RSS 2022

8th Road Safety & Simulation International Conference

Road Safety and Digitalization

08-10 June, 2022 • Athens, Greece

Methodological framework of creating the Levitate Policy Support Tool for Connected and Automated Transport Systems

Maria Oikonomou

Transportation Engineer, PhD Candidate

Together with:

A. Ziakopoulos, J. Roussou, A. Chaudhry, H. Boghani, B. Hu, M. Zach, K. Veisten, K. J. L. Hartveit, E. Vlahogianni, P. Thomas and G. Yannis

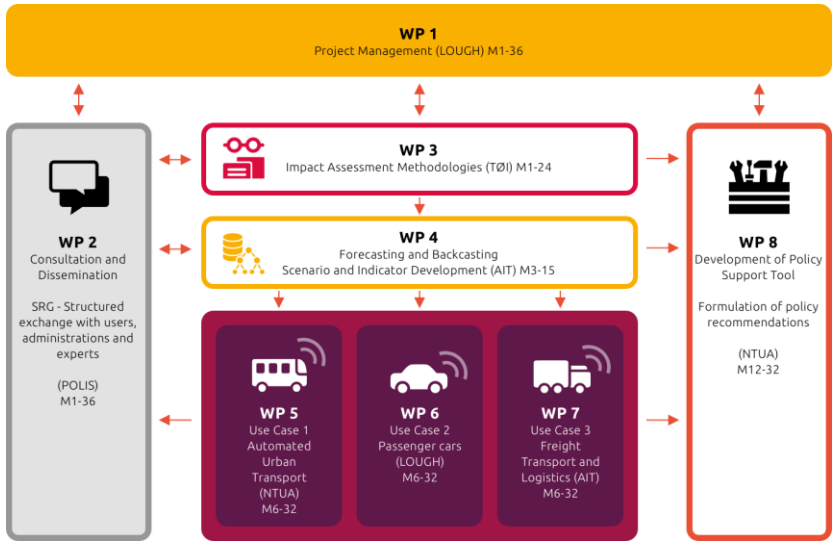
National Technical University of Athens

Department of Transportation Planning and Engineering

The LEVITATE Project

LEVITATE focused on the development of a new impact assessment framework, in order to enable policymakers to manage the introduction of Connected, Cooperative and Automated Mobility (CCAM), maximise the benefits and utilise the technologies to achieve societal objectives.

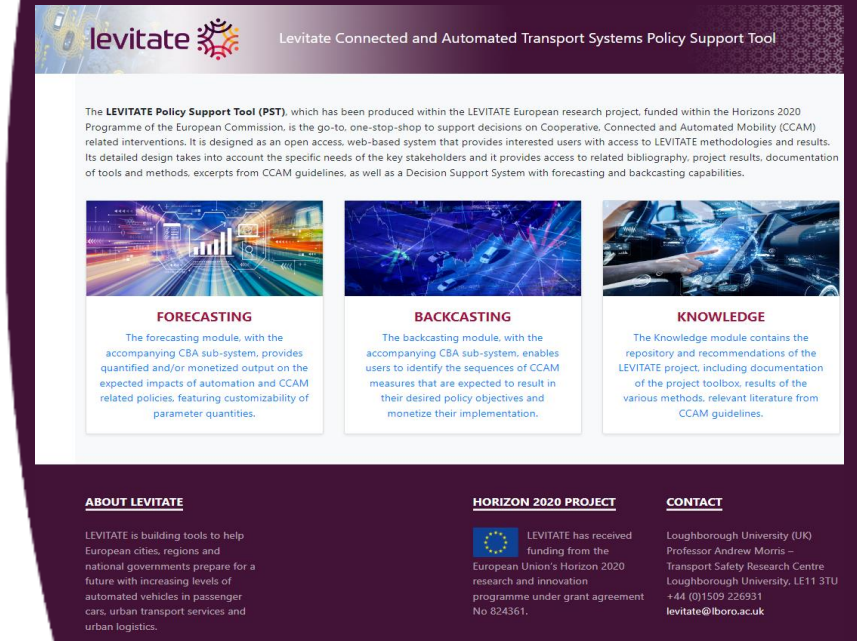
- Project partners: LOUGH (UK), AIT (AT), AIMSUN (ES), NTUA (EL), POLIS (BE), SWOV (NL), TOI (NO), TfGM (UK), City of Vienna (AT), QUT (AU), TJU (CN), UMTRI (US)
- Duration of the project: 42 months (December 2018 – May 2022)
- Framework Program: Horizon 2020 - The EU Union Framework Programme for Research and Innovation – Mobility for Growth



