# TRAVISIONS 2022

# TWO ACADEMIC
## ON INNOVATIVE TRANSPORT CONCEPTS
# COMPETITIONS

**#TRAVISIONS**
**www.travisions.eu**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006593.

# TABLE OF CONTENTS

# INTRODUCTION

**Ever more people and goods are moving around the world in constantly shorter timeframes. This makes innovative transport solutions an important necessity. What could future transport look like? How can existing systems and infrastructures cope with the rising strain, be it road, rail, air, waterborne or cross-modal transport systems? Which are efficient and sustainable solutions to the arising questions on mobility issues?**

The series of EU-funded projects TRA VISIONS invited young and senior researchers from all over Europe to enter their ideas concerning these and other questions to the competitions. The aim is to showcase European excellence and to increase the competitive advantage of the European transport industry by generating innovative concepts and solutions through a Europe-wide competition for both young and senior researchers in the sectors of road, rail, waterborne, airborne and cross-modal transport. The core activity of the TRAVISIONS 2022 project was the organisation of two competitions for transport research awards to be announced at the TRA 2022 conference from November 14th to 30th 2022 in Lisbon, Portugal:

**The TRAVISIONS 2022 YOUNG RESEARCHER COMPETITION, an academic competition with the goal of stimulating interest among young researchers and students in the field of sustainable transport.**

**The TRAVISIONS 2022 SENIOR RESEARCHER COMPETITION, a competition for senior researchers in the field of innovative transport concepts based on results only from EU-funded projects.**

The Young researchers' competition aims to target undergraduate students and early-stage researchers in the transport sector, stimulate their minds and give them the chance to interact with a wide scientific community on transport research and show off their ideas. The senior competition, on the other hand, is addressed to established senior researchers and has the goal of acknowledging the excellence of the existing research and innovation potential in the field of transport in the EU. Although the two competitions have separate evaluation procedures and different rules, they are aimed at reaching a common goal which is the creation of a scientific community made of young and senior researchers in the field of transport. The interaction between different generations of researchers and different transport mode research fields enables the achievement of the overall objective of TRAVISIONS, which is the development and deployment of innovative and cross-cutting transport solutions.

Finally, TRA VISIONS 2022 has introduced the Special Honorary Award, 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-recognized contribution to transport-related research and innovation in their respective field, demonstrating ground-breaking and future-oriented views and research.

## Objectives

The objectives of the TRAVISIONS 2022 project are to:

**Build a vibrant community of transport innovators and researchers in Europe** to foster interaction between specialists working in transport sectors.

**Promote an interdisciplinary approach**, linking basic science, socioeconomics and applied sciences/engineering.

**Disseminate knowledge and project findings** to develop innovative transport solutions in Europe.

The TRAVISIONS 2022 project builds on the success of the H2020-funded TRA VISIONS 2020, TRA VISIONS 2018 and TRA VISIONS 2016, FP7-funded TRA VISIONS 2014, FP7-funded Young European Arena of Research - YEAR competitions, that took place at TRA in 2008, 2010 and 2012, as well as the VISIONS (FP6) and VISIONS OLYMPICS (FP7) competitions. Together, these competitions captured the imaginations of more than 2.000 students around Europe. TRAVISIONS 2014, 2016, 2018, 2020 and 2022 aimed to develop this impact even further by extending the awards to include a new competition for senior researchers and the Special Honorary Award to acknowledge excellence in transport research projects.

## Impact

The expected strategic impact of TRAVISIONS 2022 includes:

**Stimulating young researchers and students** to submit their research work to the competition and attracting them to transport related studies.

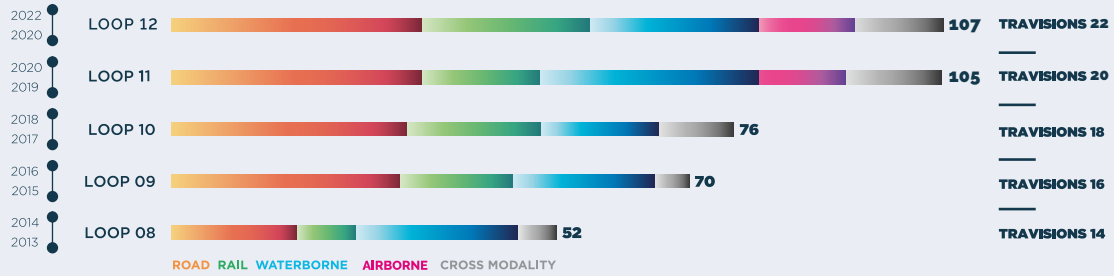
**Encouraging partners from EU-funded projects** to further develop innovative ideas from their projects.

**Supporting the TRA conference**, which is considered as the first transport research conference in Europe, with a successful and high-quality scientific competition and strong and high-level media coverage.

**Efficiently disseminating knowledge and results** of European and national research projects in the area of sustainable transport, and thus improving the coordination of research, technology development and innovation and the deployment of innovative solutions in the transport sector in Europe.

# TRA VISIONS is a series of EU-funded projects whose core activity is the organization of young and senior researcher competitions for transport research awards.

The award ceremonies are organized every two years to take place at the Transport Research Arena (TRA) conference (TRA 2014 in Paris, TRA 2016 in Warsaw, TRA 2018 in Vienna and TRA 2020 in Helsinki).




The chart above shows the number of young researchers' ideas 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 projects increases as the TRA VISIONS brand increases in popularity and recognition.

In the course of the four projects, four bi-annual academic competitions were organized and run, involving students and young researchers of European universities who were asked to generate and develop concepts for future transport related products in the sector of road, rail, waterborne, airborne and cross-modality. During the four TRA VISIONS competitions that were run:


**410**
innovative ideas made it to the finish line while many more were submitted as abstracts

**738**
young researchers were engaged as team members of the teams responsible for submitting these 410 ideas

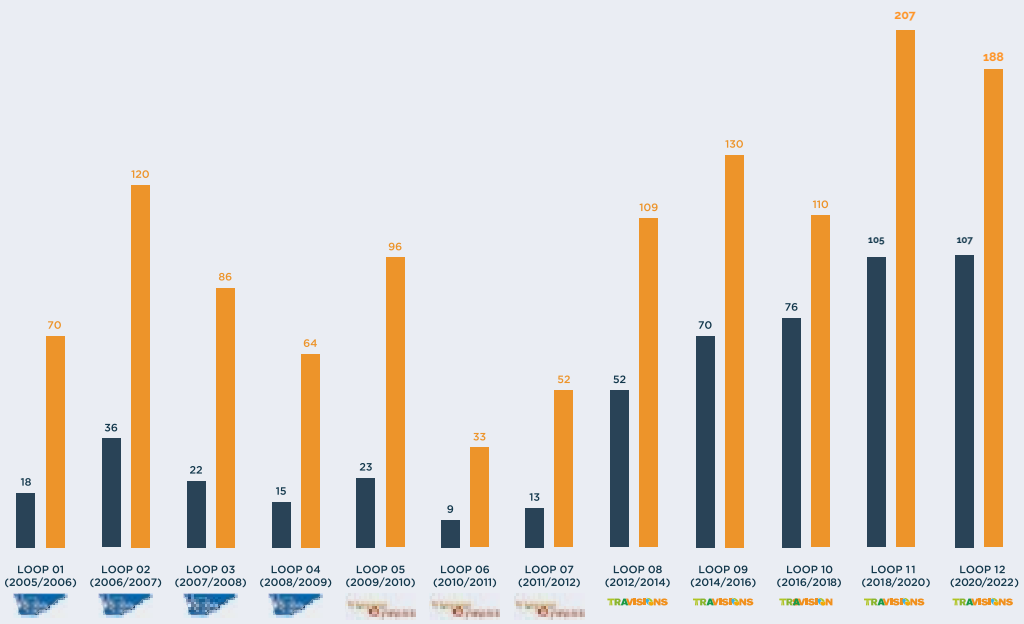
From more than

**90**
European universities located in 26 EU countries covering all major transport related universities in Europe

More than

**188.000**
euro of awards for the young researchers were secured from the European transport industry showing the strong commitment of the sector.

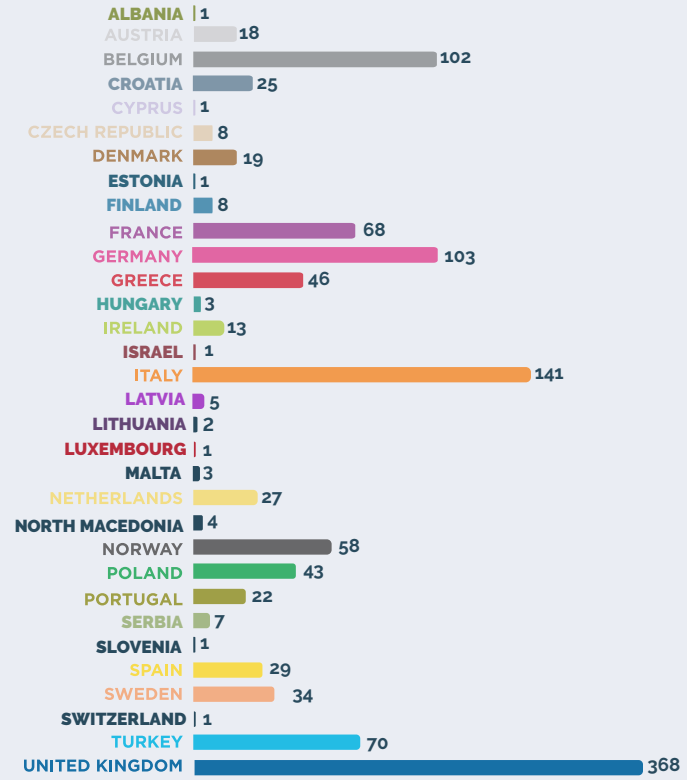
# The VISIONS, VISION OLYMPICS and TRA VISIONS competitions targeted young researchers at universities and technical institutes pursuing bachelor and higher degrees, as well as early-stage PhD researchers.

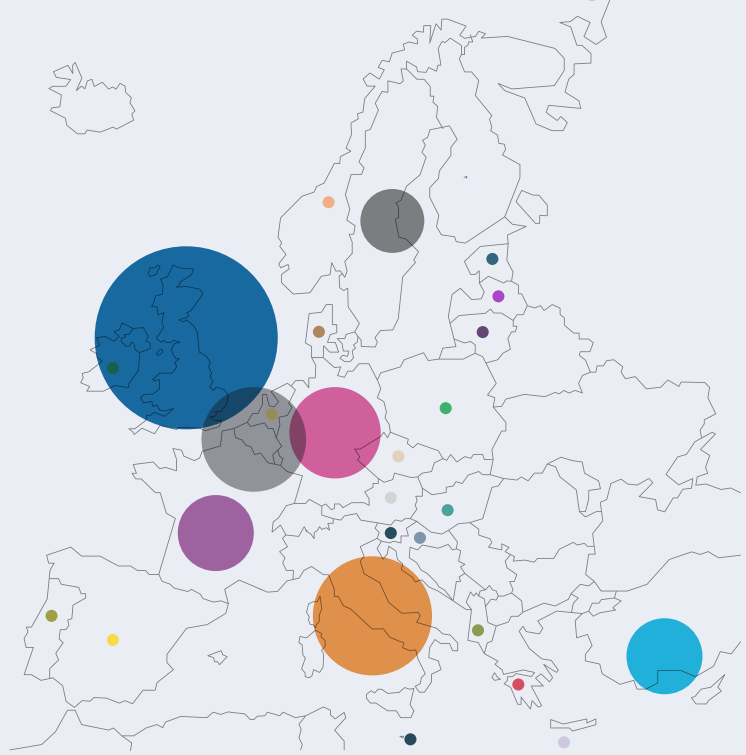



The graph shows the number of young researchers' ideas (blue bars) and the number of students (orange bar) registered per competition.

## STUDENTS PER COUNTRY

**A total of 1257 young researchers were engaged** as members of the teams responsible for submitting 546 ideas throughout all the 12 competitions that were organized.

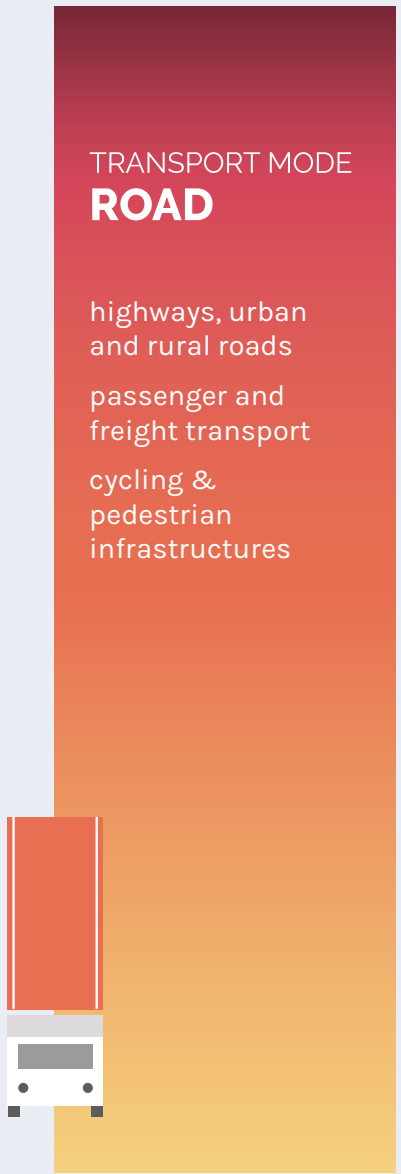


The map shows the number of these 1257 young researchers per country. The United Kingdom was the largest contributor followed by Italy and Germany.

# COMPETITION PILLARS / TRANSPORT MODES

In both competitions the participants are asked to apply for one of the following pillars/transport modes:



TRANSPORT MODE
## ROAD

highways, urban and rural roads

passenger and freight transport

cycling & pedestrian infrastructures

TRANSPORT MODE
## RAIL

high-speed

passenger and freight transport

urban and light rail systems

TRANSPORT MODE
## WATEBORNE

long distance shipping

inland waterway transport

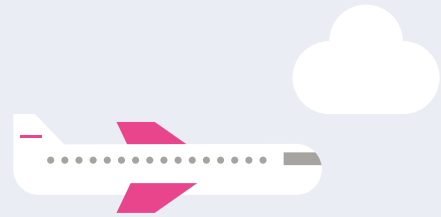
cruise

ferries

short-sea shipping

offshore

waterborne manufacturing industry



TRANSPORT MODE
## AIRBORNE

ATM and UTM, drones

aerodynamics

automation

acoustic and aero elasticity

aircraft avionics and systems

cabin design and passenger comfort

future challenges and emerging aviation risks

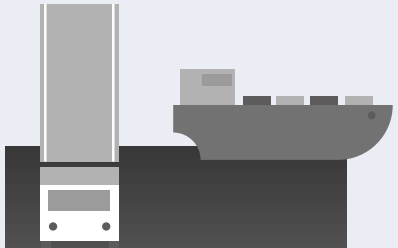
aerostructures

disruptive aircraft configurations

electric aircraft

alternative fuels & batteries

digitalization



TRANSPORT MODE
## CROSS-MODALITY

multimodality

combined transport

inter-modality

integrated infrastructures

public transport

logistics

interfaces

ports

ITS

aviation infrastructures

airports

# RESEARCH AREAS

The research areas/topics for both competitions are:

## RA1: SMART SOLUTIONS & SOCIETY

. User-focus and inclusive mobility

. Connected and automated multimodal mobility

. Innovation and the use of data, ITS, and AI

. Efficient and innovative logistics

## RA2: GREEN MOBILITY & DECARBONISATION

. Carbon neutrality and zero-emission vehicles

. Energy efficiency, electrification and alternative fuels

. Sustainable interurban and urban mobility

.Greening freight transport

## RA3: INNOVATIVE INFRASTRUCTURE FOR EUROPE 2030

. Single market for TEN-T and the wider Europe

. Intelligent, resilient and cooperative infrastructure systems

. Innovative hubs

. Safety and security

## RA4: POLICIES AND ECONOMICS FOR A COMPETITIVE EUROPE

. Transport planning and policy for recovery and resilience

. Innovative business and governance models

. Internalisation of transport externalities and pricing carbon

. Supporting competitiveness & industrial policy

# YOUNG RESEARCHER COMPETITION

The TRA VISIONS 2022 Young Researchers Competition targets students at universities and technical institutes pursuing bachelor and higher degrees, as well as early career PhD researchers.

Initially, participants are invited to submit an abstract under one of the TRA conference Topics (Call for Ideas). This is the registration period where all the participants are invited to register their ideas, and submit a title and a short abstract of their ideas. The participants then usually have a three-month period to further develop their proposals into a final project following a very clear template (Submission of Ideas). This is normally followed by an Evaluation of Ideas period, divided into two steps- a first remote evaluation by two evaluators and a second step in which the SHORT LISTed ideas (10 per mode) are evaluated by a judging panel during the SHORT LISTing Event in which the three top ideas per mode (road, rail, waterborne and crossmodality) are identified. The winner certificates and the prizes are awarded at the TRA conference during a prestigious award ceremony.

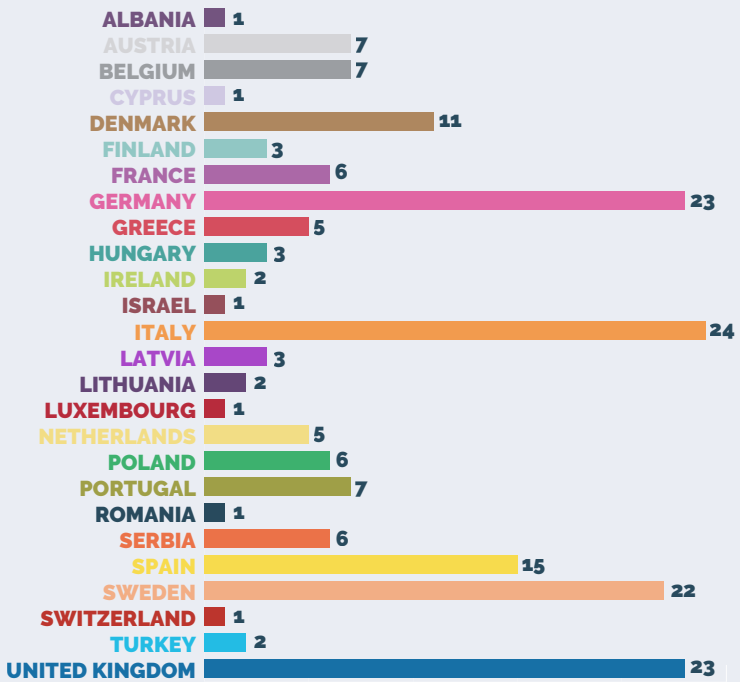
The TRAVISIONS Consortium works closely with the organisers of the TRA conference in order to ensure that the competitions have maximum exposure and impact during the conference and beyond. To ensure the active and large participation of students and early stage researchers, an extensive and well planned "promotion phase" is carried out.

# STATISTICS AND OVERALL RESULTS

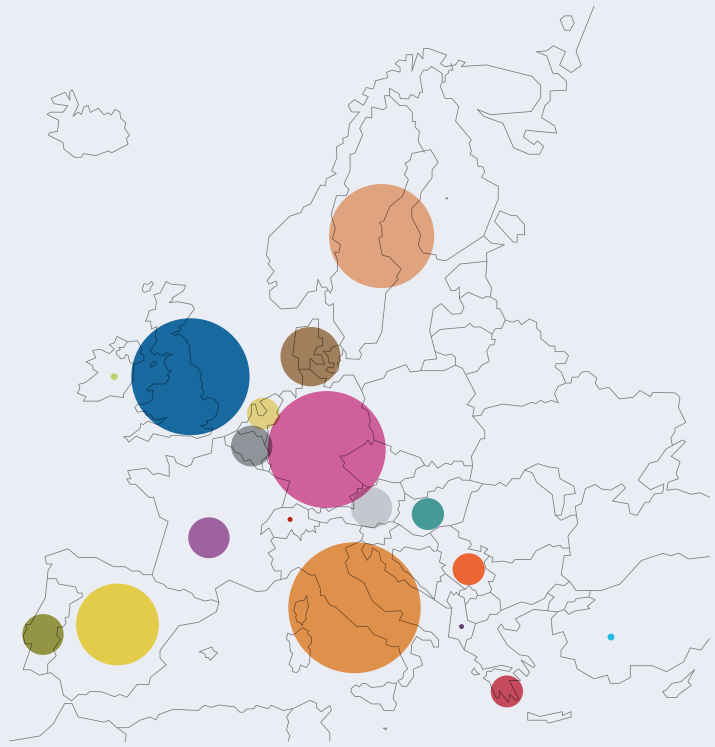
In the TRA VISIONS 2022 Young Researcher Competition, a total of 204 young researchers submitted 107 ideas. The participating young researchers were from 26 different EU countries and 78 different universities and institutions. The following charts contain some statistical information on all the ideas.

## YOUNG RESEARCHERS **PER COUNTRY**

The table below shows the number of young researchers that participated per country. Young researchers were able to join the competition as individuals or as teams of up to 7 students.

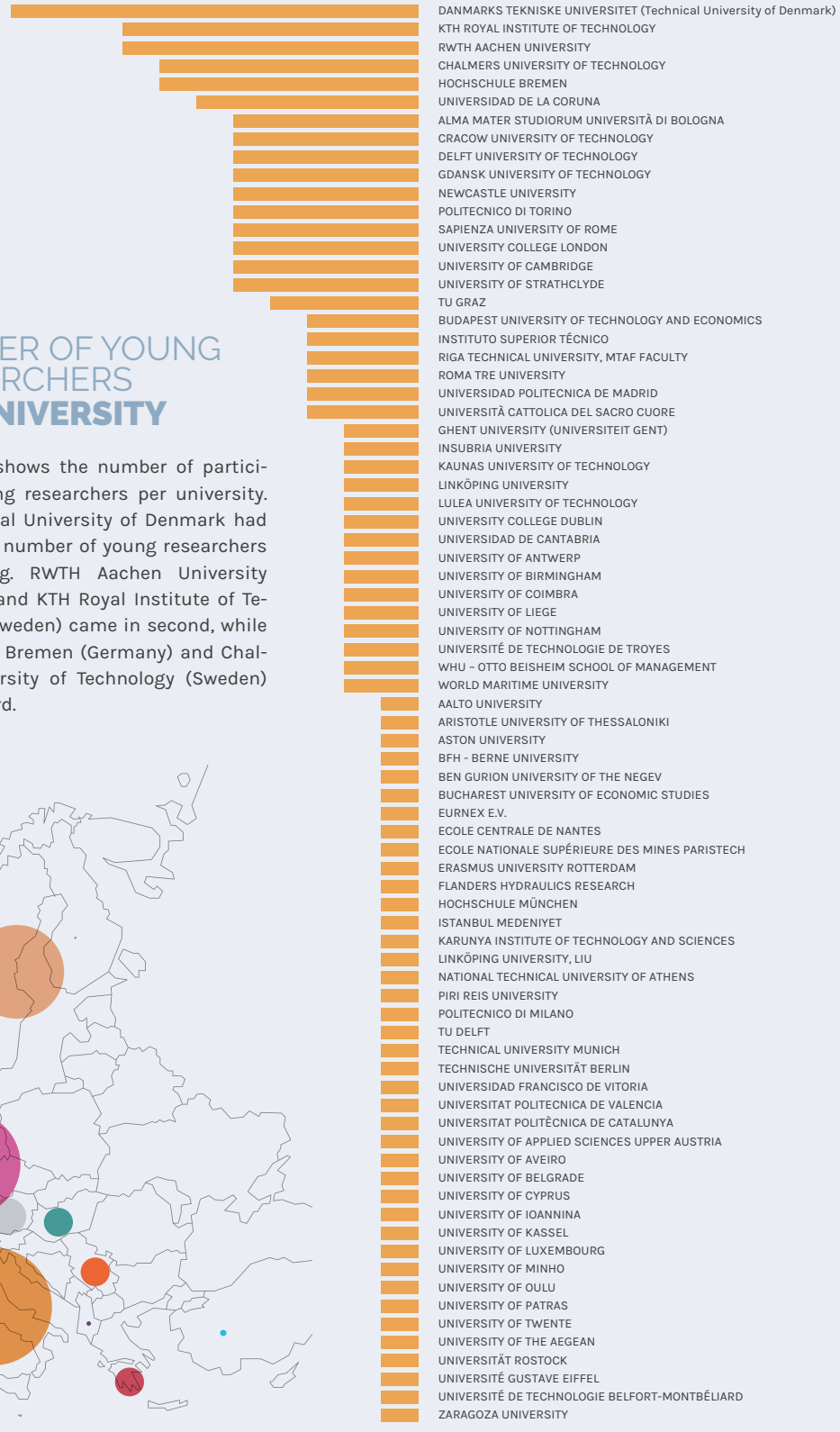



The map below shows the young researchers that participated in a geographical spread.



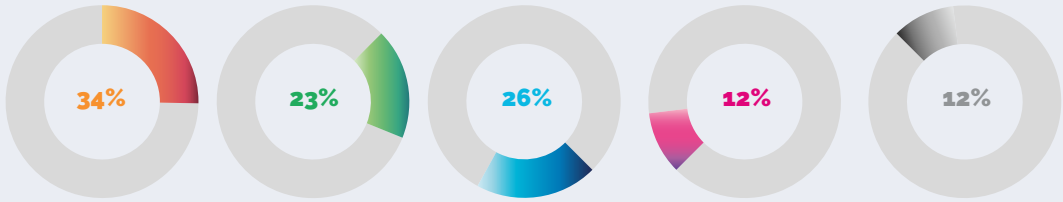
## NUMBER OF YOUNG RESEARCHERS **PER UNIVERSITY**

This table shows the number of participating young researchers per university. The Technical University of Denmark had the highest number of young researchers participating. RWTH Aachen University (Germany) and KTH Royal Institute of Technology (Sweden) came in second, while Hochschule Bremen (Germany) and Chalmers University of Technology (Sweden) came in third.



## YOUNG RESEARCHER
## IDEAS PER MODE

A total of 34 road related ideas were submitted, 23 rail, 26 waterborne ideas, 12 airborne ideas and 12 cross modal ideas. The charts below show the number of young researchers ideas submitted per mode in percentage terms.




**ROAD**
TOTAL PROJECTS
**34**

**RAIL**
TOTAL PROJECTS
**23**

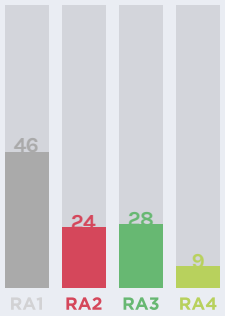
**WATERBORNE**
TOTAL PROJECTS
**26**

**AIRBORNE**
TOTAL PROJECTS
**12**

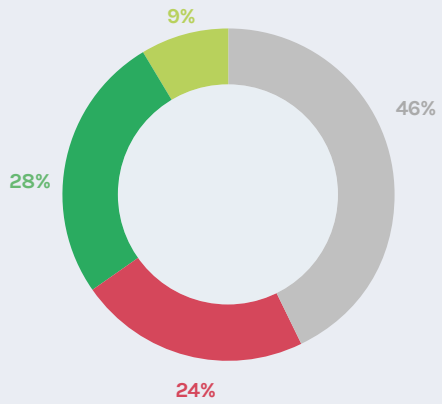
**CROSSMODALITY**
TOTAL PROJECTS
**12**

## YOUNG RESEARCHER
## IDEAS PER RESEARCH AREA

The table below shows the number of young researchers ideas per Research Area. The most popular Research Areas were RA1 "Smart Solutions and Society", and RA3 "Innovative Infrastructure for Europe 2030" with 46 and 28 ideas, respectively, followed by RA2 "Green Mobility and Decarbonisation" under which are 24 ideas, and RA4 "Policies and Economics for a Competitive Europe" with 9 ideas.

