FUTURE-HORIZON

Success Stories

Date: 02/01/2023
Edited by: POLIS
Project: FUTURE-HORIZON

FUTURE-HORIZON was funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No.101006598.

Introduction

This report intends to provide an overview of European projects that can be considered as “success stories” in road transport research. The projects included in this report represent a wide range of sectors and have been selected to represent the work of the thematic working groups of ERTRAC, the European Technology Platform for Road Transport - namely Urban Mobility, Long-Distance Freight Transport, Energy and Environment, Safety and Security, Competitiveness, Connected and Automated Driving, Electrification. This report features 12 projects select among many successful, long-lasting contributions.

This report was developed in the framework of the FUTURE-HORIZON project, funded by the European Union’s Horizon 2020 research and innovation program under grant agreement number 101006598. FUTURE-HORIZON supports ERTRAC, future Horizon Europe partnerships and the European Commission in identifying future research needs for upcoming R&I programs to further facilitate a sustainable and efficient road transport system in Europe, while extensively fostering international cooperation.

1.1 CoExist: Enabling cities to get "automation-ready”

The CoEXist is a European project which prepared the transition phase during which automated and conventional vehicles will co-exist on cities’ roads. It bridges the gap between automated vehicles (AVs) technology, transportation and infrastructure planning, by strengthening the capacities of urban road authorities and cities to plan for the effective deployment of AVs.

CoEXist provides guidance and empowers local authorities to make critical and reasonable decisions about the introduction of Connected and Automated Vehicles (CAVs) in their road networks. The automation-ready planning framework includes elements of strategic urban mobility planning (SUMP) for CAVs and a guide for urban transport planners with concrete actions to be followed. Furthermore, it brings together the methodologies and tools developed within the project, as well as lessons learned from their implementation.

PTV Vissim - the microscopic traffic flow simulator - allows to model CAVs and their interactions with conventional vehicles and other road users, considering the differences in car-following distances, simple communication aspects (V2V and V2I) and acceleration behaviour.

Empirical data collected from real AV’s on the test track in Helmond (NL) and co-simulations integrating CAV driving logics (VEDECOM), vehicle dynamics (PreScan) and traffic simulations (PTV Vissim), were used to derive, calibrate and validate behavioural parameters of CAVs.

CoEXist’s macroscopic modelling tools provide extensions to PTV Visum. The tools can be integrated into the software to replicate the impacts of CAVs on capacity and demand. They allow the model developer or model user to test various assumptions, extending the capabilities of Visum to enable the consideration of CAVs in travel demand simulations. Whilst the choice of procurement procedures is dependent on the solution to procure (high or low-tech number of potential suppliers, maturity level, etc.), the choice of different procurement approaches depends on how you want to design the competition, for example, opening the competition for small and medium-sized enterprises (SMEs) or yet unknown solutions.

As part of the SUMP EU Guideline, CoEXist developed a Practitioner Briefing on planning for road vehicle automation, which provides an initial basis of support for authorities to address Connected, Cooperative, and Automated Mobility (CCAM) in SUMP processes.

The automation-ready tools developed within the CoEXist project have been used to evaluate the traffic impact of automation for 8 strategically selected use cases in 4 different cities: shared spaces; accessibility during long-term construction works; signalised intersection including pedestrians and cyclists; transition from interurban highway to arterial; waiting and drop-off areas for passengers; Priority Junction Operation (roundabouts); impacts of CAVs on travel time and mode choice on a network level; impact of driverless car and ridesharing services.

Project full name: 'AV-Ready' transport models and road infrastructure for the coexistence of automated and conventional vehicles

Project coordinator: Rupprecht Consult

Duration: from May 2017 until April 2020

EU funding: € 3 474 067,50 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.h2020-coexist.eu

Other deliverables, presentations and brochures: https://www.h2020-coexist.eu/resources/

1.2 HANDSHAKE: Enabling the transferability of cycling innovations and assessment of its implications

50 years of knowledge on urban cycling practices squeezed into 5 years of transnational cooperation to boost a sustainable mobility transition. Building on five decades of experience and know-how accumulated by 3 cycling front-runners like Amsterdam, Copenhagen, and Munich, HANDSHAKE rolled out an integrated approach to hasten the adoption of sound cycling policy and innovative infrastructural solutions in 10 other European cities: Dublin, Manchester, Helsinki, Riga, Krakow, Bordeaux, Cadiz, Turin, Rome, Bruges.