Introduction

- The LEVITATE Policy Support Tool (PST) is an open access, web-based system that provides access to results obtained by LEVITATE methodologies.
- The LEVITATE PST is the go-to, one-stop-shop for decision support on CCAM-related interventions. It is expected to be used by city authorities, transport planners and engineers, transport researchers and interested citizens.
- Its detailed design takes into account the specific needs of the key stakeholders and provides access to related bibliography, project results, documentation of tools and methods, excerpts from CCAM guidelines, as well as a PST with forecasting, backcasting and CBA capabilities.

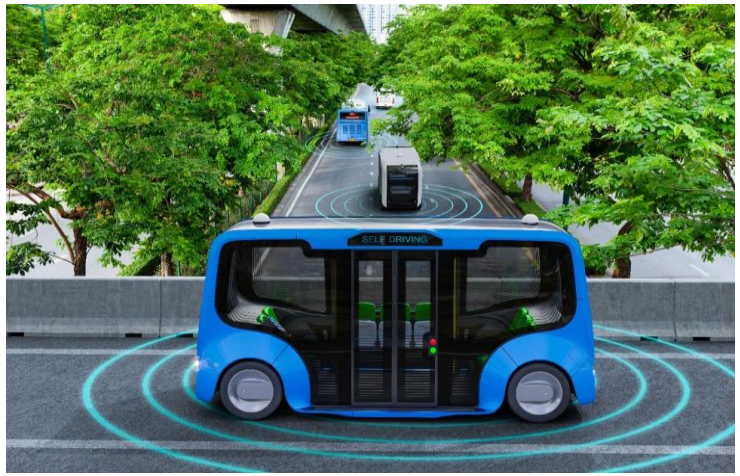
https://www.ccam-impacts.eu/



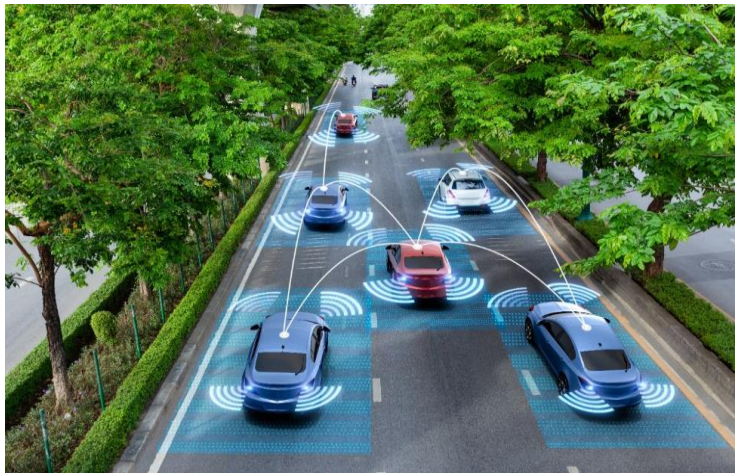
Use Cases

Three automation Use Cases are considered:

Urban transport



Passenger cars



Freight transport

as well as specific Sub Use-Cases are investigated for each domain:

- Point-to-point automated shuttle services
- On-demand automated shuttle services

