

TRAVISIONS 2026



Awards Highlights: celebrating excellence in Research and Innovation

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In memory of Markus Lehne

Co-creator and driving force of TRA VISIONS, whose brilliant mind always looked far into the future of European mobility.

This volume is dedicated to him, who deeply believed in senior researchers as the pillars of transport research, and in young talents as the true drivers of innovation and the guardians of tomorrow's transport.

His vision continues to guide our journey.

INTRODUCTION

The Transport Research Arena (TRA) Conference proudly celebrates innovation and research excellence through the TRA VISIONS Awards – one of the most anticipated moments of the conference. Established in 2014, these awards have grown into a key European platform for recognizing breakthrough achievements that push the boundaries of mobility, technology, and sustainability.

The transport sector is a key enabler of economic growth, social development, and cultural exchange by its ability to connect people, goods, and ideas, promoting cooperation, prosperity, and progress across Europe (and beyond).

However, it also faces challenges related to sustainability and environmental impacts, which require continuous attention and investment in research, development, and innovation for creating more sustainable solutions. To formulate such solutions, policy objectives and perspectives, research ideas and results, technological and industrial developments need to be discussed from time to time.

The Transport Research Arena (TRA) is Europe's flagship transport research and innovation conference, initiated by the European Commission and key stakeholders. It is the largest European conference of its kind, covering all transport modes and mobility aspects. As a premier forum for European transport innovation, TRA gathers academia, industry, policymakers, and civil society to shape the future of transport research.

At the heart of TRA is the **TRA VISIONS Awards** – an initiative supported by the European Commission which aims to highlight European research excellence and strengthen the competitive edge of the European transport sector by recognising groundbreaking concepts and solutions. Focusing on innovative ideas and concepts derived from EU-funded transport research projects, **these Awards serve to disseminate knowledge, foster future synergies, and encourage the development of pioneering ideas aligned with the strategic objectives of TRA.**

TRA VISIONS honours achievements across transport categories - **Road, Rail, Waterborne, Airborne, Crossmodal Passenger** transport, **Crossmodal Logistics** and across career stages.

The **Young Researcher Awards** recognise postgraduate students and early-stage researchers for their outstanding research in transport studies, giving them the opportunity to engage with a wide scientific community and bring forward fresh ideas.

The **Senior Researcher Awards**, in turn, acknowledge established researchers for their achievements and excellence in European research projects.

Further, TRA VISIONS 2026 is continuing the **Special Honorary Award**, introduced in the TRA VISIONS 2022 edition, and dedicated to senior researchers who are about to complete or have completed their career. The Special Honorary Award is awarded to those who made an outstanding and well-recognised contribution to transport-related research and innovation in their respective field, demonstrating ground-breaking and future-oriented views and research.

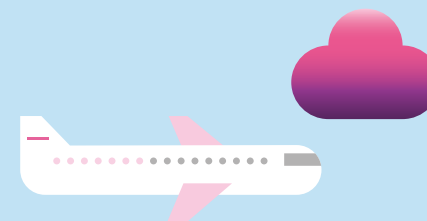
Finally, this edition of TRA introduces the **Host Award**, created by the Hungarian host to highlight remarkable regional research and innovation projects that embody the spirit of the theme of the Conference: *Re-Generation in Transport*™.

The **TRA VISIONS Awards** ceremony took place on the main stage of the **TRA 2026 conference, held in Budapest, Hungary, from 18–21 May 2026**, where winners were recognised and celebrated in front of the broad European transport community.

AWARDS CATEGORIES

Both Young and Senior Awards cover the following six transport categories.

Applicants were requested to select one of the six categories that best align with their contributions.



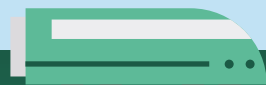
TRANSPORT MODE ROAD

Connected and Automated Vehicles
Road Infrastructure
Traffic Management, Road Safety
Shared Mobility
Active Modes
Electric Vehicles
Electrification of Road Transport
Grid Integration
Batteries
Sustainable Fuels Circular Economy Alternative Materials
Life Cycle Assessment
Software Defined Vehicles
Artificial Intelligence, Digitalisation



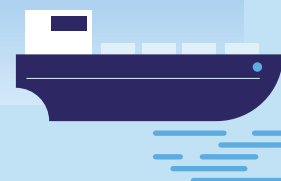
TRANSPORT MODE RAIL

High-Speed Rail and Beyond
Rail Traffic Management, Operation
Rail Vehicles and Infrastructure
Smart Railways, Autonomous Trains
Externalities of Railways
Freight Rail and Terminals
Railways Resilience, Safety and Security
Urban, Suburban and Rural Rail Networks
Rail Passenger Experience
Railway Stations
Railways Economics and Policy



TRANSPORT MODE WATERBORNE

Use of sustainable alternative fuels in waterborne transport, Energy efficiency of waterborne transport
Electrification of waterborne transport
Digital waterborne transport (digital includes automation)
Design and retrofitting of waterborne vessels
Freight transport
Passenger transport
Shipyards and equipment manufacturers
Ports and infrastructure
Safe and secure waterborne transport
Green shipping corridors
All ship types (from inland waterway transport to intercontinental)



TRANSPORT MODE AIRBORNE

Air Traffic Management
Sustainable Aviation Fuels
Electric Aircraft
Hybrid Aircraft; Urban Air Mobility
Airport Innovations
Drone Systems
Decarbonization in Aviation
Air Passenger Experience

TRANSPORT MODE CROSSMODAL PASSENGER

Public Transport
Multimodal Transport
Integrated Policy and Planning
New mobility services including Mobility-as-a-Service
Seamless Connectivity
Smart and Integrated Infrastructure
Transport Hubs
Behavioural change
Active mobility



TRANSPORT MODE CROSSMODAL LOGISTICS

Freight Transport decarbonisation
Emissions measuring and reporting, automation
Physical Internet
Interconnected Logistics
Resilient logistics networks
Ports and hubs
Intermodality/Synchromodality
Transport modes integration in logistics networks, digital technologies (AI, 5G, Digital Twins...) applications in freight transport and logistics
Data exchange and data sharing, Urban logistics, Lastmile Delivery, Integrated Passenger and Freight Systems



TRA RESEARCH TOPICS

Aligned with the TRA 2026 key theme, Re-Generation in Transport, the conference topics focused on horizontal transport challenges.

Applicants of the Young and Senior Awards selected the research topics and subtopics, as defined in the TRA 2026 Call for Papers, that best described their contribution.



USER CENTERED MOBILITY

- . Transport Policy
- . Transport Safety
- . Inclusive Mobility
- . Active Travel Modes
- . Shared Mobility Solutions

GREEN MOBILITY AND DECARBONIZATION

- . Zero Emission Vehicles
- . Electrification and Alternative Fuels
- . Greening Freight Transport
- . Circular Economy
- . Climate Neutral and Smart Cities

PLANNING AND OPERATION

- . Resilient Transport System
- . Urban Infrastructure Management
- . Innovative Logistics Solution
- . Decision Support Analysis
- . Transportation Economics

TRANSPORT DIGITALIZATION

- . Automated Mobility
- . Connected Transport Systems
- . Big Data Analysis
- . Mobility as a Service
- . Predictive Transport Solutions

YOUNG RESEARCHER AWARDS



The TRA VISIONS 2026 Young Researchers Awards targeted young researchers pursuing an MSc or PhD degree, or who have completed their PhD with the defence date after 16 June 2023, at a college, university, or research institute across the European Union, EU Candidate Countries, Potential EU Candidate Countries, and the European Economic Area.

For the 2026 edition of the TRA Conference in Budapest, applicants were required to submit their application in connection with a research paper submitted to the main TRA Conference track (Call for applications).

After that, the applicants were asked to demonstrate how their research addressed key transport challenges related to the TRA 2026 key topics, describe the practical feasibility and potential implementation at industry level, and elaborate on how their research could influence transport policy and decision-making within the European Union (Submission of applications).

This was followed by an Evaluation of Applications period, divided into two steps: a first remote evaluation by two evaluators and a second step in which the shortlisted applicants (10 per mode, 11 for the cases where the 10th and 11th ranked entries were tied) were evaluated by a judging panel during the Shortlisting Event in which the three top applicants per mode (road, rail, waterborne, airborne, crossmodal passenger, and crossmodal logistics) were identified.

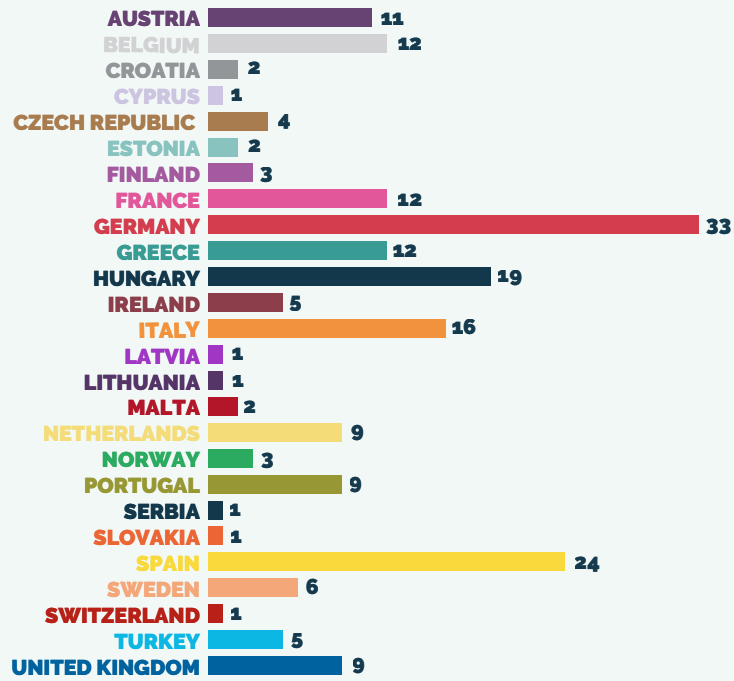
The Winners were recognised and presented with their certificates and prizes by the sponsors at the TRA 2026 Conference ceremony in Budapest.

STATISTICS AND OVERALL RESULTS

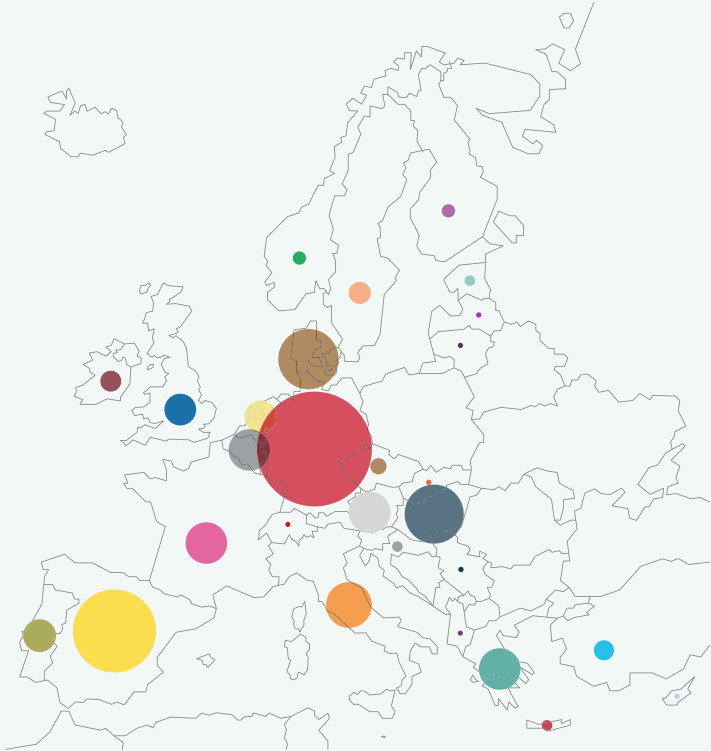
In the TRA VISIONS 2026 Young Researcher Awards, a total of 204 young researchers submitted their contribution eligibly. The participating young researchers were from 26 different EU countries, and 104 different universities and institutions. The following charts contain some statistical information on all the ideas.

YOUNG RESEARCHERS PER COUNTRY

The table below shows the number of young researchers that participated per country. Beginning from TRA 2026, Young researchers were able to join the Awards only as individuals (unlike prior editions, where they could apply as teams of up to 7 students).

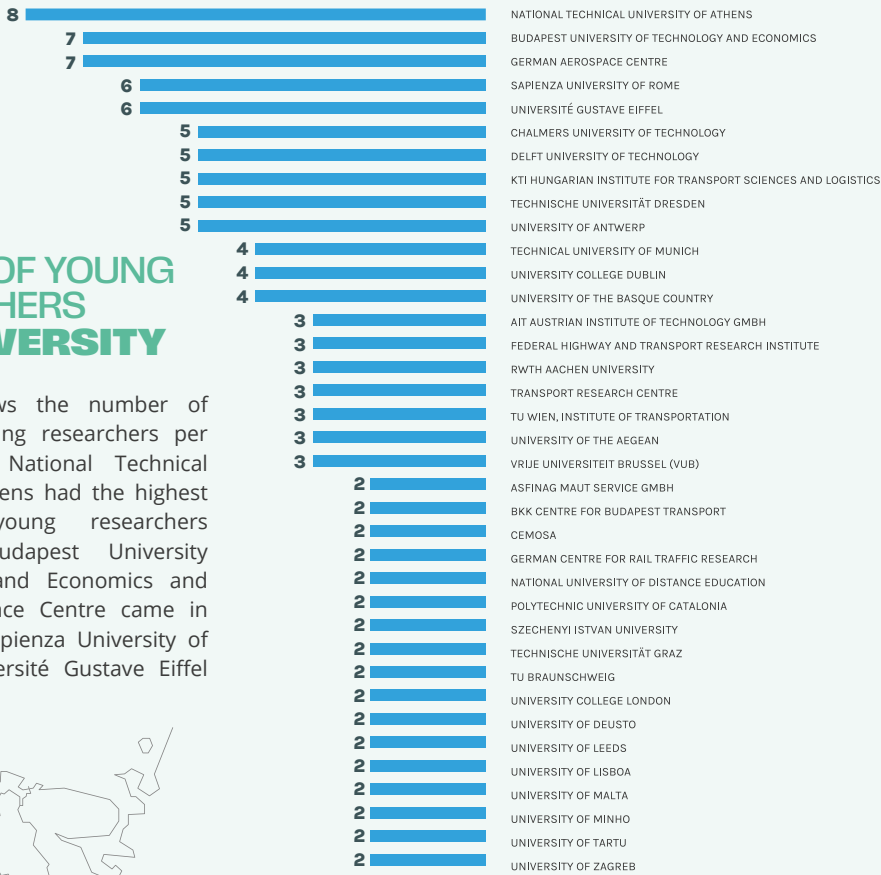


The map below shows the young researchers that participated in a geographical spread.



NUMBER OF YOUNG RESEARCHERS PER UNIVERSITY

This table shows the number of participating young researchers per university. The National Technical University of Athens had the highest number of young researchers participating. Budapest University of Technology and Economics and German Aerospace Centre came in second, while Sapienza University of Rome and Université Gustave Eiffel came in third.

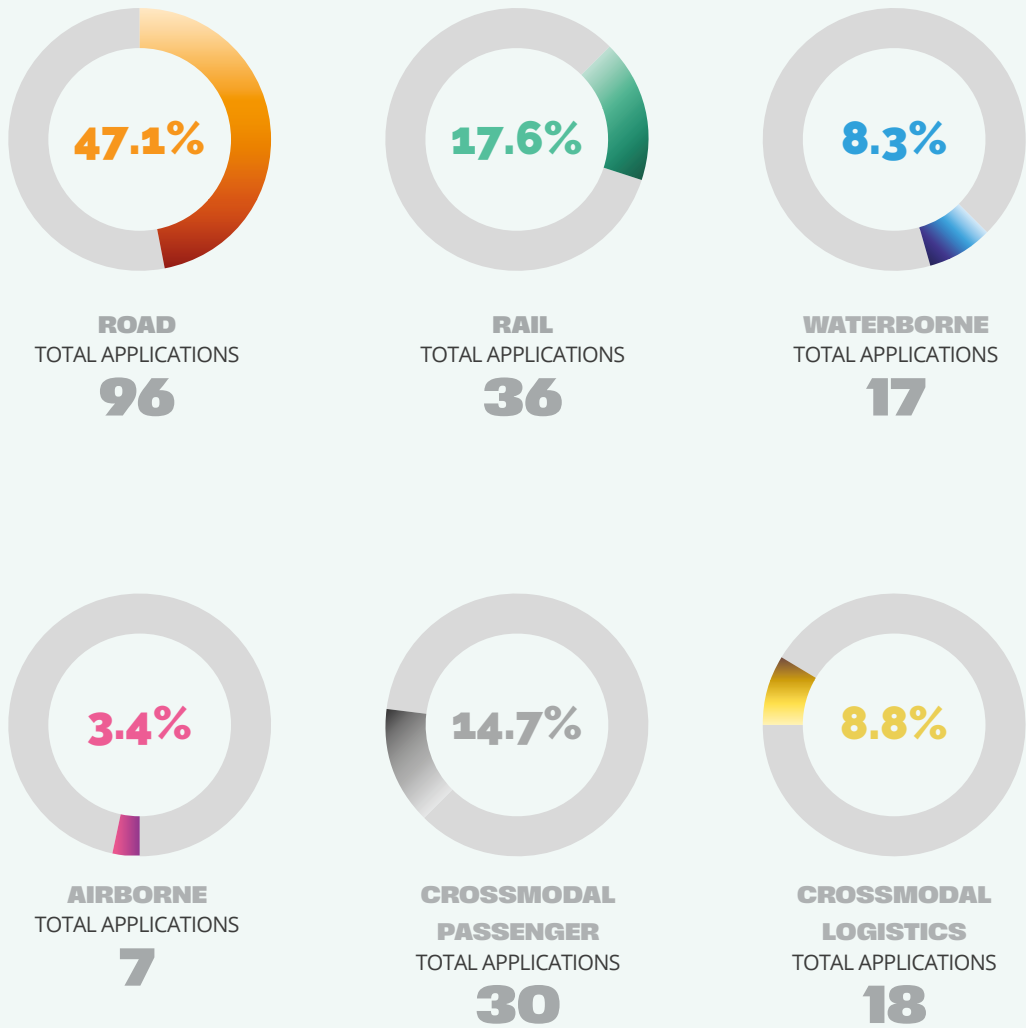


In addition to the institutions shown in the chart above, the following universities each contributed one participating young researcher:

AALTO UNIVERSITY, ANTWERP MANAGEMENT SCHOOL, BIFROST UNIVERSITY / ETH ZÜRICH, CENIT, CODIVE, DEGGENDORF INSTITUTE OF TECHNOLOGY, DOGUS UNIVERSITY, ELTE CENTRE FOR ECONOMIC AND REGIONAL STUDIES IRS, ESE, EUROPEAN UNIVERSITY INSTITUTE, FRANCHE-COMTÉ ÉLECTRONIQUE MÉCANIQUE THERMIQUE ET OPTIQUE - SCIENCES ET TECHNOLOGIES, GEBZE TECHNICAL UNIVERSITY, GHEENT UNIVERSITY, HARDT, HERIOT WATT UNIVERSITY, HORARIOS DO FUNCHAL, TRANSPORTES PUBLICOS SA, UNIVERSIDAD DE CANTABRIA, IN+ - CENTER FOR INNOVATION, TECHNOLOGY AND POLICY RESEARCH, INSTITUTE OF SHIPPING ECONOMICS AND LOGISTICS (ISL), ISTANBUL AREL UNIVERSITY, ISTANBUL METROPOLITAN MUNICIPALITY, JOINT RESEARCH CENTRE, KU LEUVEN, LA ROCHELLE UNIVERSITÉ, LMG MARIN, LNEC, LULEÅ UNIVERSITY OF TECHNOLOGY, MOL PLC, MOLDE UNIVERSITY COLLEGE, NAITEC, NATIONAL DEFENCE UNIVERSITY, POLITECNICO DI MILANO, RHOE P.C., ROYAL COLLEGE OF ART, SCUOLA SUPERIORE SANT'ANNA, SNCF RÉSEAU, TECHNICAL RESEARCH CENTRE OF FINLAND, TECHNISCHE UNIVERSITÄT HAMBURG, TRANSPORT & MOBILITY LEUVEN, TRANSPORT AND TELECOMMUNICATION INSTITUTE, TU DUBLIN, UNIVERSITÀ DEGLI STUDI DI PADOVA, UNIVERSIDAD CARLOS III DE MADRID, UNIVERSIDAD DE CÁDIZ, UNIVERSIDADE DE VIGO, UNIVERSITY OF GYÖR, UNIVERSITY OF AGDER, UNIVERSITY OF BELGRADE, UNIVERSITY OF BOLOGNA, UNIVERSITY OF CYPRUS, UNIVERSITY OF ENNA "KORE" - DEPARTMENT OF ECONOMICS AND LAW, UNIVERSITY OF GENOA, UNIVERSITY OF LEIPZIG, UNIVERSITY OF LIVERPOOL, UNIVERSITY OF MALAGA, UNIVERSITY OF NAPLES, UNIVERSITY OF OULU, UNIVERSITY OF OSLO, UNIVERSITY OF PARDUBICE, UNIVERSITY OF PLYMOUTH, UNIVERSITY OF SURREY, UNIVERSITY OF TWENTE, UNIVERSITY OF ŽILINA, UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA, VILNIUS GEDIMINAS TECHNICAL UNIVERSITY, ZEPPELIN UNIVERSITY, ÉCOLE NATIONALE SUPÉRIEURE MARITIME, ÉCOLE POLYTECHNIQUE

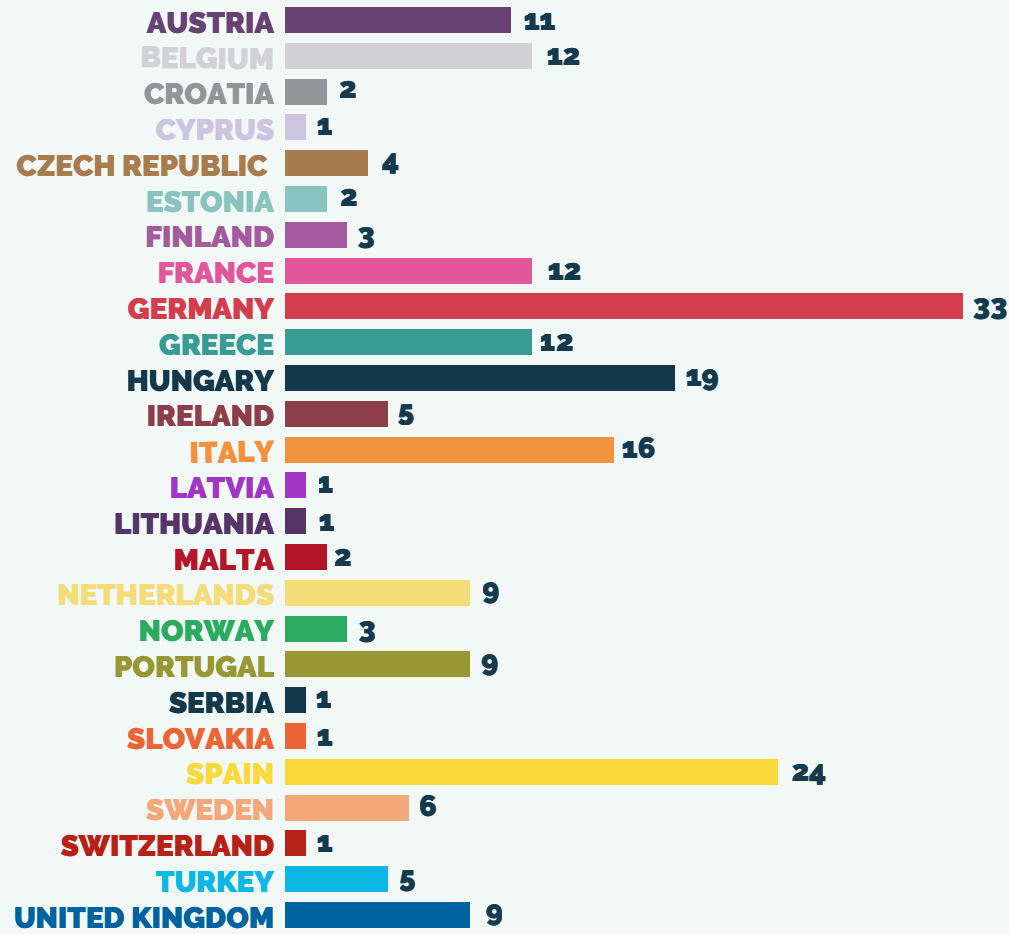
YOUNG RESEARCHER SUBMISSIONS PER MODE

A total of 204 eligible submissions were received across all mode categories: 96 in Road, 36 in Rail, 17 in Waterborne, 7 in Airborne, 30 in Crossmodal Passenger, and 18 in Crossmodal Logistics. The charts below show the number of young researchers ideas submitted per mode in percentage terms.



