



Twin-Safe: Advancing Road Safety Through Twinning

Summary of Deliverable 4.1

Workshop materials on Safe System Approach - Principles and consequences of Human Factors

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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
SSA	Safe Systems Approach
IMOB	The Transportation Research Institute

Summary

The overarching ambition of the TWIN-SAFE project is to establish the Faculty of Transport and Traffic Sciences (FTTS) as a centre of excellence in multidisciplinary road safety research, education, and innovation through strategic partnerships with Lund University (LU) and Hasselt University (HU). Moreover, one of the main aims of the project is to empower the Centre of Excellence for Road Traffic Safety (CERTS) which FTTS established in January 2023. The idea behind the CERTS is to bring together leading experts in road safety from the educational, public, and private sectors and create active ecosystem between the academic community, industry, the public sector and end users through the "Q-helix" model, and thus make significant progress in developing innovative solutions and enhancing road safety.

The vision of CERTS is to become an entity that is involved in all aspects related to road safety at the national level in the Republic of Croatia, while also being recognized and actively engaged internationally in providing innovative solutions for enhancing road safety. The main mission of CERTS is to provide a scientific research platform for conducting applied research in partnership with domestic and international public and private entities. This ensures the integration of scientific research activities into a safety system approach, aiming to expand existing knowledge and generate new knowledge with practical implementations that can positively impact all aspects of road safety. Aligned with the vision and mission, the primary goal of CERTS is comprehensive improvement of road safety in the Republic of Croatia and at the European Union level. In addition, by employing an interdisciplinary approach, CERTS aims to support the Vision Zero and Safe System Approach, enhancing road safety nationally.

To achieve aforementioned, fourth work packages within TWIN-SAFE, entitled *"Empowering the Centre of Excellence for Road Traffic Safety"* is devoted to boosting further development of CERTS and FTTS research capacities and expertise. Therefore, the objectives of WP4 are following:

- Increase researcher expertise in human factors and the Safe System Approach.
- Foster collaboration and knowledge exchange between researchers through seminars and workshops.
- Expand and enhance the Road Safety Summer School curriculum.
- Develop 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 (SSA) to road safety and the principles and consequences of Human Factors. The workshop was organised on 29nd and 30th October 2024, in Hasselt (Belgium) by Hasselt University.

During the workshop, experts from HU provided a multi-faceted exploration of SSA. The workshop started with the origins of SSA, tracing it back to the "Vision Zero" initiative in Sweden and the "Sustainable Safety" vision in the Netherlands, both originating in the 1990s. It demonstrated the success of the SSA through case studies in various countries, showcasing significant reductions in fatalities and serious injuries. These reductions are attributed to the implementation of comprehensive strategies related to five pillars of SSA – safe roads, effective speed management, safe vehicles, safe road users and post-crash care. Each pillar was examined in detail, highlighting best practices, examples of successful implementation, and how each contributes to the overall goal of minimizing fatalities and serious injuries. The emphasis was on how these pillars work together to

create a holistic system of road safety, shifting responsibility from solely the individual to a shared responsibility among all stakeholders.

Following an introduction, the workshop delved into the critical role of human factors in road safety. This section comprised three key areas: 1) Sensation and Perception; 2) Attention; and 3) Judgment and Decision-Making. The first part focused on the distinction between sensation (the purely physiological process of receiving stimuli) and perception (the cognitive process of interpreting and understanding those stimuli). This section then traced the pathway of visual information from the eye to the brain, contrasting bottom-up processing (driven by sensory input) and top-down processing (influenced by prior knowledge and experience). The presentation also examined the limitations of human visual perception, particularly in challenging conditions like fast movement and low light. Finally, it presented research from the HU Transportation Research Institute (IMOB) on how these perceptual limitations affect driving and road safety.

The second part focused on attention in traffic, its related functionalities and its impact on road safety. The session covered various types of attention, including sustained, selective, alternating, and divided attention, examining how each is challenged in the complex driving environment. Moreover, focus was directed on the negative impact of multitasking and distractions on driving performance, highlighting attention as a limited resource. Lavie's Load Theory was introduced to further explain these limitations. Furthermore, the session presented a range of countermeasures to mitigate the risks associated with attentional limitations, encompassing education and training programs, infrastructure improvements (reduced visual clutter, high-visibility signage), technological innovations, and policy measures/enforcement strategies. The final part of the session focused on the research related to attention which was conducted at IMOB.

The final part of the Human Factors session focused on how the brain processes information to guide decision-making, particularly in the context of road traffic and road safety. The session covered the Nudging and Boosting Theory, frameworks for influencing behaviour through subtle changes in the environment or information presented. Moreover, it presented the COM-B model (Capability, Opportunity, and Motivation-Behaviour Model), a framework for understanding behaviour change, and provided a structure for analysing how interventions can affect capability, opportunity, and motivation. The application of these theories and models within the i-DREAMS project was also discussed, illustrating how these principles can be used to design effective road safety interventions.

A guided tour of the Transportation Research Institute (IMOB) offered FTTs researchers' insight into the practical application of research and how research translates to real-world applications. The tour showcased IMOB's research strategy, its policy and infrastructure impact, and provided hands-on experience with state-of-the-art laboratory facilities and their role in various research and project activities at IMOB and HU.

During the second day, a "Civic University" workshop was held. The "Civic University" workshop is a part of the task in WP5 *"Developing an international research environment with strong project management capabilities"*, however it was combined with the task from WP4 *"4.1. Training workshops on Vision Zero/Safe System Approach"* given that the project team determined that it is a valuable addition since it aimed to leverage the collaborative capacity of civic universities to integrate research findings into actionable road safety policies and initiatives, promoting a more inclusive and participatory approach to crash prevention. The session introducing the "Civic University" concept and the subsequent brainstorming session with HU, FTTs and LU on how road safety connects to "Civic University" concept.

Overall, the two-day workshop aimed to promote understanding and implementation of the Safe Systems Approach to road safety. It explored the crucial role of human factors, i.e. fallibility, fragility, predictability, experience, mental workload and distraction, and its impact on road safety.

Furthermore, the workshop investigated the potential of civic universities to foster collaborative road safety initiatives, leading to the development of concrete strategies and recommendations for improving road safety.

Based on the workshop agenda and aims, participants strengthened their understanding of the Safe Systems Approach and its practical application, alongside a clearer grasp of the key human factors contributing to safety risk and road crashes. The workshop aimed to identify specific challenges and opportunities for improvement within the participating regions, fostering the development of a collaborative framework for future initiatives involving universities, government agencies, and industry. This collaboration aimed to establish concrete steps for implementing effective road safety strategies.

The main part of this deliverable includes a set of workshop materials in form of presentations. Due to the focus and aim of this deliverable, it includes only materials related to Safe System Approach and Human Factors. 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.