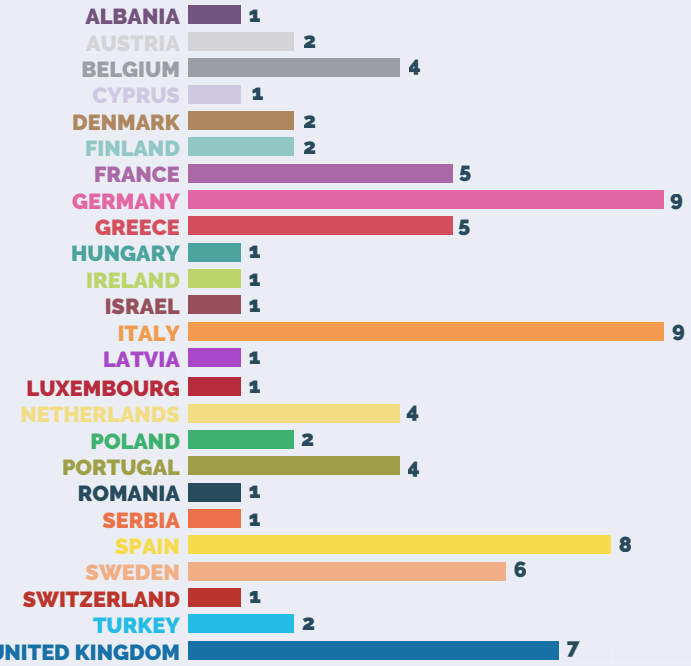



The chart below shows the number of young researchers ideas submitted per Research Area in percentage terms.

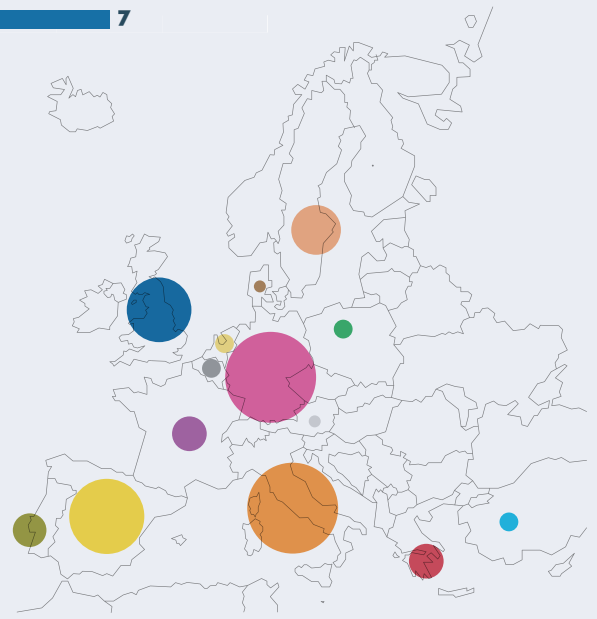



## UNIVERSITIES
## PER COUNTRY

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




The map also demonstrates the geographical spread of participating universities per country.



TRANSPORT MODE

# ROAD

1

WINNER

**Christina Makoundou**
AlmaMater University of Bologna

Category: **Road**

Country: **Italy**

Research Area 3: **Innovative Infrastructure for Europe 2030**

Idea Number: **27**

WINNER

# ProtectPav, the Protective Pavement for Vulnerable Road Users

When considering the safety of vulnerable users in urban areas, the pavement is rarely the first element to be investigated, even though it is responsible for severe injuries when falling on it. Paving is everywhere in our cities and must have an important place in improving our infrastructures and community wellbeing. Therefore, to enhance vulnerable users ' protection, this project focuses on designing innovative impact-absorbing pavements, to make the pedestrain and bike lanes pavements less dangerous than the classic ones made out of rigid traditional asphalt. Specifically, the project's aim is to reduce the severity of possible human injuries resulting from falls and increase users safety. To achieve this, crumb rubber from end-of-life tyres is successfully utilised as the primary resource, bringing into the innovative layer its elasticity to absorb the impacts. Containing more than 50% (by volume) of recycled rubber, the impact-absorbing material considerably fosters the circular use of tyres and is environmentally friendly. Inspired by the playground materials, the challenge is to transpose the technology in the traditional asphalt paving methods making the implementation of extended portions of impact-absorbing pavements (e.g. by municipalities). Finally, besides the shock-absorbing properties, the use of a cold binder makes possible a heat-free process. Together, these aspects enable the creation of more sustainable, accessible, and safer urban infrastructures. The advanced "soft" material "ProtectPav, the protective pavement for vulnerable road users" allows significant injuries reduction results, without heat-related issues including smell and fumes and eventually, an overall lower carbon footprint impact.

2

SECOND PRIZE

**Michael Dodman, Chuanshang Yin, Kuorun Liu**
**University College London**

Category: **Road**

Country: **United Kingdom**

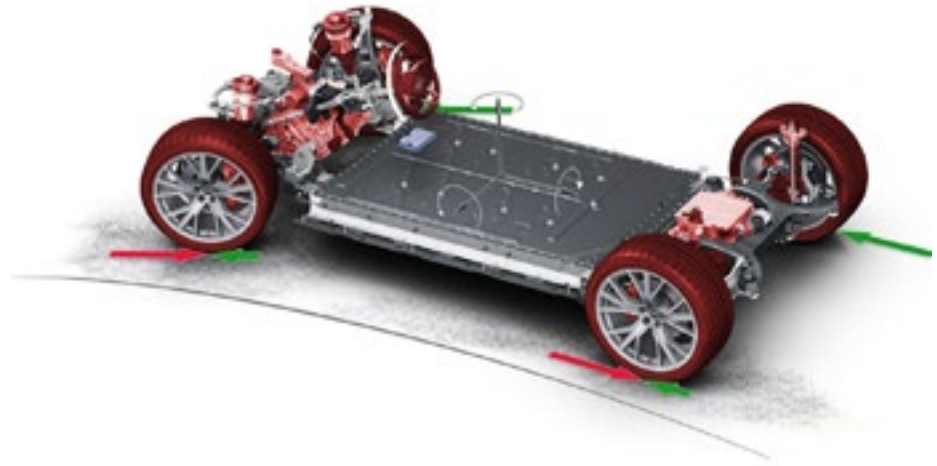
Research Area 1: **Smart Solutions & Society**

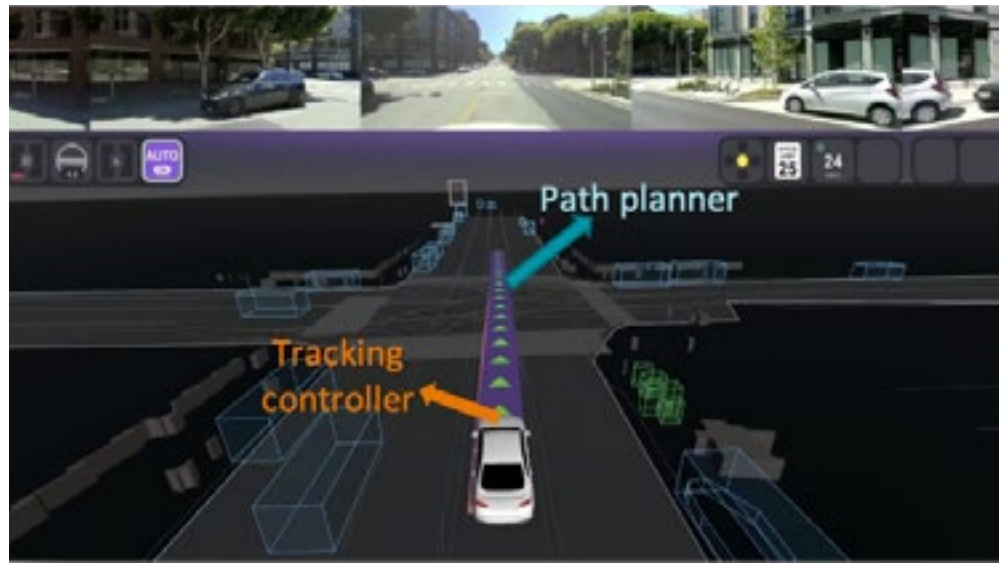
Idea Number: **115**

SECOND PRIZE

# Autonomous Vehicle Learning-based Model Predictive Controller

Safety issues are still a very serious challenge for autonomous vehicles, which require a higher degree of autonomy and reliability. Vehicle dynamic models are important for the implementation of model-based predictive control for motion planning and tracking control of autonomous vehicles. If the vehicle's dynamics, handling performance and actuator constraints can be fully considered in the path tracking process, the accuracy of the path tracking results can be effectively improved, and the occurrence of road traffic accidents can be reduced, or even avoided. Notably, model predictive controllers are a widely implemented strategy for path tracking controllers, they can improve the tracking performance significantly and with better control performance. In this research, an Adaptive Neuro-Fuzzy Inference System (ANFIS) is proposed and implemented to a traditional model predictive controller for vehicle lateral control. The main goal of this combination is to provide a prediction horizon required for use in an arbitrary autonomous vehicle's path tracking controller. Data is collected from a custom unity platform, while the performance is compared to a designed linear model predictive controller in the real time simulation. The performance of ANFIS model predictive controller  is evaluated and compared with a linear model predictive controller to validate the applicability and accuracy of this learning-based model predictive controller, in addition to comparisons with the reference states from various testing scenarios with real road conditions.





3

THIRD PRIZE

**Robert Corbally**
University College Dublin

Category: **Road**

Country: **Ireland**

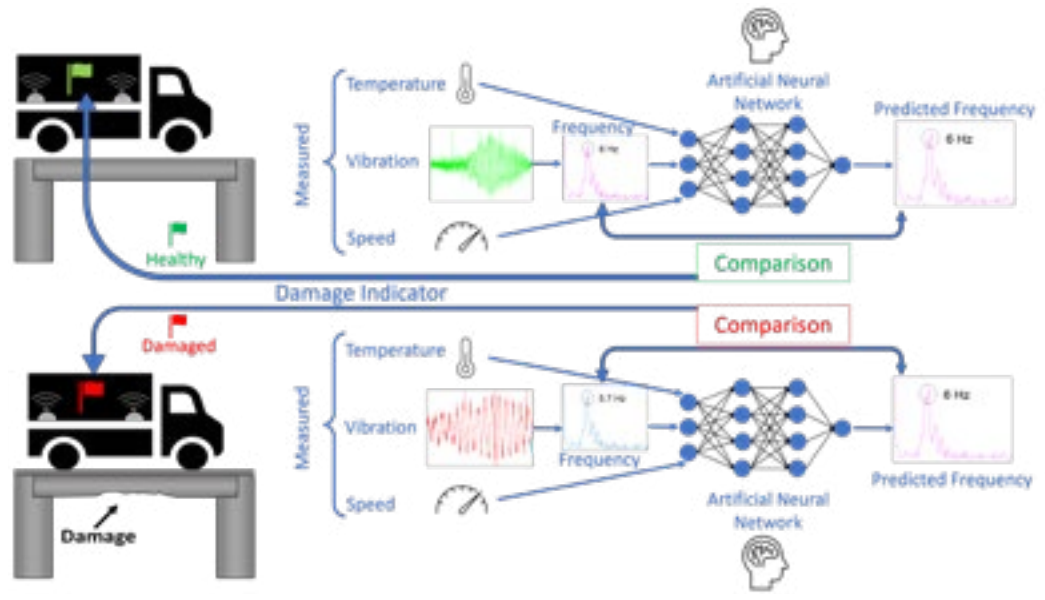
Research Area 3: **Innovative Infrastructure for Europe 2030**

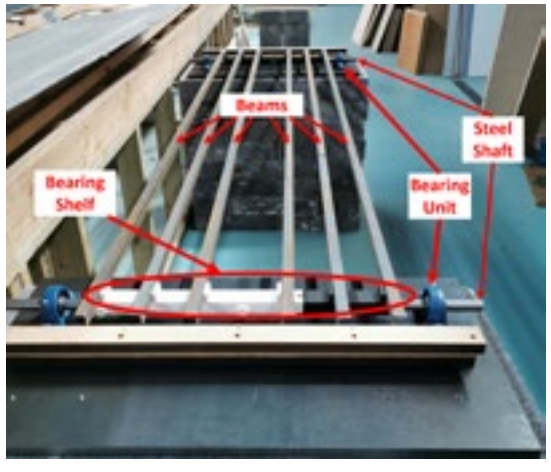
Idea Number: **80**

THIRD PRIZE

# Network Level Bridge Health Monitoring using In-Vehicle Sensors & Machine Learning

The progressive deterioration of transport infrastructure is a challenging problem for infrastructure managers, faced with the maintenance of large transport networks with limited funding. Specifically, bridges are critical elements, and bridge failure can have significant impacts on the functioning of transport networks as well as posing a safety risk. In recent years several major bridge collapses highlighted the importance of ongoing inspection and monitoring of bridges. Traditionally, inspection regimes relied on visual approaches, or, when necessary, sensors can be installed on bridges to gather detailed information on the structural performance. These methods are time consuming, labour intensive and are not scalable to facilitate regular network monitoring. Besides the costs, these methods also pose logistical challenges and safety issues, meaning that there is a clear need for quicker and cheaper methods for monitoring bridge health. This proposal presents an approach deploying in-vehicle sensors to monitor the condition of bridges. This 'drive-by' bridge health monitoring approach uses vehicles on the road network to indirectly measure the condition of the bridges. This eliminates the logistical and safety challenges. The research presents a framework for bridge condition monitoring incorporating machine learning approaches solving primary technical challenges. Individual solutions to the various technical challenges are presented, with a view to developing a practical method, which will form the basis of a drive-by bridge health monitoring framework applicable at a network level. A purpose-built, laboratory-scale vehicle-bridge interaction model is also presented.



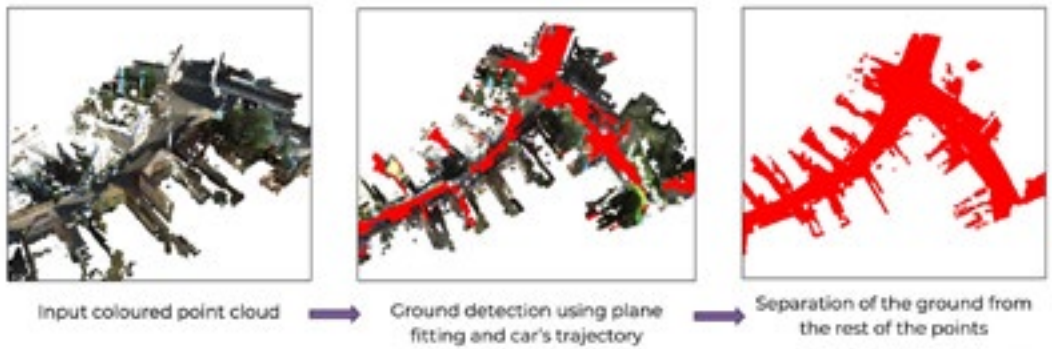
**Diana Davletshina**
University of Cambridge

Category: **Road** Country: **United Kingdom**

Research Area 3: **Innovative Infrastructure for Europe 2030** Idea Number: **100**

# Generating and Updating Geometric Digital Twins for Highways

This research focuses on automating the process of generating and updating digital twins of roads using large-scale visual and spatial datasets to reduce related costs and enable further applications, such as performance optimisation, failure prediction and future scenario modelling. Road construction is one of the fields where poor performance is observed, with many cases of construction costs overrun. The growing population will increase the demand for roads, which are already in heavy use. It is important to construct and operate road infrastructure in such circumstances efficiently. The creation of digital twins for roads has a high potential to boost the productivity of the field. In this project, an automatic framework is presented for creating and maintaining a 3D model of objects and relationships in the Industry Foundation Classes format. The framework takes as input a coloured point cloud, which is obtained using a mobile laser scanner mounted on a driving car. The framework is composed of ground separation techniques for ease of further processing, semantic segmentation using deep learning, and prior knowledge for enhancing the results from semantic segmentation. Moreover, image fusion methods are considered for dealing with the sparsity of the input point cloud and the detection of small objects. In the scope of this project, frequent road items are identified for prioritisation. The framework's output is a high-quality 3D Industry Foundation Classes model.








**Hao Luo Wang, Andrei David Radu**
KTH Royal Institute of Technology

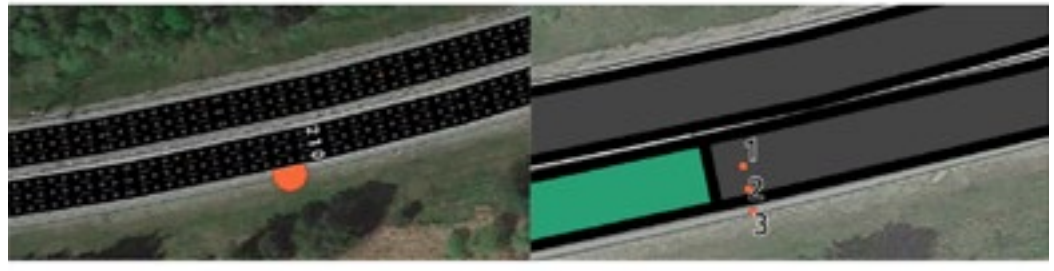
Category: **Road** Country: **Sweden**

Research Area 1: **Smart Solutions and Society** Idea Number: **102**

# Digiways – Digitalisation of Highway Traffic, Air Pollution and Operations based on CPS

Cyber-physical systems were invented as a conceptual framework to integrate physical systems, sensors and actuators, with computer models in cyberspace to implement modern control methodologies. In intelligent transport systems, cyber-physical systems are applied to build intelligent system solutions, and even develop digital twins of real transport and infrastructure systems. The union of physical and digital systems is made in a seamless way, enabling feedback loops where digital processes will impact on the physical world and vice-versa. Future intelligent transport systems see cyberspace models in decentralized edges or clouds, whereas the physical assets may find a secure and efficient environment to establish low-latency communications and cross-functional collaboration supporting decision-making from a system-level perspective.

This project presents a detailed framework to create the future cyber-physical highway traffic management system. E4S highway in Stockholm (Sweden) is selected as a case study to test the presented framework. The digital twin model of the E4S is implemented based on the SUMO microsimulation platform through its Aplication Programming Iinterface, as a proof-of-concept. All physical assets are also modelled with their virtual representation, including a variety of traffic sensor technology (MCS, V2X, drone, AQ sensor). The digital twin will be run in parallel with the real world, replicating real traffic behaviour. By leveraging the power of edge computing, real-time traffic data and synthetic simulation data will be combined to enable the capability of predicting traffic state varying in time and space. Working together with optimal control functionalities, the digital twin will provide data-driven decisions to be translated into control actions in the real traffic system.



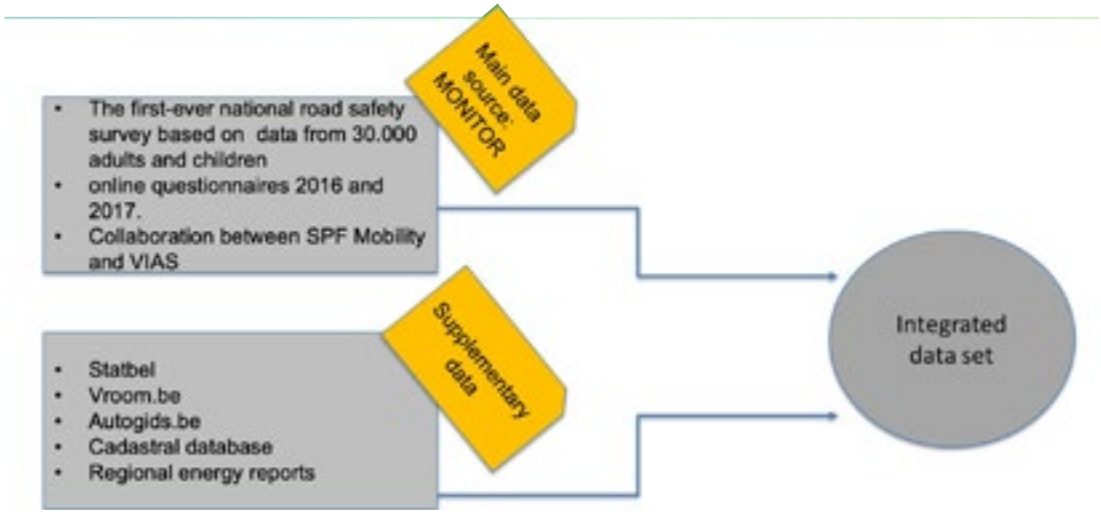
**Samaneh Bahreini**
University of Liege

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

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **91**

# Modelling an Integrated Approach for Policy Evaluation towards Sustainable Mobility Adaptation

The increasing number of cars on the roads and the variety of new mobility options resulting from innovative technologies together with the disruptive potential from shared services all have major policy implications. This project aims to study the effectiveness of behavioural intervention policies to encourage car users to replace private vehicles with shared mobility facilities and sustainable alternative fuels. The potential air quality impact of these changes will later be calculated using COPERT emission estimation software. An integrated transport-emissions model is developed, which will estimate emissions from private transportation and their environmental impacts by combining a discrete-continuous model (vehicle quantity, vehicle type and vintage, kilometres travelled) with COPERT and Open life cycle analysis software. This model will be developed and validated using mobility data in Belgium. Different mobility policies and regulation scenarios will be studied with the developed model to better understand the chain between changes in household vehicle composition and usage to air quality and environmental impacts. The model will estimate the emissions on a sample of households and behavioural factors based on household choices of number, type and usage of cars. The innovative aspect of the project is the effects forecast of various mobility policies, combined with their environmental and health impact assessment. The results will be useful for improving the evaluation of environmental impacts and localisation of polluting emissions linked to household mobility, while facilitating urban air quality and environmental policy interventions.








**Helena Miera-Dominguez, Dario Prieto-Quintana**
Universidad de Cantabria

Category: **Road** Country: **Spain**

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **103**

# Porous Asphalt Mixtures: the First Barrier for Microplastic Pollution?

In recent years, much effort has been focused on microplastics as an increasing problem of environmental pollution. In the case of those generated by tyre wear on the road, they have been gaining importance as a consequence of exhaust emission reduction. The term "microplastics" comprises plastic fragments smaller than 5 mm and larger than 1 µm. Most of them settle on or around roads, with only 1 to 10% of the particles being emitted into the air. For this reason, roads are considered an intermediate step between the source and the environment. Although the use of porous asphalt mixtures in European countries does not reach 10% coverage of the road network, recent studies suggest that this type of mixture might retain a high volume of microplastics inside its pore network. This project aims to confirm this hypothesis by developing a methodology for evaluating the real capacity of porous asphalt mixtures to retain microplastics, and thus promote their use as a first barrier against further dispersion of these pollutants into the environment. For this purpose, a three-stage methodology has been designed. Firstly, an analysis at laboratory scale is conducted, where conditions and quantities are controlled. The second stage is at medium-scale, for which a circular road simulator would be used. Finally, the last part is based on a real level analysis of microplastics by collecting samples from different roads, both dense and porous.

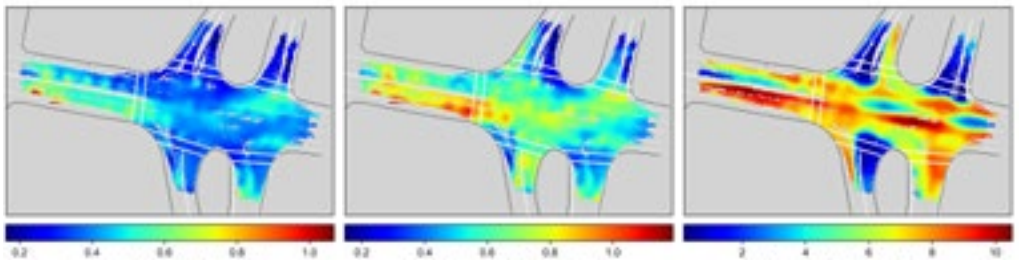
**Yiru Jiao**
Delft University of Technology

Category: **Road** Country: **Netherlands**

Research Area 1: **Smart Solutions and Society** Idea Number: **79**

# Privacy-preserving, Trajectory-based Intersection Safety Assessment

Traffic crosses, converges, and diverges at intersections: these elements of the road network entail considerable risk of conflicts and potential collisions. Assessing and improving the safety of intersections is therefore a constant need. For fine-grained infrastructure design and traffic management, the assessment and improvement are required to be at specific locations. To this end, deriving a "safety map" for intersections from real-world data is essential. However, such location-specific assessment endangers the privacy of road users: vehicles would be continuously tracked in current trajectory-based methods, which are vulnerable to malicious privacy attacks. To address the concern, this project proposes a privacy-preserving framework for intersection safety assessment. The framework prevents personal identification and tracking by using minimum segments of vehicle trajectories. These trajectory segments are further randomised and anonymised, with only the conflict relations between vehicles preserved. Based on the conflict relations, the framework quantifies the real-time spatial distribution of conflict risk at intersections. The major contributions of this project can be summarized as follows: i) assessment of real-time spatial distribution of potential conflicts at intersections from real-world traffic; ii) processing of trajectory data in a privacy-preserving manner that prevents personal identification and tracking; iii) enhancement of management insights and feasible plans to improve the safety level at intersections. Experiments on an offline dataset show the reasonableness and effectiveness of this framework. It is expected that this project can contribute to safer design and management of intersections, thus improving the road network safety.







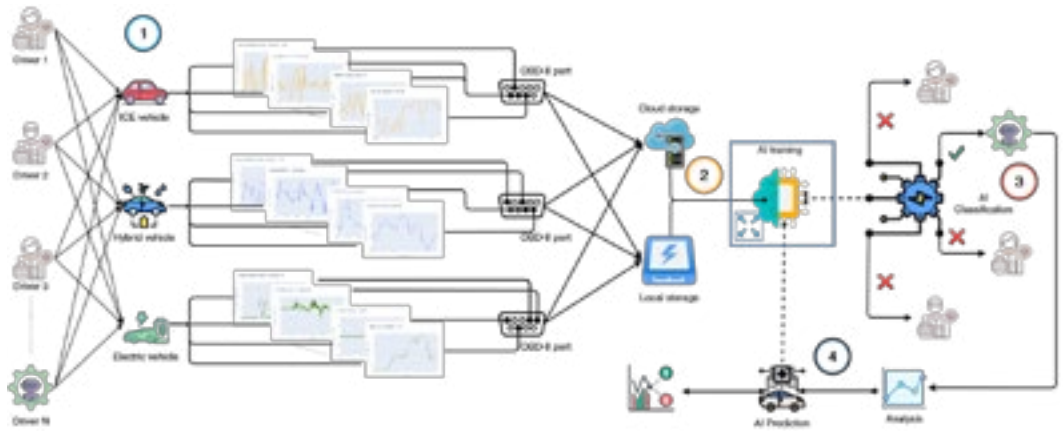
**Andrés Laverde Marìn**
Universitat Politecnica de Valencia

Category: **Road** Country: **Spain**

Research Area 1: **Smart Solutions and Society** Idea Number: **105**

# DRIPRAI: Driver Profiling by Artificial Intelligence

Modern cars can collect data from several hundreds of sensors through the controller area network bus technology. The controller area network bus is a message-based protocol designed to allow the electronic control units found in today's automobiles, as well as other devices, to communicate with each other in a reliable, priority-driven way. Messages or frames are received by all devices in the network, which does not require a central computer. The controller area network bus standard is commonly used in all vehicles due to its main advantages, which are robustness, simplicity, affordability, and full centralisation. Controller area network bus technology can provide almost real-time information about the vehicle, the surrounding environment, and the driver. These data can be later processed and analysed to offer efficient solutions and insights for human behaviour analysis, and further applied in a variety of fields, such as accident prevention, driver identification, driving model design, and vehicle energy consumption prediction. Characterising, understanding, and predicting driver behaviour in real driving conditions will lead to fewer accidents, less breakdowns, better energy management and ultimately, getting vehicles to their destination faster and efficiently. In this research, a novel, end-to-end framework for driver behaviour characterisation, analysis, and prediction in a real driving condition are developed.