UNIVERSITIES PER COUNTRY

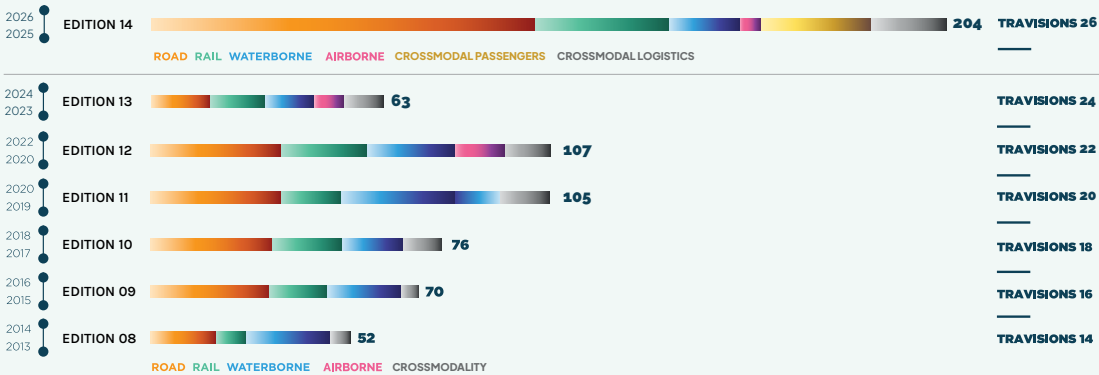
The table below shows the number of universities that participated in the young researchers Awards per country.



The Awards in Numbers: A Historical Overview



This initiative traces its origins to the VISIONS Network of Excellence (2005–2009), a European initiative focused on maritime research and shipbuilding innovation. It evolved into VISIONS OLYMPICS (2009–2012) before expanding to all transport modes as TRA VISIONS (2012–present), becoming an integral part of the Transport Research Arena conferences.



From the TRA VISIONS 2026 edition, the cross-modal category has been split into two distinct categories (Passenger and Logistics) to better reflect the diverse nature of this sector.

The chart above shows the number of young researchers' contributions per year and per mode. Road has traditionally been the most popular transport mode overall, while it can be seen that every year the number of submitted contributions increases as the TRA VISIONS brand increases in popularity and recognition.

Through out the last seven editions:

677

research outcomes.

298.000€

of awards for the young researchers were secured from the European transport industry showing the strong commitment of the sector.

TRANSPORT MODE
ROAD

David Yagüe-Cuevas
Universidad Carlos III de Madrid

Category: Road

Country: Spain

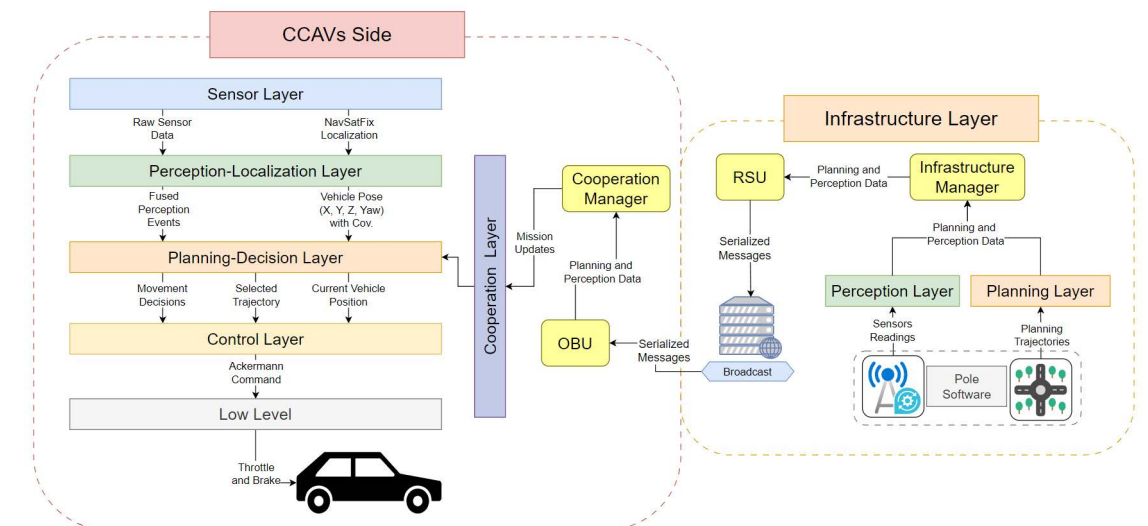
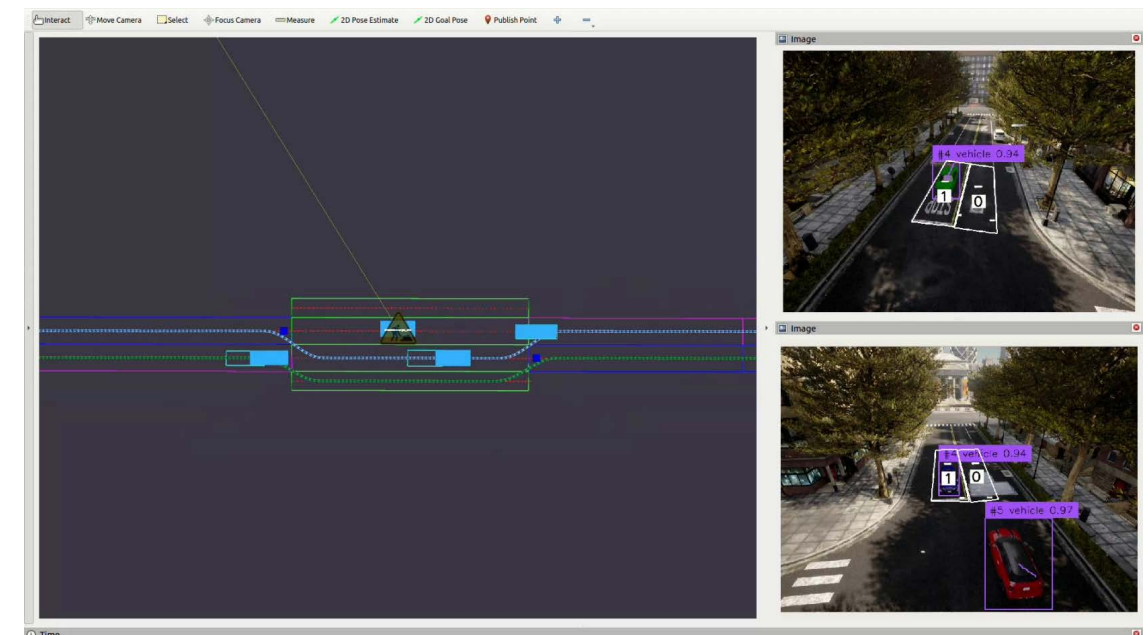
Paper Number: 1910



V2I-based Real-Time Lane Deviation Handling for Automated Vehicles to Face Road Characteristics Changes

One of the main challenges in autonomous driving arises when lane deviations occur due to maintenance works or accidents, diverging from the predefined paths stored in vehicle's high-definition maps. In such scenarios, intelligent vehicles must make rapid decisions to adapt to newly configured, and sometimes previously nonexistent, segments of the roads.

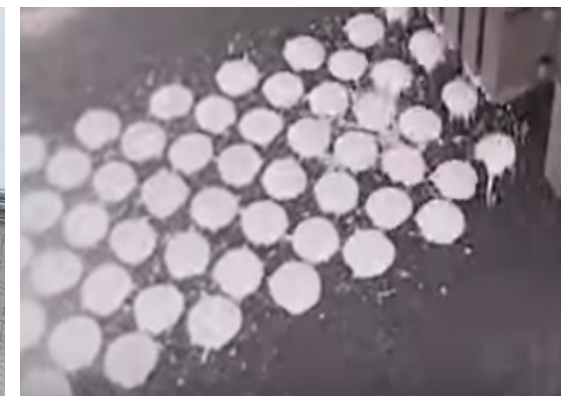
This work proposes a novel solution aimed at preserving a high level of automation in the presence of unexpected lane deviations or obstructions. To achieve this, a mobile computer vision system placed at infrastructure level has been developed, equipped with dual cameras oriented in both driving directions. This device detects dynamic elements relevant to the driving environment and broadcasts planning and perception knowledge using ETSI-compliant CAM and DEMN messages as defined in the V2X European communication standard. These broadcast messages are enriched with recommended GNSS routes as well as conflict zones occupancy detections for the arbitration of incoming CCAVs. Vehicles receiving this information generate a temporary auxiliary trajectory, which they follow as long as communication with the infrastructure is maintained, turning potentially hazardous zones into safer, more manageable environments for navigation. The entire communication system, which aims to demonstrate the advantages of V2X communication in complex traffic areas, is being tested in a real-world environment with a connected automated vehicle and an unconnected vehicle.





Structured Paint Road Markings for Large-Scale Road Digitalization: A Cost-Effective Path Toward Centimeter-Level Positioning and Safer Autonomous Driving

The digitalization of road infrastructure could transform mobility as profoundly as previous waves of digitalization reshaped information technologies. However, existing approaches—such as embedding magnets or binary-coded tags in asphalt—face prohibitive costs, complex deployment, and demanding maintenance, making them unsuitable for large-scale adoption. This paper introduces a novel, cost-effective solution based on structured paint road markings that directly encode pseudo-random binary sequences into the pavement. These raised markings, already deployed worldwide to improve lane visibility in wet conditions, remain imperceptible to drivers while enabling vehicles equipped with cameras or radar sensors to achieve centimeter-level localization. The method leverages existing road-marking practices, ensuring scalability, minimal traffic disruption, and negligible incremental costs. We assess its feasibility across the EU-27's 9 million lane-kilometers, estimate the data storage required, and highlight key applications: enhanced Intelligent Speed Assistance (ISA), seamless handover in SAE Level 3 vehicles, improved platooning stability, and advanced cooperative perception. A TRL6 prototype demonstrates reliable detection of paint drops using mm-wave radar arrays under adverse conditions, with a 24-unit system costing less than €300. The long-term benefits—including accident reduction, traffic synchronization, and environmental sustainability—far outweigh the modest adaptation effort, offering a practical pathway toward a fully digitalized road network.



Shahid Jaman

MOBI-Vrije Universiteit Brussel (VUB)

Category: Road

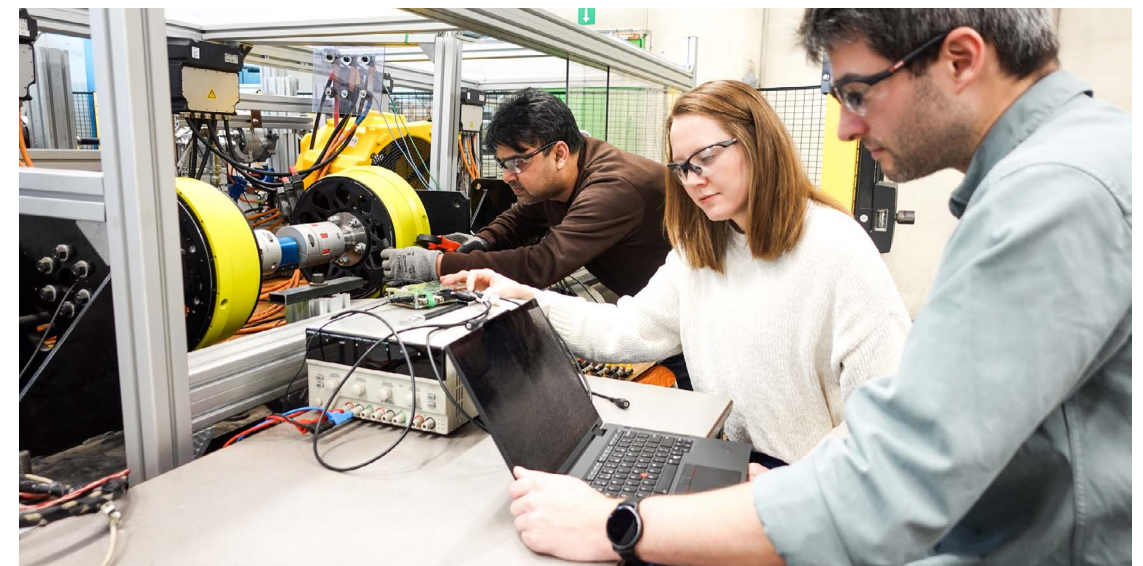
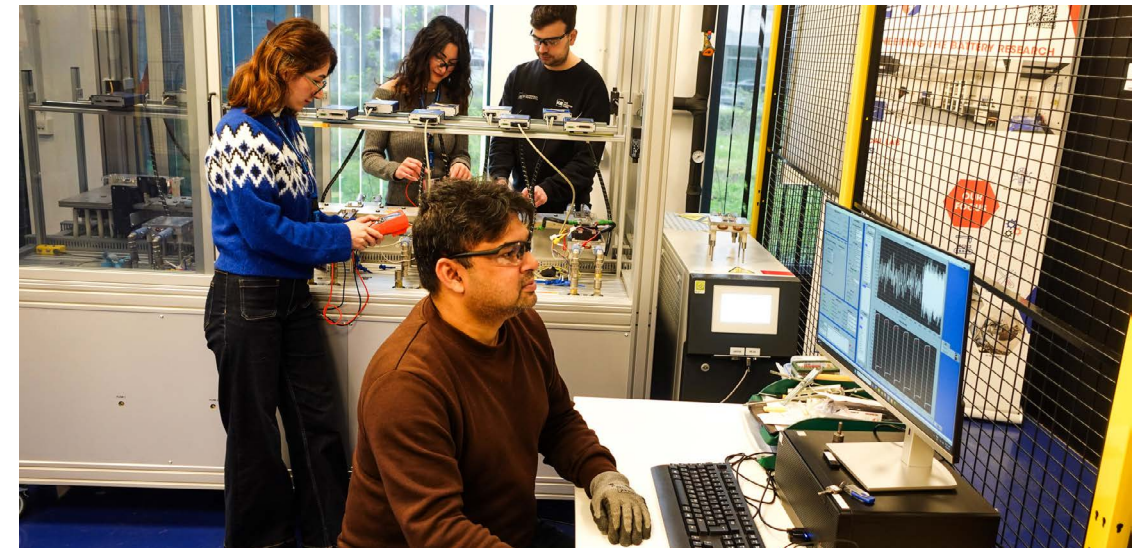
Country: Belgium

Paper Number: 1686



Multi-port Megawatt Charging System (MCS) Hub Optimization Framework for Light and Heavy-duty Electric Vehicles

The road freight electrification requires charging hubs that can meet diverse operational needs at highway rest areas and logistics depots. These charging sites must accommodate both heavy-duty trucks and passenger vehicles, with charging demand varying across use cases such as long-haul rest breaks, overnight depot charging, and mixed urban-highway operations. To enhance flexibility and resilience, hub layouts may also integrate battery energy storage systems (BESS). This paper presents an integrated optimization framework for multi-port Megawatt Charging System (MCS) hubs that serve both heavy-duty (MCS) and light-duty (CCS) vehicles. The framework effectiveness is demonstrated through a case study on a 100 m × 100 m demo site. In the demonstration, the pareto-optimal layouts achieved installation costs of approximately €16.1 million, cabling losses of 28.4–28.7 kWh, and compact land use of 4.1%. Sensitivity analysis highlighted system efficiencies up to 98.9%, with balanced trade-offs between unit cost (0.3–0.55 €/kW) and charging port availability (52–55%). These findings illustrate the potential of systematic optimization to enable scalable, cost-efficient deployment of MCS infrastructure.



OTHER SHORTLISTED

Chen Song
Gustave Eiffel University

Category: Road	Country: France
Paper Number: 1770	

Investigating the Water Evaporation Behavior of Porous Asphalt for Optimizing Its Cooling Potential in Urban Areas

Heatwaves have become more frequent in Europe in recent summers. Because pavements cover about 25–40% of urban land and are typically dark and heat-absorbing, water evaporation cooling based on porous asphalt (PA) is becoming a promising cooling strategy. This study focuses on the water evaporation mechanism, drying process, and cooling effect of PA. An evaporation test methodology was developed to measure the water evaporation process of PA with different gradations. Based on the measured evaporation rate, an Abaqus model was built to quantify the pavement surface cooling effect under controlled conditions. Results show that a larger nominal maximum aggregate size (NMAS) yields larger effective pore sizes and higher early-stage evaporation rates. Under surface wet conditions, the 10 mm NMAS PA's evaporation rate reached 0.515 kg m⁻² h⁻¹ and achieved the largest reduction of −14.9 °C in daytime peak temperature. Once the surface dried and evaporation became diffusion-limited, the evaporation rate was 0.038 kg m⁻² h⁻¹ and the cooling effect was approximately −1 °C. These findings highlight how gradation and surface water availability influence the evaporative cooling of PA, providing guidance for mixture design aimed at mitigating urban heat island effects.

OTHER SHORTLISTED

Xiaojiayue Luo
University College London

Category: Road	Country: United Kingdom
Paper Number: 1806	

Planning for AV Integration in Mixed Traffic: A Techno-Financial Framework for Driverless Shuttle Deployment

The integration of autonomous vehicles (AVs) into existing urban mobility systems brings both operational opportunities and financial uncertainties. This study explores the optimal deployment strategies and costeffectiveness of driverless shuttles (DS) within mixed traffic systems over the next 20 to 30 years. We design three scenarios to evaluate how the level of integration between AVs and conventional transport systems, both public and private, affects operational and financial outcomes using techno-economic models. Multi-source traffic data is collected to simulate mixed traffic environments, while mixed-integer linear programming is applied to generate and solve optimal DS deployment strategies in each scenario. Cost data are gathered from literature and industry sources, and financial performance is assessed through Python-based modelling. The research offers a modular framework for policymakers and mobility operators, providing quantitative methods for future AV deployment under uncertainty.

OTHER SHORTLISTED

Aristotelis Tsoutsanis
National Technical University of Athens

Category: Road	Country: Greece
Paper Number: 1790	

Self-Supervised Detection of Harsh Cornering Events at Scale using Smartphone Sensor Data

This study presents a self-supervised framework for detecting harsh cornering events using smartphone telematics under real-world deployment conditions. GPS-derived trajectory features, orientation-invariant inertial magnitudes, and Open-StreetMap validation are combined to robustly identify candidate turns despite arbitrary device placement and sensor noise. High-confidence pseudo-labels are generated via ensemble anomaly detection, enabling supervised classifiers to learn without manual annotation. Among four evaluated models, a multi-layer perceptron achieved the best performance, and its latent embeddings revealed clear separation between harsh and normal cornering. The results demonstrate that consumer-grade smartphones can reliably capture lateral risky maneuvers at scale, extending prior work focused mainly on longitudinal events such as hard braking. This approach offers a scalable foundation for applications in driver risk assessment, insurance telematics, fleet management, and urban safety planning.

OTHER SHORTLISTED

Ángel Losada Arias
Austrian Institute of Technology (AIT)

Category: Road	Country: Austria
Paper Number: 1815	

Safety Evaluation of Automated Vehicles in Simulated Mixed Traffic Using Machine Learning

This study explores the integration of an automated shuttle -Automated Vehicle (AV)-, in urban mobility through a pilot implementation in Austria. The shuttle operates in a Park & Ride area near a train station to facilitate multimodal transfers and encourage public transport use. To assess safety impacts, the Austrian Institute of Technology deployed four AI-driven Mobility Observation Boxes (MOBs) that detect, classify, and track road users, capturing interactions between the AV and conventional vehicles. Over 10 days, detailed trajectory data were collected to build microscopic traffic models in SUMO software. These models analyze interactions using speed, spacing, and acceleration, generating a conflict database with Surrogate Safety Measures (SSMs) such as Time-to-Collision (TTC), Deceleration Rate to Avoid Collision (DRAC), its reaction-time variant MDRAC, spacing (SGAP), time headway (TGAP), and brake rate (BR). Principal Component Analysis (PCA) was applied to reduce dimensionality, extract latent structures, and statistically compare AV and non-AV conflicts. Results indicated that AV participation is associated with greater spacing, longer headways, and higher minimum TTCs, indicating safer conflict profiles despite slightly higher braking demands. The study presents a robust framework for evaluating real-world AV interactions, with future work extending observation periods and applying the approach in larger urban environments.

OTHER SHORTLISTED

Erick Rodríguez-Esparza
University of Deusto

Category: Road	Country: Spain
Paper Number: 1780	

Simulation-Based Optimization of Roadworks Scheduling in Multimodal Networks under Realistic Constraints

This study presents a simulation-based optimization framework for strategic roadworks planning in multimodal transport networks. The framework integrates real-world capacity reduction scenarios, including full closures and speed restrictions, into a macroscopic simulation model in Aimsun Next. A Bayesian Optimization algorithm is used to search for intervention schedules that minimize disruption under practical constraints such as feasible start dates, multi-phase configurations, and project deadlines. A distinctive feature of the framework is the explicit evaluation of morning and evening peak periods. This dual period assessment captures differences in congestion intensity, spatial distribution, and public transport interactions that are often overlooked in studies based on daily averages or single peak evaluations. By considering both peaks, the framework identifies intervention schedules that remain robust under variable demand conditions and highlights execution windows with lower impacts. The approach is applied to a six-month planning horizon in South Holland, simulated on a weekly basis using official MELVIN roadworks data and regional OD matrices. Results show that optimized schedules reduce cumulative travel time and mitigate disruptions to public transport compared to the original MELVIN-based plan. Overall, the study provides a practical and interpretable decision-support tool for transport authorities, enabling coordinated long-term maintenance while safeguarding reliable multimodal operations.

OTHER SHORTLISTED

Ágoston Pál Sándor
University Of Győr

Category: Road	Country: Hungary
Paper Number: 1808	

Eyes on the Road: A Bicycle Simulator Study of Cyclist Gaze Behavior During Interactions with Autonomous Vehicles

The integration of Autonomous Vehicles (AVs) into urban traffic presents new safety challenges for cyclists. Unlike pedestrians, cyclists travel faster and often share lanes with vehicles, increasing conflict risk. This study addresses the research gap in understanding how cyclists perceive and adapt to AVs by examining their gaze behavior in different infrastructure settings. Using an advanced bicycle simulator, 50 participants with eye-tracking glasses navigated a 200-meter urban road segment. The experiment included 11 scenarios with varying cycling infrastructure and AV penetration rates. We recorded eye-movement data (fixations, saccades, blinks, and pupil behavior), focusing on gaze metrics and heatmaps to analyze how infrastructure and AV presence influenced visual attention. Our results indicate that infrastructure type, not AV presence, primarily shapes gaze behavior. In physically separated lanes, cyclists showed broader visual scanning patterns, with larger saccade amplitudes and wider attention areas. Conversely, shared-lane scenarios led to concentrated gaze and tunnel vision, focusing on immediate threats. Pavement color had only minor effects. These findings show that dedicated cycling infrastructure improves situational awareness by promoting broader visual search strategies. This supports the need for cyclist-centered urban road design to enhance safety in an automated traffic environment.

OTHER SHORTLISTED

Carla De Oliveira Nascimento
Molde University College

Category: Road	Country: Norway
Paper Number: 1698	

Anticipating labour market transitions in connected, cooperative, and automated mobility: a PESTLE-based assessment

The deployment of CCAM is set to reshape Europe’s transport systems, with significant implications for employment, skills, and governance. This paper presents findings from the CCAM-ERAS project, which examines the socio-economic impacts of CCAM through a PESTLE framework. Drawing on 28 expert interviews and three stakeholder workshops, the analysis identifies key barriers, such as regulatory fragmentation, skills gaps, and infrastructure and policy misalignment, alongside enabling conditions like cross-sector partnerships and targeted investment. The findings underscore the need for anticipatory, inclusive policy measures to align CCAM deployment with Europe’s green and digital goals, while ensuring equitable labour market transitions and institutional preparedness.

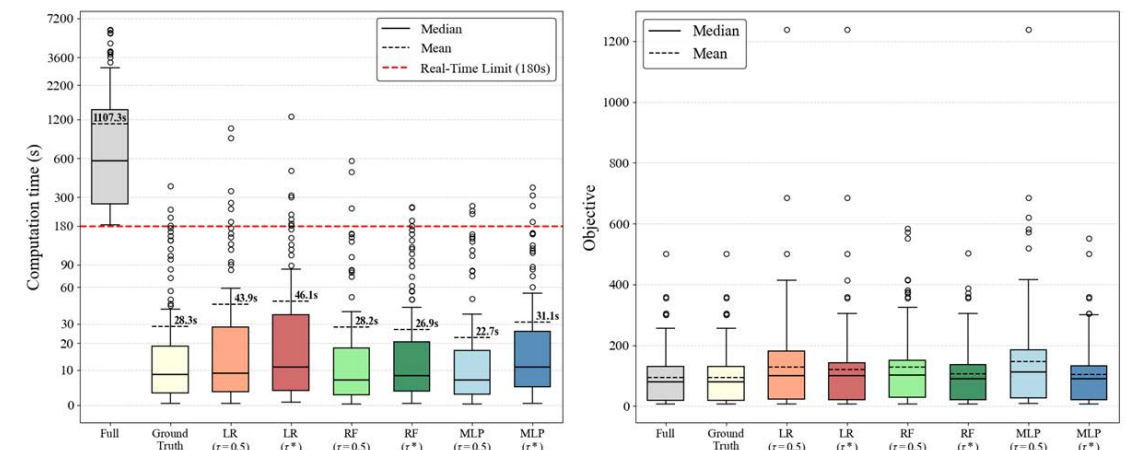
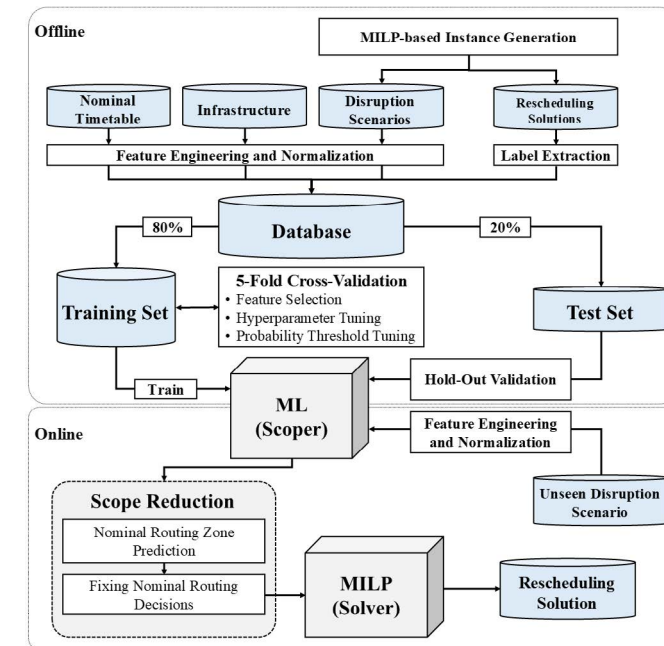
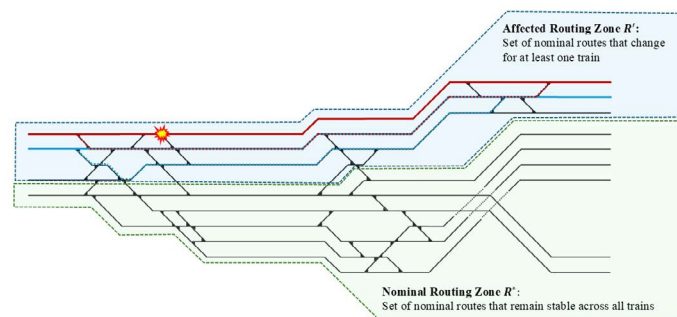
TRANSPORT MODE
RAIL



Learning-Based Problem Reduction for Real-Time Train Rescheduling in Station Areas

Train rescheduling is a core function of railway traffic management when disruptions invalidate the nominal timetable. In practice, dispatchers must make rapid and high-quality decisions to restore timetable feasibility. While mathematical optimization approaches can deliver exact rescheduling solutions, their real-time applicability is limited by excessive computation times that grow disproportionately with problem complexity. To address this challenge, we propose a data-driven problem reduction heuristic that leverages supervised Machine Learning (ML) to accelerate optimization-based train rescheduling in station areas.