The HANDSHAKE self-assessment tool aids cities in understanding their own performance and proficiency in cycling with the focus on: *hardware* (the characteristics of the infrastructure and facilities in the local cycling network, *software* (the vital awareness and communication elements of a sound cycling policy), and *orgware* (the preparedness of the local authority to deliver cycling ambitions). The tool is the gateway to the Cycling Community of Practice (CCoP), a prospective online platform aiming at gathering cities worldwide interested in assessing and growing cycling capacity, cooperating with each other, accessing existing resources, requesting specialized support to plan, design, and deliver world-class cycling ambitions.

This project banked on the power of structured peer-to-peer knowledge exchange facilitated by a group of cycling experts. In doing so, cities were able to build mutual trust, use direct and easily accessible dialogue channels, take part in capacity building programmes and participate in immersive study tours. A distinctive trait of the approach was the willingness to work with each local community, involving in the policy and decision-making process both the opposing, neutral, and supportive parties. We thus engaged institutions, operators, business associations, residents' associations, municipal police, media and environmental associations in a long-term transition management process, allowing them to share and compare viewpoints, perceptions, data and evidence, along with plans.

Project full name: Enabling the transferability of cycling innovations and assessment of its implications

Project coordinator: ISINNOVA

Duration: from September 2018 until August 2022

EU funding: € 4 859 093,75 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.handshakecycling.eu

HANDSHAKE solutions: www.handshakecycling.eu/solutions

1.3 LeViTate: Societal LEVel Impacts of connecTed and AutomaTed vehiclEs

LEVITATE built tools to help European cities, regions and national governments prepare for a future with increasing levels of automated vehicles in passenger cars, urban transport services and urban logistics.

The LEVITATE Policy Support Tool (PST) is the go-to, one-stop-shop to support decisions on Cooperative, Connected and Automated Mobility (CCAM) - related interventions. It is designed as an open access, web-based system. Its detailed design takes into account the specific needs of the key stakeholders and it provides access to related bibliography, project results, documentation of tools and methods, excerpts from CCAM guidelines, as well as a Decision Support System with forecasting and backcasting capabilities. The tool enables policy makers and other stakeholders to estimate short, medium and long-term impacts of connected and automated transport systems (CATS) and to establish the most effective policy pathways for the introduction of CATS to achieve predefined objectives.

Project full name: Societal Level Impacts of Connected and Automated Vehicles

Project coordinator: Loughborough University

Duration: from December 2018 until May 2022

EU funding: € 5 022 215 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.levitate-project.eu

Policy Support Tool: www.ccam-impacts.eu

1.4 PIONEERS: Protective innovations of new equipment for enhanced rider safety

PIONEERS aimed to reduce the number of Powered Two Wheeler fatalities and severely injured by increasing the safety, performance, comfort, and usage rate of Personal Protective Equipment and the development of new on-board safety devices.

Detailed accident data was used to simulate with Finite-Elements human body models. The analysis in the virtual environment allowed a deep understanding on potential prevention measures as well as assessment for the future personal protective equipment tests. During the last phase of the project, a new generation of test methods was developed to ensure a good quality of PPEs like airbag jackets, boots, helmet, pelvic protectors and on-board safety systems. New ideas as lateral bars and airbags to mitigate lateral impacts at low speed were also developed.

PIONEER contributed to road safety in three ways: (1) by identifying the Key Accident Scenarios in Europe in terms of frequency and severity; (2) by drawing an empathy map with PTW users to better understand the issues they encounter as users mainly related to use of PPEs, and (3) by defining the current and future scenarios relevant for the development of safety measures.

Project full name: PROTECTIVE INNOVATIONS OF NEW EQUIPMENT FOR ENHANCED RIDER SAFETY

Project coordinator: Applus+ IDIADA

Duration: from May 2018 until October 2021

EU funding: € 4 725 613,58 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.pioneers-project.eu

Link to main publications: www.pioneers-project.eu/dissemination/public-deliverables/

1.5 Park4SUMP: Parking management as game changer for urban mobility

As one of the few EU-funded projects solely dedicated to the topic of parking policy, Park4SUMP supported sixteen European cities and make parking management part of a wider strategy that can benefit urban mobility but also the overall quality of life of our cities.