- Road use pricing
- Green Light Optimized Speed Advisory
- Automated ridesharing
- Parking pricing policies
- Parking space regulations
- Dedicated lanes on urban highways

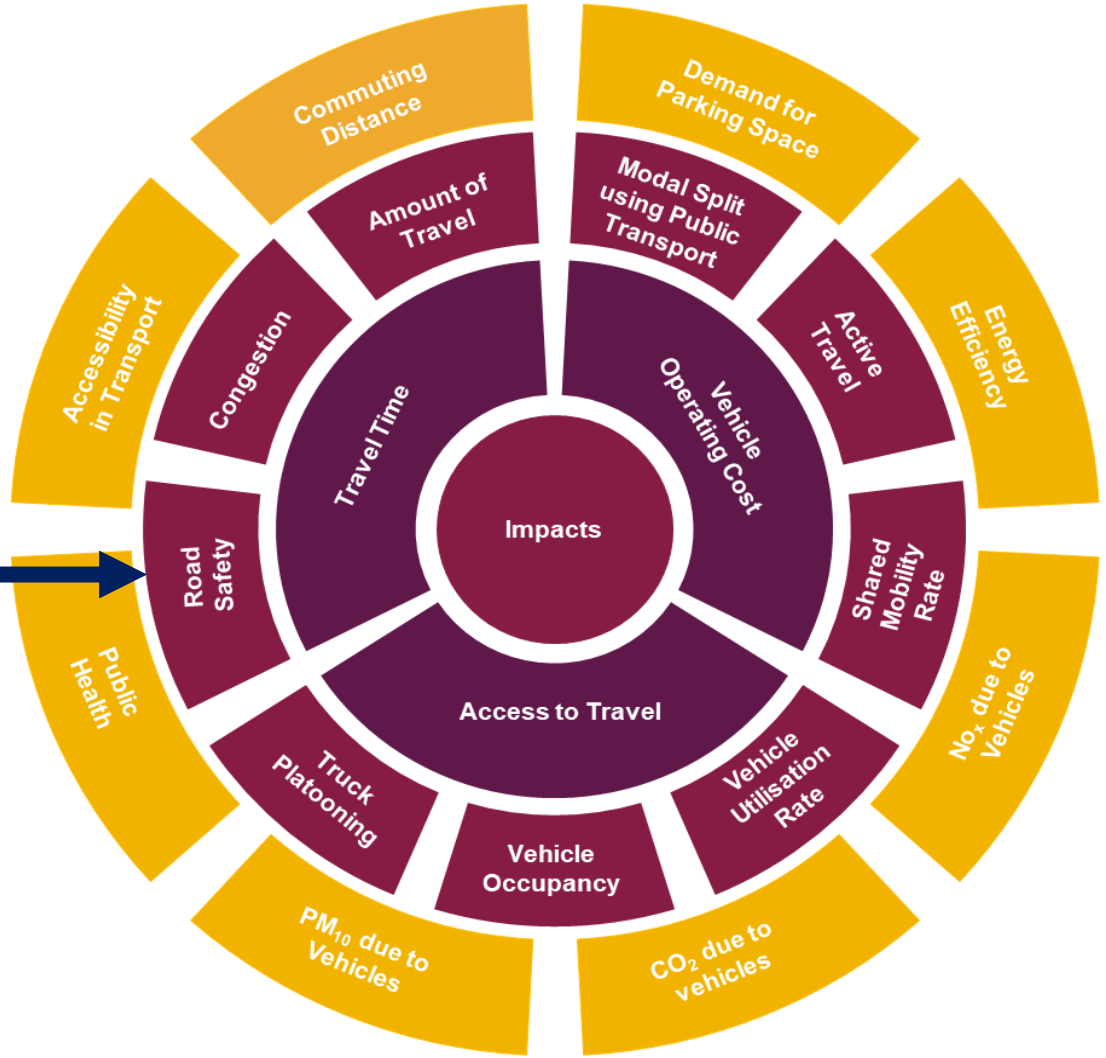
- Automated urban delivery
- Automated freight consolidation
- Hub-to-hub automated transport
- Truck platooning on urban highway bridges

Dimensions of CCAM impacts

Twenty distinct impacts are examined, classified into three distinct categories:

- **Direct impacts (inner circle)**
- **Systemic impacts (middle circle)**
- **Wider impacts (outer circle)**

While three road safety impacts are considered: unmotorized VRU crash rates, motorized road crashes and total road safety effect.