The key idea is to learn from pre-solved instances which routing-related decision variables are irrelevant and can therefore be fixed before optimization. This reduces the search space of the solver and enables substantially faster computation while preserving feasibility and solution quality. The method is evaluated on generated disruption scenarios within a real-world station area using a representative ML classifier. Results show computation time reductions of more than 90%, with improved or preserved solution quality in 74.2% of cases tested under real-time conditions. These findings demonstrate the potential of ML-assisted preprocessing to enable practical implementation of optimization-based rescheduling models in intelligent railway traffic management systems.



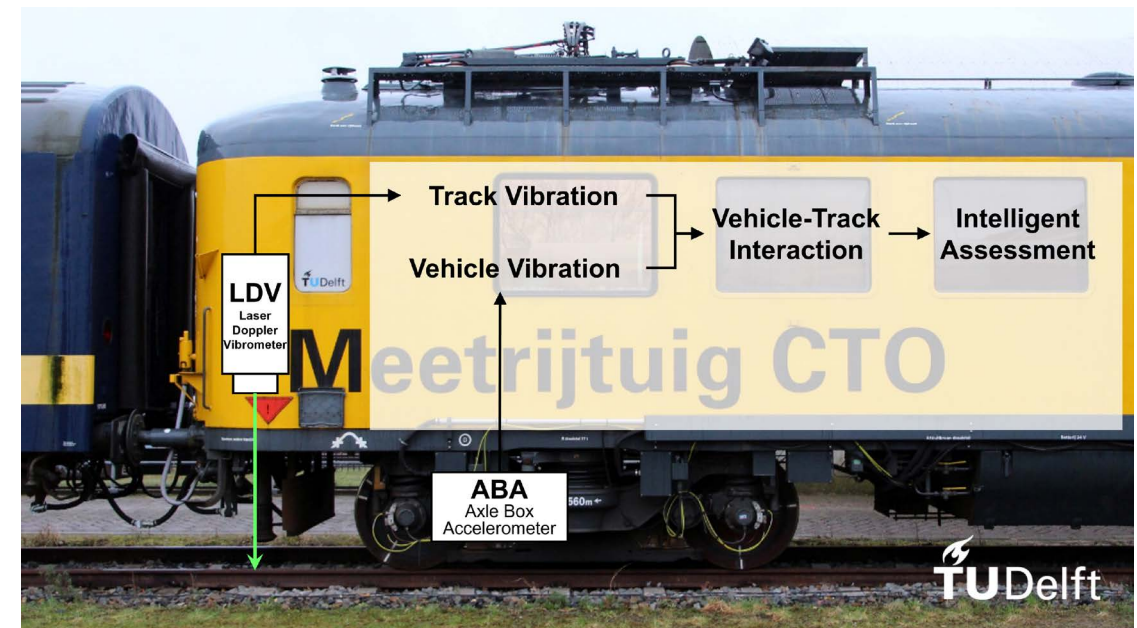


Monitoring Dynamic Stiffness of Railway Tracks from a Moving Vehicle with Laser Doppler Vibrometer

Monitoring dynamic properties of railway tracks is crucial for train operation safety, quality, and track maintenance. Among these properties, track dynamic stiffness is an informative representation of the load-response relationship over a wide frequency range. They are typically measured by impact modal testing, which is time-consuming, labor-intensive, and intrusive to train operation.

At TU Delft, with the support of EU-RAIL Project IAM4RAIL and ProRail, we are developing a novel onboard monitoring technology to continuously measure track dynamic stiffness along a railway track. The moving train serves as the excitation source, and the axle box acceleration (ABA) is measured to represent the dynamic load. Simultaneously, track vibration responses are measured contactlessly using a laser Doppler vibrometer (LDV) onboard. The ABA and LDV measurements are further combined to estimate location-specific transfer functions characterizing dynamic load-response relationships.

This paper introduces how our innovations overcome key challenges from speckle noise, laser head motion, unknown wheel-rail forces, and uncertain vehicle parameters. We demonstrate their effectiveness through laboratory validation on the V-Track test rig and field validation on the Dutch railway. This technology enables frequent monitoring and updating of track dynamic properties from in-service trains, supporting the digitization, prescriptive analysis, and predictive maintenance of rail infrastructure.



Réka Kertész-Doffkay

Hungarian Institute for Transport Sciences and Logistics (KTI)

Category: Rail

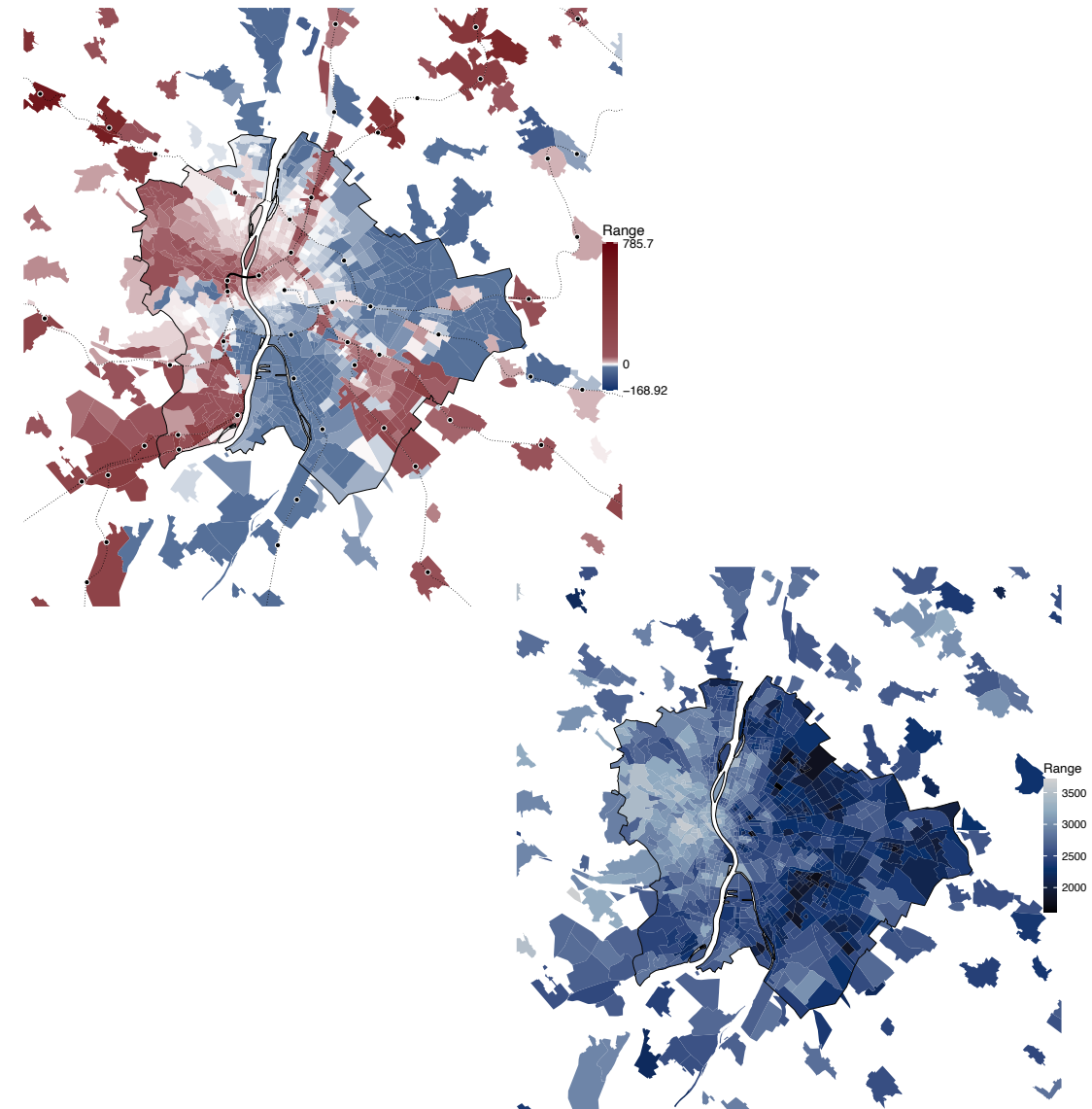
Country: Hungary

Paper Number: 1707



Mode Shift Versus Urban Sprawl: A Quantitative Spatial Model for a Suburban Railway Policy in Budapest

Investing in suburban public transport is often promoted to encourage mode shift and mitigate the negative impacts of car use. However, improved suburban access may unintentionally drive suburbanization and urban sprawl, introducing unexpected externalities. This study examines these counteracting effects using a spatial computable general equilibrium model calibrated as a quantitative spatial model. The method is applied to a proposed railway tunnel under the Danube in Budapest. Results show an increase in public transport use along the railway lines, alleviating road congestion in the city center. While evidence of urban sprawl emerges, the model also reveals that reduced car congestion may prompt some inner-city residents to revert to car use. These findings suggest that investments in suburban public transport should be paired with traffic calming measures to prevent offsetting behavioral responses and maximize the policy's effectiveness.



Israel Alejandro Hernández González
Centro de Estudios de Materiales y Control de Obra (CEMOSA)

Category: Rail	Country: Spain
Paper Number: 1700	

Real-Time Monitoring Platform for Railway Bridges Using Operational Modal Analysis and Artificial Intelligence

This paper presents a digital platform for real-time Structural Health Monitoring (SHM) of railway bridges, integrating Operational Modal Analysis (OMA), machine learning, and artificial intelligence (AI). The system allows continuous assessment of bridge performance under traffic without service interruption. Modal parameters are extracted using subspace identification to detect subtle changes in dynamic behavior. Environmental effects are compensated through data-driven models based on principal component analysis and temperature frequency correction. AI-based metamodels enable localization of structural anomalies, if present. The platform features a digital twin interface that visualizes the evolution of dynamic parameters over time, along with control charts to identify potential failure mechanisms. The system is currently implemented on the Huerta de Mateo Viaduct, a prestressed concrete railway bridge in Minglanilla (Cuenca), on the Madrid-Valencia high-speed rail line. This deployment demonstrates the platform’s capacity to monitor structural condition and support sustainable maintenance planning. The proposed solution contributes to user-centered and green mobility by improving safety and efficiency in railway infrastructure through advanced monitoring technologies.

Wassamon Phusakulkajorn
Delft University of Technology

Category: Rail	Country: Netherlands
Paper Number: 1694	

Tailored AI for Predictive Railway Maintenance

This work introduces advanced artificial intelligence methodologies to transform predictive maintenance of railway infrastructure. It addresses three critical challenges: early detection of rail defects using axle box acceleration (ABA), interpretation of unlabelled vibration data from advanced sensors (ABA and laser Doppler vibrometer, LDV), and integration of heterogeneous monitoring technologies for transition zone assessment. The main contributions are: (1) a spiking neural network for detecting subtle rail surface defects at 25.6 kHz from multiple ABA measurements; (2) an unsupervised representation learning method, combining empirical mode decomposition and a convolutional autoencoder, for detecting rail defects with ABA at 25.6 kHz and loose fasteners with LDV at 102.4 kHz; and (3) an data fusion framework that integrates ABA, InSAR, and track geometry measurements for more frequent health assessments of transition zones. Validation on Dutch and Swedish rail networks confirmed the potential for more intelligent, resilient, and transparent maintenance. Supported by ProRail, IN2TRACK3, and IAM4RAIL, this research advances European innovation priorities and knowledge transfer. Publications include ASOC, IEEE TITS, and IEEE TIM, with further papers under submission and in preparation to extend impact. A review paper with DB and ProRail received the Best Paper Award from journal ITI.

Alfredo Serafini
Luleå University of Technology

Category: Rail	Country: Sweden
Paper Number: 1763	

Implementing Variational Physics-Informed Neural Networks for Wheel-Rail Contact: A Sustainable and Intelligent Computing Approach

Railway transportation is a sustainable industrial sector in continuous evolution with the integration of AI and digitalisation to increase passenger safety and comfort while facilitating railway personnel's routine decision-making in maintenance procedures.

This study compares traditional Physics-Informed Neural Networks (PINNs) with Variational Physics-Informed Neural Networks (VPINNs) for wheel-rail contact analysis using the PhysicsNeMo framework that combines physics knowledge and machine learning (ML) belonging to Scientific Machine Learning (SciML).

The VPINN method employs weak formulation instead of strong-form partial differential equations (PDEs), significantly reducing computational costs, offering enhanced algorithmic stability and training convergence compared to vanilla PINN, making it better suited for accelerated high-performance computing (HPC) clusters.

The major cost of current AI is energy consumption for training large models and data, which raises compelling concerns about energy demand and environmental impact. The key innovation of VPINN is to address major Physics-Informed Neural Network (PINN) limitations through integration by parts, which reduces differential operator order, requiring lower solution regularity, hence more stability, compelling reduction of computational cost, energy consumption and carbon footprint.

This work addresses a key research gap in the railway sector, where PINN implementation remains limited compared to other industrial sectors, e.g. aerospace, automotive and energy exploration.

The challenges of this work are PINN complex fine-tuning hyperparameters during training. Second, define the train wheel geometry profile to be enforced into the network loss function as hard constraints, such that the network can learn the correct object geometry and wheel-rail contact conditions. The dense neural network (DNN) is guided by underlying physics governing equations, i.e. Navier-Cauchy, making the outputs of the wheel-rail contact problem a more explainable and interpretable form of the 2nd AI revolution.

The research aims to provide a more efficient and sustainable accelerated physics-driven computation on HPC, together with methodology and main results in the form of intuitive and comprehensive prognostic parameters, e.g stress and displacement fields of the wheel under train load. These results aid in supporting the railway maintainers to evaluate root causes of damage generation and next predictive maintenance planning in agreement with EU transport policy priorities and ISO or EN standards.

Rim Brahim
Gustave Eiffel University

Category: Rail	Country: France
Paper Number: 1679	

Level Crossing Traffic Management for an Innovative On-Demand Public Transport Rail System

Managing priority at intersections where conventional road vehicles interact with automated light rail systems poses new challenges, particularly with the emergence of Ferromobile.

Ferromobile is an autonomous public transport service operating on existing railways, either through fixed schedules or demand-responsive transport (DRT). By reactivating disused rural lines in France, it aims to improve regional mobility. Unlike conventional trains, Ferromobiles resemble road shuttles in size and weight, leading to specific operational concerns at level crossings (LC).

The irregular arrivals inherent to on-demand services make granting systematic priority to Ferromobiles problematic, as it may generate congestion and unsafe driver behavior. This calls for a redefinition of priority rules between rail and road traffic.

We propose an optimization-based framework that relies on a moving time-window to dynamically allocate passage slots to Ferromobiles while respecting safety constraints and traffic throughput objectives. The objective function pursues two goals:

(i) minimizing disruptions to road traffic and (ii) reducing delays in Ferromobile travel times. The proposed model is implemented and tested in Python, providing a foundation for evaluating operational performance and supporting decision-making for future deployment.

Domenico Uomo
Scuola Superiore Sant’Anna

Category: Rail	Country: Italy
Paper Number: 1798	

A software framework for virtualized next-generation ERTMS applications

The next generation European Rail Traffic Management System (ERTMS) can take advantage of emerging software technologies, such as virtualization, to improve the efficiency and dependability of railway services. However, the adoption of such technologies needs a careful analysis: for instance, softwarization introduces a level of unpredictability that must be meticulously managed. In this paper, a software framework for the deployment of an extensible and flexible ERTMS that aims to comply with real-time and fault-tolerance requirements is proposed. The presented solution leverages safe redundancy mechanisms, hard real-time frameworks, and a microservices approach to enable the implementation of additional tasks for the elaboration of the vast amount of currently underutilized railway data. Such tasks include predictive maintenance and speed curve management, which in turn enhance the overall service capabilities.

A preliminary test of the proposed configuration, carried out on the Shift2Rail OPTIMA platform for ERTMS using railway log data, is illustrated.

Prasannavenkatesh Balaji
German Centre for Rail Traffic Research (DZSF)

Category: Rail	Country: Germany
Paper Number: 1777	

Automatic Train Operation: A Comparative Review

Over the past decade, advances in artificial intelligence (AI) have substantially improved the capabilities of autonomous vehicles (AVs). High levels of automation—especially in public transport modes such as rail—offer significant benefits, including increased network capacity and reduced vulnerability to human error.

This paper presents a comparative review of the two transport sectors most transformed by AI-based perception: road and rail. The review begins with an outline of the regulatory frameworks that govern safe AI deployment in these sectors. It then examines in detail two critical research areas that challenge the advancement of autonomous train operation (ATO) research: long-range perception and data related issues. Finally, the potential for cross-domain transferability of methods and approaches is discussed.

OTHER SHORTLISTED

María José Bermejo-Barrero
University of Malaga

Category: Rail	Country: Spain
Paper Number: 1748	

Analysis of scientific interest
in the situation of women in the
railway sector

According to several railway organizations, there is a growing interest in promoting women's participation and advancing gender equality in the traditionally male-dominated railway industry. To explore this trend, a bibliometric analysis was conducted, followed by a review of the most cited articles indexed in Web of Science and Scopus over the last decade (2015–2024). The purpose is to assess the evolution of academic output, key contributors, main topics, and methodological trends, providing a foundation for future research and strategic actions to foster a more diverse and inclusive railway industry. The findings reveal that research on women in rail is expanding but with limited impact, centered on national studies of noise, health, and mobility, with more focus on user experience than on women as workers or leaders, underscoring the need for qualitative approaches to address gender gaps.

TRANSPORT MODE

WATERBORNE

Fayas Malik Kanchiralla
Chalmers University of Technology

Category: **Waterborne**

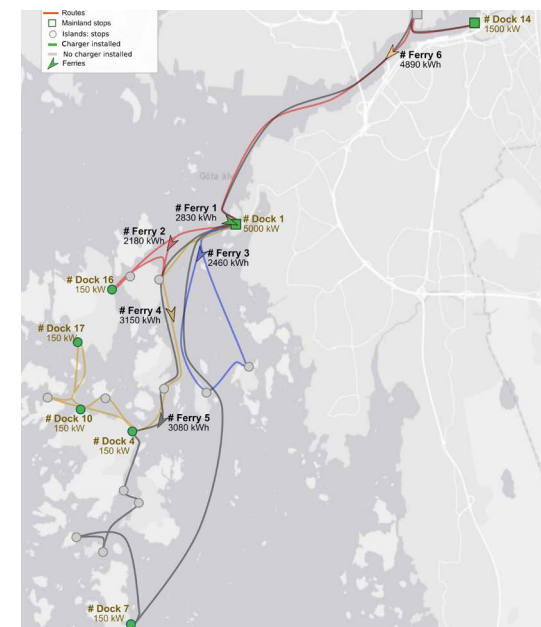
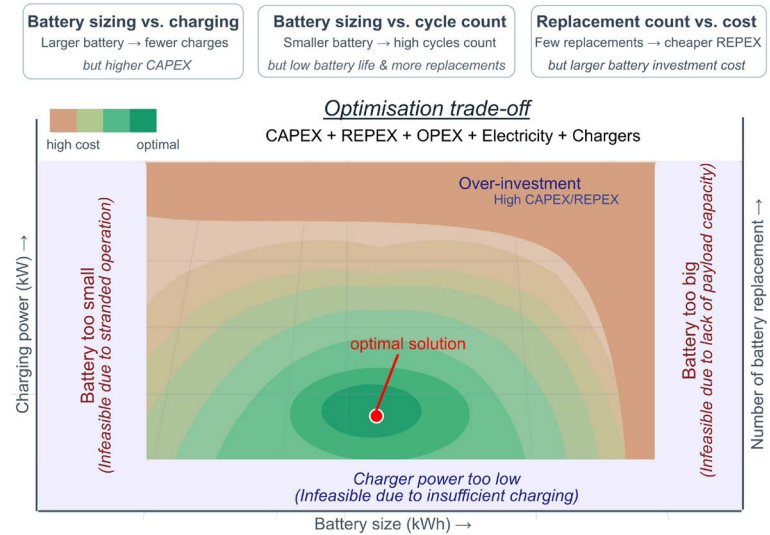
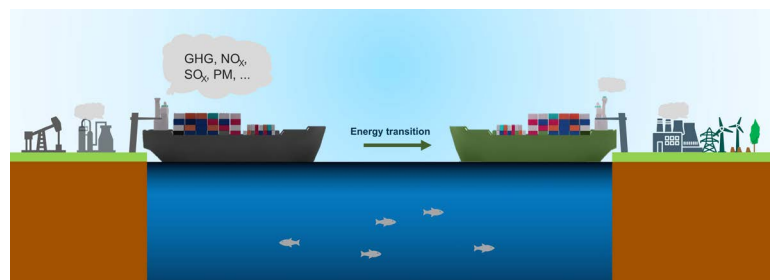
Country: **Sweden**

Paper Number: **1660**



Optimizing battery size and charging infrastructure for public ferry fleet electrification

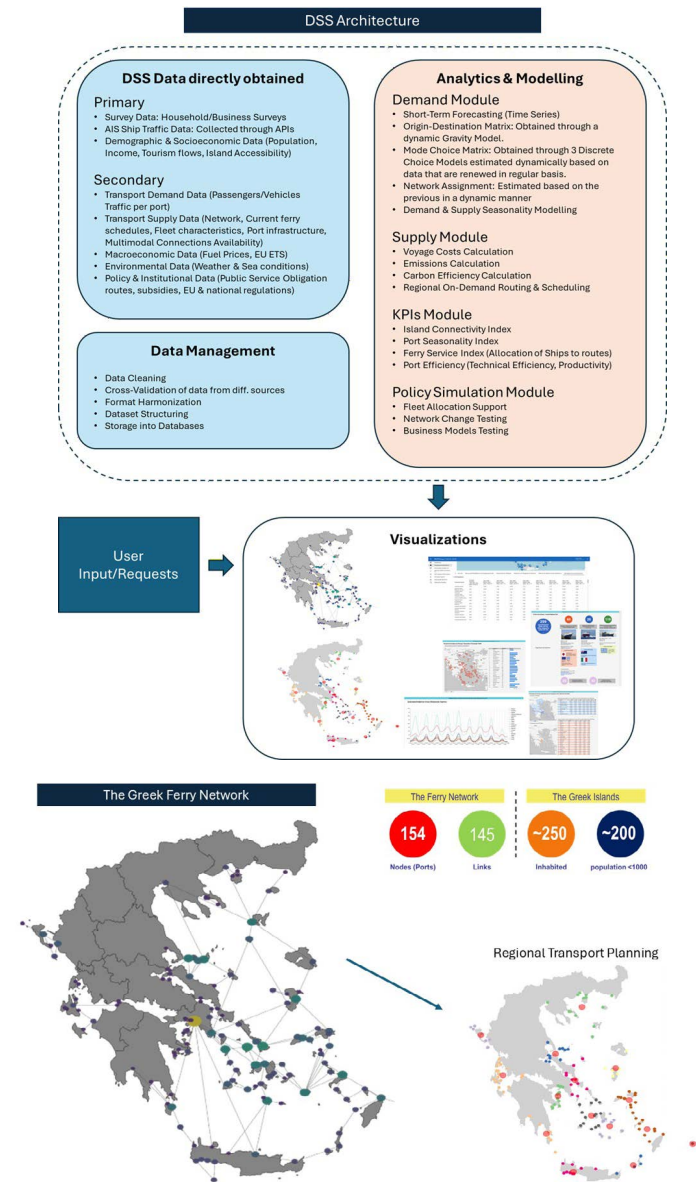
Ferry electrification plays a crucial role in reducing greenhouse gas and air emissions from transport, particularly in coastal and archipelagic countries. Current approaches typically emphasize battery electric range for continuous daily operation with night charging to match diesel ferry performance. This study develops a mixed-integer linear programming model to minimize the total cost of ownership for a battery electric ferry fleet while determining optimal battery sizes, charging locations, and charging power capacities. The study evaluates two scenarios for the public ferry fleet in Gothenburg, Sweden, which comprises six ferries operating across 19 docks: fixed routes with current schedules and flexible route assignments that maintain the overall schedule. Results show that flexible routing (Scenario 2) reduces the required charging infrastructure power by 70% and the total system cost by 10%. This cost reduction makes electrification more competitive than equivalent biodiesel-powered vessels. And with policies like a carbon tax around 100€/tCO₂eq, an electric ferry fleet can be competitive with fossil diesel. Our optimization framework demonstrates that strategic placement of charging stations, power allocation at each location, and coordinated charging strategies enable significant system cost reductions. The optimization results indicate that the underestimation of ferry electrification potential as coordinated fleet operations are neglected.