Park4SUMP provides tangible help for cities. It helps to integrate parking management into their (future) SUMP, free an average of 10% of public space currently used for parking by means of participatory planning, and invest at least 10% of parking revenues into sustainable transport, active modes such as walking and cycling and develop a more human-centred neighbourhoods.

This can be achieved thanks to a robust tool to support implementation of parking policies, that is an outcome of the project. ParkPAD tool includes an audit framework that enables European cities to start the restructuring process of their parking management and to receive tailor-made feedback on their current parking policy. It will remain available beyond the lifetime of the project as it provided a case for replicability and scalability of the ParkPAD process beyond the lifespan of Park4SUMP.

Mobility professionals who have knowledge of the local context and language, are trained to become national auditors. This allows them to carry out ParkPAD audits for cities. Additionally, institutional partners are creating the framework conditions for ParkPAD by disseminating national programmes or working on SUMP guidelines.

Project full name: Actions demonstrate how Park4SUMP will lead to achieve sustainable transport in urban areas by strategically integrating innovative parking management solutions into SUMP policies.

Project coordinator: MOBIEL21

Duration: from September 2018 until August 2022

EU funding: € 3 501 143,75 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.park4sump.eu

Link to resources and tools: www.park4sump.eu/index.php/resources-tools

1.6 MOMENTUM: Modelling Emerging Transport Solutions for Urban Mobility

MOMENTUM developed a set of new data analysis methods, transport models and planning support tools to support cities with designing the right policy mix to exploit the full potential of emerging mobility solutions such as MaaS (Mobility as a Service), CAVs (Connected Automated Vehicles), new shared mobility services and demand-responsive transport in the urban mobility ecosystem.

The multilevel Decision Support Toolset consists of three levels and its primary goal, is to develop a conceptual framework for assessing the impacts of new mobility options by collecting and analyzing heterogeneous data sources and develop mobility patterns. The Decision Support Toolset integrates mobility data from different sources and modelling improvements into one online platform, where cities can virtually test and asses the performance and impact of emerging mobility solutions. Policy makers can resourcefully use the integrated Toolset to investigate mobility scenarios in every city, in order to enhance environmental sustainability and social responsibility while simultaneously securing efficient budgeting allocation.

MOMENTUM achieved these goals through the following innovations:

- A set of **plausible future scenarios for the next decade** to be taken into account for mobility planning in European cities
- **Characterisation of emerging activity-travel patterns** of the existing forms of transport using high-resolution spatiotemporal data
- **Data-driven predictive models of the adoption and use of new mobility concepts**, in particular MaaS and shared mobility, their interaction and complementarity with public transport
- **Transport simulation and planning support tools** able to cope with the new challenges faced by transport planning
- A **demonstration of the potential of the newly developed methods and tools** by testing the impact of a variety of policies and innovative transport services in the MOMENTUM cities
- A set of **guidelines for the practical use of the methods, tools and lessons learnt** delivered by the project in the elaboration and implementation of **SUMPs** and other planning instruments

Project full name: Modelling Emerging Transport Solutions for Urban Mobility

Project coordinator: EMT Madrid

Duration: from May 2019 until April 2022

EU funding: € 2 927 875 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.h2020-momentum.eu

Decision Support Tool: www.momentum.imet.gr

1.7 AEROFLEX: Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport

The AEROFLEX project developed the knowledge, concepts and technology to improve the efficiency of long-range freight vehicles while drawing up recommendations for implementing the results within European regulations and in the transport & logistics industry. AEROFLEX provided architectures for complete vehicles with optimised aerodynamics, powertrains and safety systems as well as flexible and adaptable loading units with advanced interconnectedness contributing to the vision of a "physical internet".

The project produced two long-haul trucks, capable of running in EMS2 (European Modular System) vehicle configurations and demonstrating: distributed powertrains (traction capable in the tractor unit the trailer and the smart powered e-dolly); active and passive aerodynamic devices; active and passive safety features in the vehicle tractor units; new modular loading units; assisted with the PUZZLE software; cargo volume detection; as well as being compatible with Truck2Train multi-modality. As a result, **18-33%** efficiency improvement in long haul road freight transport was achieved.