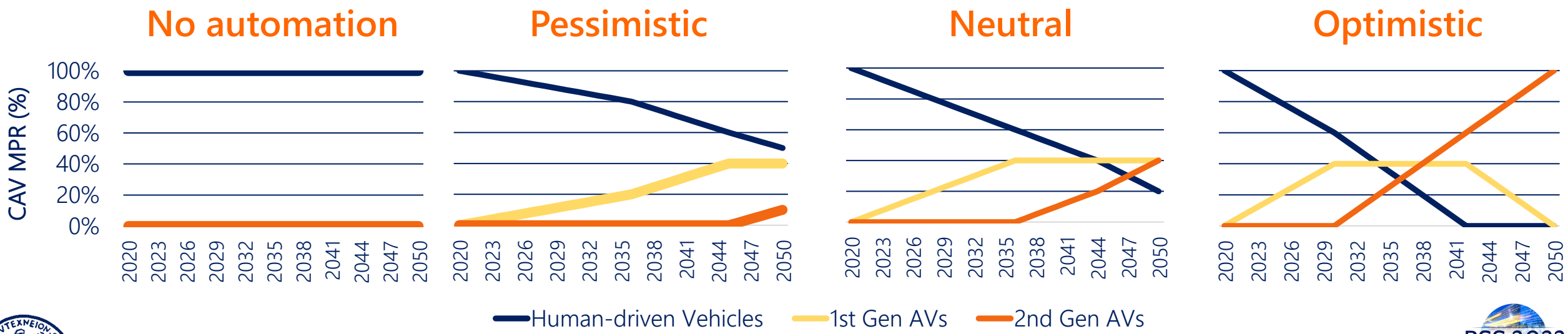


Base scenarios

Two main driving profiles of connected autonomous vehicles are considered:

- **1st Generation** (limited sensing and cognitive ability, long gaps, early anticipation of lane changes and longer time in give way situations)
- **2nd Generation** (advanced sensing and cognitive ability, data fusion usage, confident in making decisions, small gaps, early anticipation of lane changes and less time in give way situations)

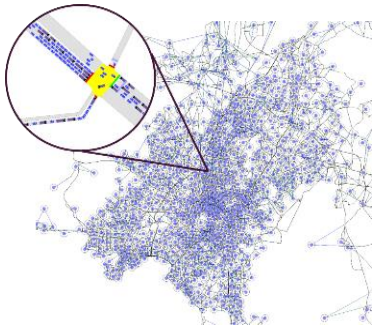
Four predefined base scenarios are also established, concerning the temporal distribution of the market penetration rates (MPRs) of CAVs throughout the study period (from 2020 to 2050):



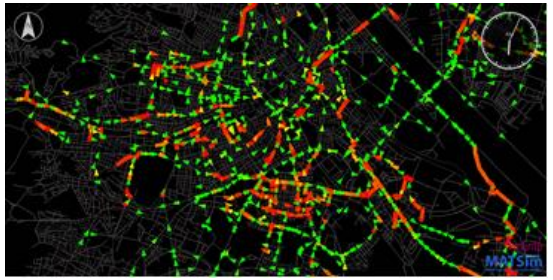
Impact assessment methodologies

Five different methods are used in order to provide and forecast the examined impacts, which are:

