Safe System Design for CCAM services - FRODDO

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Artificial Intelligence for Road Safety and Mobility Workshop

8th UN Global Road Safety Week

Athens, 15 May 2025

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The FRODDO project

FRODDO
Safe, Resilient Transport and Smart Mobility Services

- **FRODDO** :

  "Federated cybeR-physical infrastructure for ODD cOntinuity"
  https://froddo-project.eu

- 18 Project partners from 10 countries including National Technical University of Athens that also acts as the scientific and technical manager of the project

- **Duration of the project**:

  36 months (June 2024 – May 2027)

- **Framework Program**:

  FRODDO project is co-funded by the EU Horizon Europe Research and Innovation Programme under Grant Agreement No. 101147819

Co-funded by the European Union

Background

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- The operational context is the cornerstone to ensure performance and safety of CCAM
- Future Operational Design Domains (ODDs) should be designed with many redundancies (*fail safe design*)
- Seamless, safe and secure physical and digital environments must coexist and collaborate
- The big challenge is to design broader ODDs that allow for cooperation with the PDI in a safe system design framework

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Objectives

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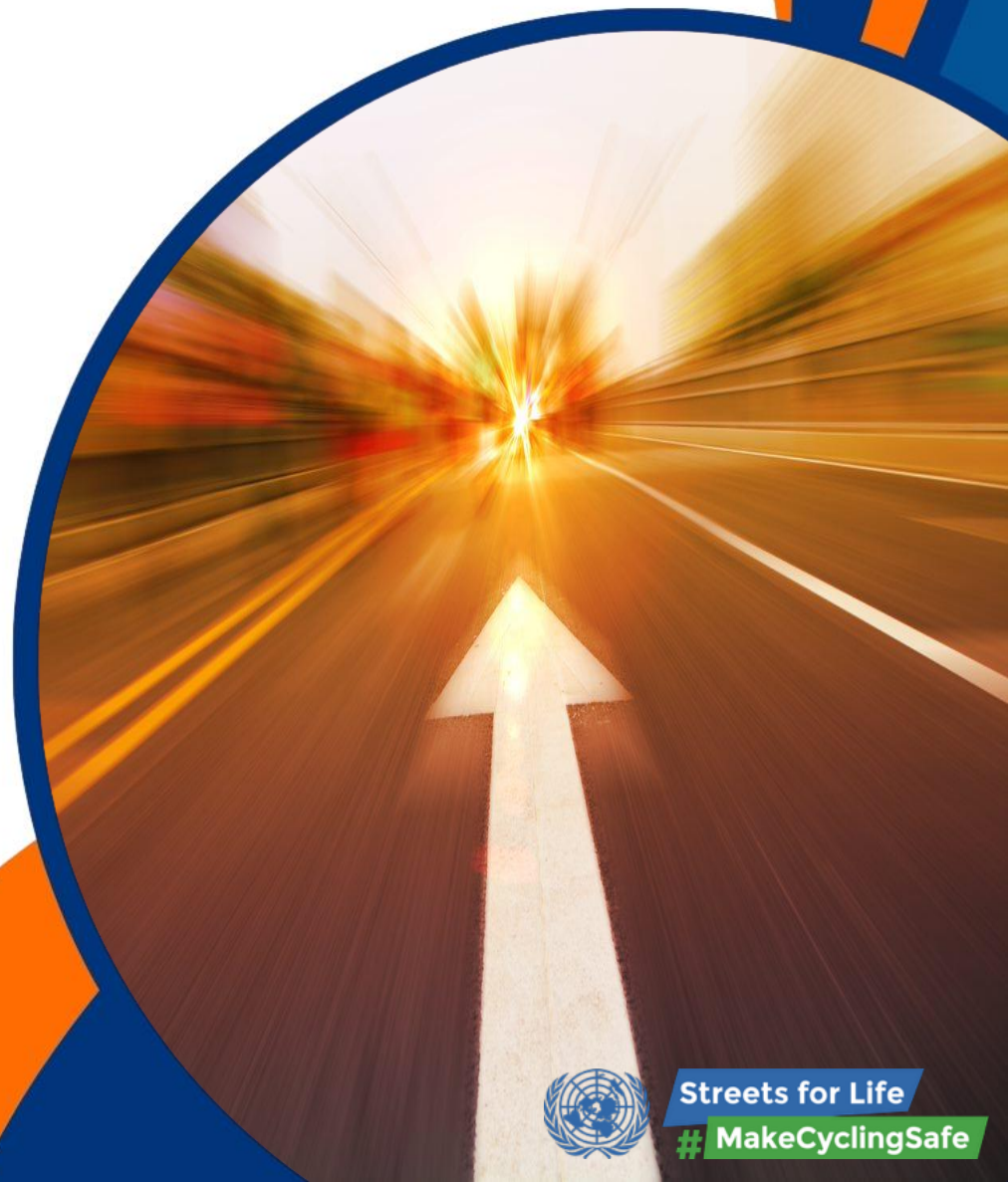
- Develop and test a complete suite of methods and tools based on the principles of safe systems design in a federated DT environment
- Leverage advanced sensing, ML, hybrid AI and simulation to account for increasing adaptability, continuity and sustainability of ODDs to complex and dynamically changing road contexts
- Allow for improved management of CCAM-enabled Physical-Digital Infrastructure