AEROFLEX provided major contribution to energy saving and road safety:

- 4-5% energy saving by separate platforms
- 4-6% energy saving by effective use of loading space
- 5-12% energy efficiency improvement from flexible advanced powertrains
- 5-10% reduction in energy consumption through improved vehicle aerodynamics
- Standardized interfaces and sharing of components for higher economies of scale
- Front end design to ensure survivability in crashes up to 50km/h for occupants and vulnerable road users

The combination of safety measures, such as an elongated front end design with specific passive and active safety systems, provides optimal protection in case of 'truck vs truck', 'truck vs car' and 'truck vs VRU' accident scenarios. The AEROFLEX elongated front-end has some influence on several existing regulations like UN29 (cab strength) and UN93 (front underrun protective devices) and will support the creation of a consumer assessment program Euro NTAP.

Project full name: Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport

Project coordinator: MAN TRUCK & BUS SE

Duration: from October 2017 until September 2021

EU funding: € 9 534 778,64 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.aeroflex-project.eu

Project results: www.aeroflex-project.eu/downloads-2/

1.8 ORCA: Optimised Real-world Cost-Competitive Modular Hybrid Architecture for Heavy Duty Vehicles

ORCA has successfully developed two PHEV protypes: a multimodal bus and a distribution truck, increasing three times their range in full electric mode. At the same time, these vehicles have been equipped with innovative PHEV rechargeable energy storage (RES) systems, designed specifically for each vehicle application.

The ORCA heavy-duty vehicles prototypes have achieved a 40% reduction in fuel consumption and 40% reduction in emissions, while keeping total cost of ownership (TCO) the same in comparison to their conventional counterparts. ORCA completely redefined and optimised the vehicles' multimodal system architecture. Parts of the DC-DC converter that fit with a 24-volt network as well as an on-board charger able to recharge more rapidly were central to achieving an innovative topology that enables a platforming concept and standardisation.

ORCA developed a simulation framework to enhance and analyse performance by optimising the powertrain configuration and its components for both design and control. This approach accelerated the design and development phases as well as the verification and validation phases.

Project full name: Orchestration and Reconfguration Control Architecture

Project coordinator: INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM

Duration: from January 2017 until June 2020

EU funding: € 4 996 475 under INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)

Project website: www.h2020-orca.eu

Other materials: www.h2020-orca.eu/library

1.9 ENSEMBLE: Enabling Safe Multi-Brand Platooning for Europe

ENSEMBLE's main goal was to pave the way for the adoption of multi-brand truck platooning in Europe in order to contribute to traffic safety, throughput and fuel economy. The ambition of ENSEMBLE was to realise pre-standards (i.e., mature input for standardisation) for interoperability between trucks, platoons and logistics solution providers, to speed up actual market take-up of (sub)system development and implementation and to enable harmonisation of legal frameworks in the member states.

ORCA has demonstrated efficiency in real life conditions achieving a multi-brand platooning technology agreed between all leading European OEMs, coping with current traffic use cases and ready for standardization.

The Platooning Support Function (PSF) is based on mature and proven technology. This multi-brand solution is ready for standardisation and is able to cope with all the different use cases encountered in current traffic. The PSF fits within the current legislation and can make today's spontaneous platooning safer. For example, the PSF provides in addition to a faster reacting ACC an earlier warning to the driver and the following vehicles in case of hard braking. The standard Advanced Emergency Braking System (AEBS) on the trucks remains active, but due to V2V communication the driver is warned earlier (at least 0.5 s), leading to an extended warning phase.

ENSEMBLE has also specified the Platooning Autonomous Function (PAF). The PAF gives the vision of the ENSEMBLE Partners for the future of platooning.

Project full name: ENabling SafE Multi-Brand pLatooning for Europe

Project coordinator: TNO

Duration: from June 2018 until March 2022

EU funding: € 19 780 383,21 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.platooningensemble.eu

Project resources: www.platooningensemble.eu/library

1.10 MeBeSafe: Measures for Behaving Safely in Traffic

There has been a lot of progress to prevent risky situations from turning into crashes as well as to mitigate the impact of occurring crashes. However, less effort has been invested in preventing risky situations from occurring in the first place. MeBeSafe tested and developed 8 soft measures to make traffic safer, including lights in the roadsides, flat stripes, moving balls and an app to help truckers coach each other. The purpose was to reduce the number of "almost-crashes" - increasing safety margins can lead to risky situations being avoided – which in turn can lead to fewer crashes in general.