TOP TEN

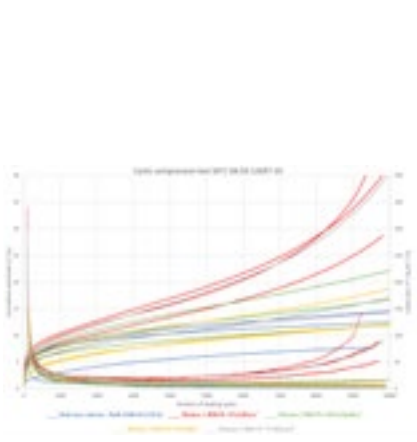
**Ahmed Al-Dbei**
BFH – Bern University

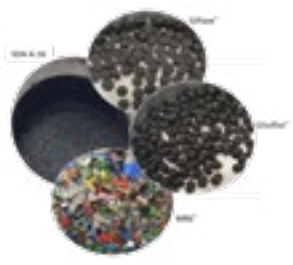
Category: **Road** Country: **Switzerland**

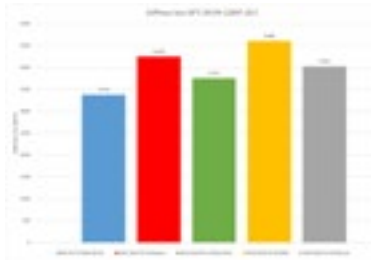
Research Area 3: **Innovative Infrastructure for Europe 2030** Idea Number: **04**

# Evaluation of Additives for the Improvement of Low Noise Asphalt Mechanical Performances

Environmental noise pollution negatively affects human life and health. For this reason, it has become a priority for Switzerland to reduce road noise by applying measures on the source. One of the most efficient methods consists of semi-dense asphalt. The major issue in using semi-dense asphalt is that the acoustic and mechanical service life does not usually exceed 10-12 years. To tackle this problem, four mixtures have been assessed, with the aim of improving the service life and replace conventional polymer-modified bitumen (CH-E) binders used for semi-dense asphalt. The tested mixtures considered various additives: recycled plastic (GiPave®); complex polymer (MR6®); natural asphalt base (Gilsoflex®) and a liquid (B2Last®). A comprehensive evaluation of the mechanical behaviour of semi-dense asphalt has been performed by applying the Marshall test (flow and stability); gyratory compactor; indirect tensile strength ITS; water sensitivity ITSR; Contabro; stiffness modulus IT-CY and cyclic compression test. Further evaluation of the neat binder PmB 45/80-65 and B50/70 with the different types of additives based on penetration, ring and ball, Fraass, and elastic recovery tests also provided some interesting information. The research results indicate that some additives can be considered as an alternative to PmB used in semi-dense asphalt , or even improve its mechanical properties. The influence of the additives on the material properties has been especially observed for stiffness modulus, cyclic compression test and elastic recovery. Finally, it can be argued that some of the tested additives are suitable alternatives to replace polymer-modified bitumen.









OTHER ENTRIES

**Human Factors-Ready Behavioral Models for Automated Vehicles**
**Erika Santuccio**
TU Graz
Austria
Road RA1

**A Five-step Design Tool - Creating Appropriate Trust in Automated Vehicles (AV)**
**Fredrick Ekman, Mikael Johansson**
Chalmers University of Technology
Sweden
Road RA3

**Analysis of V2X Performance and Rollout Status with a Special Focus on Austria**
**Andrea Ulbel**
TU Graz
Austria
Road RA3

**Artificial Intelligence applied to Road Pavement Management**
**Tiago Tamagusko**
University of Coimbra
Portugal
Road RA3

**Automated Text Analysis on Open-Ended Response Surveys: Measuring Attitudes Regarding Autonomous Vehicles**
**Vishnu Baburajan**
Instituto Superior Técnico
Portugal
Road RA1

**Monocular cues-based ontology reasoning for autonomous vehicles depth estimation**
**Fatima Ezzahra Benkirane**
Université de Technologie Belfort-MontBéliard
France
Road RA3

**Implementing Human Valence into the Behavioral Model of Fully Autonomous Vehicles**
**Ori Fartook**
Ben Gurion University of the Negev
Israel
Road RA1

**GPS phone locations for real-time traffic lights algorithm**
**Abdalla Reda Sobhy Ellithy**
Politecnico di Milano
Italy
Road RA1

**BOON: Behaviour Oracle for always-ON electrical mobility**
**Frederik Boe Hüttel, Atefeh Hemmati Golsefidi**
Danmarks Tekniske Universitet
Denmark
Road RA2

**Smart Mobility Management and Operation under Tradable Credit Scheme**
**Renming Liu**
Danmarks Tekniske Universitet
Denmark
Road RA4

## OTHER ENTRIES

**Sustainable Concrete Mix Practice**

**Sushil Timilsina**
AlmaMater University of Bologna

Italy

Road RA1

**Smart Mobility Management and Operation under Tradable Credit Scheme**

**Renming Liu**
Danmarks Tekniske Universitet

Denmark

Road RA4

**An Intelligent Visual Traffic Monitoring System from a Moving UAV**

**Mang Ning**
KTH Royal Institute of Technology

Sweden

Road RA1

**Moving road to rail - automatic comparison of long-haul transport plans**

**Antoine Robichet**
Université Gustave Eiffel

France

Road RA1

**A 'Design for Perception' Toolkit - A systematic approach for the design of driving automation systems based on the users' perception**

**Fjolle Novakazi**
Chalmers University of Technology

Sweden

Road RA1

**Emilia 4 ST - A solar-powered lab on wheels**

**Luigi Russi**
AlmaMater University of Bologna

Italy

Road RA2

**Learning an Explicit Model Predictive Controller for highway ramp metering employing Variational Auto-encoders**

**Antonios Georgantas**
University of Cyprus

Cyprus

Road RA1

**Fractional Vehicle Ownership and Revenue Generation with Asset Tokenisation**

**Elena Vitelaru**
Sapienza University of Rome

Italy

Road RA1

**Urban logistics transportation system combining passenger and freight flows**

**Bruno Machado**
University of Aveiro

Portugal

Road RA2

TRANSPORT MODE

# RAIL

1

WINNER

**Thomas McDonald**
Newcastle University

Category: **Rail**

Country: **United Kingdom**

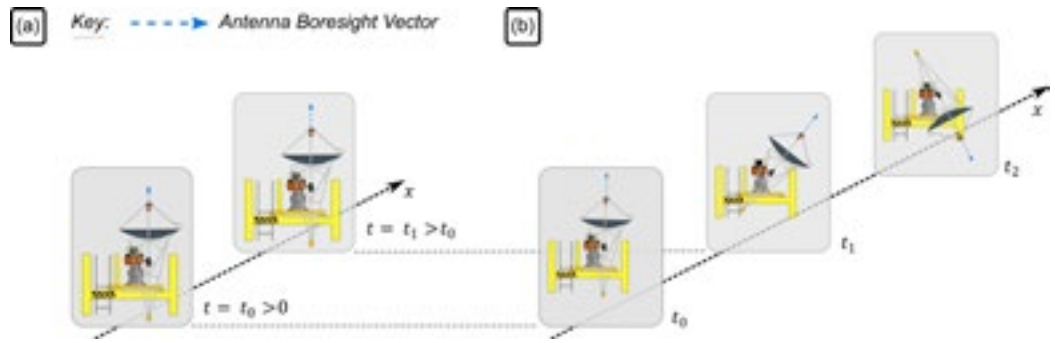
Research Area 3: **Innovative Infrastructure for Europe 2030**

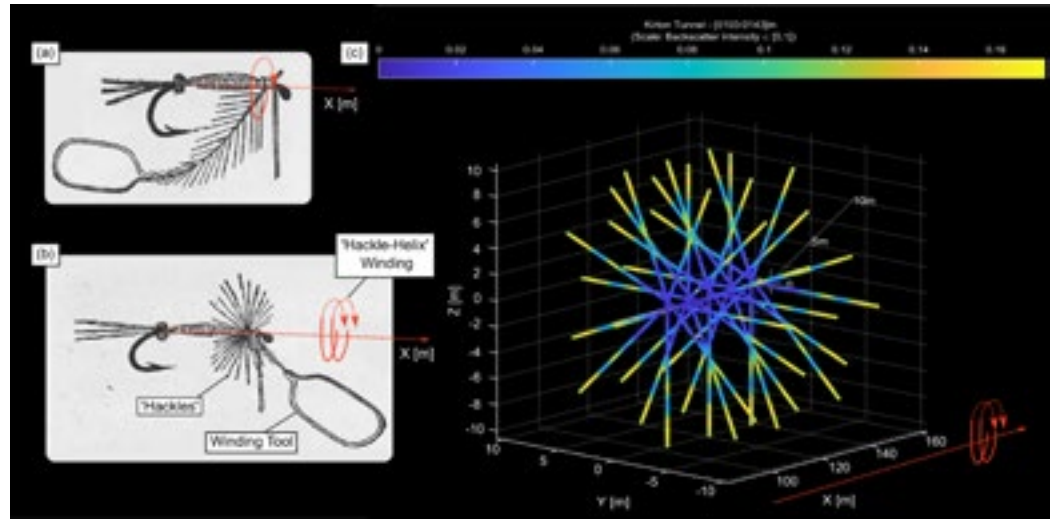
Idea Number: **99**

WINNER

# T-Vision: A Hybrid Subsurface Radar Inspection System For Intelligent Asset Management of Railway Tunnels

The UK Office of Rail and Road has repeatedly identified that inadequate accuracy and efficiency in hidden critical element detection constitutes one of the main current shortfalls in Network Rail's infrastructure inspection deliverables. Railway tunnel subsurface inspection (RTSSI) to locate the multitude of concealed shafts in historic masonry structures has been particularly problematic for existing market technologies, owing to recurrent limitations of survey dataset incompleteness and extended closure durations - attributed to laborious erection of support structures to probe crown structural health. In this context, this research identified air-launched, fixed-angle, multidirectional ground penetrating radar systems to be the only technology practically capable of returning crown subsurface imagery. However, 3D visualisation is lacking, blind-spots are commonplace and field-of-view realignment is time-consuming. This project addresses identified gaps by developing T-Vision; the first air-launched hybrid rotational- ground penetrating radar assembly for RTSSI. System novelty extends to the deployment of a bespoke single rotating antenna setup that swiftly and accurately returns comprehensive 360-degree subsurface datasets in 3D; and also hybrid raster and helical scanning functionality, capable of generating unique crown-raster imagery and pioneering hackle-helix point cloud datasets of the full tunnel subsurface. To validate technical efficacy of rotational- ground penetrating radar for RTSSI, T-Vision was deployed in Kirton Tunnel (UK). Vertical distortion artifacts identified in raster visuals evidence concealed shaft detection efficacy, whilst the form, versatility, and future innovation pathways for RTSSI hackle-helix point cloud datasets are deconstructed. The hackle-helix point cloud datasets present a viable basis for a future intelligent, virtual infrastructure management platform for Network Rail.



2

SECOND PRIZE

**Benjamin Smakic**
KTH University of Technology

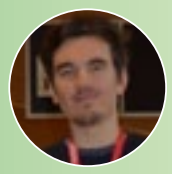
Category: **Rail**

Country: **Sweden**

Research Area 1: **Smart Solutions & Society**

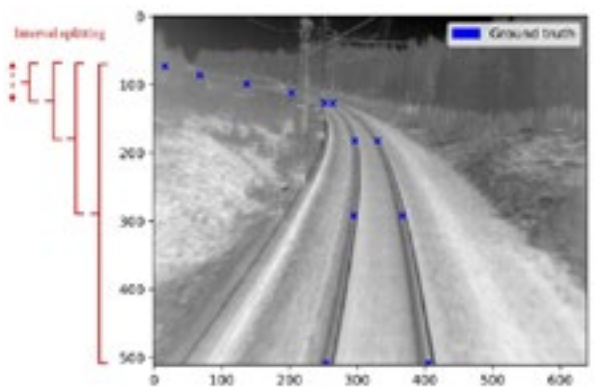
Idea Number: **40**

SECOND PRIZE



# AI applications for railway positioning and autonomous trains

The purpose of this research is to investigate how front-facing, train-mounted cameras and computer Vision can be used to compensate for GPS inaccuracies. By using footage from track-recording cameras, computer vision can determine the number of tracks and the track occupancy of the train, which can compensate for GPS inaccuracies in the lateral positioning. GPS usage in railway applications is rare, however, an AI-based positioning system would facilitate the usage of GPS for higher capacity and better utilisation of current railway infrastructure. This is especially interesting for ERTMS, a European effort to create a standardised signalling system while simultaneously increasing capacity, where potential for an AI-based positioning system can be found in both ERTMS level 2 and level 3. Cameras provide track recordings continuously at any time, while immediately updating track occupancy in case of information loss. Since it provides continuous information about position, it complements GPS perfectly. Cameras can replace equipment in the track used for positioning (e.g. balises, track-circuits, axle counters), which reduces investment- and maintenance costs. Also, it can eliminate any signal failures caused by said track equipment, thereby increasing reliability and punctuality. This is crucial for passenger services, as increasing public trust in the railway system enhances competitiveness. Future applications for on-board cameras and computer vision, in addition to train track occupancy, include identification of switches, signals, signs, other rail vehicles, station platforms, obstacles etc. The potential for AI-based autonomous trains is huge, the whole railway network can be automated and streamlined enormously for a more competitive transportation mode, for a greener future.




3

THIRD PRIZE

**Markus Loidolt**
**Graz University**

Category: **Rail**

Country: **Austria**

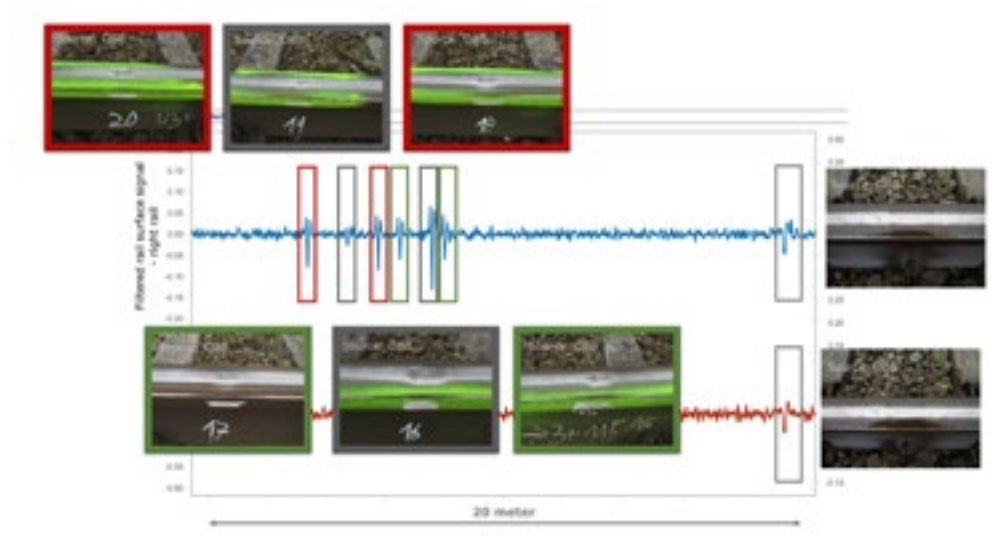
Research Area 3: **Innovative Infrastructure for Europe 2030**

Idea Number: **60**

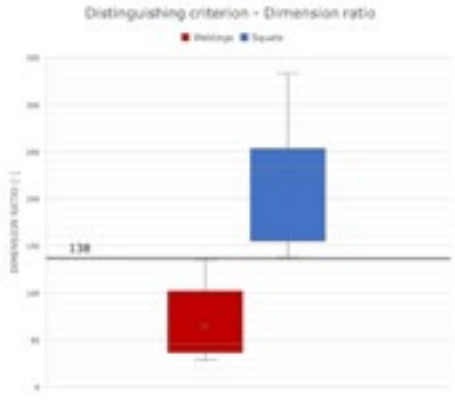
THIRD PRIZE

# The Detection of Squats (rail defects) using Existing Data Sources

Due to the increasing traction performance of powered axles coming along with the modal shift towards rail, increased rail fatigue is to be expected and, in many cases, already observed. One type of rolling contact fatigue damage that has gained prominence in recent years in many countries is squats. Untreated squats pose a risk of rail breakage due to vertical cracks. In addition, the typical indentations of the rail surface led to increased dynamic load inputs into the system. Detected early enough squats can be removed relatively easily using common rail surface treatment such as grinding or milling. However, detected too late, the only option is to exchange rails, which incurs additional costs. A measuring technique detecting squats at an early stage would thus lead to relevant cost savings. Therefore, this project tested the suitability for squat detection of existing data measured by the rail surface measuring system of ÖBB's measuring car for other purposes. The fine sampling rate leads to the assumption that the typical squat indentations on the rail surface ought to be recognizable by this measuring system. Furthermore, the assumption was confirmed during the initial evaluations. Currently, the research is evaluating details on false positive and false negative rates. It is pivotal to guarantee a reliable detection of squats and an accurate differentiation from other rail surface discontinuities (e.g., welded joints). Having achieved this, a network-wide implementation of this analysis is easily done, since the measuring car is surveying the network in a fixed schedule in any case.







**Sebastian Holzbauer**
University: Hochschule München

Category: **Rail** Country: **Germany**

Research Area 1: **Smart Solutions & Society** Idea Number: **93**

# Digital Twins for Railway Training

Digital twins for training in railway technology provide a solution to the challenges of on-site training in confined space situations with larger groups and changing learning situations. It allows trainees to explore a training object in a virtual tour consisting of high-resolution 360 images and to interact with all operating elements. The special feature of the digital twin is the fact that it reflects the real condition and state of the training object and enables the trainees to easily transfer the digitally learned operations into the real environment. All steps that must be performed in a real setting can be carried out realistically within the digital twin and can be tested under safe conditions. In addition, a digital twin contains all training content context-sensitively referenced, such as training documents, 3D animations, sectional drawings, training videos, and much more. In this way, trainees can be offered a training interface that contains all the content of the corresponding training object. At the same time, it can also be used by trainers in the classroom. The interactivity allows exercises and exams to be carried out within the digital twin, enabling trainees to prepare extensively for on-site training. This can save a large part of the time required for on-site training, as the trainees are already familiar with the training object and can orient themselves independently. Steps that have already been learned only need to be tested on the real object. Digital twins therefore offer an effective addition to on-site training.





**Tommaso Bosi, Federico Bigi**
Università Roma Tre

Category: **Rail** Country: **Italy**

Research Area 4: **Policies and Economics for a Competitive Europe** Idea Number: **20**

# A Sustainability-Centric Methodology for the Shunt-In Shunt-Out Problem

The EU plans to double rail freight traffic by 2050, both to cut pollution emissions and to mitigate congestion by shifting traffic from road to rail networks. One of the challenges is to minimize the high emissions and costs associated with shunting yard operations while maintaining an acceptable level of service. Due to the complexity of the problem, shunting operations are usually managed in a sub-optimal way, namely, based on practitioners' experience. In this context, this project proposes an event-based simulation framework for the shunt-in shunt-out problem exploiting Python and a Mixed Integer Linear Programming model to minimize the number of shunting operations, while considering the shunting yard timetable and the contractual constraints of the wagons. To test the effectiveness, the research considered the 2020 train timetable for freight trains in the Bettemburg Eurohub Sud Terminal (Luxembourg) and assessed different KPIs, linked both to tactical and strategical objectives (i.e., efficient wagon fleet management, to assign a smaller wagon pool to the shunting yard). Computational results show how the criteria for choosing which wagons should be taken-out from the inbound train and should be inserted into the outbound train might significantly impact the KPIs analysed, in terms of emissions of shunting locomotives (-38%), wagon fleet (-43%), time to shunt plus fixed and variable costs related to depot and shunting costs. The framework developed in the project can be easily implemented at zero cost and with multiple and new Shunt-In criteria, without prior knowledge of the shunting yard configuration. The research is the first step for an industrial software, named Shunty , that will address further issues concerning the shunting station.

**Ravdeep Kour**
Luleå University of Technology

Category: **Rail** Country: **Sweden**

Research Area 3: **Innovative Infrastructure for Europe 2030** Idea Number: **21**

# SecureDigiRail: A Framework for Improvement of Digital Asset Security in Railway

Digital technology is expected to improve railway systems sustainability, dependability, capacity, safety, and security including cybersecurity. In the digitalised railway, however, cybersecurity is essential to achieve overall system dependability. Gaps in cybersecurity lead to cyber incidents (Figure1 indicates categorised incidents of cyberattacks in railway) with negative consequences, including reputational damage, heavy costs, service unavailability and risk to the safety of employees and passengers. The current standards and guidelines related to cybersecurity in railways are proprietary and are followed by most railway organisations. These proprietary standards and guidelines lack a holistic approach to enable interoperability, scalability, orchestration, adaptability, and agility for railway stakeholders. Therefore, there is a need to develop a generic cybersecurity framework for digitalised railways to facilitate proactive cybersecurity and threat intelligence sharing within railways. The framework proposed by the project enhances cybersecurity maturity level (CMM) (Figure2 indicates current CMM in railways) to enable proactive cybersecurity to improve information assurance in the railway. The proposed framework integrates existing models, technologies, and standards to minimise the risks of cyberattacks on railways (Figure3). The framework uses different layers of open system architecture for condition-based maintenance in the context of cybersecurity to deliver threat intelligence. The framework also incorporates cyber kill chain models to detect cyberattacks and railway defender kill chain to enable proactive cybersecurity. The overall contribution is to help railways to implement solutions developed in a more scientific way to enhance overall dependability.






**Sinem Tola**
University of Minho

Category: **Rail** Country: **Portugal**

Research Area 1: **Smart Solutions & Society** Idea Number: **65**

# Vulnerability Assessment of Existing Bridges to Scour, Based on an Indirect Monitoring Approach and Machine Learning Tools

Foundation scour is the principal reason why bridges collapse. Assessing vulnerability to scour is a challenging and complex task. This project proposes a method to detect scours based on the dynamic parameters of the train. To observe the impact of scour effects signals of multiple train passages across a bridge will be collected before and after strengthening of the bridge foundations. The numerical study will be followed by physical measurements on a train passing over the Eden Viaduct (Carlisle, UK). The train measurements will be provided from the ongoing project In2Track3 framework of a European Union funded project. Firstly, indirect monitoring results from the instrumented in-service train carriage will be collected, calibrated and processed. This will provide the ‘apparent profile’, the profile experienced by the wheels of the train, which is made up of true profile plus bridge/track deflection elements. Secondly, a 2-stage numerical approach will be followed. Finally, introducing the measured signals and the calculated influence ordinates to machine learning algorithms might help create a link between the scour effect and the bridge response. An optimization algorithm will be used to find the bridge foundation stiffness which minimizes the sum of squared differences between the calculated (by forward problem-numerical model) apparent profile, and the corresponding measured values of apparent profile (measured displacements).

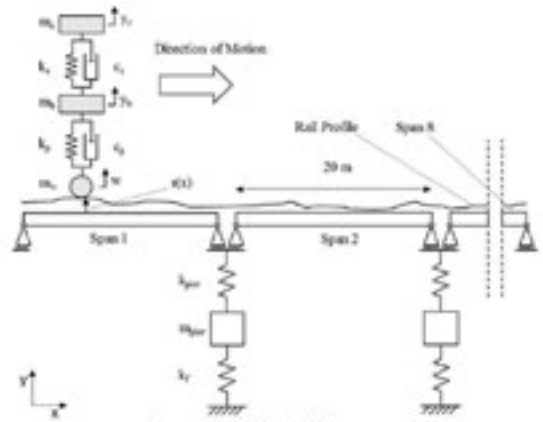



***Figure 1.** VBI Model [2]*

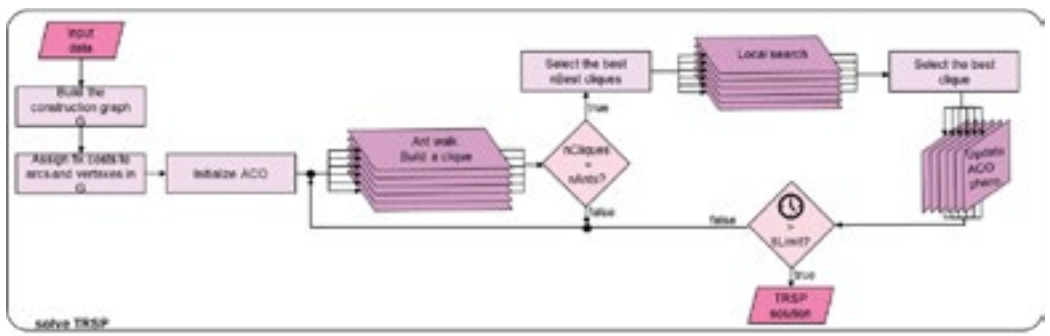
**Bianca Pascariu**
Università Roma Tre

Category: **Rail** Country: **Italy**

Research Area 1: **Smart Solutions and Society** Idea Number: **32**

# Improving train punctuality by optimized train route selection in decision support systems

The real-time Rail Traffic Management Problem (rtRTMP) is responsible for detecting and solving time-overlapping conflicting requests made by multiple trains on the same track sections. This problem consists in retiming, reordering and rerouting trains in such a way that the propagation of delays in the railway network is minimized. Recent approaches show that limiting in a smart way the number of routing variables available for each train further improves the rtRTMP solutions. This pre-process requires solving the Train Routing Selection Problem (TRSP) and consists of selecting a feasible and optimized subset of alternative routes for each train. This research proposes the enhancement of real-time traffic management solvers with an optimised artificial intelligence-based TRSP method. First, the correlation between the TRSP and rtRTMP models is increased and multiple objective functions are implemented to fit different rtRTMP solvers. The purpose is to identify the best routes to be used by the rtRTMP solver, in order to find the highest quality solutions. Then, a parallel ACO-TRSP algorithm is developed to speed-up the search space exploration and find better quality solutions in the available computation time. The TRSP is applied to supply routing alternatives to the well-established rtRTMP solvers: AGLibrary and RECIFE-MILP. A thorough campaign of experiments was carried out, referencing two areas in N France as cases of disturbed timetables: the lines around Rouen and the station area of Lille Flanders. As a result, our TRSP approach defines a good search space for the rtRTMP, with significantly better solutions than the state-of-the-art.