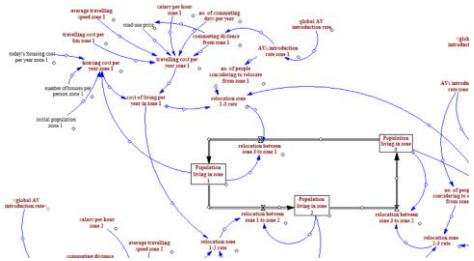
Microscopic Simulation



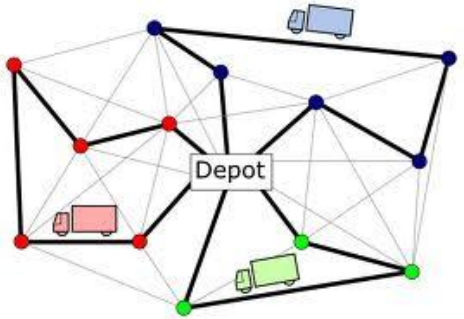
Mesoscopic simulation



System dynamics



Operations research



Delphi method

Overview of the LEVITATE PST

Forecasting

The forecasting module provides quantified and/or monetized output on the expected impacts of automation and CCAM related policies, featuring customizability of parameter quantities.

Backcasting

The backcasting module enables users to identify the sequences of CCAM measures that are expected to result in their desired policy objectives and monetize their implementation.

Knowledge

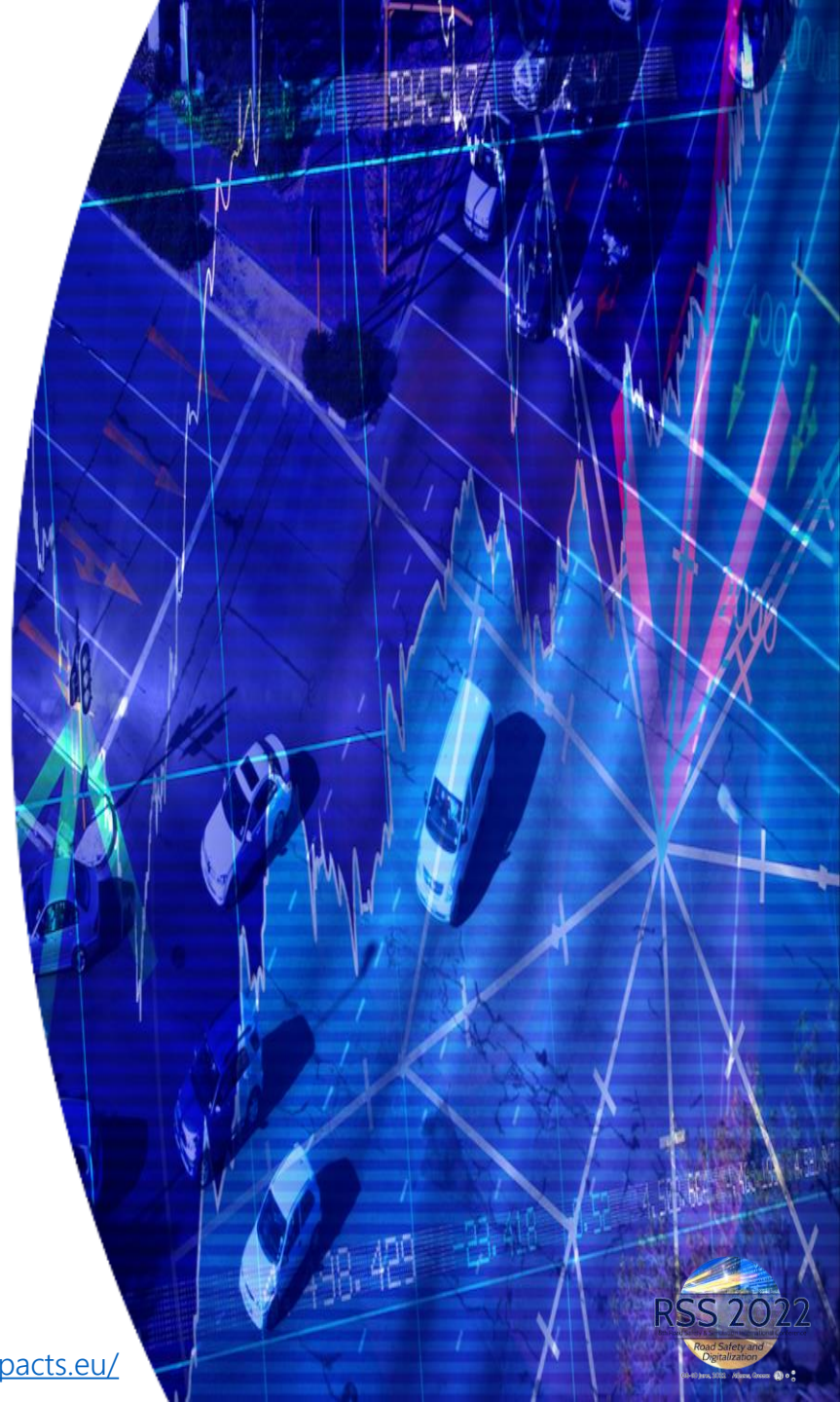
The knowledge module contains the repository and recommendations of the LEVITATE project, including documentation of the project toolbox, results of the various methods, relevant literature from CCAM guidelines.