Towards Development of a Decision-Support System for planning of services in the passenger ferry industry

This paper proposes a Decision Support System (DSS) for Greek coastal shipping, which plays a critical role in ensuring connectivity among the country's many islands, supporting local economies and national cohesion. However, effective planning and management are challenged by factors such as seasonal demand fluctuations, infrastructure limitations, vessel availability, vessel indivisibility and evolving environmental policies. The proposed DSS integrates multimodal datasets, including demand, supply and demographic data, and combines them with optimization algorithms, demand forecasting models, and policy simulation tools. It enables stakeholders—such as policymakers, port authorities, and shipping companies—to evaluate scenarios related to route planning, subsidy allocation, fleet composition, and environmental impact. Emphasis is placed on ensuring equitable service provision to remote islands, while improving efficiency and sustainability. The DSS incorporates a user-friendly interface with visualizations to support informed decision-making. Pilot applications demonstrate its potential in guiding restructuring of public service obligation (PSO) routes, enhancing inter-island connectivity, and supporting investments in low-emission vessels. The system offers a valuable tool for fostering resilient, efficient, and environmentally responsible coastal shipping, especially in light of challenges such as aggregate demand fluctuations, rapidly changing users' preferences & needs, energy transition, and regional development targets.

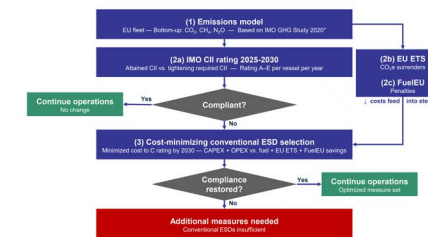




Simulation of Carbon Intensity Indicator compliance and retrofit strategies for the North and Baltic Sea fleet

Reducing carbon dioxide emissions from maritime transport requires strategies that account for the diversity of ship types, operations, and mitigation options. This need is particularly pressing in the North and Baltic Sea region, where dense traffic and ambitious environmental regulations demand tailored rather than generic solutions. We present a simulation-based framework to evaluate vessel-level compliance with the Carbon Intensity Indicator regulation introduced by the International Maritime Organization. The model combines detailed technical ship data with statistically derived operational profiles to estimate fuel consumption, emissions, and compliance trajectories. Mitigation is applied sequentially: first through operational adjustments, followed by retrofitting of energy saving devices. Vessels that remain non-compliant are assumed to be withdrawn from service, with associated losses in transport capacity tracked to quantify the demand for replacement tonnage. A case study of 5,067 merchant vessels in the North and Baltic Seas illustrates these dynamics. By 2035, more than 4,000 retrofits are projected, while older vessels – particularly in passenger and rolling cargo categories – face significant scrapping. The framework highlights both the potential and the limitations of retrofitting in meeting decarbonization targets and establishes a foundation for future work integrating fuel-switching pathways and newbuild dynamics.

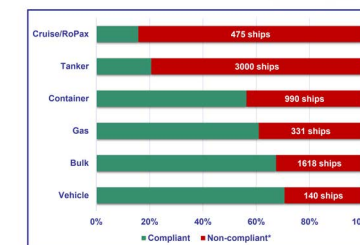
STUDY DESIGN



*IMO: Fourth IMO Greenhouse Gas Study 2020 (2021)

TRANSPORT RESEARCH ARENA BUDAPEST 19-20/05/26 TRA

FLEET-LEVEL CII COMPLIANCE BY 2030



6,554 vessels non-compliant by 2030 under business as usual assumptions (51% of fleet)

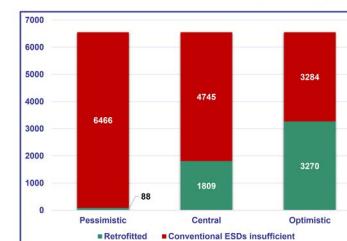
Spike in 2027
2,260 new triggers

60% via Dx3 (2025-2030 total)
Dominant compliance mechanism

*Non-compliant = triggered for corrective action (CII Rating Ex1 or 3x consecutive D)

TRANSPORT RESEARCH ARENA BUDAPEST 19-20/05/26 TRA

RETROFIT FEASIBILITY ACROSS SCENARIOS



Pessimistic
1.3% of non-compliant ships retrofitted

Central
27.6%

Optimistic
49.9%

Even under optimistic assumptions, ~50% of the vessels remain non-compliant

TRANSPORT RESEARCH ARENA BUDAPEST 19-20/05/26 TRA

Matej Fabijanić
University of Zagreb

Category: Waterborne Country: Croatia
Paper Number: 1687

Maritime Object Detection Using Lightweight Deep Learning Models on Low-Power Edge Devices

Reliable maritime situational awareness is critical for safe navigation, yet conventional technologies such as radar and AIS often fail to detect small or non-cooperative vessels and provide only limited scene understanding. Vision-based object detection offers a complementary solution, but deploying deep learning models on board smaller craft requires balancing accuracy against strict energy and latency constraints. This work investigates lightweight deep learning architectures for maritime object detection and their suitability for embedded inference. A unified dataset was created by combining several public maritime datasets with newly annotated footage from the Adriatic Sea, providing a diverse basis for training. Convolutional and attention based detectors were trained on this dataset and optimized for edge execution. The models were deployed and benchmarked on the NVIDIA Jetson Orin Nano, a representative low-power embedded GPU platform. Results show that modern lightweight detectors achieve competitive performance while remaining within the power and resource budgets of such devices. The evaluation further highlights the challenges of generalizing to unseen coastal environments. Overall, the findings confirm the feasibility of vision based maritime perception on embedded platforms, supporting future developments in autonomous surface vessels and scalable coastal monitoring.

Evelina Skorikova
University College London

Category: Waterborne Country: United Kingdom
Paper Number: 1822

Alternative Fuels in the Marine Industry – Technology Review and Life Cycle Assessment

The maritime transport industry requires a rapid decarbonization of the sector with alternative fuels aligned to International Maritime Organization's targets. Current environmental assessments lack operational realism and inclusion of upstream emissions. This study develops a hybrid Life Cycle Assessment (LCA) model, that integrates revised approaches to account upstream emissions with calibrated operational regimes of vessels under alternative fuels. Two case studies are used to validate the model. The work overviews electricity grid effects on upstream emissions and adopts marginal projections in the consequential part of LCA. Recommendations are stated based on the prognosis for fuel integration and adoption speeds.

OTHER SHORTLISTED

Felipe Bedoya Maya
University of Antwerp

Category: Waterborne Country: Belgium
Paper Number: 1722

Resilience in inland shipping: A network analysis of the Rhine-Alpine Corridor under global disruptions

There is a limited understanding of how port-hinterland connections via inland shipping respond to major disruptions. This study investigates how containerized inland waterway transport in the Rhine-Alpine Corridor adapted after global disruptions between 2007 and 2022. Employing network analysis, the paper examines regional transport hubs and reveals how their connections evolved in response to events such as the financial crisis, critically low water levels, and geopolitical instability. The results provide insights into the vulnerability of cargo flows during disruptive years, along with distinct shifts in network structure following each event. The dynamic connectivity assessment reveals the degree of robustness and redundancy across the corridor, offering practical guidance to support the formulation of regional responses to future disruptions.

OTHER SHORTLISTED

Nikos Kougiatsos
Delft University of Technology

Category: Waterborne Country: Netherlands
Paper Number: 1871

Virtual Sensor-Informed Motion Planning for Safe Autonomous Waterborne Navigation

The European Union’s ambition for climate neutrality by 2050 has accelerated the development of Autonomous Surface Vessels (ASVs), which hold promise for safer, more efficient, and cost-effective waterborne transport. Autonomous Navigation is enabled by three interconnected systems, the Guidance, Navigation, and Control (GNC) systems. Guidance is a critical system used during the vessel’s navigation, designed for objectives such as the planning of a safe path to be applied by the ASV, and collision avoidance. This paper proposes a novel Virtual Sensor-Informed motion planning scheme, with built-in resilience against sensor faults and environmental disturbances. The guidance system uses both hardware sensors and model-based virtual sensors, which act as software redundancies to mitigate sensor faults. A first-principle maneuvering model is employed to capture vessel dynamics, leveraging its modular input structure that incorporates both external and hull-induced forces. The method is validated through a realistic case study involving a RO/RO cargo vessel navigating an operational route. Simulation results demonstrate the efficiency of the proposed guidance scheme in improving path-following accuracy and robustness. The integration of virtual sensors into the guidance subsystem contributes to safer, more resilient autonomous navigation, with promising applicability to European inland and coastal waterways.

Nimni Pannila
Technical Research Centre of Finland (VTT)

Category: Waterborne	Country: Finland
Paper Number: 1764	

OnDyna - Optimal design tool Consequences of sudden port call changes on maritime stakeholders

The port call process is a critical operation that ensures the smooth arrival and departure of vessels. However, sudden changes in port calls are very frequent despite their significant financial and environmental impacts, and this normalization has led to limited research on their effects across supply chains. Addressing this gap, the study explores the impacts of sudden port call changes on stakeholders involved in the process. A multi-stakeholder perspective is adopted through interviews with 32 professionals representing port authorities, terminal operators, shipping lines, cargo owners, logistics and freight forwarding companies, port service providers, maritime software providers, and regulatory agencies across European regions. Using thematic analysis, the study identifies ten impact themes.

Queueing of vessels emerged as the most significant consequence, followed by increased costs due to port call changes. Stakeholders also highlight the cascading effects of such changes throughout the value chain. The findings confirm the necessity of streamlining the port call process by integrating Just-In-Time arrivals. Furthermore, the study emphasizes the importance of incorporating the perspectives and concerns of diverse stakeholders when designing improved port call systems and related regulations. This inclusive approach is essential for effective incentivisation and the successful adoption of a more streamlined port call process.

Alexandre Bellof
LMG MARIN France

Category: Waterborne	Country: France
Paper Number: 1873	

Post-carbon by design: A modern reinterpretation of sailing cargo ships for sustainable decarbonisation

The maritime sector remains heavily dependent on fossil fuels, with ship designs historically shaped by energy abundance and optimized for speed, size, and economies of scale. While synthetic fuels may reduce operational emissions, they increase upstream energy and material demands. Wind propulsion offers an alternative pathway but has been limited by hulls designed for propeller-based systems.

This paper outlines the objective, research framework, and methodology of an internal study at LMG MARIN France exploring the relevance of large sailing cargo vessels in a decarbonisation context. Using the historical SV France II (1911) as a reference, its sail-based architecture is reinterpreted with modern naval engineering tools to establish a conceptual baseline. A simulation-led approach is proposed to assess potential technical, economic, and environmental performance, positioning historical wind-optimized vessels as a basis for future systemic wind-based transport concepts.

OTHER SHORTLISTED

Camilla Domenighini
University of Antwerp

Category: **Waterborne**

Country: **Belgium**

Paper Number: **1926**

Risk distribution for autonomous inland shipping. A survey investigation.

Autonomous inland shipping (AIS) can foster a more efficient, sustainable and safer transport and responds to the growing lack of crew and qualified masters. Beyond technological considerations, AIS poses fundamental questions regarding risk distribution. In this sense, current laws and contracts are inadequate and hamper the commercial implementation of autonomous barges. Conversely, an updated legal framework fostering safety, legal certainty and a balanced risk distribution among the actors involved could support AIS introduction. This paper presents a proposal for legal amendment based on stakeholders' direct involvement. Stakeholders participation with a survey allow stakeholders to express their preference. The research results show that stakeholders are concerned with the current liability system and prefer a stricter system. Moreover, they favour mandatory laws for the technology providers' liability. These findings are fundamental for policymakers and lawmakers for the future of AIS as stakeholder participation fosters democratic participation and increases the buy-in of the relevant actors. The research is highly innovative as it applies participatory methods for legal innovation, typically used with affected communities and individuals, to businesses instead.

TRANSPORT MODE

AIRBORNE

Denis Andres Maigualema-Quimbita
Universitat Politècnica de València

Category: Airborne

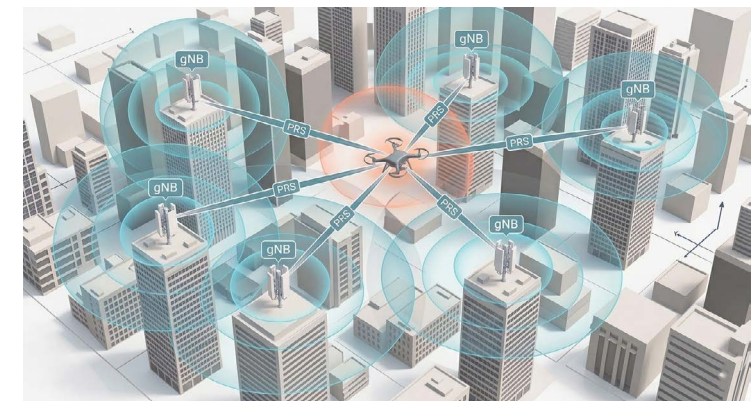
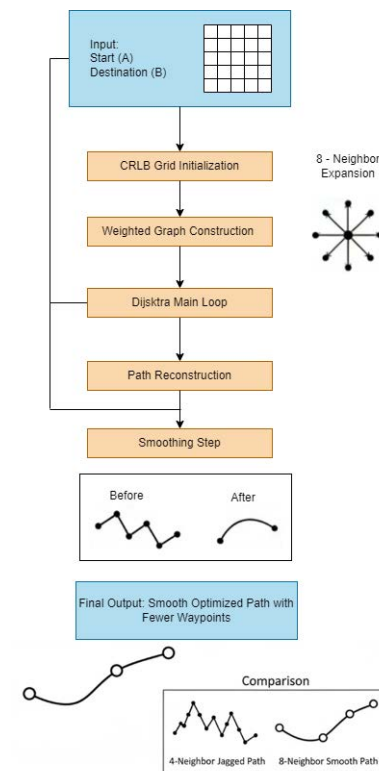
Country: Spain

Paper Number: 1854



Resilient UAV Routes for Emergency Services Using 5G Networks

This study proposes an advanced system for managing urban air transport during emergency scenarios using 5G networks as an alternative positioning system in dense urban environments, where the GNSS signals are often affected. The system is evaluated within a realistic scenario, in a predefined clustering of the existing cellular network in Valencia (Spain), assuming all stations are equipped with 5G technology. It dynamically generates resilient routes connecting a strategic point (A) with an emergency random point (B), prioritizing accuracy across congested urban areas. The core of the route planning algorithm relies on an accuracy metric, the Cramér Rao Lower Bound (CRLB), and incorporates dynamic base station selection and multilateration techniques to improve robustness. Furthermore, the system implicitly integrates inter-cluster soft handover procedures, ensuring continuity and precision as the UAV transitions across network regions. The simulated results use the Positioning Reference Signals (PRS) from 5G, comparing the Root Mean Square Error (RMSE) and route performance between direct and three optimized paths, using trajectories with a fixed-point A and a random point B. The results demonstrate the system's ability to improve the precision and generate adaptive air routes for emergency support in complex urban environments without GNSS systems.



Konstantia Kontodimou
National Technical University of Athens

Category: Airborne

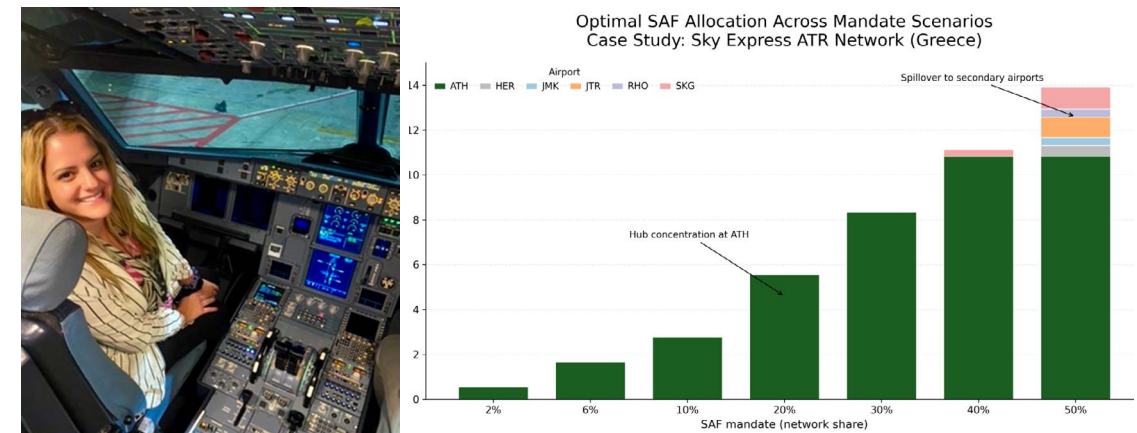
Country: Greece

Paper Number: 1944

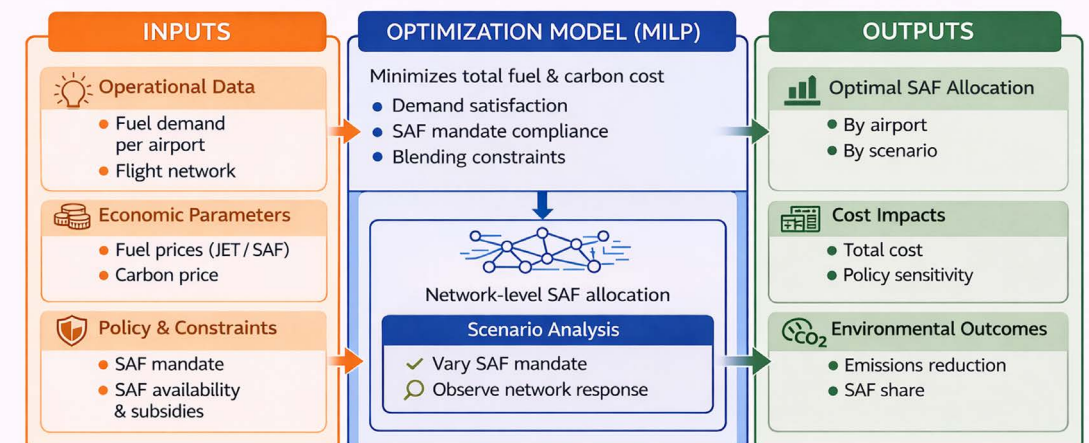


Sustainable Aviation Fuel Adoption Strategies Under Regulatory Blending Mandates

The European Union's "ReFuelEU Aviation" regulation, under the Fit for 55 package, mandates a phased increase in Sustainable Aviation Fuel (SAF) use across EU airports, setting ambitious targets for decarbonising aviation. However, the regulation provides limited guidance on how airlines can operationalise these requirements given uneven SAF availability, infrastructure readiness and cost differentials. This study develops an optimization model to support airlines in planning SAF deployment across their network in a cost-effective and regulation-compliant manner. The model minimizes total fuel procurement costs while ensuring compliance with SAF blending thresholds. It incorporates airport-level SAF availability, fuel pricing, emissions intensity and policy constraints, enabling airlines to evaluate blending strategies that satisfy both environmental targets and logistical feasibility. Scenario analysis explores the impacts of policy mechanisms such as differentiated mandates, financial incentives and supply disruptions. Applied to a regional European airline operating in Greece, where SAF distribution infrastructure is expanding, the model provides actionable insights into how SAF targets can be met without compromising operational viability. The results highlight the importance of flexible, data-informed policy design that accounts for network heterogeneity and evolving market conditions.



Optimization Framework for SAF Adoption under Policy Constraints



Abdulali Baghiyev

Transport and Telecommunication Institute (TSI)

Category: Airborne

Country: : Latvia

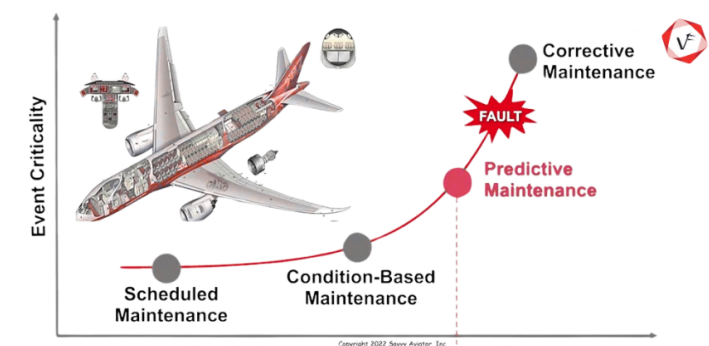
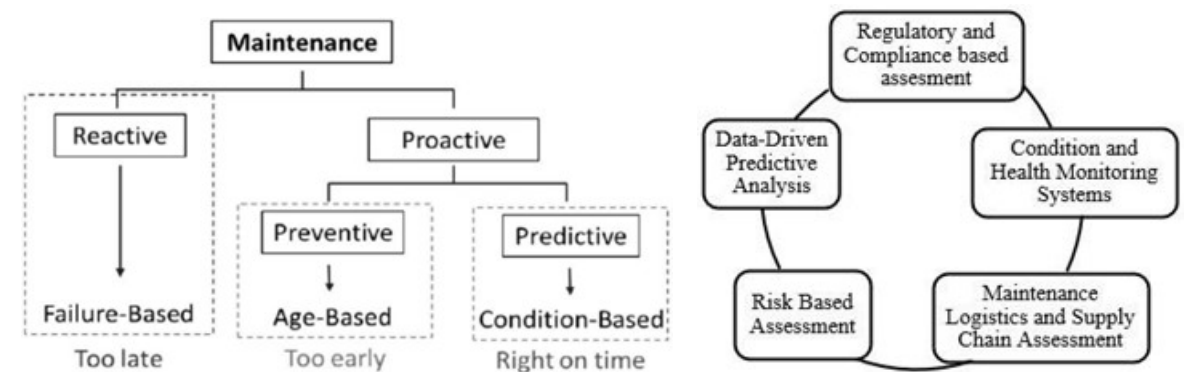
Paper Number: 1801



Methods for assessing aircraft airworthiness by analyzing data-driven implementations in the business aviation industry

Nowadays, aviation companies can anticipate maintenance needs and ensure the availability (in advance) of spare parts for maintaining aircraft airworthiness and to avoid facing an unexpected AOG (Aircraft on Ground) status. The research paper explores supportive data-driven tools for predictive analytics across the civil aviation industry, focusing on how these technologies can transform line maintenance and spare parts inquiry forecasting. This study focuses on Business Aviation, where operational continuity is highly sensitive to delays due to the need for fast, flexible maintenance support.

A structural framework was developed to describe and compare strengths, weaknesses and strategic priorities of relevant data-driven implementations. Based on the aim of the research, a case study of Bombardier was conducted, focusing on spare parts demand forecasting within its "Smart Parts" program. To obtain a deeper understanding of the predictive approach, technical data from a specific aircraft model has been taken. A predictive model for annual spare parts demand was created using machine learning and time series methods. Research is concluded by providing recommendations for OEM (Original Equipment Manufacturer) and airlines wishing to implement predictive solutions in maintenance planning and supply chain management.



OTHER SHORTLISTED

Enrico De Betta
Austrian Institute of Technology (AIT)

Category: Airborne	Country: Austria
Paper Number: 1690	

Analysis of strategies for LH2 management onboard aircraft during overnight parking

Liquid hydrogen is a key enabler for decarbonizing aviation, offering zero in-flight CO2 emissions. However, effective cryogenic storage management, especially during extended ground operations, is essential to minimize losses from boil-off gas. This study explores strategies to reduce overnight hydrogen losses for an A320-type aircraft, which typically retains 10–15% of tank capacity after its final daily flight. Two refuelling strategies are analysed: leaving the tank at partial fill overnight, and immediate post-flight refuelling to full capacity. These are evaluated alongside two airside supply infrastructure configurations: centralized fixed cryogenic storage and mobile trailer-based delivery. The thermal behaviour of the system, including tank thermodynamics, pipeline transfer losses, and insulation performance, is modelled using multi-phase, reduced-order simulations. A sensitivity analysis investigates the effects of initial thermodynamic conditions, tank design, insulation quality, and hydrogen transfer parameters on total boil-off gas. Results show that hydrogen losses are minimized with 50–75% partial post-flight refuelling.