**Antonio Giménez Macías**
Universidad Politecnica de Madrid

Category: **Rail** Country: **Spain**

Research Area 3: **Innovative Infrastructure for Europe 2030** Idea Number: **86**

# Analogies and Differences between Railway System and Hyperloop.

## Application to the Transportation Corridor Boston – New York – Philadelphia – Washington D.C.

Today we are witnessing the development of a new technology unknown to most until recently: Hyperloop. As a response to this reality, common-working groups have been created between the railway industry and Hyperloop, especially inside official bodies, such as the International Union for Railways (UIC). The aim of these groups is to find analogies, synergies, and differences between railway as transportation means and Hyperloop as a transportation means. This project starts with a state-of-the-art review. The aim of this review is not only to introduce the Hyperloop technology, but also to describe its current state of development, in addition to the strategic investment that Hyperloop is receiving from enterprises and official bodies. The second part consists of a comparative analysis between the railway system and Hyperloop. The analysis will cover two essential aspects of the life cycle of any transportation system: planning and operation of both transportation systems. Based on the analogies and differences pointed out throughout the practical application, fields for future synergies between both transportation systems will be detailed. Finally, the main conclusions of the project are drawn. Tentative conclusions of the project are oriented mainly, but not only, towards the following questions: what improvements can railways include in Hyperloop? What aspects of Hyperloop can the railways consider? This project will contribute towards future common working fields that will result in an increased competitivity, allowing Europe to stay in the vanguard of sustainable transportation.

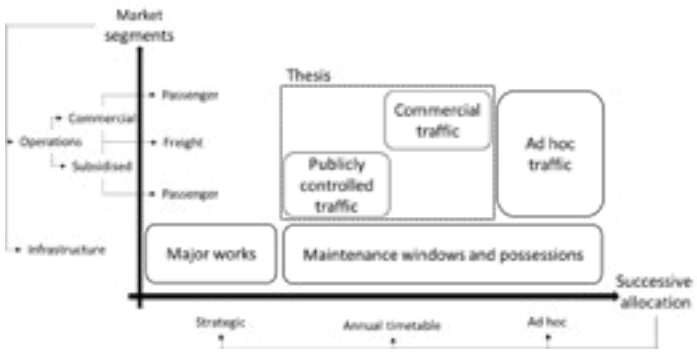
**Abderrahman Ait Ali**
Linköping University

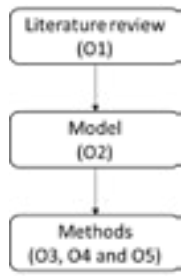
Category: **Rail** | Country: **Sweden**

Research Area 4: **Policies and Economics for a Competitive Europe** | Idea Number: **08**

# Methods for Capacity Allocation in Deregulated Railway Markets

Faced with increasing challenges, European railways have undergone major reforms to improve the efficiency and competitiveness of the sector. New market structures can allow for reduced public expenditures, increased competition, and more efficient railways. However, these structures have introduced new challenges for managing infrastructure and operations. Capacity allocation, previously internally performed within monopolistic national companies, are now conferred to an infrastructure manager, which is responsible for transparent and efficient allocation of available capacity to different (often competing) licensed railway undertakings. This research develops a number of methods to allocate capacity in a deregulated railway market. It focuses on efficiency in terms of social welfare. The project is concerned with successive allocation of capacity for publicly controlled and commercial traffic within a segmented railway market. The contributions include cost benefit analysis methods that allow public transport authorities to assess the social welfare of their traffic and create efficient schedules. The project also describes a market-based transparent capacity allocation, where infrastructure managers price commercial train paths to solve capacity conflicts with publicly controlled traffic. Additionally, solution methods are developed to help estimate passenger demand, which is a necessary input both for resolving conflicts, and for creating efficient timetables. Future capacity allocation in deregulated markets may include solution methods from this study. However, further experimentations are still required to address concerns such as data, legislation and acceptability. Moreover, future work can include prototyping and pilot projects on the proposed solutions and investigating legal and digitalisation strategies to facilitate the implementation of such solutions.








**Conceptual design and comparative analysis of hydrogen-powered propulsion system alternatives for diesel-electric regional trains**
**Marko Kapetanovic**
TU Delft
Netherlands
Rail RA2

**A Multi-Agent Based Approach for Resolving Real-Time Train Rescheduling Problem of Large-Scale Railway Network**
**Jin Liu**
University of Birmingham
United Kingdom
Rail RA1

**Success Factors in Public-Private Partnership of high-Speed Railway Infrastructures: Elements for Improvement**
**Mario González-Medrano**
Universidad Francisco de Vitoria
Spain
Rail RA3

**A Simulation-Optimization Framework for Traffic Disturbance Recovery in Metro Systems**
**Marta Leonina Tessitore**
Università Roma Tre
Italy
Rail RA1

**Evaluation and Selection of a Mechatronic Bogie Concept**
**Pascal Gil, Jinay Bhagat, Chinenye Azubuike, Priyank Mehta, Umang Shah, Paul Schneider**
RWTH Aachen University
Germany
Rail RA1

**The F-EMU: a new generation freight electric multiple units to foster intermodal transport**
**Simona Gurrì, Gilberto Zara**
Politecnico di Torino
Italy
Rail RA1

YOUNG RESEARCHERS

TRANSPORT MODE

# WATERBORNE

1

WINNER

**Ghalib Humayan Taimuri**
Aalto University

Category: **Waterborne**

Country: **Finland**

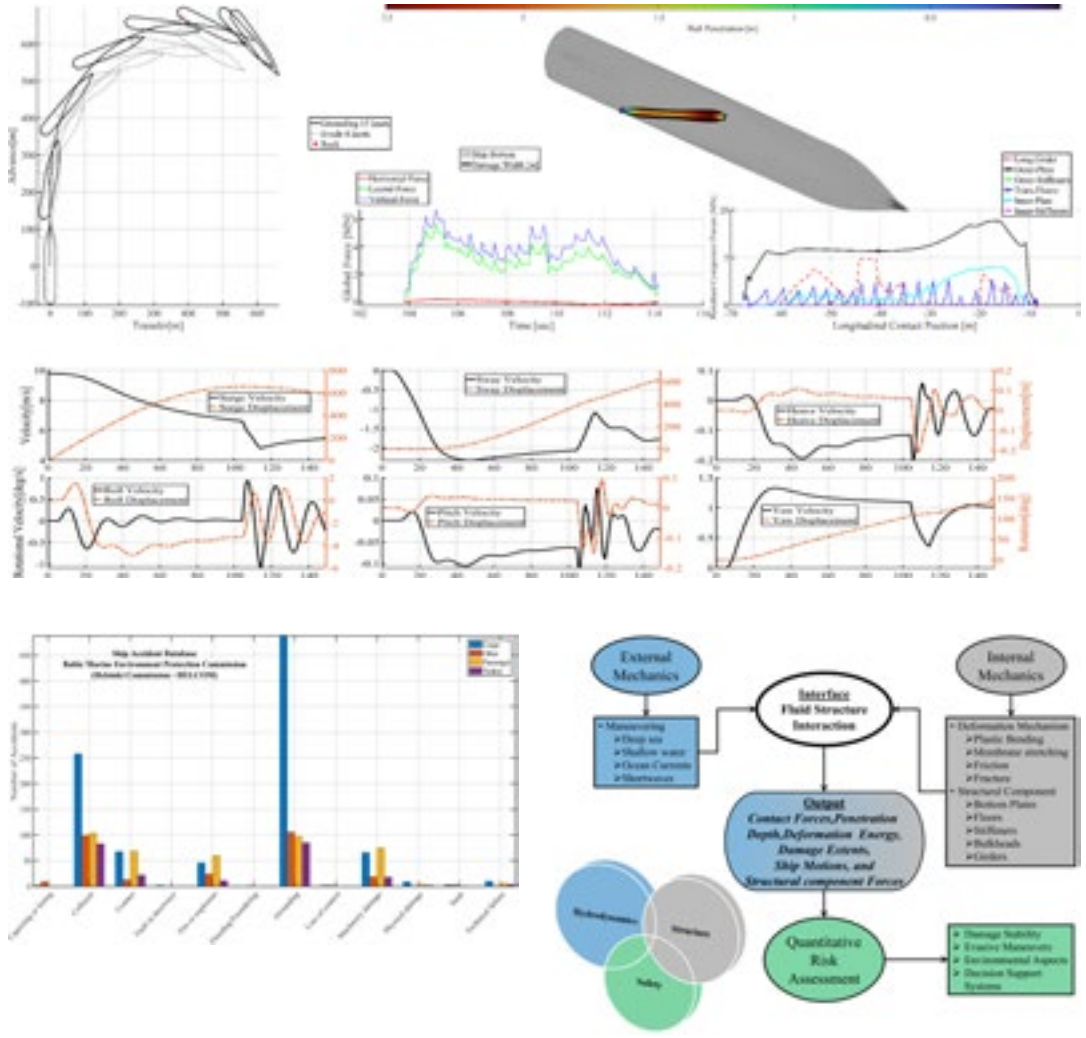
Research Area 3: **Innovative Infrastructure for Europe 2030**

Idea Number: **19**

WINNER

# A rapid assessment tool for the evaluation of ship hard grounding

In recent years, improved understanding of vessel response subjected to grounding became increasingly critical, primarily because of public concerns over several catastrophic accidents like environmental pollution, vessel capsizes and/or loss of human lives. Owing to lack of practical tools and methods, grounding accidents are understood based on limited statistical datasets, probabilistic approaches, and deterministic computational crashworthiness methods like those used by the automotive industry. Implementation of goal-based criteria in IMO Safety of Life at Sea has not been possible, because existing methods are computationally expensive and disregard idealisation of hydrodynamics, ship operation and seabed evasion. Under EU Horizon 2020 project FLARE, this project developed a time-domain, mathematical model and computational tool for the rapid evaluation of ship grounding dynamics. The model incorporates conventional rudder propeller configuration of a twin-screw ship manoeuvring in deep or shallow sea under calm-water/short-waves and ocean currents. The tool accounts for ship geometry, structural details/arrangements, and rock details. Following crashworthiness analysis, the damage, deformation energy, structural forces, ship motions, and evasive manoeuvres can be investigated. The study demonstrated reasonable comparison against computationally expensive methods. The method significantly reduces computation time from several days to a few seconds. The fluid-structure interaction methods developed push forward the state of the art in ship structural crashworthiness, can help shipyards and operators mitigate risks at early design stages and accordingly suggest risk control options for use in design development. The combination of manoeuvring and crashworthiness during grounding may enhance our understanding of the combined effects of structural crashworthiness on goal-based damage stability in design and operations.



2

SECOND PRIZE

**Paul Lee**
University of Strathclyde

Category: **Waterborne**

Country: **United Kingdom**

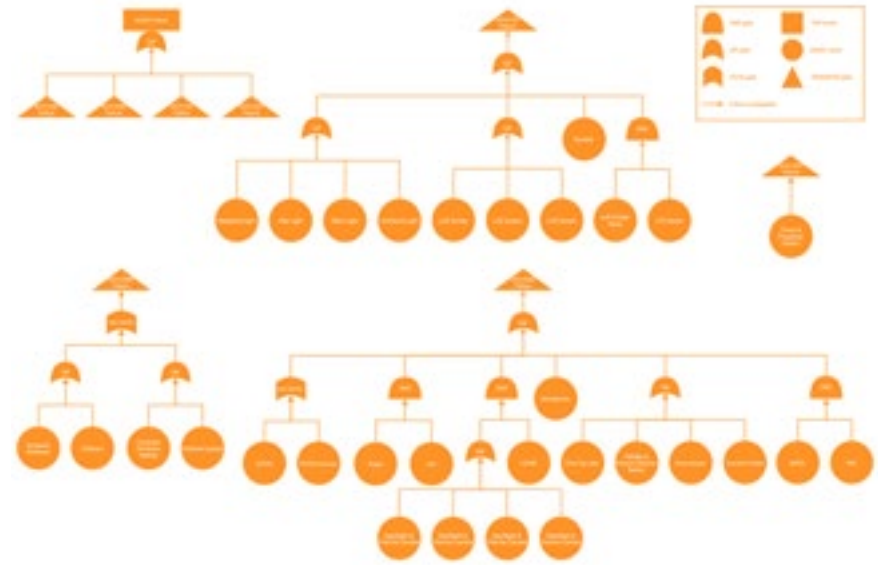
Research Area 1: **Smart Solutions & Society**

Idea Number: **52**

SECOND PRIZE

# Trustworthy Autonomous Collision Avoidance Decision-Making System for Maritime Autonomous Surface Ships

The recent maritime industry is paving the way towards the "Shipping 4.0" era and autonomous ships, also known as Maritime Autonomous Surface Ships (MASS), these are envisioned to be the key enabling technologies for the fully autonomous maritime ecosystem. However, a new emerging challenge that arises with the advancement of autonomous technologies is their trustworthiness, especially of those that execute mission-critical operations. The aim of this research is to develop a trustworthy Autonomous Collision Avoidance Decision-Making System (ACA-DMS) for MASS. A reference system layout of the expected autonomous collision avoidance system was developed, and a methodology that combines the following methods was employed: i) a digital twin of the system was developed to provide critical external risk metrics; ii) Fault Tree Analysis was conducted to acquire critical internal risk metrics; iii) a deep deterministic policy gradient algorithm was used to make collision avoidance decisions based on both external and internal risk metrics. A cargo ship was employed as a case study, and collision scenarios were developed to investigate the feasibility of the developed system. The derived simulation results verified that after training, the system was able to perform collision avoidance in trained and prior unknown collision scenarios. In addition, it was verified that the consideration of both external and internal risk metrics led to the increase of the system trustworthiness, both qualitatively and quantitatively. This project is expected to have a great impact on the future maritime industry by providing a way forward towards safer, resilient, and more dependable trustworthy autonomous systems.



3

THIRD PRIZE

**Chris Greenhough**
University College London

Category: **Waterborne**

Country: **United Kingdom**

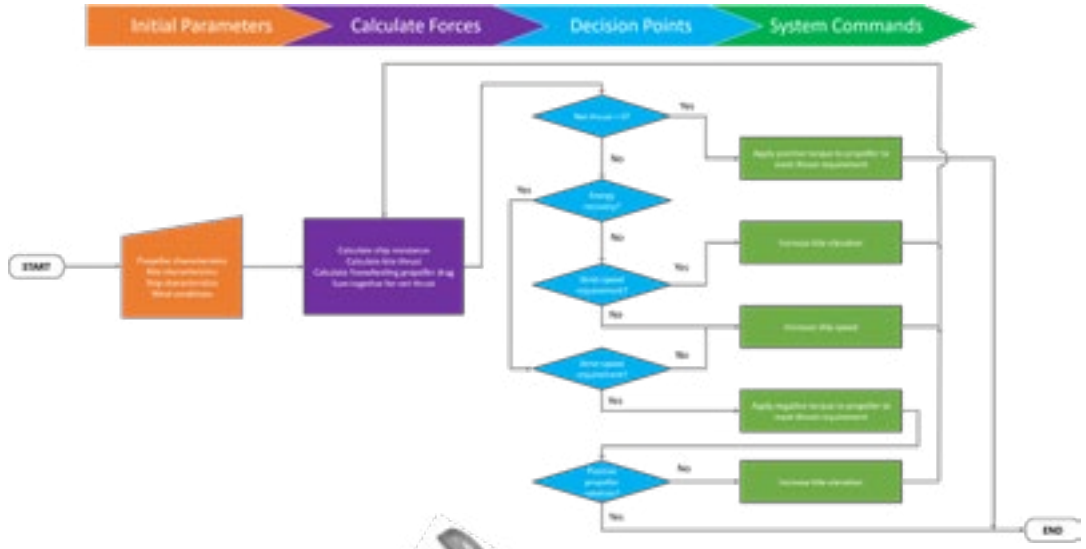
Research Area 2: **Green Mobility and Decarbonisation**

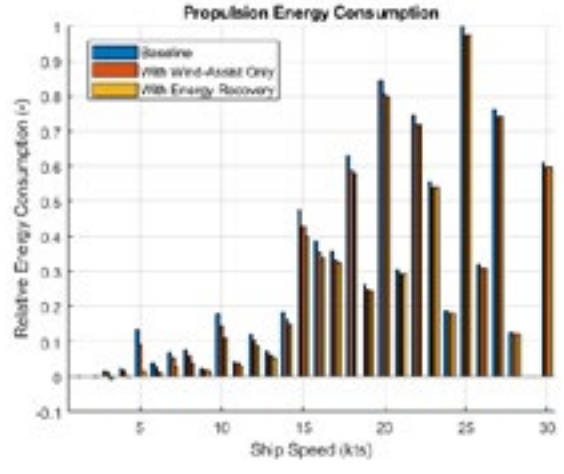
Idea Number: **31**

THIRD PRIZE

# Investigating Hydrokinetic Energy Recovery in Wind-Assisted Warships

Wind-assistance for ships has seen a resurgence of academic and commercial interest recently, owing to stricter regulations on atmospheric pollution from their engines, and the ability for new wind-assistance technologies to significantly reduce fuel consumption on many shipping routes. However, the power available from the wind is sporadic, it may not always match a ship's operational profile, and it may exceed that needed for propulsion. As an alternative solution, the aim of this project is to consider combining wind-assistance with energy recovery via the propeller, acting as a hydrokinetic turbine driving a generator, its output being connected to the ship's electrical power system, thereby offering flexibility when capturing wind energy. Research into hydrokinetic turbines in ships suggests that there is a disjoint between modelling propeller and turbine operations, often addressed by considering the two modes independently. This research aims to overcome this issue by using multi-quadrant propeller series data to calculate the torque and thrust acting on the propeller during both propulsion and regeneration. A wing kite and a fixed pitch propeller on a nominal warship design has been considered, where the wing kite has been modelled using the zero-mass model. MATLAB models to represent ship resistance, kite thrust, and propeller performance have been developed to characterise the potential for energy recovery and have been applied to a typical warship operational profile. The results indicate a good level of reduction in fuel consumption when using wind-assistance, which is significantly further improved using hydrokinetic energy recovery.



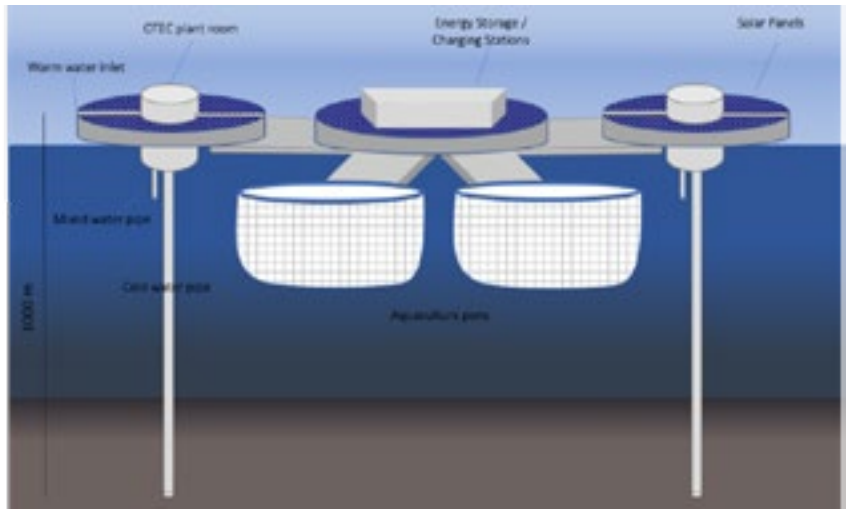
**Nilay Yavas**
University College London

Category: **Waterborne** Country: **United Kingdom**

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **01**

# Multi-use of the ocean space - Concept design of a multi-use marine platform (MUP) for Africa

The EU has developed the Blue Growth strategy to ensure sustainable use of the marine space. Combining several activities in the same marine space, as well as the introduction of multi-use platforms, has the possibility to divide the infrastructure overhead and reducing the costs of offshore operations, in addition to the demand on the space. The current focus of the Blue Growth strategy is on the European seas. This project will take a step further to expand the idea to third world countries with low access to potable water and electricity. For this purpose, different near-shore regions in Africa will be analysed for the selection of an ideal location for the design of a multi-use marine platform (MUP), combining several activities, such as energy generation, water desalination and transport. The MUP platform is placed 50 km from the north-west coast of the island nation Madagascar. The design uses the significant ocean and solar energy potential of the region to improve the energy scarcity of the island, enhance its economy, and make sustainable use of the ocean space. The MUP is designed for an operational life of 50 years. It is based on a modular megafloat, which consists of 5 circular modules. The modules are based on three different maritime uses: energy generation, energy storage, and aquafarming. The system generates 472 GWh renewable energy per year, 455 GWh through ocean thermal energy conversion, and 18 GWh through photovoltaic cells.







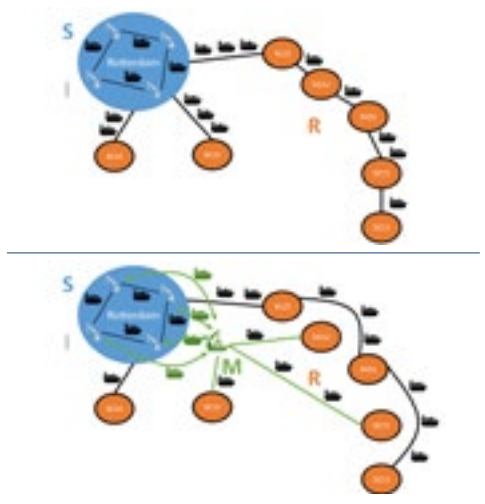

**Peter Shobayo, Adrien Nicolet**
University of Antwerp

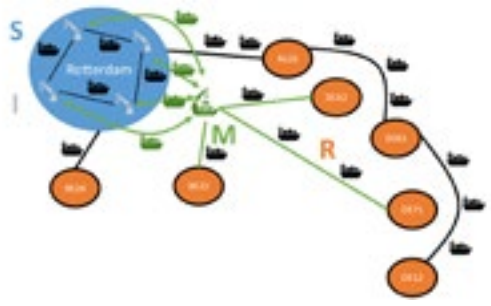
Category: **Waterborne** Country: **Netherlands**

Research Area 1: **Smart Solutions and Society** Idea Number: **13**

# Potential of the modular mobile terminal concept to improve barge logistics in seaports: a cost and time analysis

The logistics chain process of containerised cargos consists of the selection of a mode for the transport activity of the containers. The mode selection involves several factors such as the effectiveness and efficiency of the mode, transport time, service frequency, flexibility, cost, and reliability of the transport mode. Based on this, the current research examines how to improve the efficiency of container inland waterway transport to make it more competitive. This study is part of a more comprehensive EU Horizon 2020 project called NOVIMOVE (Novel inland waterways transport concepts for moving freight effectively). It examines how to eliminate the inefficiencies in inland waterborne transport by reducing sailing and waiting times at ports without expensive modifications of port infrastructures. To achieve this, a new concept known as the modular mobile terminal is examined, and its potential impact on the operational efficiency of container barges in seaports is evaluated. This research aims to evaluate the feasibility of the modular mobile terminal concept, through cost and time analyses. The results show that time savings of around 10 hours per barge can be achieved if inland vessels from hinterland regions with a substantial number of services and relatively low cargo volumes call only at the modular terminal instead of visiting deep-sea terminals. These time savings translate into significant cost reductions (in the range of 20% to 50%) for barge operators.



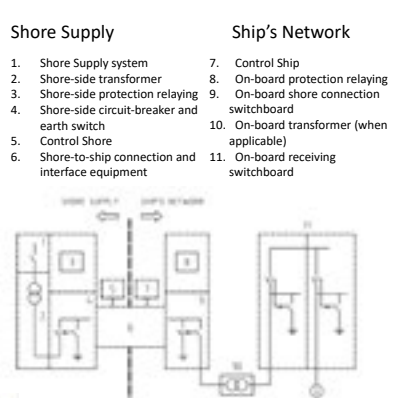
**Nikolaos Kampolis**
Newcastle University

Category: **Waterborne** Country: **United Kingdom**

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **10**

# Cold Ironing Implementation at the Port of Piraeus

Commercial Shipping greatly contributes to greenhouse gases emissions. It is estimated that more than 840 Mt of $CO_2$ were emitted by the world fleet in 2020, representing about 2.5% of global CO2 emissions. However, emissions are not limited to $CO_2$, but also include SOx, NOx, PM among others, which are well-known polluters contributing to climate change. This project's main goal is to provide an evaluation of a cold ironing station in the Mediterranean's largest commercial port to comply with future IMO regulations and help contribute to sustainable shipping is the main goal of this project. Specifically, this research is aiming at the comprehensive evaluation of the implementation of a cold ironing station in the containership terminal of the port of Piraeus. This project focuses on the technical and economic analysis of a shore power supply system, which supplies power generated from a nearby renewable power station. The power supplied from the cold ironing station will be estimated by computing the vessels' power demand while at berth. The typical cold ironing system layout will be applied and retrofitted for the port of Piraeus. A crucial factor, which enhances the sustainability of the provision of shore power, is the generation of the power supplied from renewables. Thus, this research will evaluate the development of a photovoltaic power station, while appraising the technical and economic requirements of such infrastructure. Consequently, the outcome of the project is to investigate whether the implementation of the cold ironing station in the port of Piraeus not only offers the potential for reducing GHG emissions, but also the potential to be a profitable investment for the shareholder of the project.







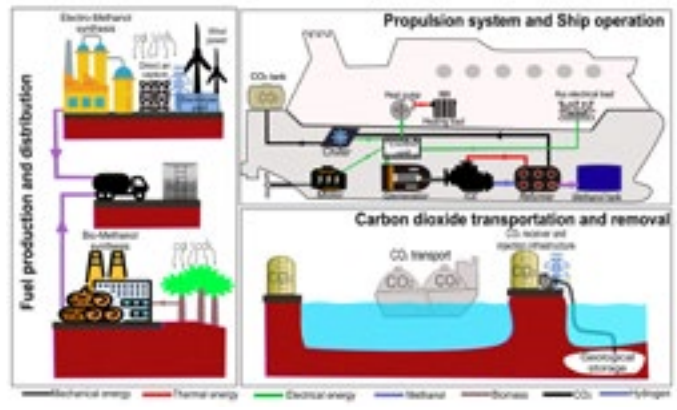

**Fayas Malik Kanchiralla**
Chalmers University of Technology

Category: **Waterborne** Country: **Sweden**

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **94**

# Negative greenhouse gas emissions for shipping

The shipping sector is a key element to the global supply chain, and about 3% of the total greenhouse gas emission comes from this sector. Currently, the rate of emission reduction is not sufficient to meet the targets to enhance the sector's sustainability, and net negative carbon dioxide emissions are required to accelerate decarbonisation and for balancing the residual emissions (i.e., methane, nitrous oxide, etc.). To limit greenhouse gas emissions from shipping, the present fossil-based marine fuels should be replaced by renewable fuels or by using carbon abatement technology. Renewable fuels may be produced from biomass (biofuels) or renewable electricity (e-fuels). Bioenergy with carbon capture and storage, and direct air capture carbon capture storage have received wide interest recently. This project analyses the potential of onboard carbon capture technology for carbon-based e-fuels and biofuels to achieve GHG emission reduction, while also presenting a cost analysis of these options. To assess the climate change impact and cost, prospective life cycle assessment and environmental life cycle costing methods are used. Key performance indicators for the climate impact performance are identified and investigated, such as renewable electricity mix requirement for fuel production, and carbon capture rate for onboard carbon capture. The advantage of using the carbon-based renewable fuel is its relative ease to store, handle and transport compared to renewable hydrogen, and onboard carbon capture is less energy intensive and can operate using heat from the engine.