Forecasting

- The main purpose of the forecasting sub-system is to provide quantitative estimates to users about the future impacts of policy interventions.
- In the forecasting sub-system, the user is able to select a policy intervention, define the required CCAM factors and the module provides quantified and/or monetized output on the expected impacts.
- In the sub-system, the capability of an intervention combination is also made based on a methodological basis drawn from the Crash Modification Factor (CMF) approach highlighted in the Highway Safety Manual and the respective CMF clearinghouse repository of the US Federal Highway Administration.

Backcasting

- The main purpose of the backasting sub-system is to provide a conclusion from a defined vision (set of policy goals) to the most promising policy interventions, given that all these relationships and impacts have been quantitatively assessed.
- A primary goal of the backasting sub-system is to estimate the impacts of CCAM for various impact dimensions.
- Coming from the opposite direction, a strategic "vision" of a city/region can also be broken down into quantified targets belonging to various dimensions in the backasting sub-system.



Knowledge

- The PST Knowledge module aims to provide a static repository through fully detailed and flexible concise reports.
- The concise reports aim to inform the user in the most essential and summarizing way, offering the necessary information.
- The reports differ in the documentation categories that essentially are the contents of the module:
  - Project-level documentation
  - Use case bibliography documentation
  - SUC-level documentation
  - Method-level documentation
  - Impact-level documentation
  - Case study documentation

Conclusions

- The LEVITATE PST provides the first openly available web-tool to effectively support decision making for CCAM in a holistic way, with guidance on both forecasting impacts of policy measures as well as identifying those that are appropriate for achieving specific policy goals.
- The online tool provides the possibility of interactive use by comparing different aspects and reducing uncertainty during the decision making process.
- The system is flexible transformed it simultaneously into a communication and planning tool, as the user is able to customize multiple parameters in order the results to be in-line with the test network or city.

https://www.ccam-impacts.eu/

RSS 2022

8th Road Safety & Simulation International Conference

Road Safety and Digitalization

08-10 June, 2022 • Athens, Greece

Methodological framework of creating the Levitate Policy Support Tool for Connected and Automated Transport Systems

Maria Oikonomou

Transportation Engineer, PhD Candidate

Together with:

A. Ziakopoulos, J. Roussou, A. Chaudhry, H. Boghani, B. Hu, M. Zach, K. Veisten, K. J. L. Hartveit, E. Vlahogianni, P. Thomas and G. Yannis

National Technical University of Athens

Department of Transportation Planning and Engineering