OTHER SHORTLISTED

Manuel González Rodríguez
Universitat Politècnica de València

Category: Airborne	Country: Spain
Paper Number: 1725	

Machine-Learning based trajectory optimisation for high-priority UAS missions in U-space airspaces

UAS operations are expected to soar for applications ranging from goods delivery to emergency response. To guarantee safe operations, the UTM/U-space concept includes a sort of operations’ coordination in which UAS flight plans are deconflicted before the flight by the Flight Authorization service (FAS) to prevent spatial or temporal overlaps that can provoke mid-air collisions. This process is based on a 4D discretisation of the airspace in cells. The deconfliction also considers the priority of the operation, i.e., higher priority flights override previously authorized ones. This paper proposes a tool which analyses discretised U-space airspaces and employs Machine Learning (ML) models to identify the route that is likely to meet the high priority mission requirements while minimizing the impact on already authorized operations. The model has been trained using synthetic data generated using in-house PX4 Simulator-in-the-Loop and FAS tools. The model’s performance is evaluated by comparing optimised routes to those generated by the A* algorithm, which is implemented as a reference for the absolute fastest path. High priority missions’ requirements can be always met using the A* approach, but can have a dramatic effect on the airspace efficiency. The ML-based approach yields a good trade-off between both types of operations.

OTHER SHORTLISTED

Behzad Bamdad Mehrabani
Transport & Mobility Leuven

Category: Airborne	Country: Belgium
Paper Number: 1823	

**Who Will Take the Air Taxi?
Modelling UAM and CCAM
Demand for Airport Access**

Airports face increasing pressure to provide efficient and sustainable ground access while accommodating rapid changes in mobility technology. Two innovations with particular potential are Urban Air Mobility (UAM) and Connected, Cooperative and Automated Mobility (CCAM). Their adoption, however, is highly uncertain and depends on traveller preferences that are not yet observable in practice. To address this challenge, we apply a discrete choice modelling framework to assess how these modes could reshape airport access patterns. The model, estimated on extensive passenger survey data from Brussels Airport, employs a nested logit structure that captures behavioural similarities across current and emerging modes. Future scenarios are simulated by introducing operational assumptions for UAM and CCAM. The results indicate that UAM primarily attracts taxi users, while CCAM competes strongly with private cars, together accounting for more than 10% of potential airport access trips. These findings suggest that emerging mobility services will complement existing public transport while challenging traditional car- and taxi-based access models, with important implications for airport planning and policy.

OTHER SHORTLISTED

Faizana Naeem
Technische Universität Hamburg

Category: Airborne	Country: Germany
Paper Number: 1918	

**Feasibility at Altitude: A
Simulation-Driven and
Economically Grounded Roadmap
for Integrating Low-Altitude
Aerial Mobility into City Transport
Systems**

Urban Air Mobility (UAM) is steadily moving from concept to reality, offering promising solutions to reduce congestion and enhance connectivity in dense urban environments. However, realizing this vision requires more than just advanced aircraft, it demands thoughtful integration into the complex infrastructure and regulatory systems that cities already rely on. This study presents a simulation-driven assessment of the full UAM ecosystem, covering demand estimation, route planning, vertiport siting, CNS (Communication, Navigation, Surveillance) infrastructure, and economic viability. High-demand routes are identified, multimodal integration opportunities are evaluated, and infrastructure nodes such as vertiports and communication hubs are strategically located. Cost-effectiveness is assessed across varying urban typologies. Further, building on these technical findings, the study delivers a set of strategic, actionable recommendations for real-world implementation. It provides city leaders, transport planners, and mobility stakeholders with a practical roadmap to evaluate UAM feasibility and guide deployment in a way that is efficient, resilient, and aligned with future urban mobility needs.

TRANSPORT MODE

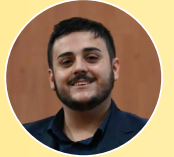
CROSSMODAL PASSENGER

Fernando Fernández-Bonilla
Universidad Nacional de Educación a Distancia

Category: **Crossmodal Passenger**

Country: **Spain**

Paper Number: **1744**



Sustainable mobility: individual choice in the context of public policies on the adoption of public transport in Spain

This paper evaluates how overlapping transport policies adopted in Spain in 2022 affected household mobility expenditure. Using nationally representative microdata from the Spanish Household Budget Survey (HBS) for 2021–2023, we analyze the effects of public transport fare subsidies, a near-full subsidy for re-tirees, and the universal fuel rebate on public and private transport spending. The empirical strategy combines pooled baseline models with two-way fixed-effects specifications to exploit within-household variation over time. Results show that public transport subsidies did not significantly increase public transport expenditure, but they were associated with substantial reductions in private transport spending, suggesting a modal reallocation effect. By contrast, fuel subsidies reduced the incentive to curb private transport dependence and weakened the environmental and distributive effectiveness of the policy package. The findings highlight that fare subsidies can support sustainable mobility, but their impact is stronger when not offset by contradictory measures that lower private transport costs.

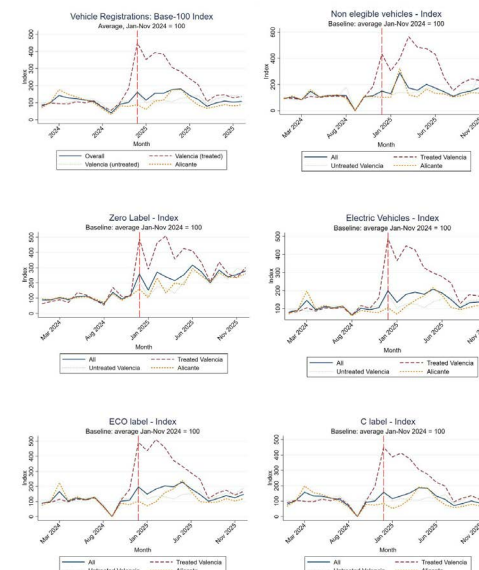
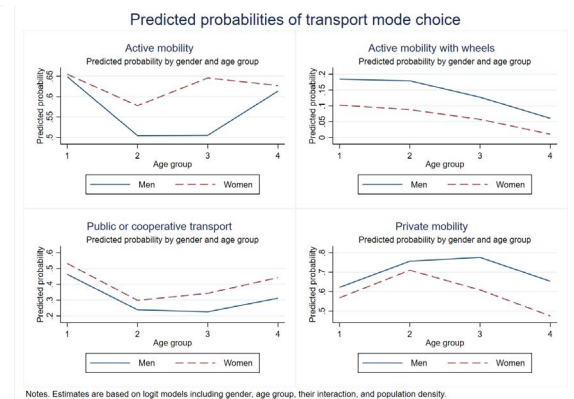
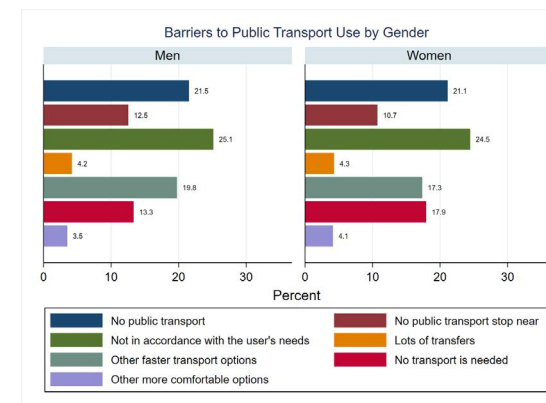


Table 4. Public policy mix: fixed effects estimate across six specifications

Variables	(7) Public expenditure	(8) Private expenditure	(9) Total expenditure	(7) Pub. Exp. (positive spenders)	(8) Pub. Exp. (positive spenders)	(9) Pub. Exp. (positive spenders)
Policy Mix						
Only fuel subsidy: 2022m4–2022m8	0.136** (0.053)	-0.291*** (0.088)	-0.146* (0.085)	-0.061 (0.100)	0.099*** (0.038)	0.087** (0.035)
Fuel subsidy + free public transport pass	-0.027 (0.059)	-0.082 (0.098)	-0.046 (0.096)	-0.033 (0.105)	0.097** (0.042)	0.059 (0.039)
Only free public transport pass	-0.049 (0.054)	-0.524*** (0.089)	-0.451*** (0.087)	-0.227** (0.096)	-0.034 (0.041)	-0.117*** (0.037)
Policy Mix x Retirees						
Only fuel subsidy x Older group	-0.101 (0.099)	-0.169 (0.186)	-0.172 (0.184)	0.363 (0.315)	-0.062 (0.098)	-0.068 (0.092)
Fuel subsidy + free public transport pass x Older group	-0.243** (0.116)	-0.279 (0.208)	-0.384* (0.209)	-0.051 (0.324)	-0.251*** (0.112)	-0.315*** (0.108)
Only free public transport pass x Older group	0.029 (0.099)	-0.164 (0.183)	-0.186 (0.182)	0.198 (0.271)	-0.098 (0.101)	-0.086 (0.095)
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	No	No	No	No	No
Observations	21,354	21,354	21,354	2,894	13,081	14,302
Groups	10,739	10,739	10,739	4,266	8,429	8,958
Within R-squared	0.002	0.007	0.005	0.010	0.006	0.011
Prob > F	0.006	0.000	0.000	0.130	0.001	0.000
Rho	0.530	0.464	0.455	0.676	0.580	0.559



Toursit Mobility Patterns in Madeira: Time-Cost Mixed Logit Model and Policy Implications.

Based on three waves of surveys involving 1,862 tourists, this research investigates mode choice in an island destination using a Mixed Logit (ML) model. The model includes a generic travel-time coefficient, mode-specific cost coefficients, and a random error component to capture panel heterogeneity. By integrating spatial, behavioural, and policy-oriented analyses, the study generates valuable insights into transport governance, multimodal accessibility, and sustainable mobility transitions in tourism destinations.

The findings contribute to international discourse on transport management in tourism, particularly regarding the optimization of mobility systems for greater efficiency, inclusivity, and sustainability. The research identifies key behavioural patterns and decision-making factors that influence tourist transport choices, offering a deeper understanding of mobility dynamics in insular regions.

It provides evidence-based recommendations for policymakers and destination managers, highlighting best practices for enhancing transport networks, mitigating mobility bottlenecks, and implementing smart mobility solutions to improve the visitor experience. Ultimately, this investigation bridges critical knowledge gaps in transport and tourism planning, offering a robust, data-driven foundation for the development of resilient and sustainable mobility systems in tourist regions.



Yuren Chen

Chalmers University of Technology

Category: Crossmodal Passenger

Country: : Sweden

Paper Number: 1666



Co-Designing Shared Mobility in Fredrikstad: A Clearing for Citizens and Multi-Stakeholders

Shared mobility is gaining traction as cities seek sustainable alternatives to private car use, but its development and implementation remain complex, particularly in the public sector where diverse stakeholders' interests, regulations, and evolving user needs converge. Co-design has emerged as a promising approach to address these challenges.

This paper presents a co-design case from the Seamless Shared Urban Mobility (SUM) project in Fredrikstad, Norway which aims to integrate an electric automated ferry line to improve city accessibility and promote commuting by bike, foot and shared micro-mobility. Two rounds of co-design workshops were conducted with citizens, planners, ferry operators, and service providers to identify problems and conditions, and co-create solutions. Different tools were designed to support the capturing, visualization, and concretisation of ideas respectively.

The ongoing process has already generated actionable ideas that take into consideration the journey beyond the ferry transfer, including a newly implemented feeder bus linking the ferry to industrial areas. Identified co-design process challenges range from recruitment of participants to the need for flexibility, adapting the process to real-world conditions and changes. Nevertheless, the paper argues that co-design offers a clearing, a conceptual space where diverse perspectives converge, and mobility solutions can take shape organically.



OTHER SHORTLISTED

Martin Haamer
University of Tartu

Category: Crossmodal Passenger	Country: Estonia
Paper Number: 1938	

Comparative Modelling of Cycling Route Choice by Bikes and E-Bikes: The Case Study of Tartu, Estonia

Cycling plays a crucial role in sustainable urban mobility, prompting cities worldwide to increase its modal share. A fundamental step in promoting cycling is understanding cyclists' route choice behaviour, which informs the design of a more efficient and attractive cycling infrastructure. In this study, we use high-resolution, long-term GPS data to model the route choice behaviour of cyclists. Furthermore, we focus on the differences in route choice between e-bike and conventional bicycle users. To our knowledge, this is the first study to analyse cycling route choice in Estonia and the broader Central and Eastern European (CEE) region, utilising one of the most comprehensive datasets available on urban cycling. Our findings provide valuable insights to support evidence-based urban planning and cycling policy development, contributing to more cyclist-friendly cities.

OTHER SHORTLISTED

Karen Valitov
Eindhoven University of Technology

Category: Crossmodal Passenger	Country: Netherlands
Paper Number: 1898	

Toward a User-Centered Privacy Framework for Transport Data Sharing: A design framework for Trust, Control, and Participation

Personal data has become essential for information-driven transport systems, including Mobility-as-a-Service (MaaS), real-time information displays, and autonomous vehicles. However, current approaches to data sharing often focus on technical or legal aspects, without fully addressing how travelers understand and respond to privacy risks. While many operators claim GDPR compliance, users remain disempowered due to vague terms, limited transparency, and a lack of meaningful control. This research focuses on how individuals experience privacy in transport systems and how current regulatory frameworks fall short in supporting user agency, as part of a broader project on privacy, behavior, and data governance in mobility. Building on examples from existing transport providers, we analyze how GDPR is operationalized in practice and identify key mismatches between legal protections and user expectations. Based on this critique, we propose a conceptual framework for understanding privacy in transport, emphasizing trust, control, and benefit framing. This framework forms the foundation for a stated choice experiment currently in development, which presents respondents with realistic travel scenarios involving different levels of data sharing, control options, and benefits. By linking these dimensions to user decision-making, this work aims to support the design of more connected, transparent, and user-aligned data-driven mobility systems.

OTHER SHORTLISTED

Florian Lammer
Technische Universität Graz

Category: Crossmodal Passenger	Country: Austria
Paper Number: 1696	

A Holistic Framework for Mobility Monitoring Using Floating Phone Data

Timely mobility monitoring is essential for evaluating transport policies, achieving climate goals, and enabling demand-responsive public transport. The COVID-19 pandemic demonstrated how rapidly travel behavior can shift, yet many cities still rely on costly surveys that quickly become outdated. While emerging data sources—such as floating phone data (FPD) and smarphone based travel survys (SBTS)—offer valuable insights, they are often incomplete and difficult to integrate due to differing methodologies, sample sizes, and spatial resolutions. We present a framework that leverages large-scale FPD as a universally available backbone for origin-destination (OD) analysis and enriches it with secondary data to create a transferable mobility monitoring system. A random forest classifier, trained on SBTS, infers transport modes from independent FPD trajectories. Applied to the urban development district of Seestadt Aspern in Vienna (12,000 residents; 5,000 workplaces), the model classified seven transport modes (walk, bike, bus, tram, train, metro, car) with an accuracy of 0.87 and a macro F1-score of 0.79. When aggregated into three broader categories (active mobility, public transport, car), accuracy improved to 0.90 and the macro F1-score to 0.87. By deriving features from trajectory geometries, GTFS schedules, and geospatial context, our framework enables data-driven, transport policy for sustainable urban mobility.

OTHER SHORTLISTED

Fatima-Zahra Dahak
INRS, La Rochelle Université, École d'Ingénieurs Généralistes

Category: Crossmodal Passenger	Country: France
Paper Number: 1964	

Risk Assessment of On-Demand Shared Autonomous Shuttles in Peri-Urban Areas Using the Global Risk Analysis Method

The integration of Shared Autonomous Vehicles (SAVs), particularly in the form of autonomous shuttles, is considered a promising solution to enhance the sustainability and efficiency of public transport systems. This paper evaluates the safety of on-demand autonomous shuttle services operating in peri-urban contexts through the application of the Global Risk Analysis (GRA) method. GRA provides a systemic framework to identify, assess, and manage risks by analyzing the interactions between users and all elements of the transport system. Focusing on the user experience—from booking via a mobile application to arrival at the destination—this study identifies potential hazards, assesses the severity and likelihood of each, proposes appropriate mitigation strategies, and evaluates residual risks. These strategies may include not only technical and operational measures, but also broader public policy interventions to enhance safety and support system acceptance. The case study is based on an autonomous shuttle service currently being implemented in La Rochelle, France, connecting eight peri-urban municipalities. The objective is to provide an evidence-based risk assessment to guide safer deployment and foster user trust in these emerging mobility solutions.

Peyman Hashemi Baragoori
Universitat Politècnica de Catalunya

Category: Crossmodal Passenger	Country: Spain
Paper Number: 1880	

Accessibility as the Objective: An Equity-Focused Framework for CCAM Integration in Public Transport Networks

Previous research shows that integrating Cooperative, Connected, and Automated Mobility (CCAM) into Public Transport (PT) systems holds strong potential. CCAM shuttles serving as First-Mile (FM) and Last-Mile (LM) feeders to PT stations are among the most common approaches. However, a clear gap remains in identifying the most effective deployment strategies to maximize societal benefits. Existing equity evaluations are typically applied after implementation, lacking a proactive framework to guide early decisions on where such services should be prioritized.

This study proposes a network-based methodology to identify optimal spatial and temporal integration paths for CCAM services. The approach introduces the Accessibility Gain Ratio (AGR), a new metric that quantifies the improvement in access to opportunities when CCAM complements the existing network. It also incorporates affordability through a generalized travel cost function combining time and monetary components into a single indicator.

By analyzing the synergy between PT and CCAM shuttles under different fare schemes and comparing them with conventional neighborhood shuttles, the method generates tailor-made integration plans for each urban zone. The results demonstrate how accessibility and affordability can jointly guide planning, supporting evidence-based and equitable decision-making for the deployment of CCAM solutions within public transport networks.

Đorđe Petrović
University of Belgrade

Category: Crossmodal Passenger	Country: Serbia
Paper Number: 1840	

Adapting autonomous vehicles to persons with physical disabilities: technological adaptations or human support?

Autonomous vehicles (AVs) offer new mobility options for persons with physical disabilities (PD). However, the question arises whether it is more cost-effective to invest in the technological adaptations of AVs or in human support. In this study, technological adaptations are defined as a set of AV modifications aimed at covering as large a portion of the population of persons with PD as possible. Human support is provided through the AV operator, who assists users during their journey. This paper aims to provide economic assessments of AVs implementation models for the population of persons with PD for different scenarios. Accordingly, this paper analyzes three scenarios (1) technological adaptations that enable independent participation of persons with PD, (2) human support for persons with PD achieved through the AV's operator, and (3) a hybrid scenario that combines the basic set of AV's adaptations and the availability of the AV's operator as needed. When concluding, the fact that the scenarios have different levels of coverage of the population of persons with PD was also taken into account. The results of this study may be helpful to decision-makers when implementing AVs in transportation systems.

OTHER SHORTLISTED

Moritz Bergfeld
German Aerospace Center (DLR)

Category: Crossmodal Passenger	Country: Germany
	Paper Number: 1834

From Innovators to Early Adopters: Implications of Different Charging Strategies on the Expansion of Charging Infrastructure in Urban Areas

Global sales of electric vehicles peaked in 2024, accounting for more than 20% of worldwide car sales. In Germany, the largest market in the European Union and the third largest globally, electric vehicles made up 5.3% of the fleet in January 2025, of which 3.3% were battery electric vehicles. According to Roger’s theory of technology adoption, the earliest users, known as innovators, tend to be older males, well-educated with an above-average income, and preferred wallbox charging at their detached homes equipped with solar panels. The next group, early adopters, is generally younger, more often female, and resides in urban areas with limited access to private parking. Therefore, effective planning of future charging infrastructure must consider the different charging behaviors of early adopters. Alternative charging strategies such as workplace, retail, and public charging are becoming increasingly important, influencing the temporal distribution of demand and connected power profiles. Our analysis, using the charging demand model CHARGIN, reveals distinct charging patterns for an average week and various location types. While traditional approaches typically focus on established charging patterns, our findings highlight the necessity of incorporating early adopters’ requirements to ensure efficient infrastructure development.

TRANSPORT MODE

CROSSMODAL LOGISTICS

Emma Ceulemans
University of Antwerp

Category: **Crossmodal Logistics**

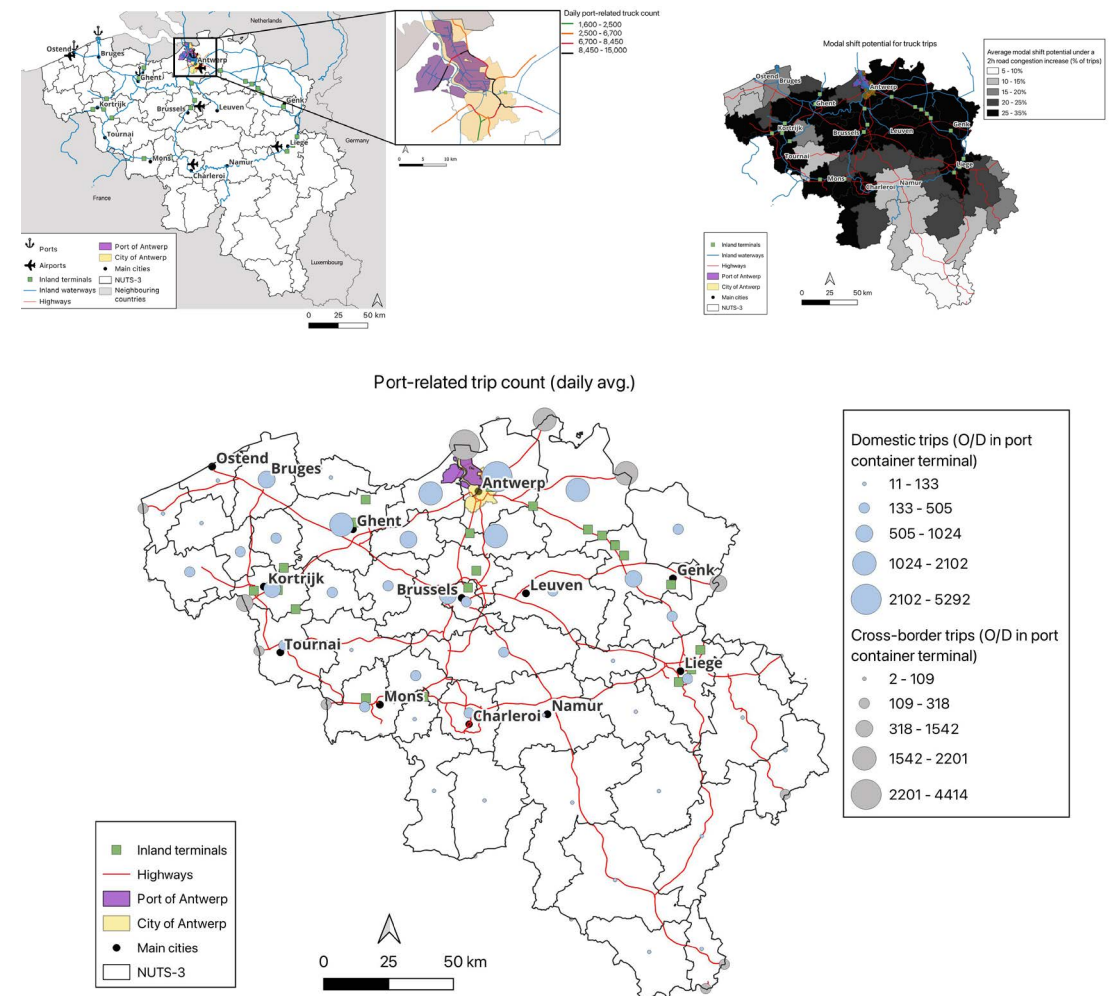
Country: **Belgium**

Paper Number: **1897**



From tracking to shifting: using truck GPS data to assess modal shift in port- hinterland transport

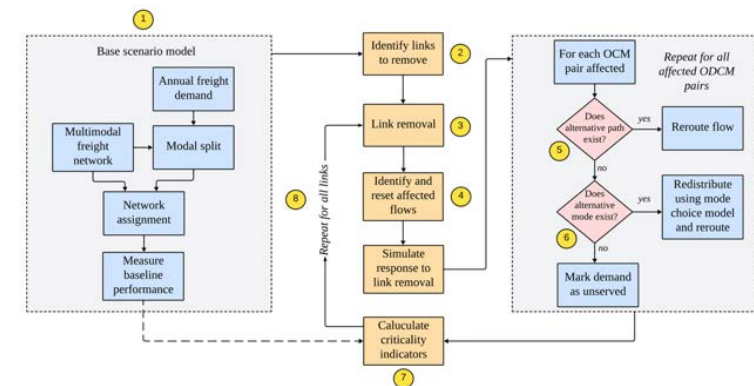
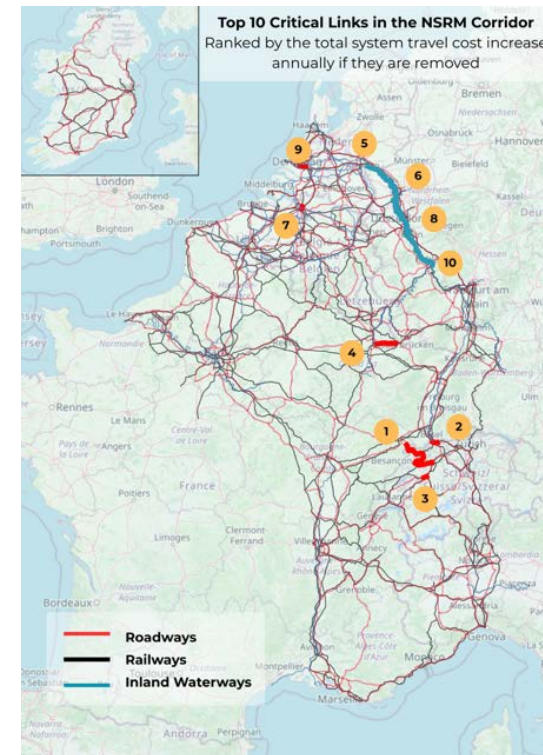
The heavy reliance on trucking in port-hinterland transport causes significant environmental and societal issues for surrounding areas, straining the port-city relationship. To mitigate these impacts, shifting traffic to alternative hinterland transport modes, such as inland waterway transport, is essential. Existing literature mainly focuses on estimating potential modal split changes for transport corridors, whereas few studies begin from empirically observed truck movements to evaluate the shift potential of road-based freight. Therefore, this study assesses the modal shift potential for observed port-hinterland container truck trips, derived from truck GPS data, by estimating generalised transport costs under varying road congestion scenarios and applying a logit mode choice model. Results indicate that 18 to 27.5% of domestic port-hinterland container truck trips could shift to inland waterway transport under a one- to two-hour increase in road travel times, particularly from locations near inland terminals along three major traffic corridors linking the port of Antwerp to Liège, Brussels, and Kortrijk. Diverting these truck trips from the road network could reduce port-related highway traffic around the city by up to 6.5%. These findings offer valuable guidance for policymakers, enabling targeted interventions at locations with the highest modal shift potential, thereby reducing trucking dependence and alleviating port-city tensions.