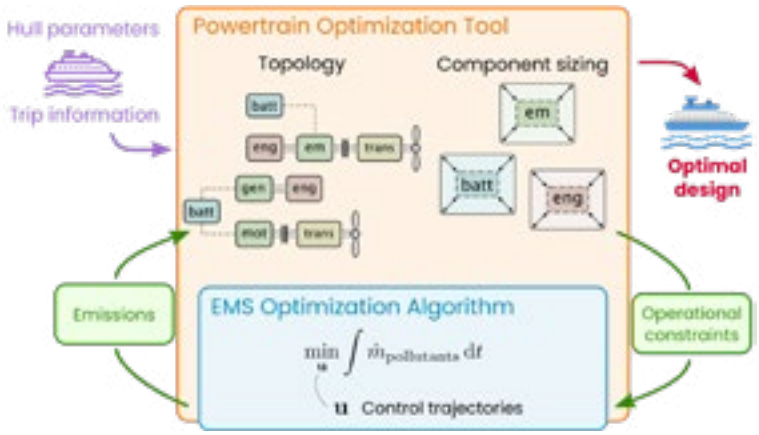
**Federico Miretti, Matteo Spano**
Politecnico di Torino

Category: **Waterborne** Country: **Italy**

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **44**

# OnDyna - Optimal design tool for hybrid marine powertrains

Increasing concern over air quality in maritime areas is pushing towards the adoption of stringent regulations, such as the 2021 adoption of a Nitrogen oxides Emission Control Area in the Baltic Sea, requiring ships to satisfy IMO Marpol Tier III standards. In this context, diesel-powered ships for short-distance transport (i.e., ferries) might benefit from electrification. Indeed, they typically emit more when operating in highly dynamic conditions, and this behaviour can be damped by hybridising the powertrain. However, selecting the optimal hybrid powertrain is a complex and challenging task due to the large design space stemming from the variety of architecture topologies (i.e. the number, position and function of the electrical machines) and component sizes. In order to tackle the challenge, this project presents a powertrain optimal design tool for diesel-hybrid vessels, which rapidly compares a large number of hybrid powertrain layouts with various topologies and component sizes. Different design objectives can be targeted, including pollutant emissions. These are strongly dependent on the energy management strategy, which defines how the different power sources are operated. To decouple the design of the energy management strategy from that of the powertrain, the former is handled for each design candidate by a dynamic programming algorithm ensuring an unbiased comparison between them. The tool developed by this research would have several applications. It would allow designers to eliminate the first layer of complexity by identifying the optimal hybrid candidate based on their application. On the other hand, it would permit policy-makers to assess the potential impact on air quality of ferry fleet hybridisation.







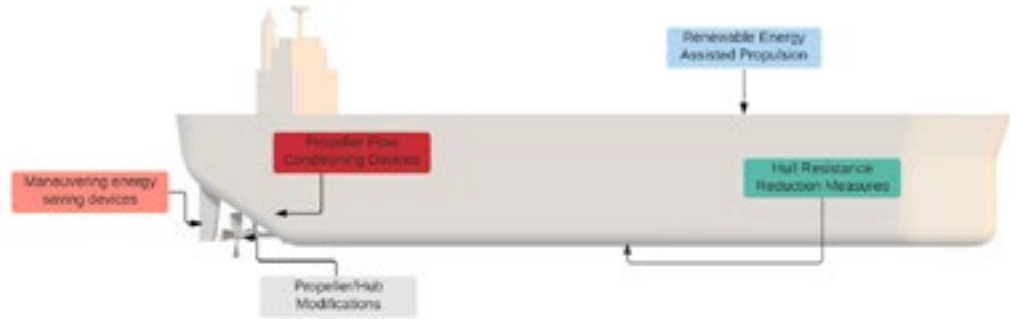

**Callum Stark, Yunxin Yu, Ming Zhang**
University of Strathclyde

Category: **Waterborne** Country: **United Kingdom**

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **63**

# Developing energy saving solutions for hydrogen-powered waterborne transport

Decarbonisation of waterborne transport is arguably the biggest challenge presently faced by the maritime industry. By 2050, the International Maritime Organization (IMO) aims to reduce greenhouse gas emissions from shipping by 50%. To meet such targets, various strategies are being deployed. For instance, green hydrogen as an alternative fuel may be a solution to meet future targets to achieve a future clean shipping vision. The cost of hydrogen fuel is higher compared to conventional fuel, therefore energy saving devices (ESDs) for ships are more important than ever. However, existing, and emerging energy saving devices have not been researched to assess their compatibility for hydrogen-powered ships, presenting challenges and considerations within their design and operation. This project aims to bridge the gap by firstly identifying the new challenges that a hydrogen-powered propulsion system brings forth, reviewing the quantitative energy saving capability and qualitative additional benefits of individual existing and emerging energy saving devices in standalone and combination; investigate a novel concept conceptualised by the project team (tubercle-assisted propulsors) and its energy saving capability; and finally, draw up recommendations for the most compatible energy saving device combinations with hydrogen-powered waterborne transport presented to maximise energy saving and minimise the negative impact on the propulsion system. In summary, the most compatible combination of energy saving devices for hydrogen will depend largely on factors such as vessel type, route, propulsion, operation, etc. Through preliminary investigations throughout the project, tubercle-assisted propulsor technology has the potential to provide energy savings and mitigate load fluctuations, which will be favoured by the hydrogen powertrain.



## TOP TEN

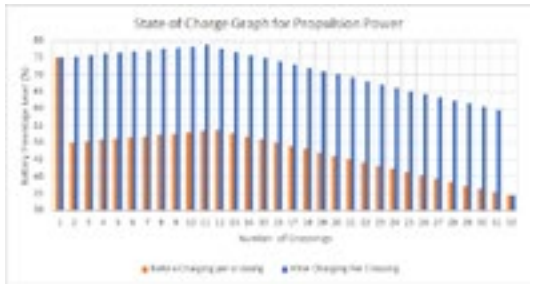
**Ioanna Stefania Arkadi**
Newcastle University

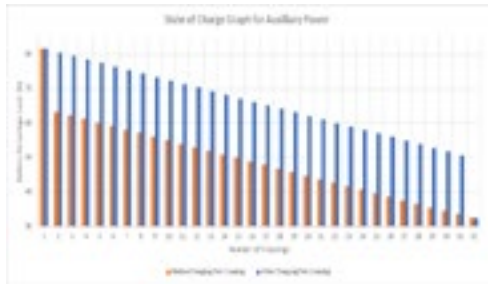
Category: **Waterborne** | Country: **United Kingdom**

Research Area 2: **Green Mobility and Decarbonisation** | Idea Number: **15**

# Pure Electric Ferry Design in Bosporus Strait

Cities of the future are integrated with technology, the environment and urban mobility. Istanbul is a great example due to its current problems with congestion, emission levels and its dynamic potential towards being a future smart city. As Istanbul is one of the most populous cities globally and attracts many tourists, it has major traffic problems with the Bosporus Strait being the centre of them. On the other hand, the increased shipping industry environmental pressures has urged the development of new technologies based on renewable sources to lower emissions, with the most promising being electric power systems. Hence, this research designed a new propulsion system to retrofit the current Bosporus Strait ferry and to investigate how emission reductions can be achieved, while also tackling congestion problems. The vessel's machinery is replaced with battery systems for propulsion and auxiliary power. This is achieved by matching the battery system with operational requirements. A fast-charging method also reduces on board battery weight, which results in higher weight and space efficiency to accommodate more passengers. The proposed system delivers the same power output as the current system by using an appropriate motor and the battery characteristics. Hence, the model ferry's fuel consumption is reduced to zero, and as the electric power available onshore is generated from renewable sources, the ferry's emissions are reduced to zero. Consequently, the ferry can not only carry more passengers, but also operate using a fully renewable propulsion system, thus both congestion and emission issues are tackled.



## OTHER ENTRIES

**Contemporary challenges and AI solutions in port operations: applying Gale-Shapley algorithm to find best matches**

**Merhan Farzadmehr**
University of Antwerp

Netherlands

Waterborne RA1

**ModiYacht: Intelligent CAD tool for parametric, generative, attributive and interactive modelling of yacht hull forms**

**Shahroz Khan**
University of Strathclyde

United Kingdom

Waterborne RA1

**MV Viridis**

**Simone Lambeck, Jasper Wellmann, Marco Jaegers, Leon Neuendorf, Patrick King Rauhut, Amr Malek, Jakob Boksch**
Hochschule Bremen

Germany

Waterborne RA2

**Energy Efficiency Operational Index (EEOI) analysis in different weather conditions according to big operational data and machine learning techniques.**

**Mikolaj Marczak**
Universität Rostock

Germany

Waterborne RA2

**Standardized logistics emission calculation in inland navigation**

**Denise Beil, Bianca Borca, Laura Hörandner**
University of Applied Sciences Upper Austria

Austria

Waterborne RA4

**Application of AI methods to solve the lashing problem of stowage planning**

**Niclas Dorn**
Technical University of Denmark

Denmark

Waterborne RA1

**A comprehensive assessment of electro- and biofuels in global shipping: A comparative study**

**Phillip Dyrberg, Nicolai Mossing Madsen**
Technical University of Denmark

Denmark

Waterborne RA2

**A new Innovative approach for Emission Abatement and reutilisation of Captured Carbon to create energy**

**Naveen Ramanathan, Pritam Patel, Saeid Panahi, Ahsan Ullah Jawad, Muhammad Fuad Shofly**
Universidad de la Coruña

Spain

Waterborne RA2

**Renewable Energy alternatives for cargo ships - Case study of Application of Flettner rotors combined with Photovoltaic panels on bulk carriers**

**Leopaul Singor Tamdjokouen**
World Maritime University

Sweden

Waterborne RA1

**The Missing Link for Autonomous Navigation: Ship Motion Control Systems for Shallow and Confined Conditions**

**Changyuan Chen, Thibaut Van Zwijnsvoorde, Hongwei He**
Ghent University

Netherlands

Waterborne RA1

YOUNG RESEARCHERS

TRANSPORT MODE

# AIRBORNE

1

WINNER

**Gleb Panfilov, Juri Lukanov, Emils Aliks**
Riga Technical University, Mtaf Faculty

Category: **Airborne**

Country: **Latvia**

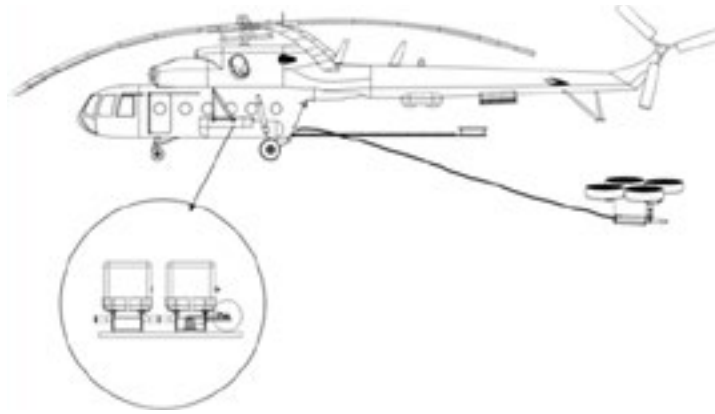
Research Area 3: **Innovative Infrastructure for Europe 2030**

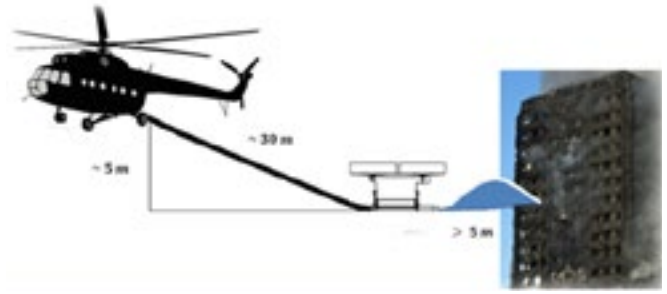
Idea Number: **03**

WINNER

# Airmobile Fire-fighting Complex

Fires in dense urban areas and high-rise buildings are a big problem in terms of suppression. To extinguish such fires, special-purpose helicopters are often used, which drop water or use horizontal fire extinguishing systems - water cannons. The effectiveness of such systems is not optimal, and they play more of an auxiliary role than the main one. Currently, drones are used to extinguish fires, allowing delivery of a fire hose to a great height and close to the fire. However, drones also have disadvantages due to the difficulty of preparing for use and their rapid activation. This project proposes to use an airmobile fire-fighting complex, including a helicopter-tanker which carries fire-fighting foam, provided with a special platform on which a firefighter drone is located. The drone is connected by a hose to the tank with fire-fighting foam, ensuring the delivery of the hose to the fire site. The range of the firefighting drone is about 30 metres from the helicopter. This fire-fighting complex enables effective extinguishing of fires in areas of dense residential development and high-rise buildings, where it is difficult to use conventional fire extinguishing means. The response time of an airmobile fire-fighting complex for extinguishing fires is much shorter in comparison with standard fire extinguishing methods.






2

SECOND PRIZE

**Nicola Cavagnetto, François Brambati, Marco Fusar Poli**
**Università Cattolica del Sacro Cuore**

Category: **Airborne**

Country: **Italy**

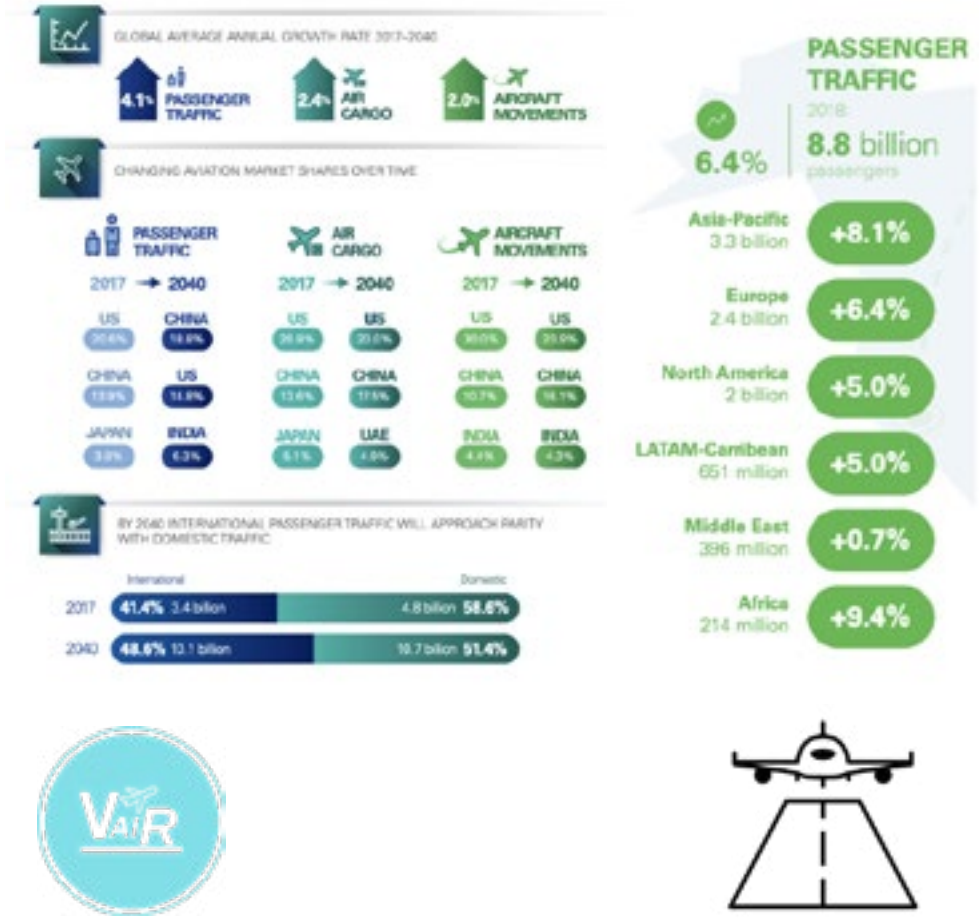
Research Area 1: **Smart Solutions & Society**

Idea Number: **70**

SECOND PRIZE

# V.AIR

The fear of flying is described as a common anxiety disorder, physiological and psychological symptoms may include panic attacks, fear, sweating, dizziness, muscle tension, heart palpitations, shortness of breath and nausea. Several psychological and pharmacological treatments already exist for fear of flying, focusing on learning strategies such as Cognitive Behavioural Therapy, or in pharmacologically reducing the arousal. The project focuses on positive distraction through virtual reality in-vivo exposure to reduce the arousal through performing cognitive tasks and/or experiencing relaxing scenarios as coping strategies directly while flying. Integrating these techniques in virtual reality could offer a more interactive and immersive experience, thus helping the user feel engaged in a non-phobia-related context. First, restorative effects of virtual natural settings have been demonstrated. Second, immersive, and interactive virtual reality experiences allow participants to learn and apply several strategies to cope with stress. Third, in healthy subjects, stress deriving from the performance of cognitive tasks induces an increased activation in left dorsolateral prefrontal cortex, critical region for cognitive control, and a decreased activation in the right ventromedial prefrontal cortex, area associated with anxiety. The project aims to test the feasibility, usability, and effectiveness of a protocol of immersive experiences stimulating a positive distraction effect to reduce stress and anxiety levels experienced during flight.



3

THIRD PRIZE

**Ulrike Schmalz**
Otto Beishem School of Management - WHU

Category: **Airborne**

Country: **: Germany**

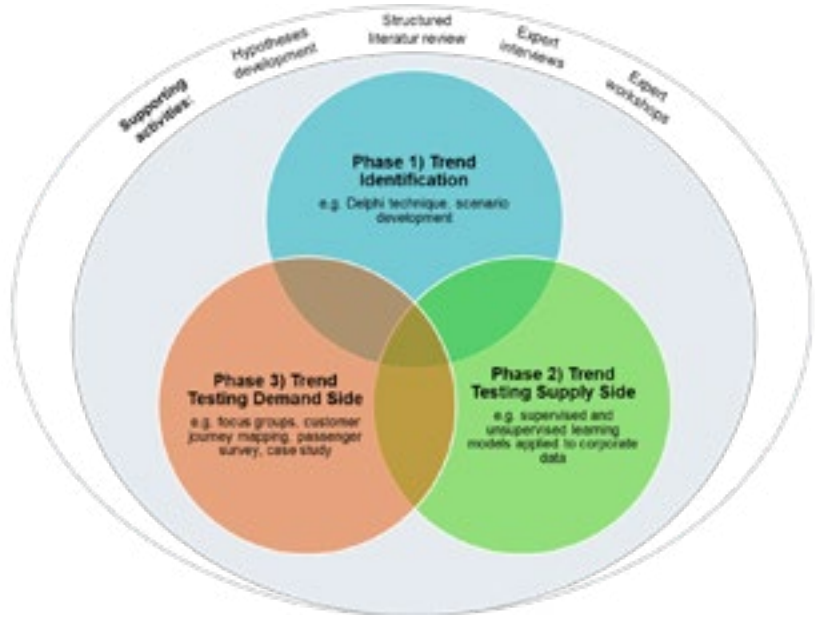
Research Area 1: **Smart Solutions & Society**

Idea Number: **97**

THIRD PRIZE

# Exploring trends of D2D Air Travel in Europe

Air passengers face at least five main travel segments and various pain points along their entire travel chain, such as a lack of comfort, long travel times, possible disruptions, and multiple aspects concerning various ticketing and integrated booking processes. Improving their intermodal journey is a key challenge for future aviation, the mobility sector and policymakers. This research supports creating a more seamless, data-driven, sustainable, and passenger-centric door-to-door (D2D) air travel chain within Europe. The goal is to understand trends of D2D air travel within Europe, looking at both the supply and demand sides. It is a (quasi)-cumulative dissertation project with three main parts that apply different methods. The Delphi technique is used for trend identification in the first part, a novel data-driven, text-classification model for trend testing studies supply in the second part, and a choice-based conjoint analysis is used to study the demand (passenger) side in the last part. The main outcome are three possible future scenarios of D2D air travel in 2035 and the most critical trends for the future of D2D air travel. Further, passenger preferences are quantified for selected ancillary (non-ticket) services for the German market as a case study. Overall, the results of this research project support Transport Service Providers on various levels who want to become true D2D mobility providers (e.g. within strategy-, decision-, and product making). Further, a three-phases and multi-method framework is developed that is transferable to multiple mobility-related trend studies, contributing to academia and scientific literature.





Schmalz, U., Ringbeck, J., Spinler, S., 2021. Door-to-door air travel: Exploring trends in corporate reports using text classification models. *Technological Forecasting and Social Change* 170, 120865.

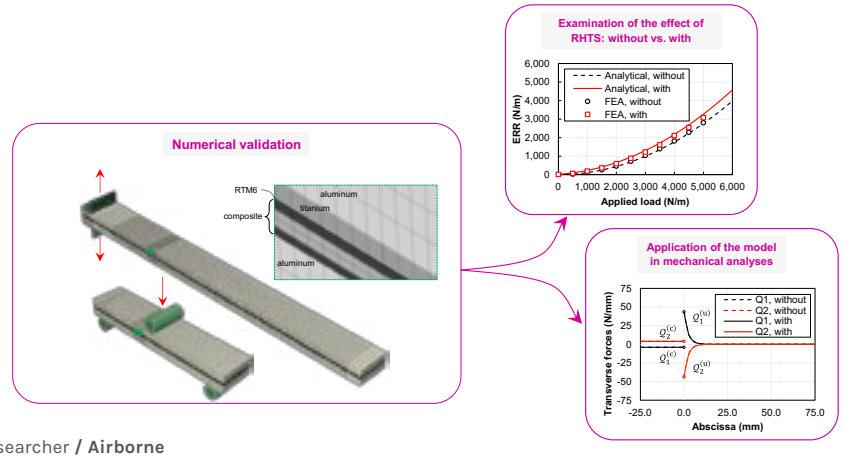
**Panayiotis Tsokanas**
University of Patras

Category: **Airborne** Country: **Greece**

Research Area 3: **Innovative Infrastructure for Europe 2030** Idea Number: **58**

# Fracture analysis of non-conventional layered structures: a novel framework

Inspired by a tangible problem in the aerospace industry, this project proposes an analytical framework—currently being developed by the author for the fracture analysis of hybrid structures with a beam geometry. The structural elements under consideration may feature several peculiarities: they may consist of multiple layers of dissimilar materials; they may have asymmetries in thicknesses; they may feature elastic couplings; they may contain environmental stresses; they may be loaded by a multitude of mechanical loads; etc. The technological problem that sparked the study concerned the fracture analysis of a titanium and Carbon Fiber Reinforced Plastic (CFRP) to be applied in the Hybrid Laminar Flow Control system of future aircraft. With this problem as a springboard, the project proceeded to build a generic analytical theory for the determination of the fracture toughness of beam structures with all the peculiarities mentioned above. Classical theories of the mechanics discipline (e.g., beam theory, mechanics of composite materials, energy methods) and important tools in the field of fracture mechanics (J-integral, crack-tip element, crack closure integral, etc.) were employed during developing this novel framework. After extensive literature review, the proposed analyses and solutions extend the existing level of knowledge, and provide the possibility of studying a variety of new geometries, hybrid material systems, different testing setups, etc. All new solutions were confirmed based on thorough numerical analyses. A handful of experimental, analytical, and computational studies of the fracture toughness of various material systems and configurations have been carried out, and many of them have already been published in scientific journals.







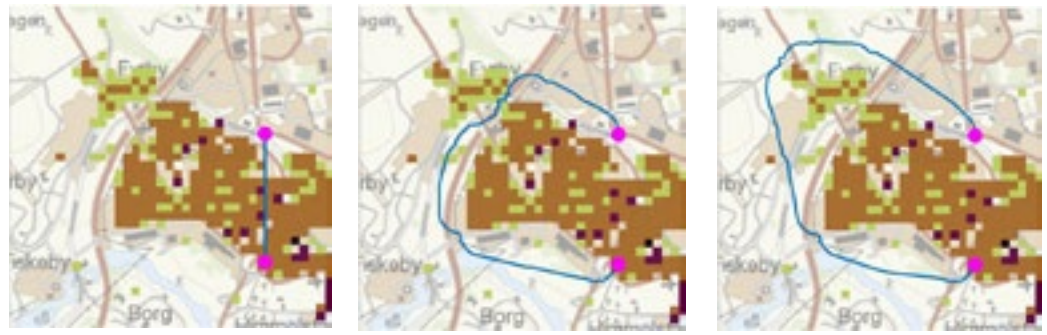

**Leonid Sedov**
Linköping University

Category: **Airborne** Country: **Sweden**

Research Area 3: **Innovative Infrastructure for Europe 2030** Idea Number: **112**

# Development of key enablers for future Unmanned Traffic Management

Commercial demand for small unmanned vehicles is quickly growing. Before long, thousands of electric autonomous drones will be flying in cities improving multitudes of services. However, management of dense drone traffic requires an efficient and reliable Unmanned Traffic Management (UTM) system. This project addresses the need to establish such an UTM system and enable the growth of the new technology. The research worked closely following authorities and industry experts to identify missing components and to fill the research gaps. As a result, in this project centralised and decentralised UTM systems, developed algorithms for establishing zones with different performance requirements in multi-layer airspace design, developed algorithms for establishing common reference altitude for drones, and developed approaches for ground risk management are compared. The project pushes forward the development of UTM and raises an important question of establishing stricter requirements for drone operations only where it is necessary to enable the growth of the novel technology.



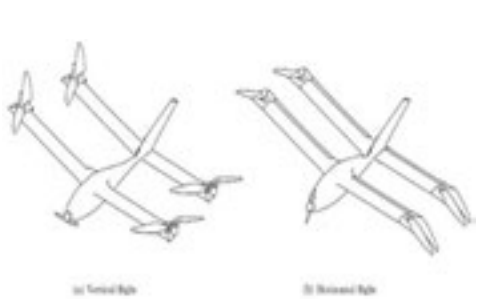
**Chris Gurjao**
AlmaMater University of Bologna

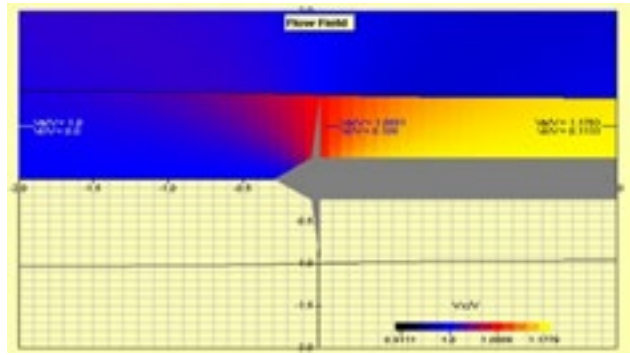
Category: **Airborne** Country: **Italy**

Research Area 1: **Smart Solutions & Society** Idea Number: **74**

# Design of Extreme Altitude Mountain Rescue Vehicle 'Chocard'

Transporting people by helicopter at very high altitudes is not generally feasible. This presents both technical difficulties as well as commercial opportunities, in emergency services and adventure tourism. Freezing temperatures, low atmospheric pressure and harsh climate with mostly reduced visibility all add up towards making transporting persons, whether rescuing them or conveying them, very risky. Since the weather conditions can change very quickly, receiving relevant information for mission preparation and possible mission adjustments can be as important as vehicle performance. Nowadays, some helicopter models are modified to carry out high altitude mountain rescue operations. However, no model is currently in the market that has been created specifically for this particular purpose. This project describes the design of an Extreme Altitude Mountain Rescue Vehicle named 'Chocard'. The mission of the reconfigurable Vertical Take-off and Landing aircraft is to transport human persons over a specified mission profile, subject to various constraints. The project includes the initial sizing, choice of propulsion system, the preliminary design of the lifting surfaces, fuselage, landing gear, the expected performances and limitations. The aircraft configuration was generated through the use of various design philosophies such as optimization through iteration, component build-up drag estimation, and realistic systems integration using empirical data from several sources. The aircraft utilises existing aeronautical technologies to fulfil its mission objective.









