design and cultural factors; a Denmark/Netherlands comparison illustrated the context-dependent nature of interpreting SMOs. Finally, the session argued for the use of both manual and AI-driven video analysis to enhance the understanding and prediction of road safety, highlighting the potential and limitations of using surrogate measures to supplement traditional crash data.

The second presentation was held by Tom Brijs from Hasselt University which covered 15 years of driving simulation research at the Transportation Research Institute (IMOB). The presentation provided insight into different approaches and uses of driving simulation in understanding driver performance, limitations, and responses to various traffic scenarios, contributing significantly to the development of effective road safety interventions.

Furthermore, Dario Babić from the Faculty of Transport and Traffic Sciences University of Zagreb presented the work of FTTs's research group on improving post-crash safety for motorcyclists, particularly on rural roads, through the implementation of smart guardrails. The presentation highlighted the vulnerability of motorcyclists due to their high speed, lack of protection, and smaller size, contributing to their disproportionate representation in road fatalities (approximately 23% globally and 16% in the EU27). The presentation emphasizes the high percentage of fatal motorcycle crashes occurring on rural roads (52%), citing characteristics of these roads—variable geometry, numerous intersections, mixed traffic, and poor maintenance—that increase the risk. The core of the presentation introduces a system of smart guardrails equipped with impact sensors that automatically transmit collision data (time, intensity, location) to a control centre via a LoRaWAN network. This allows for rapid response and potentially life-saving interventions. A case study detailing the implementation of this system on a rural Croatian road was presented, demonstrating the effectiveness of the system in a real-world setting showcasing how the smart guardrail system may save a motorcyclist's life after the crash.

During the second part of the third day, Andras Varhelyi from Lund University, presented the AfroSAFE project and lessons learned related to the managing road infrastructure safety within low- and middle-income countries (LMICs). The presentation highlighted the challenges of implementation of SSA and highlighted the importance of context-specific approaches, capacity building, and collaborative partnerships to effectively improve road safety infrastructure in LMIC settings.

In the final part of the workshop, the project team moved beyond theory to explore practical applications of SSA through real-world examples from Belgium, Croatia, and Sweden. The team

focused on applying the SSA framework developed by the International Transport Forum (ITF, 2022)<sup>1</sup>. The goal of the ITF Safe System Approach (SSA) framework is to offer a structured, practical tool for organizing and assessing road safety interventions, helping countries advance their Safe System implementation based on real-world experiences. Developed as a flexible, evolving guide, the framework addresses the complex and varied challenges of road safety across different contexts. It aims to support countries in systematically improving road safety by adapting the SSA to their unique conditions and needs, ensuring consistent progress toward reducing road injuries and fatalities. The SSA framework gives a clear snapshot of your country's progress in adopting Safe System principles within road safety policies and actions. It highlights the current implementation stage and maps out the necessary steps to reach full safe system adoption.

Prior to the workshop, researchers from Hasselt University developed the Excel-matrix template which each partner used to review their country's road safety policies, as well as the guidelines and benchmarks outlined in the ITF 2022 report. For each SSA pillar and its key components, partners assessed the current development stage in their country, selecting between "emerging," "advancing," or "mature." During the workshop, each partner presented their findings, focusing on the current level of SSA implementation in their respective countries. Following the presentations, the project team engaged in a group discussion to compare and analyse these results, with the aim of identifying shared challenges, valuable lessons, and potential areas for improvement in implementing the Safe System Approach.

This group exercise not only allowed project team to benchmark SSA implementation across different countries but also helped lay the foundation for identifying key trends in future research and development. The collective insights and experiences will foster a collaborative approach toward systematic and sustainable improvements in road safety.

The main part of this deliverable includes a set of workshop materials in form of presentations. This deliverable serves as a learning material primarily to FTTS and CERTS researchers. However, the deliverable serves as a structured material available to other TWIN-SAFE partners.

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<sup>1</sup> ITF (2022), The Safe System Approach in Action, Research Report, OECD Publishing, Paris.