Simulation framework to evaluate link criticality in multimodal freight transport networks using operational metrics

Growing geopolitical risks and climate extremes have renewed interest in strengthening the resilience of transport networks to safeguard economic competitiveness and stability. A key step in resilience planning is identifying critical components within these networks. While link criticality has been widely studied, freight networks present challenges due to their multimodal, multi-commodity nature. This study introduces a simulation framework to evaluate link criticality in multimodal freight networks at a transnational scale, balancing accuracy with computational efficiency. The framework integrates mode-choice and routing algorithms while preserving operational characteristics. It combines a traditional transport model for baseline simulation with a link criticality analysis algorithm to assess disruptions. By systematically removing links, the model quantifies network-wide impacts using operations-based metrics. A case study on the North Sea–Rhine–Mediterranean TEN-T corridor demonstrates the method's practicality and efficiency. The framework enables planners and policymakers to prioritise investments, strengthening resilience and sustainability in freight transport systems.



Daniela Castaño-Herrera
Universidad Politécnica de Madrid

Category: **Crossmodal Logistics**

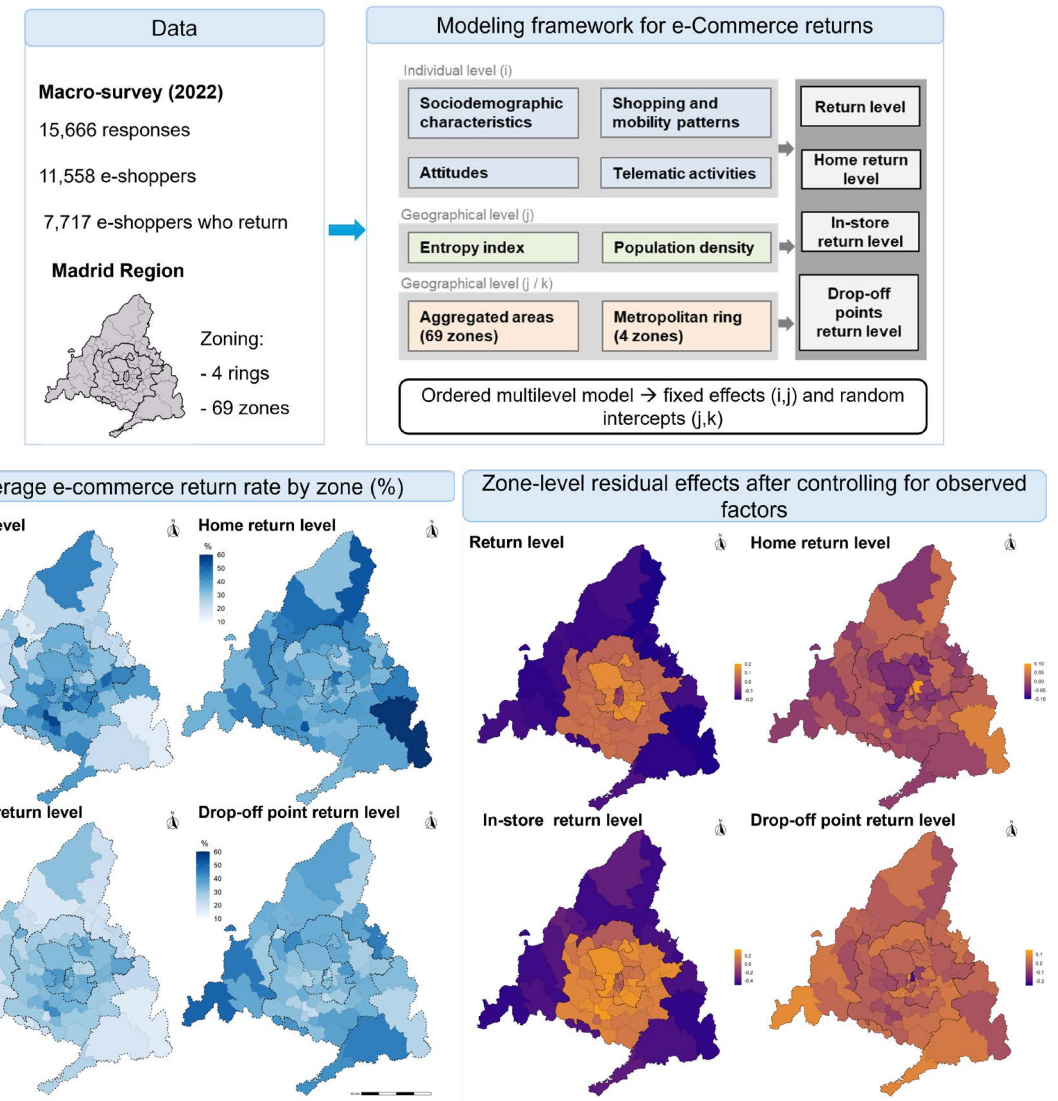
Country: **Spain**

Paper Number: **1862**



Spatial analysis of online shopping returns: application to the Madrid Region

This study examines e-commerce return behaviors and their environmental implications, utilizing data from a 2022 macro-survey conducted in the Community of Madrid with 11,558 online shoppers. Employing a multilevel econometric model, the analysis examines how socio-demographics, attitudes, mobility, shopping patterns, and spatial factors influence both the frequency of returns and the choice of return options (home, in-store, or locker). Findings show that frequent online shoppers have less sustainable behavior as they are more likely to return more items and do it at home, while individuals with stronger technophilia make fewer returns and are less likely to home returns and those who travel by active modes more frequently, particularly have more sustainable decisions, make fewer returns and are more likely to make it at a locker. Spatial context also matters: residents in densely populated and diverse urban areas return more often but are less likely to use home collection. Overall, the study highlights that tailoring return alternatives to local contexts can help reduce less sustainable return behaviors, thereby enhancing the potential environmental benefits of e-commerce.



Tanvi Anand
Antwerp Management School

Category: Crossmodal Logistics Country: Belgium
Paper Number: 1772

Resilience Without Borders: A Framework for Climate Resilient Port Ecosystems

Climate change is a systemic threat with cascading impacts across geographies and sectors(LI et al., 2021). The past year underscored this through record-breaking extremes(Davidson et al, 2024) and ports, critical infrastructure nodes, are increasingly vulnerable to climate risks(Becker et al., 2018). Yet resilience strategies remain fragmented, lacking consistent guidelines detailing actions or responsible actors for climate preparedness (Kwesi-Buor et al. 2019). By presenting a multi-dimensional resilience guideline framework called CRISP (Climate Resilience for Ports), developed under Horizon-Europe SAFARI, this paper aims to address this gap and strengthen the port resilience and the broader ecosystem to climate change. The framework was developed through a qualitative, iterative process combining thematic analysis of existing frameworks(e.g., Sendai, ARUP) and port/city documents using NVivo, alongside co-creation workshops involving the ports of Livorno, Lisbon, Tripoli, Sevilla, Dunkirk and stakeholders like CMA-CGM, AIVP. CRISP provides a transferable tool for designing port-specific resilience strategies, linking seven resilience-phases (anticipate, prepare, resist, accommodate, absorb, recover, evaluate & adjust) with five dimensions: infrastructure, environment, society, economy, ecosystem. It shifts the focus from infrastructure-only solutions to holistic, governance-aware planning. Rather than a prescriptive audit, it supports shared understanding and informed dialogue, forming the basis for co-developing tailored resilience guidelines with port stakeholders.

Johannes Hiller
Federal Highway and Transport Research Institute (BAST)

Category: Crossmodal Logistics Country: Germany
Paper Number: 1680

Designing the Data Future of Multi-Modal Transport in Germany

Transport and traffic planning in Germany are still predominantly organized along single-mode lines, with road, rail, and inland waterway systems often treated in isolation. A key issue for integrated planning is the absence of an up-to-date, consistent, routable and referenceable dataset that spans all three of these major transport modalities. This fragmentation hampers not only personal mobility and logistics but also administrative coordination and policy-making. This paper proposes a unified data model that integrates road, rail, and inland waterway networks into a consistent, interoperable framework. By harmonizing existing datasets and aligning semantic structures and attributes across modalities, the model aims to enable seamless routing, planning, and analysis. Special attention is given to intermodal nodes, transfer capacities, and the preservation of mode-specific characteristics. Key use cases include intermodal logistics planning, emergency response coordination, and infrastructure maintenance and investment analysis. The approach builds on established standards where possible to ensure compatibility with current and future systems and thereby facilitates adoption. By taking the requirements of the different stakeholders from public and private entities into account, this work lays the foundation for a more connected, efficient, and data-driven transport ecosystem in Germany while strengthening digital sovereignty.

Joséphine Mariquivoi
Vrije Universiteit Brussel (VUB)

Category: **Crossmodal Logistics** Country: **Belgium**
Paper Number: **1882**

Socio-environmental disparities in consumer trips to collection points in Brussels- Capital Region

E-commerce parcel volumes continue to rise, accompanied by negative externalities in urban areas (e.g congestion, pollutions). To reduce the environmental impact of deliveries, cities are seeing a rise in collection points such as automated lockers, post offices, and retail stores. These alternatives aim to reduce delivery distances and negative externalities through better consolidation and delivery organisation. However, the environmental benefits depend on geographic context and consumer travel behaviour according to recent research. At the metropolitan scale, diverse populations can lead to varying levels of environmental impact reduction from such solutions. This study analyses the environmental impact of consumer trips using real data from a survey of 1,059 online consumers in the Brussels Region (Belgium) in November 2022. Environmental impact is expressed in marginal external costs and modelled as a binary outcome using a logistic mixed-effects model with random intercepts for geographic region. Fixed effects include housing type, gender, employment status, nationality, income, age, and car ownership. Findings show that individual demographic and housing factors are more predictive of environmental impact than regional differences. Environmentally costly trips were more likely among women, older individuals, and those not living in row houses. These insights can support urban planning and sustainable logistics strategies.

Lars Klapper
Rhenish-Westphalian Technical University Aachen, Research Institute for Industrial Management

Category: **Crossmodal Logistics** Country: **Germany**
Paper Number: **1867**

Designing resilient and sustainable multimodal Logistics Platforms: functional Requirements and Industry Ecosystem Integration

Disruptions in global supply chains and increasing sustainability demands challenge Europe's multimodal logistics systems. This paper conceptualises the modular requirements of a digital platform solution designed to improve resilience and sustainability by identifying multimodal route alternatives and enabling efficient route planning and orchestration utilising real-time data exchange. Derived from expert interviews and an online survey focusing on challenges caused by disruptions in the transport system, functional, non-functional, and technical requirements for resilient platform design have been identified. Employing a Design Science Research (DSR) approach, the paper conceptualises platform modules that support resilience and sustainability goals, emphasising the reduction of environmental impacts and promoting multimodal transport alternatives. The focus lies on the collaborative approach to adaptive route orchestration and optimisation through predictive analytics and cross-system data availability for all relevant stakeholders of the multimodal transport ecosystem. The modular approach enables the proposed structure to be extended in future research and practical implementation. The Horizon Europe research project ReMuNet leverages intelligent algorithms and digital platforms to enhance multimodal networks, optimise route planning, and improve disruption response, contributing to the vision of the Physical Internet.

Dominic Kwakye Ampong
University of Pardubice

Category: **Crossmodal Logistics** Country: **Czechia**
Paper Number: **1693**

A Modern and Sustainable Rail-Enabled Urban Logistics System and its Economic Evaluation

The European Union has set ambitious climate goals as part of its commitment to the Paris Agreement and the European Green Deal. Urban freight transport is one of the main sources of greenhouse gas emissions, air pollution, and traffic congestion, which is a major hurdle for sustainable urban development. Despite significant policy and research interest, there are currently limited published studies that fully combine rail transport with low/zero-emission last-mile delivery and its comprehensive economic evaluation. Specifically, this study presents and evaluates a comprehensive solution combining rail transport of inter-regional shipments with logistics micro-depots located near the railway. This will be done by using a combination of micro-hubs located in close proximity to rail stations and transshipping shipments through environmentally friendly last-mile delivery modes such as electric vehicles, cargo bikes, or crowdshipping. The methodology consists of applying several methods to assess the economic viability of the proposed solution, including the inclusion of different scenarios for the evolution of the regulatory framework (in particular, transport emission allowances). The findings indicate that the proposed model is economically feasible, especially when externalities resulting from carbon reduction are addressed. These results contribute to the Sustainable Development Goals on climate action and sustainable cities.

Mylena Cristine Rodrigues de Jesus
University of Antwerp

Category: **Crossmodal Logistics** Country: **Belgium**
Paper Number: **1667**

Perceived transport mode integration and stakeholder collaboration

Supply chain actors' perceptions are critical in building a better-connected and collaborative transport ecosystem. This study investigates how supply chain professionals perceive stakeholder collaboration and transport mode integration, and what organizational and individual factors influence these perceptions. Using survey data from logistics professionals worldwide, the research applies a two-step quantitative approach: an ordinal probit model to assess associations between perceptions and company/professional profiles, and a generalized structural equation model (GSEM) to examine the causal relationship between collaboration and integration. Findings indicate that perceived integration is generally higher, but more dispersed, than collaboration. Logistics service providers report the highest levels of transport mode integration, while terminal operators perceive greater collaboration. Shippers perceive the lowest levels for both. Significant influencing factors include company size and type, transport modes involved, and seniority level. Professionals with decision-making power on the transport modes report notably higher collaboration perceptions, influencing perceived integration. By identifying key organizational drivers and perceptual gaps, this paper provides practical insights for industry and policymakers seeking to enhance collaboration across supply chain actors and support the development of more responsive, efficient, and sustainable transport networks.

OTHER SHORTLISTED

Joao Costa

Joint Research Centre (JRC)

Category: **Crossmodal Logistics** Country: **Italy**

Paper Number: **1749**

**Enhancing Transport Innovation
Knowledge Management
Workflows Using Artificial
Intelligence: A TRIMIS Database
Case Study**

The Transport Research and Innovation Monitoring and Information System (TRIMIS) tracks EU-funded transport research and innovation projects to inform policy-making and identify trends. A key function of TRIMIS is maintaining a comprehensive and accurate database of transport projects. Selecting and categorising relevant projects is a manual and time-consuming process. This study explores the use of artificial intelligence (AI), specifically large language models (LLMs), to support and accelerate this task.

A workflow was developed using an LLM API (GPT@JRC), fine-tuning prompts to match human judgment in identifying relevant projects from CORDIS. Comparing AI-generated outputs to the existing TRIMIS database, projects were assessed for inclusion/exclusion and classified by mode, sector and thematic area for faster filtering. Iterations and structured output analysis significantly improved accuracy and consistency. The best prompt analysed 31,110 projects in a day, identifying 4,123 which are relevant, reducing manual work and identifying matches in previously overlooked funding schemes. Outcomes also helped to re-evaluate existing taxonomies.

The results demonstrate the potential of AI-assisted workflows to reduce manual workload, improve accuracy, and scale project curation for the TRIMIS database, displaying broader implications for using AI-assisted methods in public-sector knowledge management. Future work will explore hybrid human-AI review pipelines and domain-specific fine-tuning.

SENIOR RESEARCHER AWARDS



The TRA VISIONS 2026 Senior Researcher Awards recognised established researchers for their achievements and excellence in European research projects. Eligibility was open to researchers with at least 10 years of experience in their field and a proven track record of conducting EU-relevant research.

The evaluation was a two-stage process. Participants were asked to submit applications by providing information on: (i) how their research addressed key transport challenges related to the TRA 2026 key topics; (ii) the practical feasibility and potential implementation of their research at industry level; (iii) how their research contributed to influencing transport policy and decision-making within the European Union; (iv) their research track record over the past 10 years, including publications, patents, and research leadership; and (v) their involvement in EU-funded projects, including funding amounts and roles.

Following a preliminary eligibility check, all entries were reviewed for content, and relevance with a remote evaluation by two evaluators. These submissions were assessed by at least two independent expert evaluators against the following selection criteria: (i) amount and proportion of EU funding contributed; (ii) impact of research at national, EU, and global levels; (iii) relevance to transport; and (iv) research track record. A shortlist of three to four applicants was produced for each transport mode (road, rail, waterborne, airborne, crossmodal passenger, and crossmodal logistics).

Winners were selected by an expert panel at a shortlisting workshop held at the European Commission in Brussels on 4 March 2026. The panel brought together transport experts representing the European Commission, academia, industry, and the TRA 2026 organising team.

The Winners were recognised at the TRA 2026 Conference Gala dinner in Budapest, and invited to speak at one of the Conference Strategic or Special Sessions.

STATISTICS AND OVERALL RESULTS

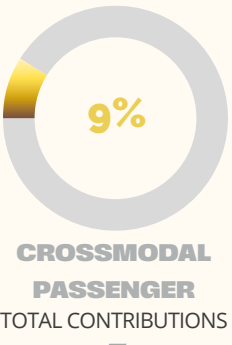
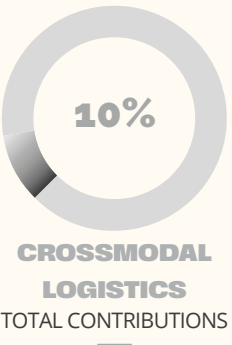
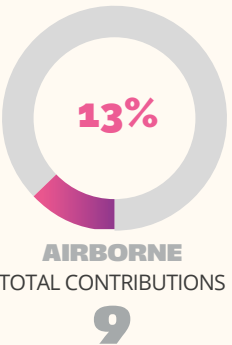
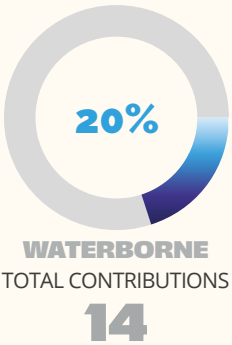
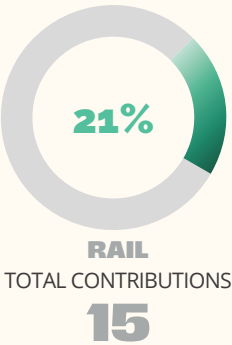
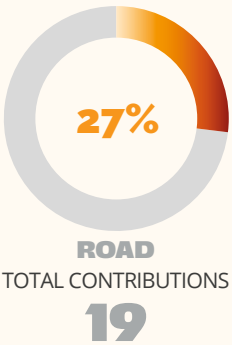
The TRA VISIONS 2026 Senior Researcher Awards received a total of 70 submissions.

The following charts contain some statistical information regarding all the seniors' contributions.

ENTRIES PER MODE

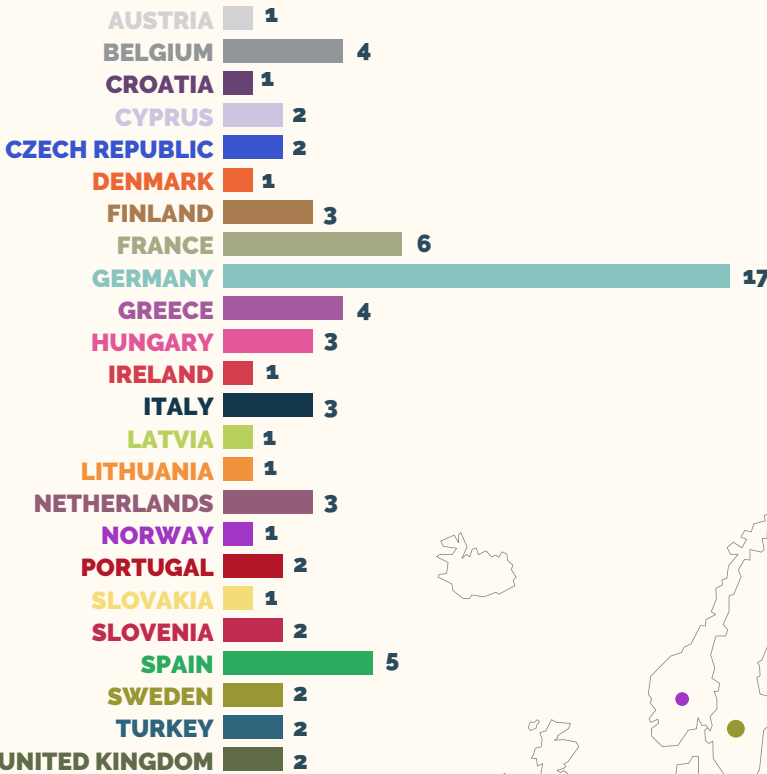
A total of 19 road-related entries, 15 rail-related entries, 9 waterborne-related entries, 6 airborne-related entries, 14 cross-modal passenger-related and 7 cross-modal logistics-related entries were submitted for the Senior Researcher Competition.

The charts below show the number of entries submitted per mode in percentage terms.

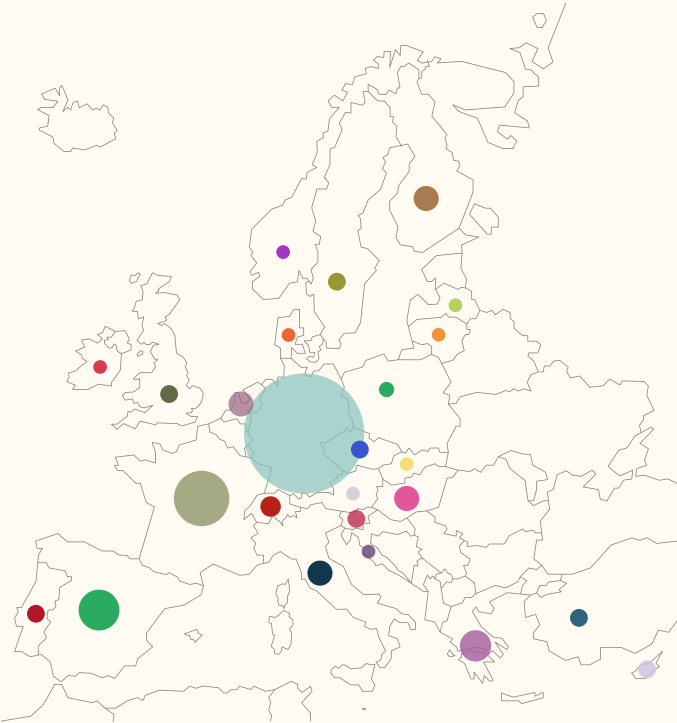


ENTRIES PER COUNTRY

The chart below shows the number of entries submitted per country. Germany was the largest contributor with a total of 17 eligible submissions, France came second with 6 entries, and third place is Spain with 5 entries.



The map on the right shows the entries submitted per country and their geographical spread.



TRANSPORT MODE
ROAD

Pedro Arias Sánchez
Universidade de Vigo

Category: Road

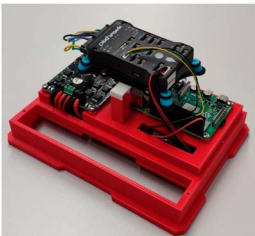
Country: Spain

Geotechnologies & AI for Transport Digitalisation: Safer Roads, Greener Mobility, Data-Driven Planning & Operations

Prof. Pedro Arias Sánchez, has built a research trajectory distinguished by direct translation of results into industrial practice and transport policy. As founder of the spin-off INSITU Ingeniería, S.L., and lead of more than 100 R&D contracts, he has collaborated with ADIF, ALSTOM, FERROVIAL, and VIAS Y CONSTRUCCIONES across rail and road environments. His group holds 18 patents, 9 commercialised, and INSITU has grown into a consolidated company within the sector. As Editor-in-Chief of the journal Infrastructures, he further fosters knowledge transfer across the academia-industry interface.

At EU level, Prof. Arias Sánchez coordinated InfraROB, delivering robotised, modular road-work processes to reduce worker exposure and increase network uptime, and SAFEWAY, a GIS-based platform validated on multiple European corridors. IM-SAFE contributed harmonised infrastructure monitoring methods, including technical input for a European Commission mandate to CEN to update structural Eurocodes for bridges and tunnels. SUM4Re promotes circular construction through material traceability and circular BIM workflows, and ENGINENCY addressed building energy efficiency.

His work aligns with the European Green Deal and the Sustainable and Smart Mobility Strategy, addressing decarbonisation, digitalisation, resilience, and safety. Platform pilots in Portugal, Spain, the United Kingdom, the Netherlands, Austria, and Norway have stress-tested climate adaptation policies, while standardisation inputs through IM-SAFE accelerate the adoption of monitoring and Digital Twin solutions across the EU, supporting the shift from corrective to preventive, performance-based maintenance.