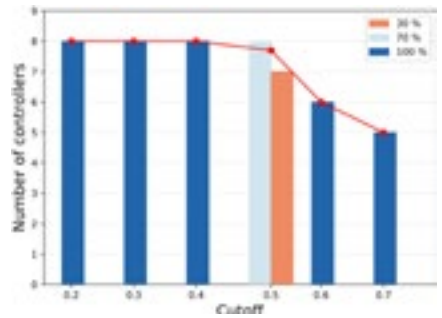

**Anastasia Lemetti**
Linköping University

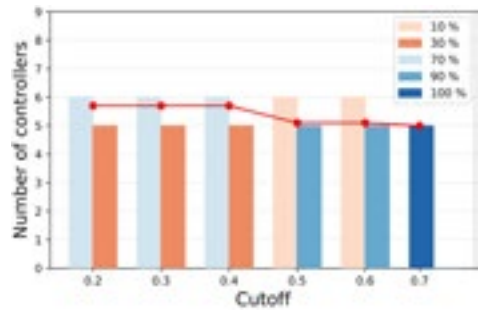
Category: **Airborne** Country: **Sweden**

Research Area 4: **Innovative Infrastructure for Europe 2030** Idea Number: **113**

# Integrating Weather Impact in Air Traffic Controller Shift Scheduling in Remote and Conventional Towers

This research studies the impact of various weather phenomena on air traffic controller (ATCO) task load through structured interviews with ATCOs. Task load-driven impact factors and the corresponding thresholds for the intensity of the weather phenomena at several Swedish airports are taken into consideration and analysed. To account for the uncertainty in the weather prediction, the research obtained probabilistic weather data from Ensemble Prediction Systems. The prior mixed integer programming model was adjusted for remote tower centre staff scheduling to account for uncertain impactful weather occurrences and yield a distribution for the necessary number of ATCOs for remote tower centre staff scheduling. The framework can be used for conventional towers as well. The impact of weather is quantified by comparing the number of controllers necessary to operate at five Swedish airports from a remote tower during two example days in 2020, with and without taking weather events into account. The calculations use historical weather and flight data to show that ignoring weather impact may lead to significant understaffing at a remote tower centre.



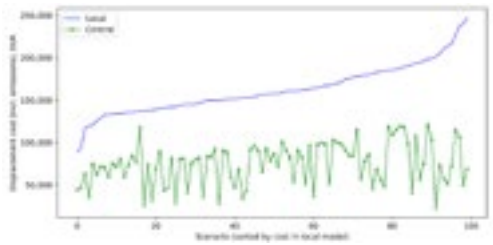
**Jan-Rasmus Künnen**
Otto Beishem School of Management - WHU

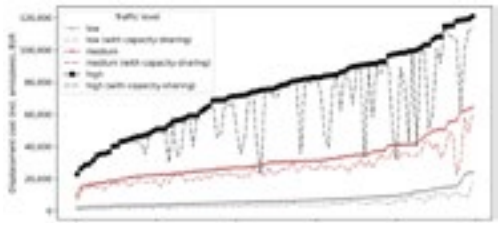
Category: **Airborne** Country: **Germany**

Research Area 2: **Green Mobility & Decarbonisation** Idea Number: **88**

# Rethinking air traffic capacity management to reduce emissions and improve resilience

With the surge in demand after the lows during the COVID-19 heights, the air traffic capacity problems (particularly at peak times) have rebounded to pre-pandemic levels, witnessed by long queues at airports and flight delays. One reason for the observed demand-capacity imbalances is that even today, all European air navigation service providers make local, autonomous decisions on how much air traffic controller capacity to provide on a certain day, without considering the network effects on other air navigation service providers. Failing to information on capacity not only leads to flight delays, but also to re-routings of flights to avoid congested airspace. In fact, a better capacity allocation for air traffic services in Europe may save 10-20% fuel (and emissions) from flight re-routings. As a remedy, the project proposes a centrally coordinated capacity planning on a European-wide level which considers both network effects and emissions in making capacity decisions. This may not only improve network performance and reduce flight emissions through available capacities, but also provide the basis for capacity flexibilization via capacity sharing. The research contributes to a capacity planning tool (based on simulation optimization) that structurally evaluates capacity decisions in terms of delay and re-routing costs, as well as emissions, and allows to determine the number of controllers that should be trained for capacity sharing. Current capacity planning models do not share these properties. In this study, it is found that these central capacity decisions can reduce emissions from re-routings by 45%, and that capacity sharing can reduce them by another 17%.









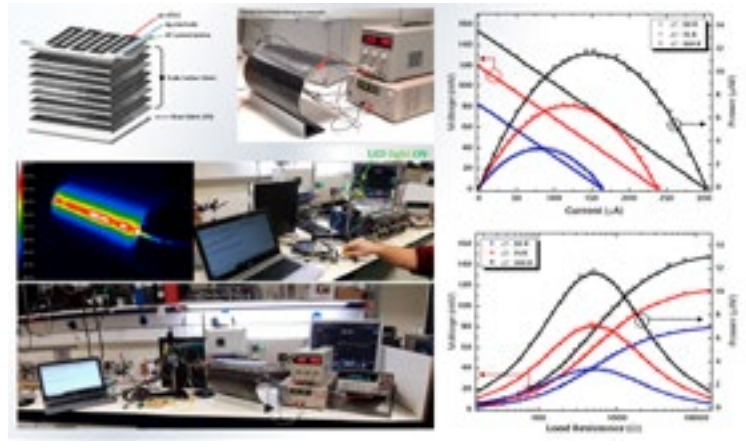
**Christos K. Mytafides**
University of Ioannina

Category: **Airborne** Country: **Greece**

Research Area 2: **Green Mobility & Decarbonisation** Idea Number: **26**

# Efficient thermal energy harvesting from an integrated organic thermoelectric generator within a carbon fiber-reinforced polymer composite

Lightweight advanced structural composites such as fibre-reinforced polymers are developed and adapted in many applications related to the transport sector. The reduction of CO2 footprint and a more sustainable life cycle cost analysis are key objectives leading to positive environmental impact. Although fibre-reinforced polymers structural performance is well established, the multifunctionality of these materials is a topic of active research. A huge amount of the energy produced globally is dissipated as waste heat, with the transport sector being the major contributor to this unutilised energy, since only 34% of the fuel's energy ends up as useful energy. A thermoelectric generator which can convert directly thermal energy to electricity can recover significant amounts of this lost energy. A thermoelectric generator is typically used for energy conversion through the Seebeck effect, producing electrical power when subjected to a temperature gradient. Organic-based nanomaterials such as Carbon Nanotubes are being extensively studied due to their desirable properties and their added value when incorporated as filler. In addition, regarding the electrical properties, their intrinsic p-type semiconducting behaviour can be effectively tuned when doped to n-type semiconductor. In this study, an in-plane fully organic thermoelectric generator was integrated within a fibre-reinforced polymer part via an easy and fast printing technique, achieving a high thermoelectric performance of 11.6 μW at ΔT = 100 oC.



**Dung Nguyen-Dinh**
Budapest University of Technology and Economics

Category: **Airborne** Country: **Hungary**

Research Area 2: **Green Mobility & Decarbonisation** Idea Number: **12**

# Design and Development of Drones as Novel Transportation Systems

Science and technology are ready to develop and produce an extensive series of low-cost, small, remotely controlled, or autonomous air vehicles as drones (generally UAV, UAS, including even small pilot-less air vehicles, air taxis). The existing air traffic management system cannot control the predicted amount of drones operated at low altitudes in the urban area between large buildings and complex environments (with, e.g., reflection), due to the limitations in the system capacity, the required workforce, the expected cost, and the required duration of the system development. In addition, given the anticipated large amounts of drones and widely varying performance characteristics, it is far beyond the capabilities of conventional air traffic management systems to deliver services for drones in a cost-effective manner. Hence, integrating drones in smart city transportation is an essential task, which requires innovative, highly automated, autonomous solutions. The main objective of the project is to develop an intelligent total transportation management system for integrating drones into a smart city environment. This objective is divided into four sub-objectives, including: (i) to develop the concept of an intelligent total transportation management system for future smart cities; (ii) to analyse and develop an air traffic management and flight control for managing drones or a group of drones; (iii) to improve a method for managing drones based on drone-following models and the internet of things and the Internet of Drones technologies; (iv) to investigate the landing process of UAVs.







**VTOL Vehicle or Natural Disaster Relief**

**Udit Sharma**
AlmaMater University of Bologna

Italy

Airborne RA1

TRANSPORT MODE

# CROSSMODALITY

1

WINNER

**Arkadiusz Drabicki**
Cracow University of Technology

Category: **Crossmodality**

Country: **Poland**

Research Area 1: **Smart Solutions & Society**

Idea Number: **116**

WINNER

# Modelling the impacts of real-time crowding information in public transport

Passenger overcrowding is an important and recurrent phenomenon, especially in urban public transport systems. Meanwhile, recent advancements in intelligent transport systems allow for designing new measures that can help potentially counteract the negative effects of passenger overcrowding. An especially interesting and feasible solution pertains to providing passengers with Real-Time Crowding Information (RTCI) on current passenger loads of public transport services. The aim of this research is to contribute towards bridging the main gaps regarding the analysis of RTCI effects in public transport networks: missing empirical underpinning of RTCI influence upon travel behaviour, methods for analysing the RTCI consequences for passengers' travel choices and ensuing service performance. Empirical surveys reveal the potential of willingness to wait with RTCI to become a significant travel behaviour phenomenon. Modelling outputs highlight the chain of events triggered by RTCI in passengers' travel choices. Finally, simulation analyses reveal that RTCI-induced decisions can significantly reduce the experience of overcrowding effects and play a crucially instrumental role, especially in case of public transport service disruptions (bus bunching), albeit with certain inaccuracy risks. This project aims to contribute with a research framework for understanding the ramifications of RTCI provision in urban public transport networks, both from passengers' and operators' perspective. As such, it may effectively support the formulation of strategies and operations for enhancing the real-time public transport capacity utilisation, journey experience and system performance. It can also help with the designing future RTCI systems as effective travel demand management tools in modern-day urban public transport networks.

| Passenger crowding level distribution | | anticipated (acc. to RTCI) | | | |
|---|---|---|---|---|---|
| | | ●●●● | ●●●● | ●●●● | ●●●● |
| experienced (on-board) | ●●●● | 36.4% | 2.8% | 4.1% | 0.3% |
| | ●●●● | 6.1% | 1.3% | 2.4% | 0.2% |
| | ●●●● | 13.5% | 3.6% | 14.9% | 3.2% |
| | ●●●● | 2.6% | 0.7% | 4.4% | 3.5% |

2

SECOND PRIZE

**Shaghayegh Rahnama**
Zaragoza University

Category: **Crossmodality**

Country: **Spain**

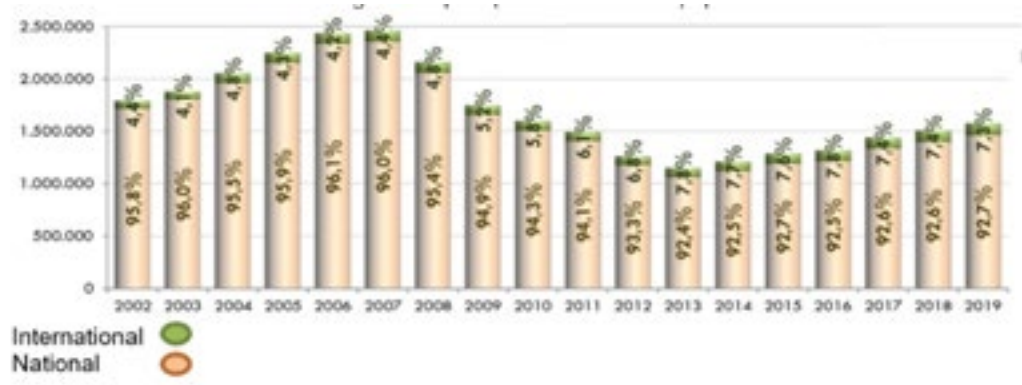
Research Area 1: **Smart Solutions & Society**

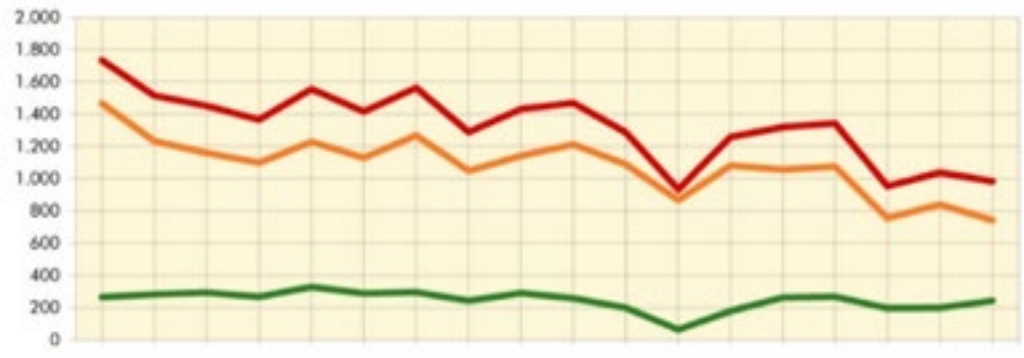
Idea Number: **109**

SECOND PRIZE

# Development of a DSS and prioritization of criteria for synchromodality in transport operations.

Logistics service providers must effectively employ real-time information and integrate new technology into their operations so that it becomes demand-driven. Synchromodal logistics is a new type of logistics that aims to improve supply chain flexibility, stakeholder cooperation, and resource use. This project, called SYNCHRO-NET, is aimed at reducing stress in modern supply chains caused by increasing transportation distances, increased complexity, and susceptibility. The SYNCHRO-NET concept encourages intelligent coordination that allows a complicated supply chain to be efficiently and optimized. This paper presents a decision support system that incorporates professional evaluation of criteria involved in synchromodal operation. Based on the three primary parameters that affect operations, the decision support system enables the establishment of synchromodality in a transportation operation (economic, operational, and environmental). Many factors, such as the routes geography, the structure of the terminal, and others, can impact the decision. This study will give specialists evaluating synchromodality more freedom, because the tool will allow them to change the weight of the various criteria, based on the evaluation scenario. The base case is built on the integration of expert opinions from several domains, such as transportation, government, and logistics, and is open to the addition of new viewpoints throughout time. The new platform will be able to build a robust database, based on the results of companies that will be collected for the main source for the future customer in the same area. Cooperation amongst other logistic organisations working in this research will be used to test the whole platform's efficiency.



3

THIRD PRIZE

**Rui Henriques**
Istituto Superior Técnico

Category: **Crossmodality**

Country: **Portugal**

Research Area 1: **mart Solutions and society**

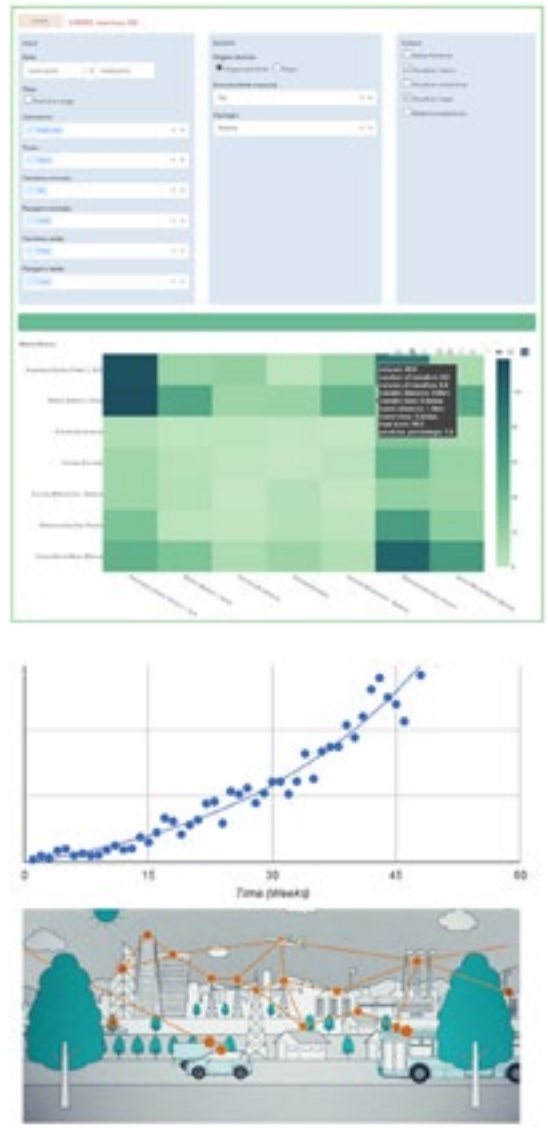
Idea Number: **117**

THIRD PRIZE

# Context-aware Learning from Heterogenous Traffic Data Sources: Exploring Cross-Modal Synergies

The Integrative Learning from Urban Data and Situational Context for City Mobility Optimization, or (ILU) project, is a Portuguese innovation effort that has just concluded. ILU joined national institutes, the Lisbon city council, and major public transport operators with the aim of revealing valuable knowledge hidden in heterogeneous traffic data sources. Grounded on Machine Learning advancements, a wide multiplicity of computational contributions has been devised in the context of the ILU project.

In this context, this project (ILU APP), designed a recommendation system able to integrate ILU project computational outcomes and subsequently deploy them at the stakeholders level. The research identified three major challenges: the adequate implementation of the analytical facilities proposed along the ILU project, ensuring their ready and seamless use by transport operators and municipalities; the coherent integration of these computational facilities, while further exploring their synergistic dependencies and taking into account the unique data access privileges per stakeholder; and finally, the complementary satisfaction of specific quality requirements – including interoperability, reliability, usability, efficiency, and extensibility – so that ILU APP can be securely configured on a server in the public partners. The project outcome of ILU APP will be a recommendation system able to explore cross-modality synergies from heterogeneous sources of traffic data in order to answer pivotal stakeholder needs, including the dynamic inference of multimodal origin-destination matrices, or the discovery of emerging mobility patterns to establish mobility reforms in response to the ongoing changes. A prototype version of ILU APP is already deployed and currently under use at CARRIS, the primary bus operator in the city of Lisbon, and at the Lisbon municipality.



**Aledia Bilali**
Technical University Munich

Category: **Crossmodality** Country: **Germany**

Research Area 1: **Smart Solutions & Society** Idea Number: **73**

# System-wide Analysis of On-Demand Ride Pooling Impacts

On-Demand Ride Pooling (ODRP) services have the chance to improve urban traffic congestion, while offering customer-centric mobility services. Simulation studies have shown promising impacts, the results vastly depend on system modelling and the chosen system parameters, suffering from high computation time and input data needed, making it difficult to analyse the ODRP overall impacts. Hence, the aim of this project is to explore the system-wide impacts of ODRP services and to determine in which parameter space these services might be attractive for customers, profitable for operators and can improve traffic conditions. To overcome the drawbacks of agent-based simulations, an analytical modelling approach is used Initially the influence of service quality parameters and network modelling details on the percentage of shareable trips in an area is captured. Secondly, the traffic impacts of ride pooling are analytically investigated by using the macroscopic fundamental diagram. Finally, an overall analytical model is developed to capture the requirements of customers, operators, and cities, allowing an exploration of the framework conditions for which a win-win-win situation can be realised. The analytical models are tested by an agent-based simulation and a microscopic traffic simulation for a study area in Munich city. The results prove the validity of the developed models to quickly analyse the overall impact of ride pooling, requiring low input data and computational time, while making their transferability to other cities possible. Policy makers and operators could use the results of this project for better planning and implementation of ODRP services.





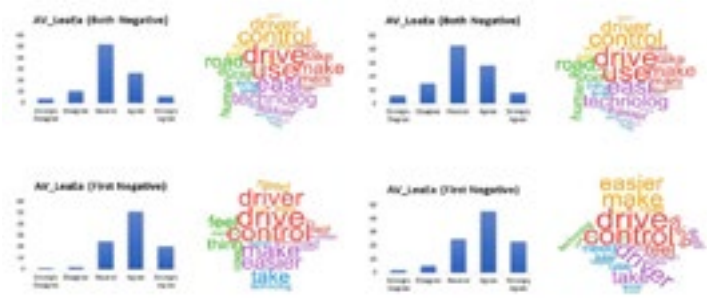

**Vishnu Baburajan**
Instituto Superior Técnico

Category: **Crossmodality** Country: **Portugal**

Research Area 1: **Smart Solutions and Society** Idea Number: **106**

# Automated Text Analysis on Open-Ended Response Surveys: Measuring Attitudes Regarding Autonomous Vehicles

Despite open-ended surveys bringing richer insights, extracting information is difficult and time-consuming. Therefore, surveys that aim for a large sample often use closed-ended responses. Topic Modelling approaches could speed up the analysis of open-ended responses, while eliminating subjective bias. Therefore, this project pursues two objectives, i) to analyse the suitability of using Topic Modelling to extract information from open-ended responses and compare it with closed-ended responses; and ii) to develop a framework that allows respondents to choose the questionnaire type to answer surveys, while allowing analysts to use their preferred models to predict behaviour. This was achieved by using questionnaires that collected information from respondents on the attitudes related to autonomous vehicles, by randomly presenting alternative questionnaire versions that consider open- and closed-ended questions. 3002 responses were collected from the USA on the intention-to-use autonomous vehicles for commuter trips, and Probabilistic Graphical Models were deployed to model the choice. In this project's context, Topic Modelling techniques are deemed effective in extracting information from open-ended responses. However, models estimated using open-ended responses could not match the performance of those estimated using closed-ended responses. Thus, a modelling framework that allows researchers/analysts to let respondents choose their preferred questionnaire types (closed- or open-ended) is proposed. Using this study's framework, analysts can still use state-of-the-art models to predict behaviour, regardless of the questionnaire type used to answer. The research demonstrates how researchers/policymakers could use this framework for practical applications, as its use could be beneficial, particularly when voice-based surveys are gaining popularity, with some respondents preferring them over closed-ended surveys.



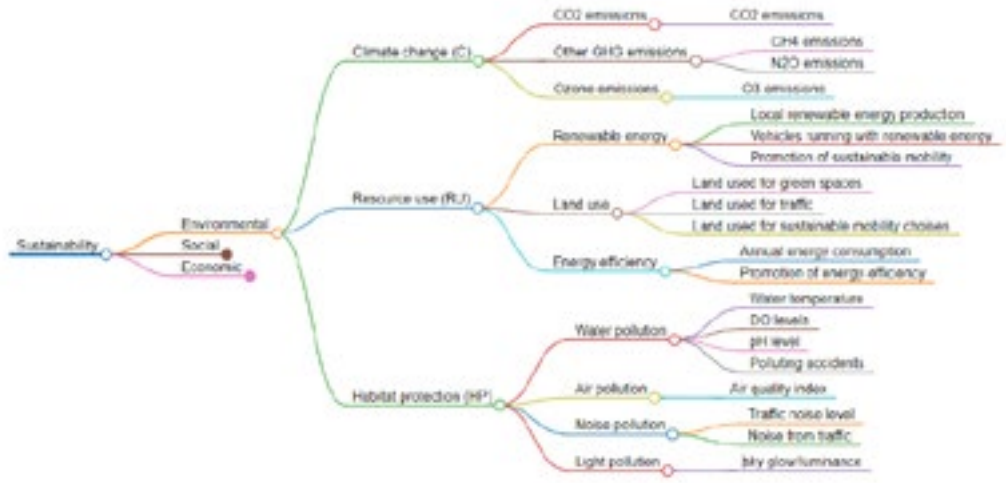
**Valtteri Ahonen, Shahid Hussain**
University of Oulu

Category: **Crossmodality** Country: **Finland**

Research Area 1: **Smart Solutions and Society** Idea Number: **111**

# A comprehensive framework for evaluating and measuring sustainability of smart mobility solutions

According to United Nations (2015), all three dimensions of sustainability – economic, social, and environ-mental – need to be achieved in a balanced and integrated manner. Furthermore, the Agenda 2030 target 11.2 (United Nations, 2016) is to "provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons". As many of the projects in smart mobility aim to achieve the goals and targets of the United Nations, evaluating and measuring their achievements is often difficult. The idea that this research is presenting here is a comprehensive framework to evaluate sustainability of smart mobility pilots. developed framework can be used to evaluate and measure the sustainability of all transport modes. Specifically, it is developed to evaluate the impacts and benefits that smart mobility solutions have to the society. The project expanded the said framework from qualitative measures to also include quantitative measures to allow a more wide-ranging tool to evaluate sustainability of smart mobility solutions. Furthermore, added quantitative measures have been extracted from the existing scientific literature as well as other sources.







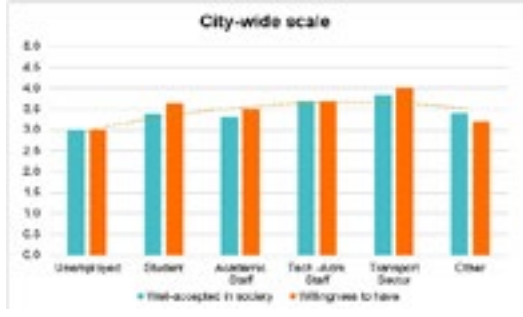

**Sevket Oguz Kagan Capkin, Anastasiya Azarko**
Sapienza University of Rome

Category: **Crossmodality** Country: **Italy**

Research Area 3: **Policies and Economics for a Competitive Europe** Idea Number: **48**

# Surveys of the future's transport concept: a guideline for the questionnaires on the Automated Logistics as a Service concept uptake from a test in Rome

The concept of sustainable passenger and freight transport is changing significantly with the globalisation of supply chains and environmental awareness. Due to transportation for an ever-larger concept, user acceptance uncertainty, a safe and efficient approach should be found to facilitate those impacts. Initially, the implementation of automated logistics services is dependent on potential user behaviour in terms of "Safety and Efficiency" impacts in relation to "User Acceptance" as the main objective. Therefore, this study firstly aims to examine existing approaches for questionnaires and logistics relevant acceptance questions, with respect to existing key indicators to identify the ways to better address user acceptance evaluation, also concerning safety and efficiency perceptions, when Automated Logistics as a Service concept is planned. Moreover, the objective of this study is to create "an acceptance evaluation questionnaire guideline in terms of Automated Logistics as a Service concept". To define the hypothesis that "adoption of automated logistics concepts will be assessed through a questionnaire based on defined guidelines", the project starts with a review of the questionnaire guidelines and performance indicators for automated logistics, selected from previous research projects on adoption assessment in order to define the questionnaire guidelines to assess the automated technologies in logistics as a service concept adoption. Moreover, the questionnaire is prepared and recommended (without implementation) for further development to address safety and efficiency of user acceptance of automated vehicles in the Logistics as a Service concept, with the prepared questionnaire in line with the Rome site and providing relevant recommendations for future application in Europe.