Pilot Implementation

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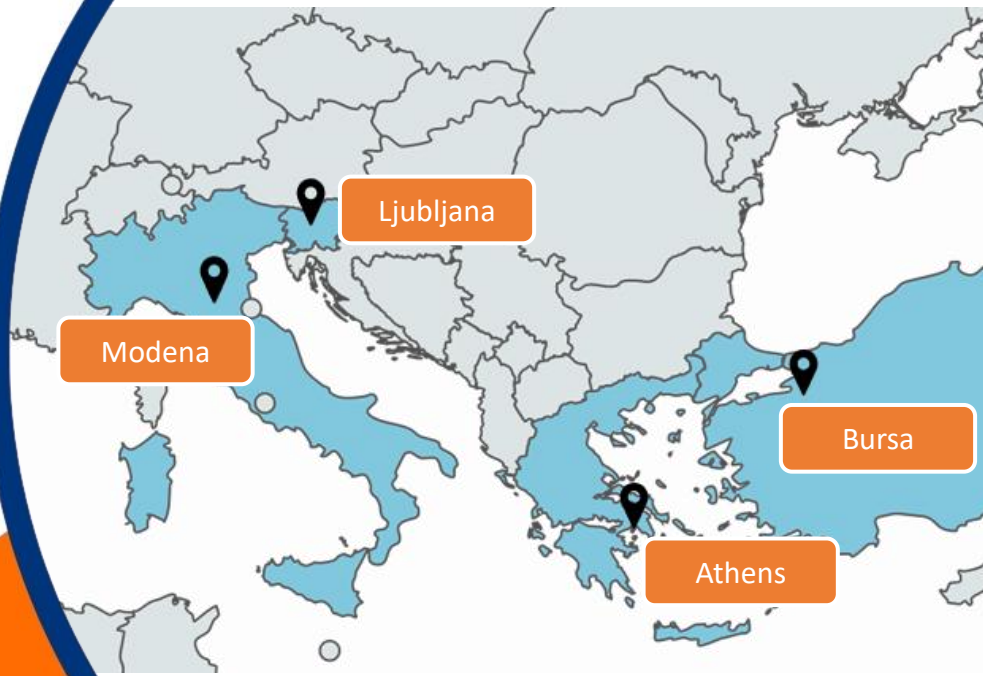
- 4 pilot sites – Field & Lab testing
  - Pilot 1 - Ljubljana: Multi-modal user interface for automated vehicles
  - Pilot 2 - Athens: A unified PVT framework and tools in support of future ODDs of automated vehicles
  - Pilot 3 - Modena: Increased cross section awareness
  - Pilot 4 - Bursa: Cost effective alternative solution instead of GNSS

- A DT environment will be developed for each pilot to provide operators and traffic managers with federated tools to monitor CCAM systems and manage incidents.



Methodological Approach

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- Adapt the Safe System Design approach to CCAM Services

  - Improve the situational awareness of individual vehicles through V2V and V2I communications and by leveraging predictive ODD scenarios
  - Design and implement absolute positioning algorithms towards improving Position-Navigation-Timing quality
  - Develop AI-based TMS for mixed traffic conditions
  - Assess physical infrastructure readiness, propose upgrades and interventions for safer AV-ready roads
  - Develop misbehavior detection methodologies with V2X communications to increase security and privacy of connectivity.
  - Deliver safe interaction mechanisms to identify optimal communication means between vehicles and users

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- Enhance continuity of ODDs and therefore ensure safety and comfort for both passengers and the rest of the road users
- Ensure safe interactions between road users
- Road operators can use the DT to assess future scenarios of mixed traffic and adapt their strategies and policies to improve safety and traffic efficiency
- Guidelines for designing a safe CCAM system and innovative AI-based solutions for improving the predictability for ODDs

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Scientific and Social Impact