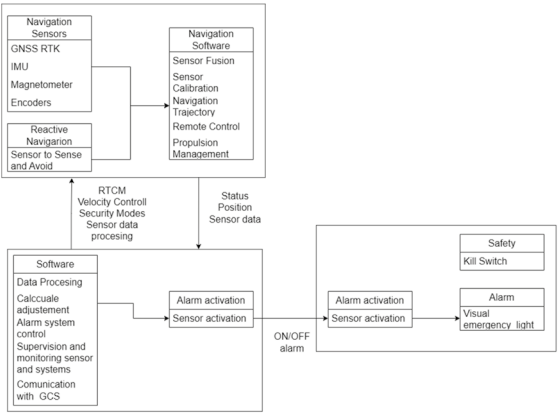
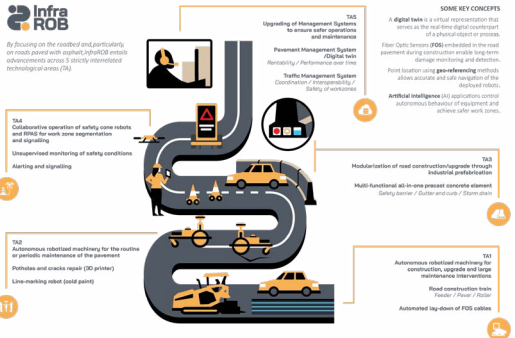
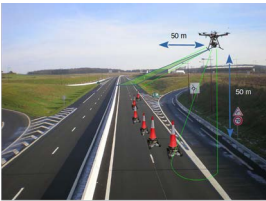
(a)



(b)



(c)



Pedro Arias-Sánchez is Professor at the University of Vigo (Spain) and a senior expert in road infrastructure, digitalisation, and intelligent transport systems. His work has made sustained contributions to European transport research through advances in resilient and sustainable roads, digital road monitoring, mobile mapping, and AI-based inspection technologies. He has led major national and European projects, authored more than 250 scientific publications, supervised more than 30 doctoral theses, and generated patented innovations with successful technology transfer. His work connects academia, industry, and public institutions to advance safer, smarter, and more sustainable road mobility and infrastructure management in Europe.

OTHER SHORTLISTED

Valentin Ivanov
Technische Universität Ilmenau

Category: **Road** Country: **Germany**

Software-Defined Vehicles and Wheel-Corner Architectures: An X-in-the-Loop Path to Deployment

Valentin Ivanov’s research career focuses on smart vehicle systems for electrified and automated road transport, with emphasis on vehicle dynamics, active safety, and software-defined vehicle architectures. As Head of Smart Vehicle Systems at TU Ilmenau, his work spans chassis control, energy-efficient EV design, and integrated validation methods for automated mobility. His research improves vehicle stability, comfort, and driver trust while enabling higher energy efficiency through advanced control of powertrains and chassis systems. He has also developed X-in-the-loop and digital twin methodologies to accelerate testing and validation of complex vehicle functions, reducing development time and increasing system reliability. These approaches directly support safer and more efficient deployment of electric and automated vehicles. Through EU projects such as GEN1200, HiPE, EVC1000, and XILforEV, and collaborations with industry partners, his work is translated into industrial demonstrators and validation platforms. At EU policy level, his research informs Green Deal objectives, CCAM frameworks, and type-approval evolution for software-defined vehicles, while supporting standardisation activities through SAE and related expert groups.

OTHER SHORTLISTED

Yentl Swolfs
Katholieke Universiteit Leuven

Category: **Road** Country: **Belgium**

Tackling the challenges of fibre-reinforced composites for automotive applications

Yentl Swolfs’ research career is focused on advanced fibre-reinforced composites for automotive applications. His work, developed through EU projects such as HIVOCOMP, FiBreMoD, and HyFiSyn, addresses lightweight structural materials that improve vehicle efficiency while maintaining high mechanical performance. He has contributed to the development of hybrid and self-reinforced composites with enhanced stiffness, toughness, and fatigue resistance, including patented materials already demonstrated in industrial components. A strong feature of his career is close collaboration with major automotive manufacturers, including Volkswagen, Daimler, Fiat, Toyota, and BMW, ensuring direct alignment between research and industrial needs. His MSCA-led projects have advanced the understanding and modelling of damage mechanisms in composites and improved their applicability for mass production in vehicles and pressure systems. His current research extends to recycling and reuse of carbon fibre composites, addressing a key bottleneck for circular mobility systems under EU sustainability policies. Through international benchmarking studies, standardisation activities with ISO, and industrial collaborations, his work supports more reliable material testing, improved design standards, and stronger evidence bases for policy and industry decisions in sustainable transport manufacturing.

TRANSPORT MODE
RAIL

Marion Berbineau
Gustave Eiffel University

Category: Rail

Country: France

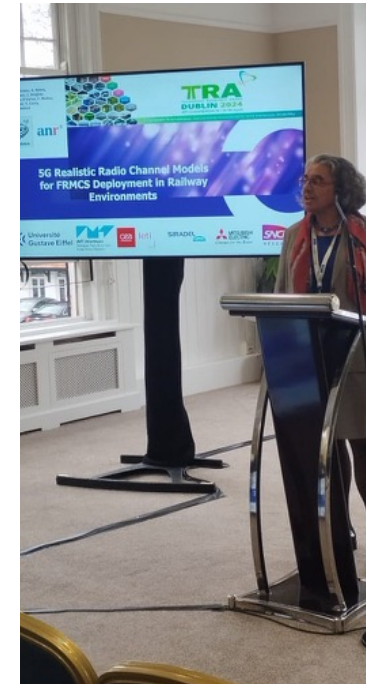
A woman career dedicated to wireless communications challenges for Railway applications

Prof. Marion Berbineau has developed an internationally recognised career spanning more than three decades in wireless telecommunications for transport, with a focus on rail systems. Her work has been central to the evolution of transport digitalisation, addressing the design and validation of robust communication architectures for safety-critical and mission-critical mobility applications. Positioned at the intersection of radio channel modelling and system engineering, she has combined theoretical research with large-scale experimental validation, reaching TRL6 demonstrators in operationally relevant environments.

Her contributions to cross-modal rail communication systems focus on enabling reliable, secure and interoperable connectivity under complex mobility conditions. Starting with foundational work on GSM-R through the MORANE project, she has continuously supported the transition towards next-generation railway communications, including LTE, 5G and future FRMCS architectures. Her research has advanced cognitive radio, heterogeneous network integration and resilient wireless system design, all essential enablers for digitalised and automated rail operations across Europe.

A defining element of her work is the strong integration of research and industrial deployment. Through long-standing collaboration with major rail stakeholders and technology providers, her innovations have been validated in demonstrators and simulation platforms supporting system testing and optimisation. These activities have directly contributed to the development of tools and methodologies for train control, communication performance assessment and system dependability under real operational constraints.

At European level, she has played a significant role in shaping research and innovation strategies through participation in numerous EU-funded programmes and advisory bodies, including leadership roles within ERRAC and EURNEX. In these capacities, she has contributed to strategic research agendas and roadmaps supporting EU priorities such as the Green Deal, the Sustainable and Smart Mobility Strategy and the digital transformation of the TEN-T network.



Since 1989, my research deals with wireless telecommunications for Rail. I specialize in designing safe, resilient and interoperable communication systems for mission-critical applications, particularly in complex environments. My work bridges radio channel modeling and system development, combining theory with experimental validation up to TRL6, shaping digital rail communications. With involvement in 35 European projects, 15 national initiatives, and 13 industrial contracts, I've always aligned research with operational needs. My internationally recognized work includes over 4128 citations (h-index 29), 67 journal and 168 conference papers, 30 book contributions, and 5 patents. I supervised 28 PhD students, 20 postdocs, and 13 engineers.

OTHER SHORTLISTED

Michael Meyer zu Hörste
German Aerospace Center (DLR)

Category: Rail Country: Germany

Enabling safe and cost-efficient rail operation in Europe

Michael Meyer zu Hörste is a senior rail research leader whose research focuses on the digital transformation of railway systems, enabling fully digital and increasingly autonomous train operation. This includes ERTMS/ETCS evolution, satellite-based positioning, railway IoT architectures, and virtual coupling concepts aimed at improving safety, efficiency, and cost-effectiveness in rail operations, particularly for regional and local services. He has played a key role in turning research into operational standards. His methodology for ETCS testing was incorporated into European interoperability specifications (TSI ETCS subset 076), becoming part of the EU rail system framework used across accredited laboratories for more than two decades. He also co-invented the Railway Collision Avoidance System, later developed to TRL 9 and commercialised through industry spin-off. At policy level, his work has directly supported the deployment of the Single European Railway Area and contributed to the Europe’s Rail Joint Undertaking Multi-Annual Work Programme, shaping key sections on digital automation.

OTHER SHORTLISTED

Anna Lina Ruscelli
Scuola Superiore Sant’Anna

Category: Rail Country: Italy

Advanced ICT technologies in support of railway digitalization and greening

Anna Lina Ruscelli is a research leader in railway digitalisation. Her work focuses on advancing ERTMS evolution through advanced ICT architectures that improve interoperability, scalability, and service integration. She contributed to the implementation of the ETCS Radio Infill function and to the Shift2Rail OPTIMA project, where she helped design a modular digital platform enabling seamless data exchange between railway systems and external services such as passenger information and weather systems. Her work also explores cloud-native and microservices-based architectures to support real-time, safety-critical rail applications. She has been actively involved in industrial and EU collaborative projects, including OPTIMA demonstrators with key European rail stakeholders such as RFI, UIC and Adif, translating research concepts into operational prototypes aligned with Shift2Rail objectives. Her applied research extends to sustainable railway technologies, including photovoltaic solutions for powering trackside and onboard systems. Her contributions support EU priorities on the Single European Railway Area, TEN-T modernisation and the Green Deal by enabling more interoperable, efficient and sustainable rail operations through digital innovation and system standardisation.

OTHER SHORTLISTED

Carlo Mannino
Stiftelsen for industriell og teknisk forskning DIGITAL

Category: Rail Country: Norway

Optimization methods for scheduling and planning in transportation systems

Carlo Mannino’s research career focuses on optimisation for transport systems, mainly in railway operations, with extensions to air traffic control and multimodal planning. His work covers timetabling, dispatching, routing, capacity allocation, and disruption management using mathematical programming and AI-based methods. A key feature of his work is the translation of research into operational systems. Through the spin-off Optrail, he co-developed and deployed large-scale optimisation tools used in real railway operations, including Union Pacific railroads in the US and systems in Europe such as the Milan metro and Norwegian rail corridors. These implementations demonstrate industrial maturity and scalability. At EU level, his research supports digital and sustainable mobility strategies by enabling AI-driven scheduling, multimodal coordination, and more efficient freight and passenger operations. It contributes to TEN-T optimisation, greener logistics, and resilient infrastructure planning, providing decision-support tools used in real-world transport operations.

TRANSPORT MODE

WATERBORNE

Maria Boile
University of Piraeus

Category: **Waterborne**

Country: **Greece**

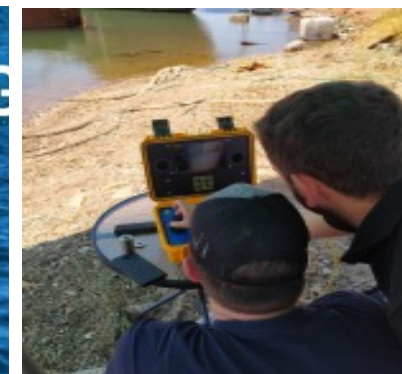
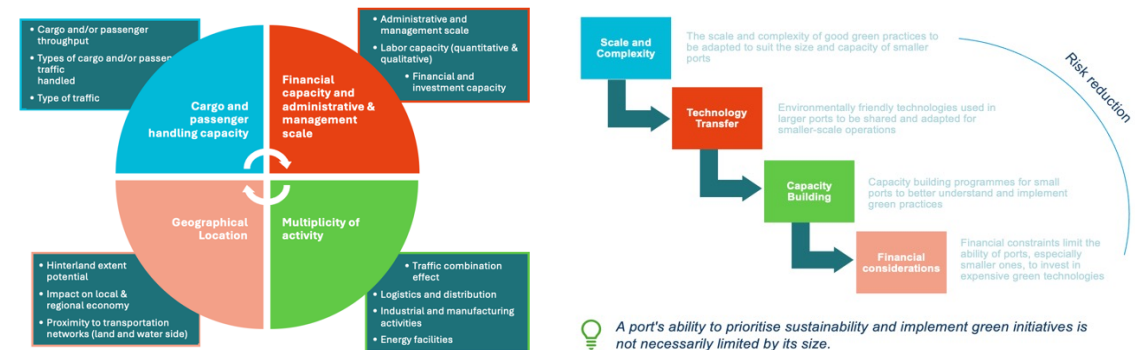
Shaping the future of sustainable and intelligent waterborne transport: from research and innovation to policy implementation

Prof. Maria Boile has built a 20-year-long international career in waterborne transport, with a focus on ports, maritime logistics and the transition towards sustainable and digitally enabled shipping systems. As Professor at the University of Piraeus and Coordinator of the European Waterborne Technology Platform, she has contributed to shaping European research and innovation priorities for the maritime sector, ensuring alignment with EU goals on sustainability, competitiveness and digital transformation.

Her work in waterborne transport addresses decarbonisation, digitalisation and multimodal integration across ports, shipping and hinterland logistics. She has advanced research on green port operations, maritime electrification, alternative fuels, coastal shipping efficiency and intermodal corridor development. Through strategic roadmapping and research coordination, she has supported the design of pathways towards zero-emission maritime systems and smarter port ecosystems, linking environmental performance with operational efficiency and economic viability.

A key feature of her career is the strong connection between research, industry and policy. Through collaboration with ports, shipping companies and logistics stakeholders, she has supported the development and application of decision-support tools, simulation models and performance assessment frameworks for maritime operations. These solutions have been used in real-world contexts to improve energy efficiency, emissions monitoring and port management, enabling the practical uptake of research results.

At European level, she has contributed to transport policy development through leadership in major EU-funded initiatives and the European Waterborne Technology Platform. Her work supports EU priorities such as the European Green Deal, the Sustainable and Smart Mobility Strategy, TEN-T policy and the Zero-Emission Waterborne Transport Partnership, particularly in relation to energy transition and digitalisation.



Dr. Maria Boile is Professor of Port and Intermodal Terminal Policy and Management at the University of Piraeus and Director of the Quantitative Analysis in Shipping Laboratory; Coordinator of the European Waterborne Technology Platform; Marine Liaison of the Executive Subcommittee on International Cooperation, Transportation Research Board, US National Academies; Affiliated Faculty, Center for Advanced Infrastructure and Transportation, Rutgers University. She previously served as Research Director at the Hellenic Institute of Transport and continues to lead its shipping and ports unit. With more than 30 years of international academic, research, and policy experience in Europe and the US, she has led over 100 major projects, published extensively, and received several distinctions for her contribution to the transport sector.

OTHER SHORTLISTED

Igor Bačkalov

Development Centre for Ship Technology and Transport Systems (DST)

Category: **Waterborne**

Country: **Germany**

Advancing Resilience and Competitiveness of Waterborne Transport through Improved Ship Design and Operation, and Redefined Safety and Efficiency Concepts

Igor Bačkalov's research career focuses on innovative ship design and operational concepts for inland and coastal waterborne transport, with a strong emphasis on shallow-water navigation, automation, and decarbonisation. Over the past decade, he has developed and assessed novel vessel designs such as shallow-draught ships (E-Type, X-Type), autonomous inland vessels (e.g. Oskar 2.0), and specialised concepts for vessel platooning and alternative fuel supply, including ammonia bunkering ships. These solutions address key challenges such as low-water resilience, zero-emission operation, and labour shortages, while supporting safer and more efficient waterborne transport systems. His research is closely linked to EU-funded projects such as NOVIMAR, AUTOFLEX, SYNERGETICS, and FLEETfor55, ensuring direct alignment with industrial and policy needs. By combining simulation, design innovation, and regulatory analysis, his work supports evidence-based decisions on fleet modernisation, decarbonisation pathways, and the safe introduction of autonomous technologies in European inland and coastal shipping.

OTHER SHORTLISTED

José Andrés Giménez

Terminal Industry Committee (TIC) 4.0

Category: **Waterborne**

Country: **Spain**

Waterborne and Port-Logistics Efficient and Sustainable Operations

José Andrés Giménez's research career focuses on the decarbonisation and digital transformation of ports and maritime logistics. Over two decades, his work has advanced low- and zero-emission port operations, port call optimisation, and interoperable digital logistics systems through EU projects such as GREENCRANES, SEA-TERMINALS, MONALISA 2.0, H2Ports, PLANET, and BOOSTLOG. These projects enabled development and real-world demonstration of alternative fuel equipment, hybrid and electric port machinery, and data-driven coordination tools for maritime supply chains. A key feature of his career is the translation of research into industrial practice. His work has led to deployed LNG and electric terminal equipment, hybrid cranes, and digital port call platforms implemented in European and international ports, demonstrating strong industrial readiness and scalability. At EU policy level, his research supports the Green Deal, Fit for 55, TEN-T, and the EU Maritime Strategy by providing validated evidence on alternative fuels, digitalisation standards, and logistics optimisation.

OTHER SHORTLISTED

Erdeniz Erol

Elkon Marine and Electric Technologies R&D Center (ELKON)

Category: **Waterborne**

Country: **Turkey**

Operational Energy Management and Risk Assessment of Battery Electric Propulsion Ships

Erdeniz Erol's research career focuses on enabling the transition to zero-emission waterborne transport through battery electrification, hybrid propulsion systems, and port charging infrastructure. With an academic background in maritime transportation engineering, computational science, and electrical engineering, he works at the interface between system modelling and industrial deployment of maritime energy technologies. At Elkon and through multiple Horizon Europe projects (including NEMOSHIP, FLEXSHIP, BLUEBARGE, GAMMA, REFEST and HARPOONERS), Erdeniz Erol contributes to scalable battery integration, energy management systems, and safe shore-to-ship charging architectures. His work supports the decarbonisation of short-sea shipping, offshore operations, and port services, while improving interoperability and standardisation across maritime energy systems. His role in the Waterborne Technology Platform and BEPA further aligns research with EU industrial and policy priorities. Overall, his contributions directly support TRA Topic 2: Green Mobility and Decarbonization by delivering validated technological pathways for the practical deployment of zero-emission waterborne transport solutions across Europe.

TRANSPORT MODE

AIRBORNE

Jürgen Rataj

German Aerospace Center (DLR)

Category: Airborne

Country: Germany

From Assistance to Automation in Transport Systems

Dr. Jürgen Rataj has built a research and leadership profile in system-level transport automation, focusing on assistance systems and human-machine cooperation. As Vice Director of the DLR Institute of Transport Research and former Head of Controller Assistance at the DLR Institute of Flight Guidance, he has contributed to research agendas and architectural principles for European work on aviation and multimodal automation systems.

His work introduced foundational concepts such as listening assistance, assistance-based controller command creation, and transition principles for progressive automation, several protected by patents. These form a coherent framework linking cognitive interaction, intent modelling, and delegated task execution, enabling an incremental pathway from assisted operations to higher automation while maintaining human oversight.

At European level, he has contributed to major SESAR projects including MALORCA, HAAWAIL, GREAT, FALCO, SUMO, XSTREAM, PJ10, PJ05, PJ16-04, IFAV3, HUCAN, PATH2ZERO and Diversify-CCAM. His role has focused on defining system logic, setting research priorities, and ensuring coherence between technological development and operational validation, supporting the transfer of concepts into pre-operational environments.

A key outcome is a two-dimensional transition framework combining technical evolution from assistance to automation with incremental deployment within existing infrastructures. This enables stepwise adoption without disruptive replacement and supports operational constraints across aviation and wider transport systems. His work informs EU policy on digitalisation, safety, certification and human-machine roles, and extends to road and multimodal mobility systems.



Jürgen Rataj is a former Deputy Director at the Institute of Transport Research, German Aerospace Center (DLR). Over more than three decades, he has shaped the evolution of assistance and automation in transport systems, with a particular focus on air traffic management. A hallmark of his work is the ability to connect conceptual innovation, system architecture and practical implementation to enable the stepwise introduction of higher automation levels. Throughout his career, he has built national and international collaborations, developed strategic patent lines and established research directions that contributed to operationally relevant systems and European initiatives, including key activities within SESAR.

OTHER SHORTLISTED

Bianca Schuchardt
German Aereospace Center (DLR)

Category: Airborne Country: Germany

Pioneering Innovative Air Mobility: The Integration of Aerial Transport into Europe's Multimodal Mobility Ecosystem

Dr. Bianca Schuchardt is a senior research leader at the German Aerospace Center (DLR), working on the digital transformation of aviation through Innovative Air Mobility (IAM). She leads research on integrating highly automated aircraft into future airspace systems, focusing on vertiport operations, digital procedures, and human-machine interaction. In EU projects such as EUREKA, U-ELCOME and IAM-OSA, she has contributed to harmonised concepts for U-space services, air traffic integration and simulation environments supporting urban and regional air mobility. A key element of her work is the translation of research into operational solutions, notably through the VERTIFIED vertiport research infrastructure, which enables real-world testing with industry and regulatory stakeholders. Through advisory roles in ICAO and IFAR, she also contributes to international standardisation efforts.

OTHER SHORTLISTED

Giovanni Riccardi
Ente Nazionale per l'Assistenza al Volo (ENAV)

Category: Airborne Country: Italy

Shaping the Future Sky: SESAR-Driven Research for Integrated Air Traffic, Drone, and Urban Air Mobility Operations

Dr. Giovanni Riccardi is a research expert at ENAV working on the digital transformation of aviation, with focus on Air Traffic Management, RPAS integration, and U-space/Urban Air Mobility. Through SESAR projects such as CORUS-XUAM, EUREKA and U-ELCOME, he has contributed to the design and validation of digital architectures enabling safe drone and air taxi operations, including simulation environments and large-scale demonstrations across Europe. A key element of his work is the translation of research into operational deployment. As coordinator of the Italian cluster in U-ELCOME, he led multi-stakeholder trials validating interoperability, real-time data exchange and automated flight authorisation for U-space services, supporting their progression towards pre-operational use. His research supports EU priorities on digital aviation under the European Green Deal and the Sustainable and Smart Mobility Strategy. Results from SESAR activities have informed EASA regulatory development and ICAO discussions on Advanced Air Mobility, particularly on U-space implementation and RPAS integration frameworks.

TRANSPORT MODE

CROSSMODAL PASSENGER

Elisabete Arsenio
Laboratório Nacional de Engenharia Civil (LNEC)

Category: **Crossmodal Passenger** Country: **Portugal**

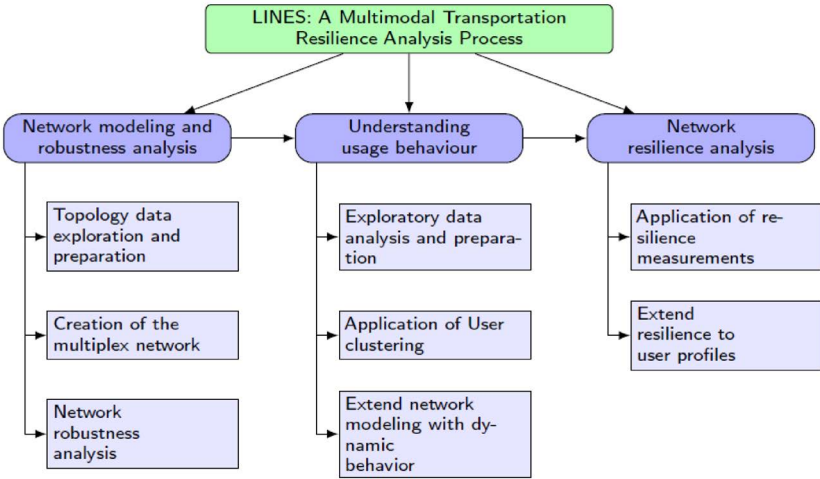
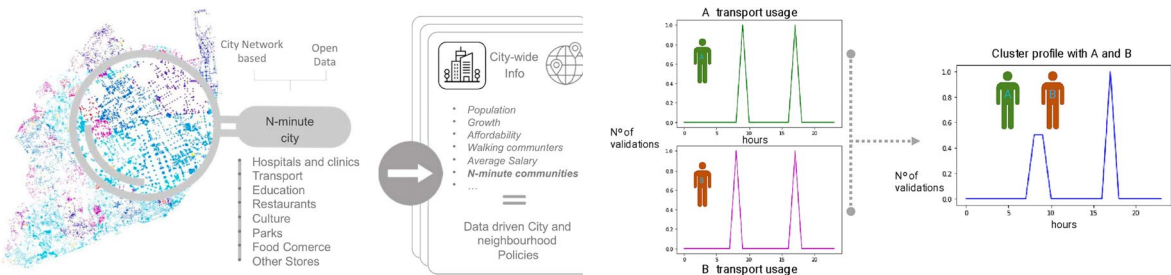
Collaborative Innovation for Sustainable and Smart Mobility in Europe

Prof. Elisabete Arsenio has developed an international career of more than twenty years in cross-modal passenger mobility, transport equity, and smart mobility systems, with a strong focus on turning research into deployable solutions and policy-relevant knowledge. As a senior researcher at LNEC, she has contributed to shaping national and European agendas in sustainable mobility, combining transport engineering with behavioural science and data-driven innovation.

Her work in cross-modal passenger mobility addresses decarbonisation, accessibility and system performance through integrated multimodal planning and user-centred approaches. She has advanced methods and tools for public transport analysis, resilience assessment, and mobility behaviour modelling, linking environmental objectives with social inclusion and equity. Her contributions support the development of low-carbon and efficient mobility systems that better reflect real user needs across urban and regional contexts.