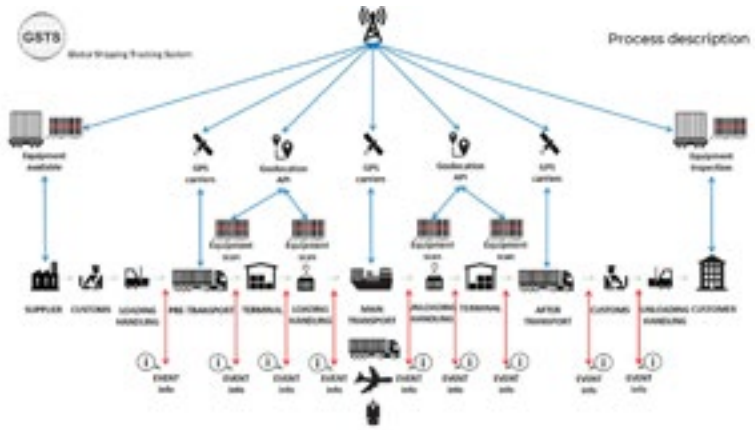
**Ionut Ciprian Dobre**
Bucharest University of Economic Studies

Category: **Crossmodality** Country: **Romania**

Research Area 1: **Smart Solutions and Society** Idea Number: **69**

# GSTS: Global Shipping Tracking System, solution for real time supply chain traceability

This research proposes a model for global equipment traceability, by presenting a single integrated global system, named Global Shipping Tracking System (GSTS). This will be done by using emerging technologies such as big data and blockchain, to provide access for all the supply chain parties to information, using a single contact point, which based on a reference number assigned to each piece of equipment, as a registration ID in the system, to be able to generate useful track and trace information, status of the equipment, and important events recorded and noted in the system during the entire circuit of the equipment (such as POD's, discrepancy information at loading and unloading, damages, missing documents info and more). Such a system could serve as the basis for future systems for the digitalisation of logistics operations, in the direction of standardising the systems used globally. This feature can facilitate a faster and easier interconnection with other systems used individually by companies, as the automatization of logistics activities are currently limited by the lack of internationally accepted and/ or imposed standards, in order to allow the use on a larger scale of intelligent automatization scanning, labelling, information consolidation and analysis systems, to serve along the way for the development of the supply chain artificial intelligence.








**Nicole Raddatz**
University of Kassel

Category: **Crossmodality** Country: **Germany**

Research Area 1: **Smart Solutions and Society** Idea Number: **64**

# Real-Time Smarticipation

Transport and infrastructure projects are increasingly met with resistance, especially by civil society. For instance, the construction of new transport-related facilities and infrastructures often trigger protests and dissent from the population living close to the building projects. The decline in the quality of life, in connection with noise and air emissions and the destruction of the environment and natural landscapes are often mentioned reasons, in addition to citizens' lack trust in the administration and politics. One reason is the release and communication of information about planning projects in general. Information is often received too late, it is incomprehensible, and the entire planning process is usually non-transparent. This research investigates the problems in participation procedures, especially for large-scale transport projects, focusing on what role and which potentials online formats (mobile) have, especially the smartphone device. Therefore, this study aims at finding out what criteria these kind of devices must meet for an active citizen participation in planning processes. The basis for achieving the expected results are a sample survey and a participant observation, as well as the categorial comparison of planning and participation apps, such as targeted use of the smartphone and an app in the context of the design thinking method. Studies and research projects, as well as the results of a first survey have shown that mobile participation via smartphone and tablet are capable of enabling active citizen participation due to their user-friendliness and intuitive use.

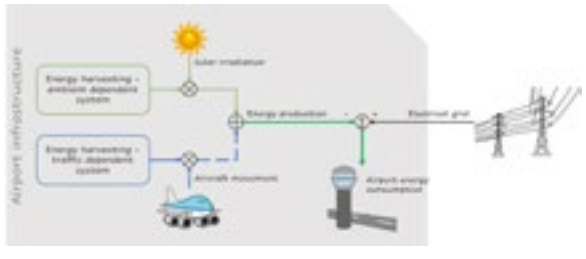
**Diogo Correa**
University of Coimbra

Category: **Crossmodality** Country: **Portugal**

Research Area 2: **Green Mobility and Decarbonisation** Idea Number: **22**

# Energy Harvesting Solutions for Airport Infrastructures

Recent developments in energy harvesting systems has opened up the opportunity for their implementation in various transport infrastructures. Among the different existing transport infrastructures, this research focuses on airports used by several airlines and regulated by multiple aviation agencies. The aviation agencies enable the safe use of these infrastructures by aircraft and their occupants, people, and goods. The aviation service allows a fast connection between origin and destination, firming up regions development. Although an aircraft are a transport mode that operates mainly in the air, it starts and ends its connection on the ground. The airport infrastructure is composed of elements capable of supporting an aircrafts high load and speed in a short space, with only a few kilometres. Given the characteristics of the airside, access to it is reserved. The use of energy harvesting - ambient dependent products, the framework of energy harvesting - traffic dependent solutions in the FAR/CS/CCAR-25 regulations allow a mix of power generation to meet the current challenges. Because energy harvesting collects wasted energy, it is considered sustainable energy. Sustainable electric power generation will reduce non-renewable electric power generation and decrease CO2 emissions. The decrease of CO2 emissions is a challenge referred to all sectors, as stated by UN's SDGs and into the civil aviation sector to the ICAO's CORSIA program. Given the characteristics of the airport (size, reserved access, etc.), it can also provide a humanitarian response after extreme events, with the ability to continuously operate due to their supply of electric energy locally based.








**Working out a sustainable and competitive solution for enhancing intermodal freight transportation**

**István Fütyü**
Budapest University of Technology and Economics

Hungary

Cross-Modality RA3

# SENIOR RESEARCHER COMPETITION

The concept behind the Senior Researchers Competition is to have an award celebrating excellence in transport related research. It is open for leading transport researchers engaged with EU-funded projects who can demonstrate proven impacts in their field.
The competition provides a platform to disseminate knowledge and results from innovation and/or research projects in Transport, promoting future synergies and further development of pioneering ideas, in line with the strategic objectives of the TRA stakeholders.

The Senior Researchers Competition acts as a showcase for some of the best EU-funded innovation and research, and encourages the identification of current and future leaders in their field. The competition was promoted through the stakeholders in the consortium, through national contact points and through targeted contact coordinators and participants in EU-funded transport projects. Participants could register for the competition either directly via the TRA VISIONS website or via the TRA 2022 conference entry portal.

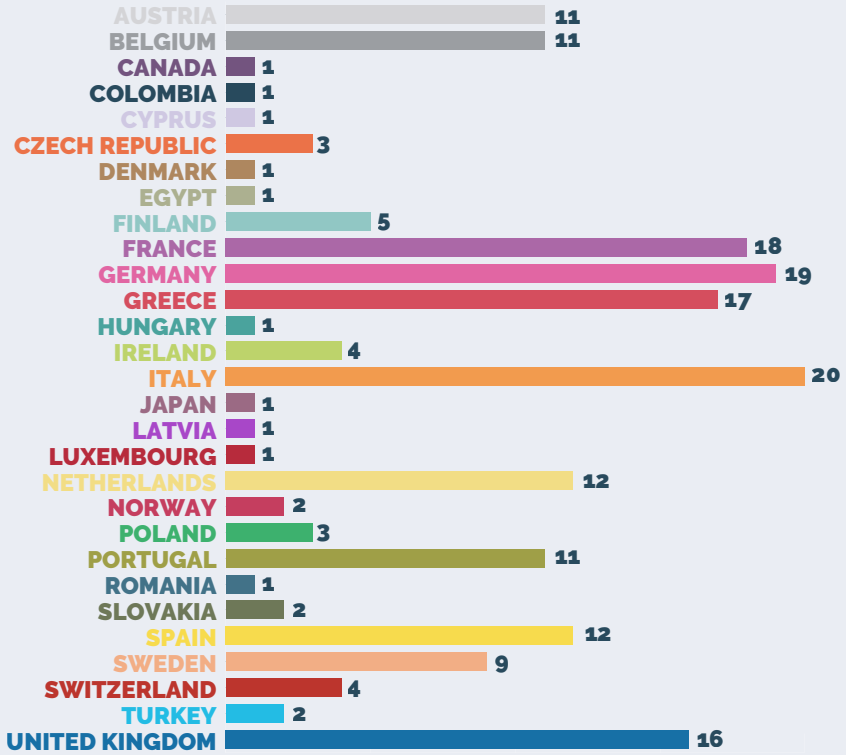
The evaluation was a three-stage process. Firstly, all entries were reviewed for content, eligibility, and relevance to produce a long list. All entries which were selected for the long list were then invited to submit additional information, an impact statement about their research and a brief CV. These submissions were assessed by at least two independent, subject expert evaluators against the following selection criteria: (i) amount and proportion of EU funding; (ii) impact of research on national, EU and global levels; (iii) relevance to transport and (iv) research track record of entrants. A SHORT LIST of four entrants was produced for each transport mode (Road, Rail, Air, Waterborne and Cross modality). The winners were chosen by an expert panel at a selection workshop held at the European Commission in Brussels on September 13th, 2022. The panel consisted of transportation experts and stakeholders, as well as representatives from the EC and academia.

# STATISTICS AND OVERALL RESULTS

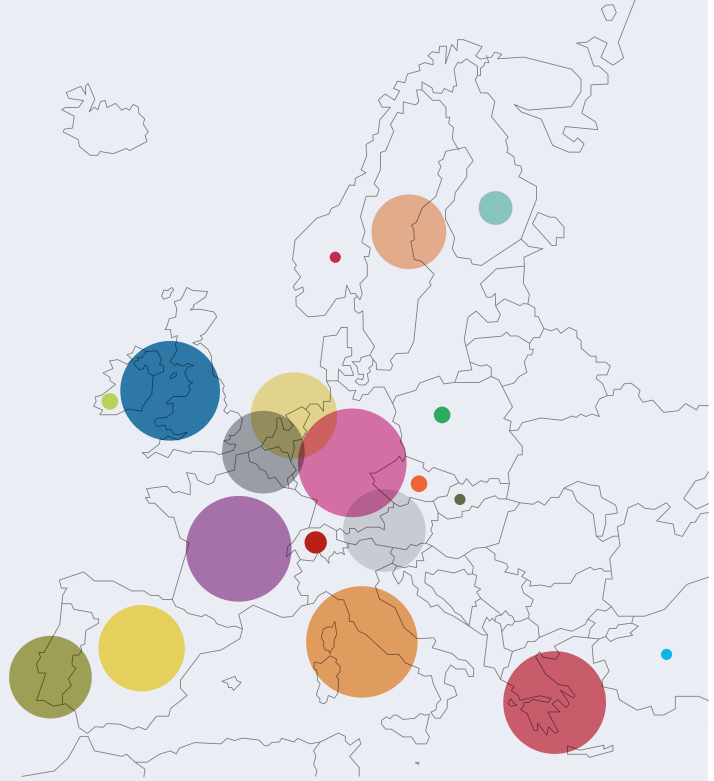
The TRAVISIONS 2022 Senior Researcher Competition received 106 entries of which 50 were longlisted. The following charts contains some statistical information regarding all the seniors' entries.

## ENTRIES **PER COUNTRY**

The table below shows the number of entries submitted from each country. Italy was the largest contributor with a total of 20 eligible submissions, Germany and France came second and third with 19 and 18 entries each.



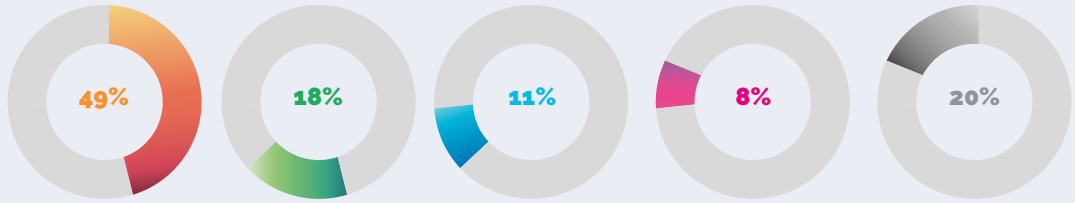

The map on the right shows the entries submitted per country and their geographical spread.



## ENTRIES **PER MODE**

A total of 49 road-related entries, 18 rail-related entries, 11 waterborne-related entries, 8 airborne-related entries and 20 cross modal related entries were submitted for the Senior Researcher Competition.

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




**ROAD**
TOTAL PROJECTS
**49**

**RAIL**
TOTAL PROJECTS
**18**

**WATERBORNE**
TOTAL PROJECTS
**11**

**AIRBORNE**
TOTAL PROJECTS
**8**

**CROSSMODALITY**
TOTAL PROJECTS
**20**

TRANSPORT MODE

# ROAD

WINNER

## George Yannis

**National Technical University of Athens**

Category: **Road**

Country: **Greece**

George Yannis is an expert in Traffic and Safety Engineering with particular focus on data management and analysis. Increasingly during the last 15 years Professor Yannis has played a leading role in the design, implementation and operation of Open Road Safety Decision Support Systems (ORS-DSS) in collaboration with other experts and Road Safety Research Institutes. He has put an emphasis on collecting, processing and analysing reliable detailed safety data, and also organising extensive scientific knowledge and the related high-end analysis tools. The work was mostly funded by the European Union but also by other international organisations (i.e. UNECE, CEDR). The most recent EU funded projects are BeOpen (European forum and oBsErvatory for OPEN science in transport, 2019-21) and Levitate (Societal Level Impacts of Connected and Automated Vehicles, 2018-22).

The Open Road Safety Decision Support Systems make publicly available a wealth of scientific evidence in terms of detailed quality data and scientific knowledge and high-end analysis tools in the multi-disciplinary field of road safety, which cannot be found in any other international road safety system. They are among the very few global key management tools, not only providing scientific evidence but also monitoring efforts, developing capacity and engaging stakeholders.

The ORS-DSS developed have achieved global recognition and have received key scientific awards (ERSO, SafetyCube, SaferAfrica). Furthermore, these systems inspired the recent development of Regional Road Safety Observatories across the globe (ERSO and SaferAfrica being the first two).

Efforts for the further improvement and more efficient operation and broader global coverage of these Open Road Safety Decision Support Systems are under way by Prof. Yannis and his collaborators, with emphasis on new Big Data, Artificial Intelligence and Machine Learning Analysis Tools and covering also Connected and Automated Mobility.

## Key research themes

Traffic and Safety Engineering; data management and analysis



WINNER


*George Yannis is Professor of Traffic and Safety Engineering at the Transportation Planning and Engineering Department, National Technical University of Athens. He specialises in data management and analysis and has contributed to 157 research projects and published over 200 journal papers. He contributes to numerous international scientific organisations.*

SHORT LIST

**Key research themes:**
Autonomous Vehicles, Electric Vehicles, Cooperative Intelligent Transport Systems, Physical and Digital Infrastructure

## Nicolas Hautière

**Université Gustave Eiffel**

Category: **Road**

Country: **France**

After ten years of research in computer vision applied to cooperative intelligent transport systems and autonomous mobility, Dr Hautière's current mission is to initiate, develop and manage novel instruments of research and innovation which allow the transfer of research results in the area of the renewed intelligence of vectors and infrastructures for mobility, while supporting infrastructure innovation and adaptation policies at every level. Since 2014 he has participated in 10 EU funded projects including the most recent SMARTI ETN (European Training Network on Sustainable Multi-functional Automated Resilient Transport Infrastructures, 2017-22), BISON (Biodiversity and Infrastructure Synergies and Opportunities for European Transport Networks, 2021-23) and Augmented CCAM (Augmenting and Evaluating the Physical and Digital Infrastructure for CCAM deployment, 2022-25).

SHORT LIST

**Key research themes:**
Autonomous systems; control theory; connected automated driving; testing and validation.

## Selim Solmaz

**Virtual Vehicle Research GmbH**

Category: **Road**

Country: **Austria**

Within the EU-funded project INFRAMIX (Road Infrastructure ready for mixed vehicle traffic flows, 2017-20) Dr Solmaz was the technical lead for developing a vehicle-in-the-loop testing methodology, named the "Hybrid Testing Methodology", which enabled the testing of critical virtual traffic scenarios in a safe test environment with a real automated driving demonstrator vehicle. This work inspired several more research projects with partners, including two further EU projects ESRIUM (EGNSS-ENABLED SMART ROAD INFRASTRUCTURE USAGE AND MAINTENANCE FOR INCREASED ENERGY EFFICIENCY AND SAFETY ON EUROPEAN ROAD NETWORKS, 2020-23) and HADRIAN (Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs, 2019-23).



**Key research themes:**
Road Traffic Safety, Autonomous Vehicles

SHORT LIST

## Carmelo d'Agostino

**Lund University**

Category: **Road**

Country: **Sweden**

TRANSPORT MODE

# RAIL

WINNER

WINNER

## Nicole Dörr

**AC2T research GmbH**

Category: **Rail** Country: **Austria**

Nicole Dörr is an expert in tribology and condition monitoring. Her activities straddle academia and industry. She has longstanding expertise in assessment, benchmarking, and optimization of lubricants and lubricated components in a wide range of applications. Since 2002 she has been involved in a multitude of national and EU funded research projects. Most notable are 7 projects delivered as part of two long running series under the Shift2Rail joint undertaking, IN2TRACK 1-3 (2016-19, 2018-20 & 2021-23) and FR8RAIL I-IV (2016-19, 2018-22, 2019-22 & 2020-23). IN2TRACK is focused on enhancing permanent way infrastructure by reducing lifecycle costs and improving the reliability and punctuality of tomorrow's railway. The FR8RAIL series of projects aim to increase the sustainability and attractiveness European rail freight.

One challenge within the FR8RAIL series is to develop suitable and robust sensor systems and a set of algorithms as a basis for condition-based maintenance of lubricated components (transformer, axle box bearing, diesel engine) in locomotives and wagons. This required developing and then field testing these customized sensor systems from scratch as no appropriate sensor systems previously existed for the selected applications. Dr Dörr's in-depth expertise in tribology and machinery damage patterns was crucial to realizing the customized sensors and establishing the algorithms that can reliably inform on the health status of lubricants and lubricated components, i.e., correlating lubricant properties with sensor signals.

Field demonstration of the sensor systems so far confirms functionality and robustness under real operating conditions. There is the potential for a significant extension of lubricant change intervals with resulting maintenance cost reduction, resource savings and safety benefits. The customized sensor systems are mostly assembled from commercial individual sensors; hence, acquisition costs are in line with stringent cost requirements of operators. A major advantage of the developed sensor systems is that they can be retrofitted to existing locomotives or wagons. The sensor development environment can be also applied to other railway applications and machinery with similar stress profiles, were robustness of sensor and algorithm is indispensable for example mining vehicles and wind turbines.

## Key research themes

Tribology; Condition-based and predictive maintenance strategies


*Nicole Dörr, Scientific Head of AC2T research GmbH and holder of a venia docendi in tribology at TU Wien, has longstanding expertise in assessment, benchmarking, and optimization of lubricants and lubricated components in a wide range of applications. She is involved in the FR8RAIL and IN2TRACK project series of the Shift2Rail Joint Undertaking and contributes to new maintenance strategies of rail vehicles and infrastructure.*

SHORT LIST

**Key research themes:**
Railway track dynamics; railway settlement; hyperloop

## David Connolly
University of Leeds

Category: **Rail**

Country: **United Kingdom**

Professor Connolly is an expert in railway track dynamics and settlement with over 100 publications to his name. He is the leader and coordinator of the H2020 project IN2ZONE (The Next Generation of Railway Transition Zones, 2020-23). The aim of IN2ZONE is to develop and manufacture new self-correcting sleeper technologies for transition zones, which offer a step-change reduction in maintenance requirements compared to existing solutions. In addition to conventional railway systems he is also contributing to novel concepts such as Hyperloop. HYPERNEX (Ignition of the European Hyperloop Ecosystem, 2020-22) focuses on developing the European hyperloop ecosystem and the melding of R&D institutions, industry actors, regulators and societal needs with hyperloop developers.

SHORT LIST

**Key research themes:**
Rail Infrastructure, Passenger & Freight Terminals, Rail Carbodies

## Stefano Ricci
Sapienza University of Rome

Category: **Rail**

Country: **Italy**

As a founder member of EURNEX (European rail research network of excellence, 2004-08) Professor Ricci clearly has a long-standing interest in supporting the rail research community in Europe. Today EURNEX is a fully recognized association, presented in ERRAC and actively participating and promoting research activities. He has engaged in many research projects supported by industry, national bodies and the EU. Recent projects include two from the SHIFT2RAIL Joint Undertaking CARBODIN (Car Body Shells, Doors and Interiors, 2019-22) and GEARBODIES (Innovative Technologies for Inspecting Carbodies and for Development of Running Gear, 2020-22).



**Key research themes:**
Control and signalling; energy efficiency; freight transport and circular economy.

SHORT LIST

## Juan de Dios Sanz Bobi
Universidad Politécnica de Madrid

Category: **Rail**

Country: **Spain**

Professor Juan de Dios Sanz Bobi has been researching railway technology since 1992. He has contributed to different activities and projects supported by the EU. The EU funded project E-LOBSTER (Electric LOsses Balancing through integrated STorage and power Electronics towards increased synergy between Railways and electricity distribution networks, 2018-22) explores the potential of electrified transport networks such as light railways to enhance distribution grid stability by providing ancillary services and inter-exchanging electricity. UPM and the Spanish Railway Foundation work together to identify the standardization gaps and marketability actions. The proposed solution encompasses the integration of high-power flow Electric Storage with smart Soft Open Points providing flexible control. The hardware and software control platform will be demonstrated at TRL 6 in one substation owned by Metro de Madrid. He has contributed to Shift2Rail as member of the Scientific Committee.

SENIOR RESEARCHES

TRANSPORT MODE

# WATERBORNE

WINNER

## Mehmet Atlar

University of Strathclyde

Category: **Waterborne** Country: **United Kingdom**

Mehmet Atlar is an expert in experimental and computational naval hydrodynamics, and he has carried out a wide range of projects funded by industry, the UK Ministry of Defence and EU (FP4, 5, 6, 7, H2020 and Horizon-Europe). He played a significant role in the development of podded propulsors and was the coordinator of The EU FP5-funded project FASTPOD (Fast ship applications for pod drives, 2002-05). He also led to the design and commissioning of the novel semi-displacement type Deep-V catamarans, including Port of London Authority's four harbour patrol vessels (*"Lambeth", "Kew", "Southwark", "Barnes"*) and Newcastle University's research vessel *"The Princess Royal"*

Prof Atlar is the project coordinator for the current H2020 project GATERS (GATE Rudder System as a Retrofit for the Next Generation Propulsion and Steering of Ships, 2021-24), which builds on earlier research work conducted as part of the Emerson Cavitation Tunnel research activities when he was the director of this facility and in collaboration with the major patent holder of the Gate Rudder concept, Dr Noriyuki Sasaki of Japan.

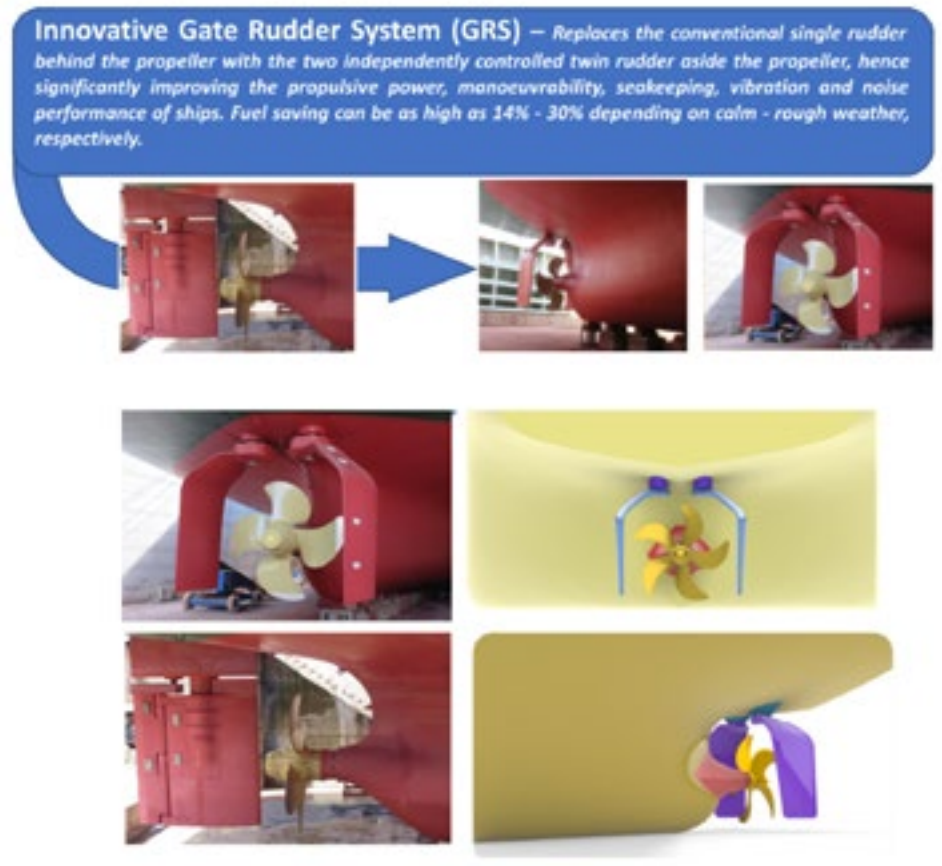
The GATERS project has already impacted and will significantly impact the shipping and maritime world at the national, EU and global levels. The Gate Rudder System (GRS) was proven as the most beneficial "sole" energy-saving and greenhouse gas-reducing propulsion and steering device for purpose-built new ships (14% fuel saving in calm weather and over 20% saving in rough weather). In addition, the GRS improves the manoeuvrability in harbours and hence the safety of ships, as well as reducing the underwater radiated noise (about 15dB). The new rudder system was demonstrated on four new-built Japanese ships. However, there has been no application of the gate rudder system as a "retrofit". The GATERS project aims to develop and demonstrate the first retrofit application of the Gate Rudder System to enable greener, safer and cost-effective propulsion for the existing global shipping fleet. Such a cost-effective retrofit solution will have a significant beneficial impact on the global shipping fleet.

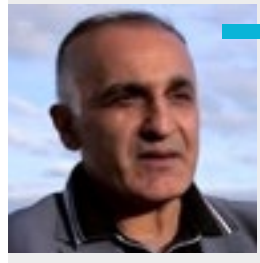
## Key research themes

Hydrodynamics, Ship powering, Energy saving



WINNER



*Mehmet Atlar is the Professor of Naval Hydrodynamics at the Department of Naval Architecture, Ocean and Marine Engineering, University of Strathclyde. His main interests include experimental and computational hydrodynamics with a bias on ships and offshore systems-based design applications. He has won several awards for his research and publications and was a member of six consecutive ITTC committees.*

SHORT LIST

**Key research themes:**
Human Factors; Ship design; maritime safety

## Rafet Kurt
**University of Strathclyde**

Category: **Waterborne** Country: **United Kingdom**

Rafet Kurt is the principal investigator for the EU-funded project, SAFEMODE (Strengthening synergies between Aviation and maritime in the area of human Factors towards achieving more Efficient and resilient MODE of transportation, 2019- 2022). SAFEMODE has seen for the first time in maritime, human factors integrated into the risk-based design in a quantified manner, making cost-benefit analysis possible for human factors related safety enhancements. SAFEMODE utilised extra-EU partners (China, Indonesia and the Philippines) to support developing countries where human factors research is lacking. A significant policy impact is also in progress at IMO, which may amend the current regulation based on our findings.