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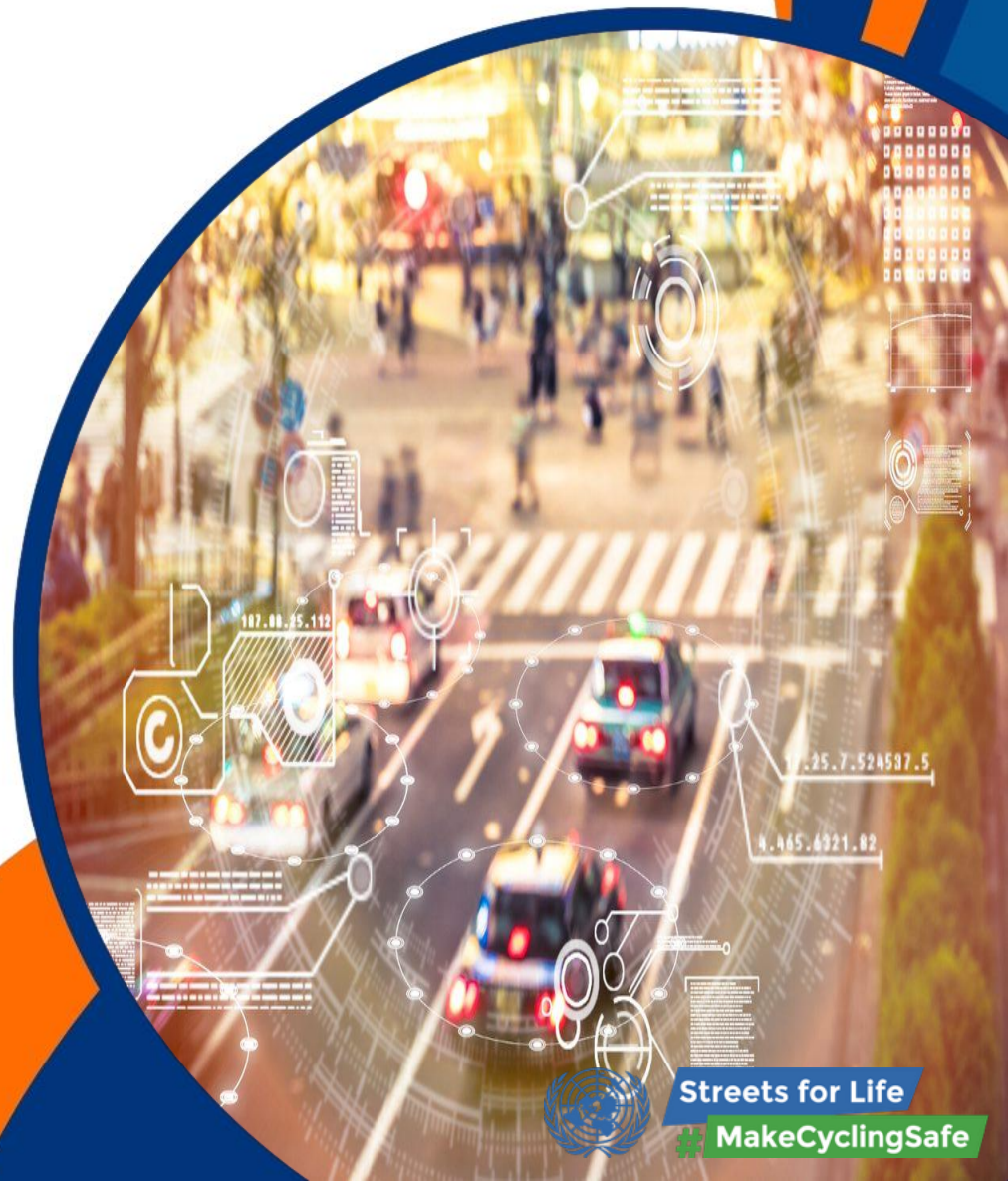
- Increased efficiency of ODD services → increasing the feeling of safety for users, and efficient information provision
- AI and causal ML developments → facilitate federated AI-assisted Digital Twins for CCAM services → trustworthy and secure decentralized data management for decision support
- Meet all societal challenges (acceptance, inclusivity, bias-free solutions) by delivering a "CCAM advanced cooperation pathway"



Future Challenges

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- Guide the development of fail-safe ODDs which are scalable, interoperable and ensure user acceptance and equity.
- Establish efficient cooperation of CCAM actors including road owners and public authorities, mobility service providers, telecom providers and technology partners.
- Create links with standardization bodies related to CCAM - aiming to ensure harmonized deployment across Europe.

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