A defining element of her activity is the use of real-world experimentation through living labs, pilot deployments and co-creation environments. These settings bring together cities, operators and industry partners to test and validate digital mobility solutions, including applications for multimodal integration, public transport optimisation and urban mobility planning. This approach has enabled the uptake of research results in tools such as mobility applications, data platforms and planning support systems used by public authorities.

At European level, she has been actively involved in research and policy initiatives supporting transport transformation. Through participation in major EU-funded projects and scientific networks, she has contributed to shaping priorities related to the European Green Deal, the Sustainable and Smart Mobility Strategy, TEN-T development and Sustainable Urban Mobility Plans, with particular emphasis on equity, resilience and digitalisation.



Elisabete Arsenio holds a Ph.D. from the University of Leeds, Institute for Transport Studies (ITS), UK. She's Principal Investigator at LNEC's Department of Transport, Lisbon, Portugal. She's a leading woman expert in transport engineering with expertise in sustainable and smart urban mobility. Since 2002, she has co developed numerous EU funded research projects, serving as LNEC coordinator in major international consortia including OPTIMISM, SOLUTIONS, TEA and USE it. She has advanced low carbon, equitable and user centred mobility. Most recently, she led WP2 Sustainable transport & logistics in the ADMIRAL project, with scientific results reinforcing her role as a key figure in European mobility research.

OTHER SHORTLISTED

Maria Kamargianni
MaaS Lab

Category: Crossmodal Passenger Country: Cyprus

Hon. Professor of Transport Systems
Innovation & Sustainability

Maria Kamargianni is a leading researcher in user-centred mobility, contributing strongly to the TRA crossmodal passenger theme. Her work focuses on placing the traveller at the core of transport innovation, combining behavioural science, digital platforms and policy design to develop inclusive and sustainable mobility systems. Starting from studies on youth travel behaviour, her research evolved towards Mobility-as-a-Service (MaaS) and autonomous mobility, examining how different user groups respond to emerging transport technologies. She applies mixed methods, including surveys, interviews and experimental tools, to ensure mobility solutions reflect diverse user needs. Through MaaS Lab, she has shaped internationally recognised approaches to integrated mobility services, influencing both research and practice. Her work has supported industry pilots with Citymapper, Mastercard, Bosch, AECOM and PwC, as well as Horizon Europe demonstrations. She has also advised governments and cities, including the European Commission, Transport for London and Singapore authorities, contributing to MaaS and digital mobility strategies. Her research supports EU priorities on user-centred, inclusive and sustainable transport aligned with the Green Deal and the Sustainable and Smart Mobility Strategy.

OTHER SHORTLISTED

Jana Sochor
Chalmers University of Technology

Category: Crossmodal Passenger Country: Sweden

The Challenges, Opportunities, and
Practicalities of Integrated Mobility

Jana Sochor is a leading researcher in Mobility as a Service (MaaS) and transport digitalisation. Her work focuses on improving the ecological, social, and economic sustainability of mobility services by integrating user behaviour, service design, and governance perspectives. Starting from user-centred studies of travel behaviour, her research expanded to systemic analyses of how digital mobility services interact with institutional, business, and policy environments. She has played a key role in developing and evaluating some of the earliest MaaS pilots in Europe, including UbiGo and other living labs testing integrated mobility, shared services, and electrified logistics solutions. Her frameworks, such as the MaaS topology and IRIMS model, have become widely used reference points in both research and industry, shaping how integrated mobility services are designed and assessed. Through active engagement in the MaaS Alliance and international standardisation bodies, her work has influenced industry practice and policy discussions on digital mobility integration. Her contributions support EU ambitions for seamless, user-friendly and sustainable multimodal transport systems under the Green Deal and Sustainable and Smart Mobility Strategy.

TRANSPORT MODE

CROSSMODAL LOGISTICS

Georgia Ayfantopoulou

Centre for Research & Technology Hellas - Hellenic Institute of Transport (CERTH-HIT)

Category: **Crossmodal Logistics**

Country: **Greece**

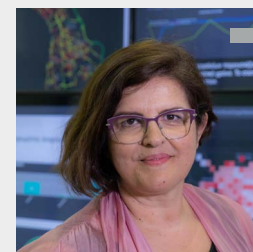
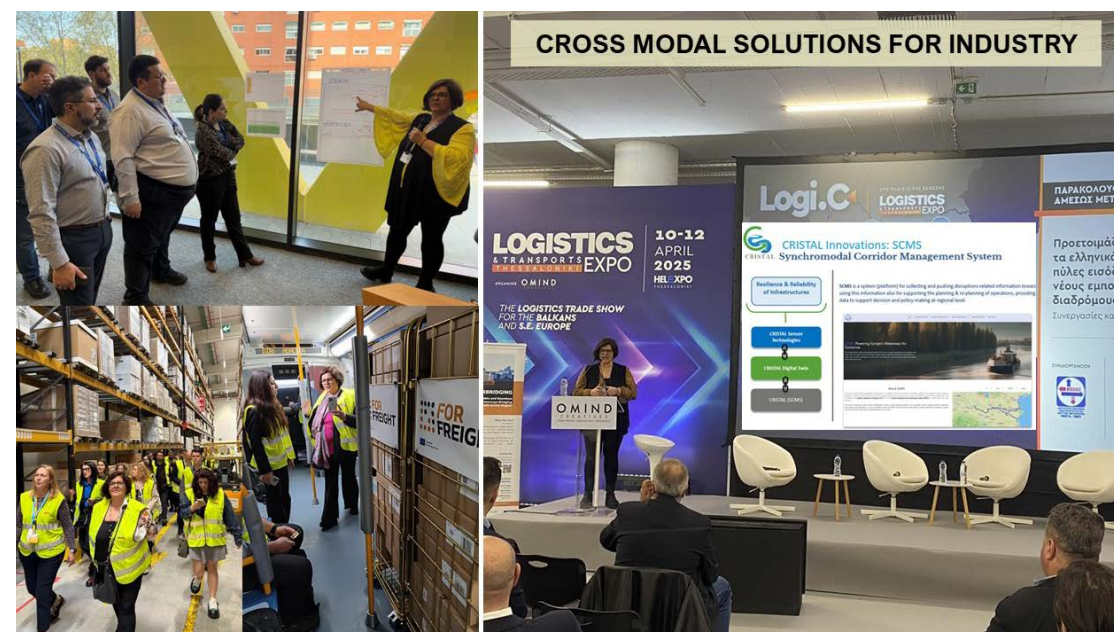
Optimizing Multimodal Supply Chains for the Future: Bridging Research and Practice

Prof. Georgia Aifadopoulos has built a research trajectory distinguished by over 30 years of work in cross-modal logistics, freight systems and transport policy, driven by a consistent effort to translate research into operational and societal impact. As Research Director at CERTH/HIT, she has steered research agendas integrating logistics optimisation, digital transformation and sustainability, ensuring strong alignment with EU priorities on green, resilient and smart mobility.

Her work in cross-modal logistics and decarbonisation focuses on enabling modal shift, improving corridor efficiency, and developing integrated multimodal freight systems. She has contributed to Physical Internet-inspired logistics, synchromodal transport solutions and corridor-based management frameworks linking inland waterways, maritime, rail and road networks into coordinated European supply chains. These approaches have enhanced system efficiency and resilience, grounded in data-driven methods, systemic analysis and strong public-private collaboration.

A central dimension of her career is the development of innovation ecosystems, including living labs, clusters and digital platforms that support experimentation and co-creation. These environments bring together industry, public authorities and research organisations to test and validate logistics and mobility solutions in real-world conditions, accelerating the deployment of digital tools for urban freight, multimodal coordination and corridor planning.

At European and international level, she has contributed to research and innovation strategies through leadership roles in organisations such as EIT Urban Mobility, ENoLL, ERTRAC and national and EU advisory bodies. In these positions, she has influenced research agendas and reinforced alignment with key EU frameworks, including the European Green Deal, TEN-T policy and the Sustainable and Smart Mobility Strategy.



Dr. Georgia Ayfantopoulou, is Research Director at the Hellenic Institute of Transport (HIT) of CERTH with experience for over 25 years in transport systems planning, management and optimization. She was lately appointed by the Greek parliament as President of the Independent Authority for Greek Railways Safety. Her academia and consultancy work focuses on mobility and logistics systems transformation through digitisation and innovations towards their sustainability, resilience & economic viability. Her research work emphasises on: a) Intelligent Transport Systems and dynamic transport management, b) Tools for Multimodal networks optimisation and c) city logistics systemic change for societal benefit. Coordinator of many research, innovation and policy making projects funded by the EU. She is involved in the Management of European Networks and is acting as National representative in EU expert groups and committees. She is coordinating the Thessaloniki Smart Mobility & Logistics Living Lab, an ecosystem approach for data sharing, knowledge creation and innovation uptake in cross modal mobility & logistics.

OTHER SHORTLISTED

Eric Ballot
Mines Paris - PSL

Category: Crossmodal Logistics Country: France

Physical Internet: contributing to more sustainable and resilient logistics

Prof. Eric Ballot is a senior researcher at MINES Paris-PSL working on cross-modal logistics, focusing on reducing the environmental impact of freight transport through system redesign and digitalisation. He co-originated the Physical Internet concept, which applies internet-like principles to logistics to improve efficiency, interoperability and resource sharing across transport, packaging and storage systems. His work supports key TRA priorities on green and digital freight by promoting standardised physical, digital and procedural layers for logistics operations. This approach enables higher asset utilisation, fewer empty runs and reduced packaging, while maintaining service quality. In collaboration with industry partners and organisations such as ALICE and GS1, his research has influenced emerging practices in reusable packaging, shared logistics systems and data-driven freight coordination. At EU level, his contributions inform policy discussions on TEN-T development, circular economy objectives and digital logistics ecosystems. The Physical Internet concept is increasingly reflected in European roadmaps for more efficient and sustainable freight systems.

OTHER SHORTLISTED

Uwe Clausen
Technical University Dortmund

Category: Crossmodal Logistics Country: Germany

Sustainable and intermodal logistics

Uwe Clausen is a senior research leader whose career has significantly shaped European freight transport research, particularly in intermodal logistics, digitalisation and decarbonisation. His work spans the full innovation chain, from fundamental modelling to deployment in real logistics operations, with a strong focus on sustainable and efficient freight systems. Early contributions to last-mile logistics have evolved into broader system-level approaches addressing resilient and climate-friendly supply chains, including carbon accounting, multimodal optimisation and infrastructure adaptation. Through his leadership at Fraunhofer IML and TU Dortmund University, he has steered large-scale research programmes linking academia, industry and policy. He played a key role in establishing and advancing European platforms such as ALICE, strengthening the coordination of logistics innovation across stakeholders. His work consistently informs EU priorities on green freight corridors, digital logistics ecosystems and multimodal integration. By combining simulation, optimisation and real-world testing, he has helped translate research into operational tools and industry practices, reinforcing the competitiveness and sustainability of European transport systems.

OTHER SHORTLISTED

Saskia Seidel
German Aerospace Center (DLR)

Category: Crossmodal Logistics Country: Germany

User-Centred and Digitalised Urban Freight: Enabling

Saskia Seidel is a research leader in urban and freight logistics work combines behavioural analysis, modelling and applied projects to understand how consumption patterns and digital services reshape last-mile logistics and urban freight systems. Her PhD work on retail distribution in France and Germany already highlighted how e-commerce and new delivery models transform mobility demand and infrastructure needs. Through projects such as Smart eFleets and LEARN, she has advanced low-emission fleet concepts, carbon accounting methods and standardisation frameworks supporting EU climate and mobility goals. As head of research activities at DLR, she has led studies on space-efficient urban logistics and integrated freight planning, supporting municipalities in more sustainable transport design. She also contributes to digital freight policy development through involvement in the DG MOVE eFTI framework, linking research on data governance and interoperability with regulatory implementation. Her work has been disseminated through TRA sessions and European collaborations, ensuring strong alignment between research, industry practice and EU transport policy development.

SPECIAL HONORARY AWARD



A new Special Award was introduced for the first time at the 2022 edition, for honouring a senior personality of the transport sector, representing well established researchers, who through the years have made an outstanding and well-recognised contribution to research and innovation in their respective field. Someone who has, throughout their career, demonstrated ground-breaking and future-oriented views and research.

A call for nomination was launched to the European Technology Platforms supporting the TRA Conference (ERTRAC, ERRAC, WATERBORNE, ACARE, ALICE and ECTP). Each nomination had to include a proper justification (up to two pages long) based on the overall impact, visionary thinking, breakthrough achievements and track record of the nominated person (including but not limited to EU funding policy impact, publication track record, patents and research leadership, research leadership experience, etc.).

The winner (irrespective of transport mode) was selected by an expert panel at a shortlisting workshop held at the European Commission in Brussels on 4 March 2026. The panel brought together transport experts representing the European Commission, academia, and the TRA 2026 organising team.

The Winner was recognised at the TRA 2026 Conference Gala dinner in Budapest, and invited to speak at one of the Conference Plenary Sessions.

HONORARY WINNER

Alan McKinnon
Kuhne Logistics University

Category: Road Country: UK/Germany

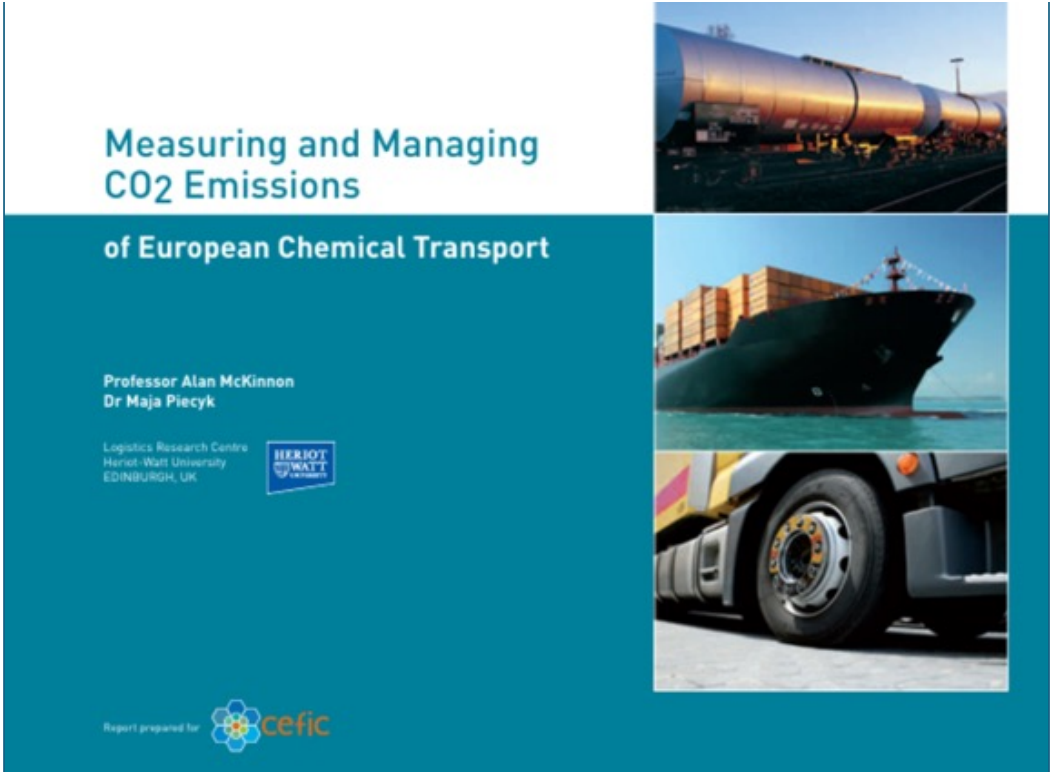
Professor Alan C. McKinnon is one of the world’s leading authorities on logistics, freight transport, and supply chain sustainability. Over a career spanning more than four decades, he has played a pivotal role in advancing understanding of freight transport efficiency, logistics management, and the environmental impacts of global supply chains. His work has been instrumental in positioning logistics at the centre of the sustainability and climate agenda, making major contributions to Green Mobility and Decarbonisation, as well as Planning and Operation.

After pioneering some of the earliest academic research in logistics in the United Kingdom, Professor McKinnon established internationally recognised research and education programmes at Heriot-Watt University and later helped shape the development of Kühne Logistics University in Hamburg. His research has produced influential frameworks for freight decarbonisation, modal shift, vehicle utilisation, and supply chain resilience, providing practical solutions adopted by governments, industry, and international organisations.

Professor McKinnon’s impact extends well beyond academia. As Lead Author of the transport chapter of the IPCC Fifth Assessment Report, adviser to the European Commission, OECD, World Bank, International Transport Forum and World Economic Forum, he has helped shape transport and climate policy at the highest international level. His influential book Decarbonizing Logistics and extensive body of research, comprising more than 24,000 citations, have established him as a global thought leader in sustainable freight transport. Further, he has served as the Rapporteur of an Expert Group set up to review the transport section of the European Union’s 7th Framework Programme for Research (FP7).

Through his research, policy leadership, and international engagement, Professor McKinnon has transformed the way logistics is understood and managed, helping to create more efficient, resilient, and environmentally sustainable transport systems worldwide.

HONORARY WINNER



Alan McKinnon is Emeritus Professor of Logistics in Kuehne Logistics University, Hamburg and Heriot-Watt University, Edinburgh. He has been researching and teaching logistics since the late 1970s and published extensively in journals, books and reports on many different aspects of the subject. He has also been an advisor to companies, governments and international organizations, including the European Commission, UN, World Bank and World Economic Forum. Much of his research has focused on the environmental sustainability of freight transport, particularly its decarbonisation. As Chairman of the Transport Advisory Group for Horizon 2020 he helped to shape the EU's transport research agenda.

HOST AWARD



A new Host Award was introduced for the first time at the 2026 edition of TRA VISIONS, with the aim of recognising the best scientific paper addressing the key theme of TRA 2026: ReGeneration in Transport. This inaugural award highlighted outstanding contributions demonstrating innovative, forward-looking and system-level approaches to renewing transport systems in response to technological, environmental and societal challenges.

A structured evaluation process was established to identify the winner. All submitted papers first underwent the standard peer review procedure, after which the top-performing contributions (approximately 10%) were shortlisted for further assessment. In a second step, Hungarian thematic experts evaluated these papers against two dedicated criteria: their relevance to the ReGeneration in Transport theme and their overall fitness for the award, considering originality, scientific quality and potential impact.

Following this evaluation, a shortlist of the ten highest-ranked papers was established, ensuring a balanced representation across the main TRA thematic areas. A jury of distinguished experts representing the Host, the European Commission, the Management Committee, the Programme Committee, the Local Advisory Board and the TRA2026 Project then reviewed the shortlisted contributions and provided a final ranking at an online meeting in March 2026. The winner was selected based on this combined assessment process, reflecting both scientific excellence and strong alignment with the conference's core theme.

The Winner was recognised at the TRA 2026 Conference Gala dinner in Budapest and presented with their prize by the sponsor.

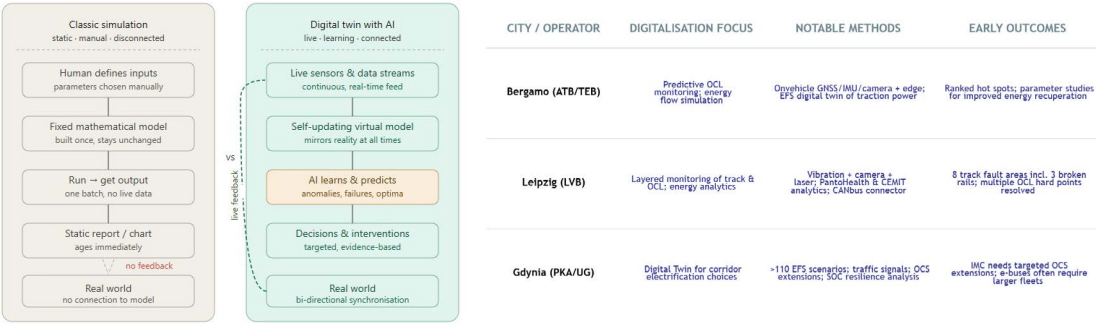
Jan Röhl, Conrad Jentzsch & Marta Woronowicz
Kruch Railway Innovations GmbH. & Co.KG, Infrastructure Division, Leipziger
Verkehrsbetriebe & trolley:motion

Paper Number: 1197



Public Transport Digitalization: Leveraging AI and Digital Twins for Smarter Urban Mobility Management

Urban transport systems face mounting pressures—from climate change and rising energy prices to ageing assets and growing ridership expectations. Meeting these challenges sustainably requires extending the useful life of infrastructure and vehicles, improving energy efficiency, and reducing waste across the whole lifecycle. Circular economy principles offer a systemic approach: design for longevity, maintainability and reuse, measure wholelife value and favour interventions that avoid material and energyintensive renewal of the fleet, rolling stock and infrastructure. Digitalisation in public transport is a key enabler of this shift. AI-assisted analytics, edge sensing and Digital Twins in combinations with simulation technology make hidden conditions visible, reduce diagnostic costs, and allow operators to test interventions virtually before deploying them in the field. Within The Interreg Central Europe-funded CE4CE project (Public Transport Infrastructure in Central Europe – facilitate transitioning to circular economy), three pilots translate these capabilities into practice: (i) predictive maintenance and energyflow simulation on the Bergamo tram (Italy), (ii) multilayer infrastructure monitoring and diagnostics on the Leipzig tram network (Germany), and (iii) a Digital Twin & energy simulations for strategic electrification of e-bus and trolleybus corridors in Gdynia (Poland). Together, they illustrate complementary paths for delivering ‘usemore, reuse, and recycle’ outcomes in public transport operations.



OTHER SHORTLISTED

Tailored AI for Predictive Railway Maintenance

Wassamon Phusakulkajorn, Zili Li, and Alfredo Nunez

Section of Railway Engineering, Delft University of Technology, The Netherlands.

Paper N°: 182

A Group-Based Hierarchical Adaptive Traffic Control System for an Emergency Vehicle Priority Signal along with Consecutive Signalized Intersections

Seulbin HONG*1, Dohyeon KIM*1, Dongmin LEE*1, Sooncheon HWANG*1, Wai WONG*2 and Seunghyeon LEE*1

*1 Department of Transportation Engineering, University of Seoul, Republic of Korea
*2 Department of Civil and Environmental Engineering, University of Canterbury, New Zealand

Paper N°: 236

Digital Twin-Enabled Energy Simulation for Automated Zero-Emission Vessels in Constrained Inland Waterways

Pauline Bernat *1, Charilaos Latinopoulos *1, Florin Dimitrie Pacuraru *2, and Sandita Pacuraru*2

*1 VLTN, Antwerp, Belgium
*2 Universitatea Dunarea De Jos Din Galati, Galati, Romania

Paper N°: 309

RailVision: An Integrated Solution for Train Defection, Speed Estimation, and Direction Analysis in Railway Environments

Laura Rabadán Ortega*1
Andoni Cortés Vidal*1
Alexandre Marc Corcia Aguilera*2
Javier Ortuondo Arambalza*2
Javier Barandiaran Martirena*1
Oihana Otaegui Madurga*1

*1 Vicomtech Foundation, Basque Research and Technology Alliance (BRTA), San Sebastián, Spain;
*2 DOMINION, Bilbao, Spain

Paper N°: 1273

GREEN-LOG Logistics as a Service Marketplace: A Policy-Aligned Marketplace for Sustainable Last-Mile Operations

Babis Magoutas*1, Amalia Bozinaki*1, Ioannis Tsouros*2, Francesca D'Alessandro*3, Joris Becker*4, Panagiotis Georgakis *5, Athina Tsimpa*2, Kotsantinos Barboropoulos*1, Vivian Kiouisi*1

*1 Frontier Innovations I.K.E., Athens, Greece,
*2 MOBY X Software Limited, Limassol, Cyprus,
*3 Factual Consulting SL, Sant Cugat Del V Allés, Spain,
*4 Universiteit Antwerpen, Antwerpen, Belgium,
*5 University of Wolverhampton, School of Architecture & Built Environment, Wolverhampton, England

Paper N°: 1509

Electric Road Systems: Experimentation and Development in France

Bernard Jacob*1, Nicolas Hautière*1, Marc Raynal*2, Patrick Pelata*3, Pierre Delaigue*4, Patrick Duprat*5, Olivier Besson*6

*1 Université Gustave Eiffel, France,
*2 Cerema, France,
*3 Metaconsulting, France,
*4 Vind Autoroutes, France,
*5 Alstom Group, France,
*6 EVIAS, France

Paper N°: 1565

What Is a Circular Road? Defining Circularity for Road Infrastructure

Alexander Grødum Vetnes and Reyn O'Born

University of Agder, Norway

Paper N°: 381

Standardizing GHG Emission Factors: A Critical Review and Gap Analysis

Bruna Rodrigues, Mehul Khandelwal, Alan Lewis, Nabil Abdalla, Kirsten Biemann, Stelios Doulgeris, Giorgos Mellios

Smart Freight Centre, Netherlands; IFEU, Germany; e:misia, Greece

Paper N°: 438

Repeated Exposure to eHMI: Behavioral Adaptation Across Age Groups in Pedestrian-HAV Interaction

Marc Wilbrink and Michael Oehl

Institute of Transportation Systems, German Aerospace Center (DLR), Braunschweig, Germany

Paper N°: 551

OTHER SHORTLISTED

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Yanying Li (ALICE)

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Please note that panelists were required to declare any conflict of interest and abstain from evaluating the concerned applicant.



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