SHORT LIST

**Key research themes:**
Combustion and Pollutants Formation in Thermal Engines

## Leonidas Ntziachristos
**Aristotle University of Thessaloniki**

Category: **Waterborne** Country: **Greece**

Leonidas Ntziachristos has an established research track record in the areas of emissions, noise, powertrains, as well as their impacts for both marine and road transport. He has been involved in over 120 research projects funded by public or private sources. He is currently involved in 7 EU funded projects including SCIPPER (Shipping Contributions to Inland Pollution Push for the Enforcement of Regulations, 2019-2023) as project coordinator. In SCIPPER, emission monitoring techniques have been developed and deployed in vessel measurement field campaigns. Other on-going projects with his involvement as a team leader include EMERGE(Evaluation, control and Mitigation of the EnviRonmental impacts of shippinG Emissions, 2020-2024) on the environmental impacts of scrubbers, ENGIMMONIA (Sustainable technologies for future long distance shipping towards complete decarbonisation, 2021-2025) on emission control of an ammonia-powered marine engine and Up-To-Me (Unmanned-Power-to-Methanol-production, 2022-2025) on the production of green methanol for use as a marine fuel.



**Key research themes:**
Renewable fuels, combustion

SHORT LIST

## Sebastian Verhelst
**Ghent University / Lund University**

Category: **Waterborne** Country: **Belgium / Sweden**

Sebastian Verhelst has a strong interest in renewable fuels. He is the architect and coordinator for the H2020 project FASTWATER (FAST Track to Clean and Carbon-Neutral WATERborne Transport through Gradual Introduction of Methanol Fuel: Developing and Demonstrating an Evolutionary Pathway for Methanol Technology and Take-up, 2020-2024). FASTWATER is developing and demonstrating an evolutionary pathway for methanol technology in waterborne transport and is building on results from an earlier EU project LEANSHIPS (Low Energy And Near to zero emissions Ships, 2015-2019). His research interests extend beyond the maritime sector as demonstrated by his involvement with another EU H2020 project BioRen (Development of competitive, next generation biofuels from municipal solid waste, 2018-2022).

TRANSPORT MODE

# AIRBORNE

WINNER

## Bruno Santos

**Delft University of Technology**

Category: **Airborne**

Country: the Netherlands

Bruno Santos started researching the digitalisation of the aircraft maintenance decision processes in 2015 when contributing to the Clean Sky project AIRMES (Airline Maintenance Operations implementation of an E2E Maintenance Service Architecture and its enablers, 2015-19)

This gave him a good understanding of the current challenges and opportunities in the Aviation Maintenance, Repair and Overhaul (MRO) industry, and together with colleagues and other European partners, he created the Integrated Fleet Health Management (IFHM) solution proposed in the EU funded project ReMAP (Real-time Condition-based Maintenance for Adaptive Aircraft Maintenance Planning, 2018-22). The aim of ReMAP is to make aircraft maintenance smarter and more efficient by using operational data for health diagnostics and prognostics from different aircraft systems and structures. Dr Santos is not only the project coordinator of ReMAP, but also a researcher, continuing the work started with the AIRMES project on developing maintenance planning decision-support.

Part of ReMAP was to develop an IT platform and machine learning models. The IT platform architecture is unique, allowing airlines and other partners to share models without the data having to leave the servers of the airlines, guaranteeing cooperation between stakeholders and the confidentiality of the data. The machine learning models can detect and predict future failures for eight different aircraft systems and adaptively schedule maintenance tasks based on health predictions. Despite the low TRL expectation from the call (TRL 4-5), the platform and models were deployed and successfully tested in-service with KLM, using live operational data from 50 of their aircraft. The data from these tests were made publicly available for future research.

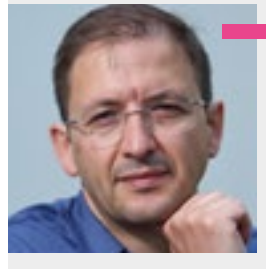
ReMAP has reinforced European leadership in aeronautics. The results to date, ongoing demonstration, and the IT platform architecture have attracted the attention of many key aviation stakeholders, including Airbus, Embraer SA, Delta Air Lines, American Airlines, IATA, and Collins Aerospace. It is estimated that ReMAP will have an estimated benefit to European aviation of more than 700 million euros per year due to a direct decrease in maintenance costs, reduced unscheduled aircraft maintenance events, and increased aircraft availability.

### Key research themes

Condition-based maintenance; data-driven decision support; aircraft maintenance;



WINNER



*Dr Bruno Santos is an Associate Professor of Airline Operations and Aircraft Availability at the Faculty of Aerospace Engineering from the Delft University of Technology. He is also the Section Leader of the Air Transport and Operations group and is responsible for the KLM E&M Chair at his faculty. Developing digital transformative solutions for sustainable aviation operations is his main research goal.*

SHORT LIST

**Key research themes:**
Aircraft design; UAV; Sustainable Aviation

## Vittorio Cipolla
University of Pisa

Category: **Airborne**

Country: **Italy**

Dr Cipolla has one foot in academia and one in industry. He is an Assistant Professor in the Industrial and Civil Engineering Department of the University of Pisa and also a co-founder and Board member of SkyBox Engineering S.r.l. The unifying theme is his interests in the design of advanced aircraft and UAVs. His work has been supported by Italian and EU funding. PARSIFAL (Prandtlplane ARchitecture for the Sustainable Improvement of Future AirpLanes, 2017-20) was a H2020 project aiming to demonstrate the technical feasibility, and the environmental and economic impact of a box-wing aircraft configuration. In addition to being consortium leader, Dr Cipolla also contributed to aircraft design and environmental impact assessment. The output of PARSIFAL significantly advanced the development of this novel aircraft configuration.

SHORT LIST

**Key research themes:**
Multimodality; passenger behaviour; air transport demand.

## Annika Paul
Bauhaus Luftfahrt

Category: **Airborne**

Country: **Germany**

Dr Paul has a keen interest in understanding how to improve the cooperation across transport modes in order to meet future challenges, placing a particular focus on the passenger experience. The project Modus (Modelling and assessing the role of air transport in an integrated, intermodal transport system, 2020-22) is funded within the scope of the EU-H2020-SESAR programme 'The role of Air Traffic Management (ATM) in intermodal transport'. The Modus consortium is developing a modelling approach to assess seamless door-to-door multimodality and passenger experience in Europe, and the impact of diverse passengers' modal choice decisions on capacities, predictability and the environment. Dr Paul has been working on the development and assessment of multimodal mobility scenarios, drivers of future passenger behaviour and modal choice considerations.



**Key research themes:**
Composite Materials

SHORT LIST

## Konstantinos Tserpes
University of Patras

Category: **Airborne**

Country: **Greece**

Dr Tserpes has contributed significantly to the research at EU level for the certification of primary composite bonded structures. Research into the design of crack stoppers in composite bonded joints in BOPACS (Boltless assembling Of Primary Aerospace Composite Structures, 2012-16) has transferred to the design of primary welded thermoplastic structures via a pair of Clean Sky 2 projects TAILTEST (Development of a multipurpose test rig and validation of an innovative rotorcraft vertical tail, 2019-23) and TORNADO (innovaTive disbOnd aRrest features for loNg thermoplAstic welDed jOints, 2021-22). The outcome will be more cost efficient and sustainable design of aircraft through the promotion of the use of composites and adhesive joining.

TRANSPORT MODE

# CROSSMODALITY

WINNER

## Anu Tuominen

**VTT Technical Research Centre of Finland Ltd**

Category: **Crossmodality** Country: **Finland**

Anu Tuominen has a long-standing interest in sustainable mobility, transport policy and carbon free transport. She has been engaged in EU funded research since she first participated in the FP4 project POSSUM (Policy scenarios for sustainable mobility, 1996-98). Since then, she has participated in a variety of National and EU funded projects covering a number of themes including how to measure the effectiveness European transport research and the impact of extreme weather events on transport systems. Currently Dr Tuominen is a member of the core group leading the transport themes of the H2020 funded MAtchUP smart city project and the very large (€53M) project NetZeroCities.

MAtchUP (MAximizing the UPscaling and replication potential of high-level urban transformation strategies, 2017-23) aims at strengthening the planning processes for urban transformation. This will be achieved by using substantially improved models for replication and upscaling, based on impacts evaluation, and ensuring the bankability of the solutions by means of innovative business models. It will deploy large scale demonstration projects of innovative technologies in the energy, mobility and ICT sectors which will go beyond pilots conducted in the lighthouse cities.

Supporting the European Green Deal, NetZeroCities (Accelerating cities' transition to net zero emissions by 2030, 2021-25) will help European cities to overcome structural, institutional and cultural barriers to significantly reduce their greenhouse gas emissions and achieve climate neutrality by 2030. It will develop a service-oriented platform, co-create solutions, and develop new and improved existing tools, resources and expertise.

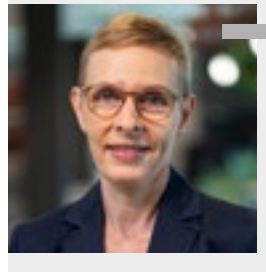
Dr Tuominen also contributes directly to policy creation and supporting the Finnish and European transport research via her enabling activities. Since 2017 she has been the Rapporteur of the Economics and Policies Working Group of ECTRI contributing to several position papers sent to the EC. In Finland she has supported the National Transport Climate Strategy and Road map works in 2007, 2015 and 2020. She was one of the core team members for coordination and delivery of the TRA 2020 conference (The Transport Research Arena 2020) in Helsinki, 2020.

### Key research themes

Sustainable Mobility; Transport Climate Policy



WINNER

*Anu Tuominen (D.Sc.Tech.) is a principal scientist at the VTT Technical Research Centre of Finland Ltd. Previously she has worked for VTT as a research team leader and senior scientist and as a transport consultant in the private sector. Her professional experience lies in the fields of urban sustainable mobility transition, transport policy analysis, transport system-level impact assessment, socio-technical change and foresight.*

SHORT LIST

**Key research themes:**
Logistics; Port infrastructure

## Peter Bresseleers
**Port Expertise**

Category: **Crossmodality**

Country: **Belgium**

Peter Bresseleers has more than 30 years of experience in maritime transport economics and financial cost benefit analysis of logistic projects. The FENIX Network (European Federated Network of Information eXchange in LogistiX, 2019-23) is co-financed by the EU Connecting Europe Facility. It is developing the first EU Federated architecture for data sharing serving the European intermodal logistic community in order to offer interoperability between any individual existing and future platforms. Peter's contribution was leading the economic and financial analysis consequently developing various digitisation business models. The success of FENIX is evidenced by its planned continuation beyond the project end date as a private organisation with mixed financing techniques.

SHORT LIST

**Key research themes:**
Automated Transport; electric mobility; shared mobility hubs.

## Gonçalo Homem de Almeida Correia
**Delft University of Technology**

Category: **Crossmodality**

Country: **the Netherlands**

Dr Correia has been working both on understanding travel behaviour (demand side) and how to operate the systems most efficiently and sustainably (supply side) which has contributed to improving shared mobility implementations around the world. His early research on car-sharing operations has been extensively used by practitioners and has sprung new fields of research such as AI-based algorithms for shared transport systems management. His work has been continued in projects such as DiREC (Digital Road for Evolving Connected and Automated Driving, 2021-23) funded by CEDR, and the SMART HUBS (Shared mobility solutions) funded by the EIT KIC on Urban Mobility.



**Key research themes:**
Transport resilience

SHORT LIST

## Páraic Carroll
**University College Dublin**

Category: **Crossmodality**

Country: **Ireland**

The EU-funded PRECINCT (Preparedness and Resilience Enforcement for Critical INfrastructure Cascading Cyberphysical Threats, 2021-23) will connect critical infrastructure stakeholders in a geographical area to a cyber-physical security management method that will produce a protected territory for citizens and critical infrastructures. As part of PRECINCT, Dr Carroll and his team have developed a Serious Games tool. Serious Games are computer-based simulations that merge knowledge and skills development with video game-playing aspects to enable active, experiential and problem-based learning. The Serious Game concept has been patented and with further development it has many applications including training policy makers and industry practitioners to make more informed and better decisions regarding investing public resources to increase the resilience of transport networks and minimise vulnerabilities to cyber-physical threats.

SPECIAL

# HONORARY AWARD

A new Special Award was introduced for the first time this year, for honouring a senior personality of the transport sector, representing well established researchers, who through the years have made an outstanding and well-recognized 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 Selection Board of distinguished and renowned personalities representing all transport modes and the European Commission was created for selecting the winner of the TRA VISIONS 2022 Special Honorary Award (one winner, irrespective of transport mode). An Open Call for nominations was launched to the entire transport research community through the TRA VISIONS 2022 website. Nominations could be made by single persons, including the members of the Board, or groups of persons. Self-nominations were excluded. 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, etc.). The criteria for the selection of the winner were holistic.

The members of the Selection Board were provided in due time with all nominations for the Special Honorary Award, in order to carefully review and evaluate them. Subsequently, a consensus meeting of the Selection Board took place virtually on September 16th, 2022, to select the winner.

HONORARY WINNER

HONORARY WINNER

## Rune Elvik

**Institute of Transport Economics, Norwegian Centre for Transport Research**

Category: **Road**

Country: **Norway**

From 1994 to 2015, Rune Elvik was chief research officer for road safety at the Institute of Transport Economics, Norwegian Centre for Transport Research. During this period, he also held part-time chairs in road safety at Aalborg University (Denmark) from 2008 to 2015, and Lund University (Sweden) from 2009 to 2012. He has over 40 years of experience in road safety research and is recognised as one of the World's leading road traffic scientists, having made a significant and sustained impact on road safety, this was recognised in 2008 by the award of the Nordic Road Safety Council prize. From 2005 to 2013 he was editor-in-chief (with Karl Kim) of Accident Analysis and Prevention. His substantial academic output includes more than 160 papers in scientific journals, and contributions to over 18 books, including as senior author for "the Handbook of Road Safety Measures", which has been published in six languages (Norwegian, Finnish, Russian, English, Spanish, Portuguese). He also contributed to the first edition of the Highway Safety Manual, published by the American Association of State Highway and Transportation Officials in 2010. Exceptionally, he has four doctoral degrees, his most recent thesis in 2017 was also published as a book "The Value of Life: The Rise and Fall of a Scientific Research Programme".

Rune Elvik has contributed to many EU-funded projects, starting in 1988 with the ITHACA-project (In-depth accident collection and analysis). Subsequent projects include ESCAPE (police enforcement), IMMORTAL (driver impairment), ROSEBUD (cost-benefit analysis), SILVIA (low-noise road surfaces), SAFETYNET (knowledge database), RIPCORD-ISEREST (road infrastructure safety), SUPREME (examples of best practices), DACOTA (knowledge database; time-series modelling), SAFETYCUBE (decision support system), VIRTUAL (open source human body models) and LEVITATE (societal impacts of connected and automated vehicles).


*Dr Rune Elvik has been a road safety researcher at the Institute of Transport Economics since 1980. He was editor-in-chief (with Karl Kim) of Accident Analysis and Prevention for 2005 to 2013. He obtained doctoral degrees in 1993, 1999, 2007 and 2017. He has been a senior author of the Handbook of Road Safety Measures. He has published more than 160 papers in scientific journals.*

## Key research themes

Road Safety; with emphasis on methods; meta-analysis; road safety policy analyses

# TRAVISIONS 2022 CONSORTIUM PARTNERS

**WEGEMT (coordinator)**
*George Smyrnakis,*
*Secretary General*
8-9 Northumberland Street
London, WC2N 5DA,
United Kingdom
george.smyrnakis@ncl.ac.uk
**www.wegemt.com**

**SEA EUROPE - SHIPYARDS' & MARITIME EQUIPMENT ASSOCIATION**
*Monia El Faziki*
Rue de la Loi 67
1000 Brussels, Belgium
info@seaeurope.eu
**www.seaeurope.eu**

**BALance Technology Consulting GmbH**
*Markus Lehne*
Contrescarpe 33
28203 Bremen, Germany
**www.bal.eu**

**UCL - University College London**
*Alistair Greg*
*Torrington Place*
London WC1E 7JE, United Kingdom
a_greig@meng.ucl.ac.uk
**www.ucl.ac.uk**

**Deep Blue ltd**
*Micol Biscotto*
Via Daniele Manin 53
00198, Rome, Italy
**www.dblue.it**

**EASN TECHNOLOGY INNOVATION SERVICES**
*Irene Pantelaki*
Terweidenstraat 28
B-3440 Budingen, Belgium
**www.easn-tis.com**

**Centre for Research and Technology Hellas (CERTH)**
*Matina Loukea*
6th km Charilaou-Thermi Rd, PO Box 60361
57001 Thermi, Thessaloniki, Greece
**www.certh.org**

**Swedish National Road and Transport Research Institute (VTI)**
*Birgitta Sandstedt*
Olaus Magnus väg 35
SE–581 95 Linköping, Sweden
**www.vti.se**

**EUROPE'S NATIONAL ROAD RESEARCH CENTRES (FEHRL)**
*Thierry Goger*
info@fehrl.org
Boulevard de la Woluwe 42,
1200 Brussels, Belgium
**www.fehrl.org**

**European Conference of Transport Research Institutes (ECTRI)**
*Caroline Almeras*
Rue du Trône 98
1050 Brussels, Belgium
**www.ectri.eu**

**MAGELLAN**
*Manuela Flachi*
geral@magellan-association.org
Av. da Boavista, 1588 7
4100-115 Porto, Portugal
**www.magellan-association.org**

**LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL (LNEC)**
*Elisabete Arsenio*
lnec@lnec.pt
Avenida do Brasil, 101
1700-066 Lisboa, Portugal
**www.lnec.pt**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006593.

# TRAVISIONS 2022 ADVISORY BOARD



# SPONSORS 2022

TRAVISIONS 2022
YOUNG RESEARCHER COMPETITION SPONSORS

**ROAD SPONSOR**

**RAIL SPONSOR**

**WATERBORNE SPONSORS**

**AIRBORNE SPONSOR**

**CROSSMODALITY SPONSORS**

# ACKNOWLEDGEMENTS

We would like to thank the following experts for taking part in the TRAVISIONS 2022 project as remote evaluators and/or panellists.

## REMOTE EVALUATORS

### YOUNG RESEARCHER COMPETITION **ROAD**

Evangelia Gaitanidou, *CERTH/HIT*
Evangelos Bekiaris, *CERTH/HIT*
George Yannis, *NTUA*
Janis Barbars, *Latvian State Roads*
Jose Barrios, *IDIADA*
Josef Affenzeller, *AVL*
Laszlo Gaspar, *KTI*
Maria Gemou, *CERTH/HIT*
Maria Panou, *CERTH/HIT*
Matina Loukea, *CERTH/HIT*
Nicolas Hautiere, *UniEiffel*
Thilo Bein, *FhG/LBF*
Xavier Aertsens, *ERTRAC*

### SENIOR RESEARCHER COMPETITION **ROAD**

Evangelia Gaitanidou, *CERTH/HIT*
Evangelos Bekiaris, *CERTH/HIT*
Francesco De Florio, *Polito*
Jan Bavendiek, *FKA*
Jose Barrios, *IDIADA*
Laszlo Gaspar, *KTI*
Maria Gemou, *CERTH/HIT*
Maria Panou, *CERTH/HIT*
Matina Loukea, *CERTH/HIT*
Thilo Bein, *FhG/LBF*
Xavier Aertsens, *ERTRAC*

### YOUNG RESEARCHER COMPETITION **RAIL**

Anders Peterson, *Linköping University*
Andy Doherty, *AMDTECH INNOVATIONS LTD*
Bertrand Houzel, *SCNF*
Felix Schmid, *University of Birmingham*
Florin Nemtanu, *Polytechnic University of Bucharest*
Ganesh Chandramouli, *Alstom Group*
Henrik Sylvan, *DTU*
Ingo A. Hansen, *TU Delft*
Javier Goikoetxea, *CAF*
Joaquin Rodriguez, *Université Gustave Eiffel*
Luiz Baeza, *Universitat Politècnica de València*
Marie Catrou, *SNCF*
Markus Bohlin, *Mälardalen University*
Mercedes Solla, *University of Vigo*
Niklas Olsson, *VTI*
Paul Allen, *University of Huddersfield*
Robert Steinberger-Wilckens, *University of Birmingham*
Roberto Palacin, *Newcastle University*
Stanislav Lenart, *ZAG Slovenia*
Stefano Ricci, *Sapienza University of Rome*
Stephen Famurewa, *Trafikverket*
Svenja Hainz, *DLR*
Tom Zunder, *Newcastle University*
William Powrie, *University of Southampton*
Yann Bezin, *University of Huddersfield*
Yongqiu Zhu, *ETH Zürich*

### SENIOR RESEARCHER COMPETITION **RAIL**

Markus Hecht, *TU Berlin*
Sakdirat Kaewunruen, *University of Birmingham*

### YOUNG RESEARCHER COMPETITION **WATERBORNE**

Alistair Greig, *University College London*
Andreas Kraus, *Hochschule Bremen*
Apostolos Papanikolaou, *National Technical University of Athens*
Dimitrios Nikolakis, *BS*
Evangelos Boulougouris, *University of Strathclyde*
Henk Prins, *MARIN*
Ioannis Ergas, *WEGEMT*
Ismail Helvacioglou, *Istanbul Technical University*
Laurent Courregelongue, *Bureau Veritas Group*
Leonidas Drikos, *Glafcos Marine*
Markus Lehne, *BALANCE*
Mohammad H. Ghaemi, *Gdańsk University of Technology*
Paolo Guglia, *FinCantieri*
Peilin Zhou, *University of Strathclyde*
Pentti Kujala, *AALTO*
Philip Wilson, *University of Southampton*
Philippe Rigo, *University of Liege*
Tony Morrall, *Consultant*

### 2022 BOOK **AUTHORS**

Alistair Greig, *University College London*
Alessandro Tedeschi Gallo, *Deep Blue*
George Smirnakis, *WEGEMT*
Irene Pantelaki, *EASN*
Micol Biscotto, *Deep Blue*
Graphics and Layout by *Deep Blue*

### SENIOR RESEARCHER COMPETITION **WATERBORNE**

Alistair Greig, *University College London*

### YOUNG RESEARCHER COMPETITION **AIRBORNE**

Ana Garcia Garriga, *Collins Aerospace*
Andrea Gentili, *European Commission*
Andreas Strohmayer, *University of Stuttgart*
Damiano Taurino, *Deep Blue*
Enzo Gueli, *European Commission*
Filippo Tomasello, *Euro-USC*
Giuliano Coppotelli, *Sapienza University of Rome*
Laura Mainini, *Collins Aerospace*
Marcello Amato, *CIRA*
Marco Ducci, *Deep Blue*
Menouer Boubekeur, *Collins Aerospace*
Rohan Chabukswar, *Collins Aerospace*
Simone Pozzi, *Deep Blue*
Spiros Pantelakis, *University of Patras*
Vassilis Kappatos, *CERTH/HIT*

### SENIOR RESEARCHER COMPETITION **AIRBORNE**

Spiros Pantelakis, *University of Patras*
Angelos Filippatos, *TU Dresden*

### YOUNG RESEARCHER COMPETITION **CROSSMODALITY**

Caroline Almeras, *ECTRI*
Christoph Schneider, *Munich Airport*
Thierry Goger, *FEHRL*
Tom Zunder, *Newcastle University*
Xavier Aertsens, *ERTRAC*

### SENIOR RESEARCHER COMPETITION **CROSSMODALITY**

Caroline Almeras, *ECTRI*
Christoph Schneider, *Munich Airport*
Thierry Goger, *FEHRL*
Tom Zunder, *Newcastle University*
Xavier Aertsens, *ERTRAC*

## PANELISTS

### ROAD PANEL

Ema Muk-Pavic, *UCL*
Evangelia Gaitanidou, *CERTH/HIT*
Karen Vancluysen, *POLIS*
Maurizio Maggiore, *European CommIssion*

### RAIL PANEL

George Kotsikos, *European Commission*
Ismerie Colussi Corte, *UIC*
John Cleuren, *European Commission*
Judit Sandor, *Europe's Rail Joint Undertaking*
Marion Berbineau, *Université Gustave Eiffel*

### WATERBORNE PANEL

Agnieszka Zaplatka, *European Commission*
Dimitrios Nikolakis, *ABS*
George Smyrnakis, *WEGEMT*
Henk Prins, *Marin*
Ioannis Ergas, *WEGEMT*
Leonidas Drikos, *Glafcos Marine*
Reinhard Ahlers, *BALANCE*
Tony Morrall, *Consultant*

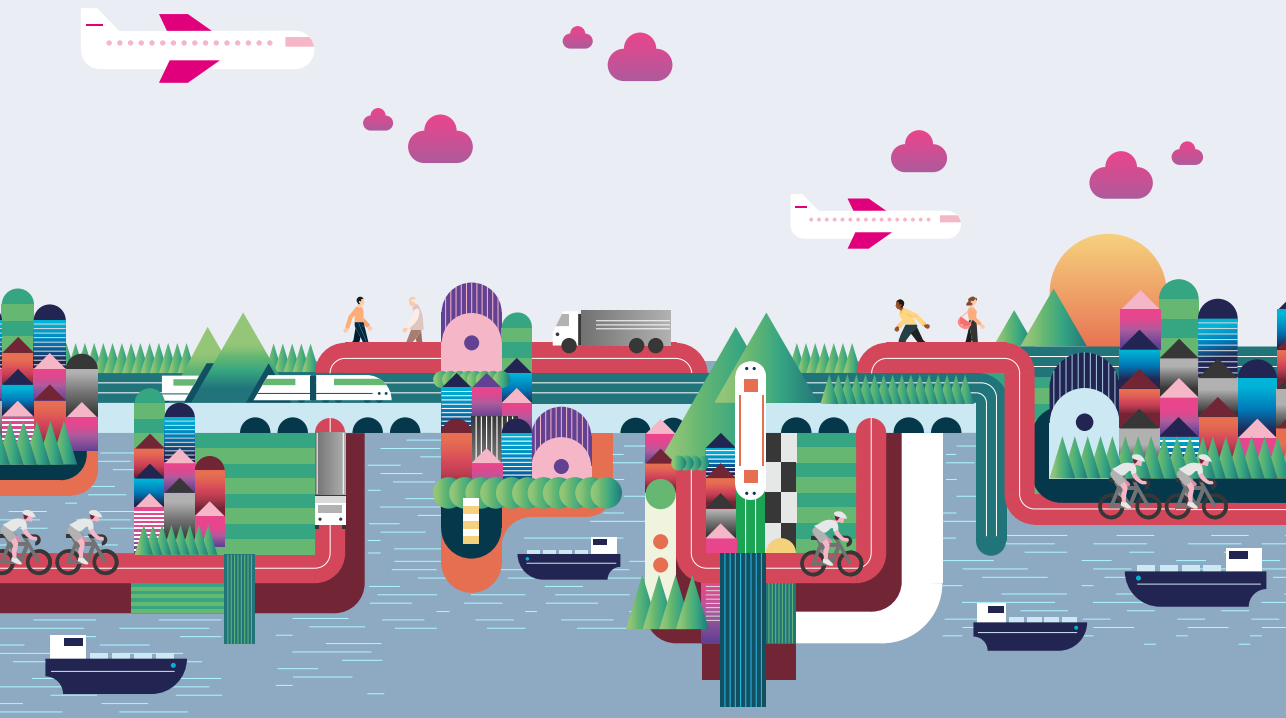
### AIRBORNE PANEL

Andrea Gentili, *European Commission*
Giuliano Coppotelli, *Sapienza University of Rome*
Menouer Boubekeur, *Collins Aerospace*
Michael Kyriakopoulos, *European Commission*
Stanley Tang, *Clean Aviation JU*

### CROSSMODALITY PANEL

Caroline Almeras, *FEHRL*
Fernando Liesa, *ALICE*
Patrick Mercier-Handisyde, *European Commission*
Thierry Goger, *FEHRL*
Umberto Guida, *UITP*

Please note that in case of conflict of interest, the panellist was not allowed to vote for that session.



www.travisions.eu

ISBN 00000000