The legacy of MeBeSafe consists of 8 well-evaluated nudges and coaching measures:

1. **InfraDriver nudge** - to help drivers adapt speed before dangerous road exits.
2. **ACC order nudge** - to increase distances between cars by using Adaptive Cruise Control.
3. **ACC scoreboard nudge** - to increase distances between cars by using Adaptive Cruise Control (ACC).
4. **ACC COACHING** - to help people understand features in their car, such as Adaptive Cruise Control (ACC).
5. **Cyclist nudge** - to help adapt speed and increase attention before hazards.
6. **Attention nudge** - to increase drivers' attention towards crossing cyclists.
7. **Trucker Coaching app** - to help truckers drive better by coaching one another.
8. **Take-a-break reward** - to help tired drivers stop and take a break before an accident.

The positive impact of MeBeSafe can be as large as 500 lives saved per year in EU 2030, and between 21 000 and 65 000 injuries prevented. Estimates suggest that in 2030, it is most probable that the MeBeSafe measures will save 366 lives, and eliminate 40 000 injuries. On a societal scale, this could lead to yearly saving of 3.3 billion euros. The resulting simulation approach has since become part of the industrial methods able to explore design strategies aimed at reducing the occurrence and negative impact of CCV on the efficiency of spark-ignition engines for road transport.

Project full name: Measures for behaving safely in traffic

Project coordinator: RWTH Aachen University

Duration: from May 2017 until October 2020

EU funding: € 7 136 979 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.mebesafe.eu

Project resources: www.mebesafe.eu/deliverables

1.11 i-HeCoBatt: Intelligent Heating and Cooling solution for enhanced range EV Battery packs

i-HeCoBatt aimed to achieve a smart, cost bursting industrial battery heat exchanger to minimise the impact on full electric vehicle range in extreme conditions. It integrates an innovative heat exchanger that removes the currently used gap filler between the heat exchanger and the battery.

A burst-costing novel heat exchanger based on MIBA's **FLEXcooler®** technology with greater heat transmission capabilities was designed, manufactured and assembled in a commercial battery pack. It implies a great advance in terms of technology, but especially, it brings a relevant decrease on the economic cost as well as in the environmental cost of actual heat exchangers. MIBA's FLEXcooler® compared with the actual SOA provides 12% improved heat transmission capacity, 75% cost reduction, and 80% environmental effect reduction.

The project generated a model library in MATLAB/SIMULINK that provides the resources to simulate accurately the original AUDI e-tron battery pack, the assembled prototype (A-sample) and designed industrialized set-up (B-sample). It created a proof of concept of a BTMS control strategy based on machine learning algorithms and contributed to design and validation of a smart BTMS control strategy through simulations and test at lab level. Other achievements of the project:

- Increased the e-powertrain overall efficiency up to +5% through a novel heat exchanger
- Proven a minimum -20% mass production cost of the thermal system thanks to an innovative heat exchanger
- Integration of new components and functionalities leading to higher user friendliness, reduction of range anxiety and temperature impact on degradation of the BP
- Achieved automotive class quality
- Longer vehicle range due to smart and more efficient heat exchanger
- Demonstrated the efficiency increase & addition of new functionalities in 3 AUDI e-tron EVs

Project full name: Intelligent Heating and Cooling solution for enhanced range EV Battery packs

Project coordinator: CIDETEC

Duration: from January 2019 until June 2022

EU funding: € 3 287 012,43 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.ihecobatt.eu

Project publications: www.ihecobatt.eu/publications

.

1.12 VIRTUAL: Open access virtual testing protocols for enhanced road user safety

The VIRTUAL project contributed to the development of virtual testing in the crash safety assessment area in order to increase road user safety. It developed and provided models of the human (both an average female and male model) and procedures needed to conduct virtual testing in scenarios addressing vehicle occupant and vulnerable road users safety.

Open-source Human Body Models of both average females and males as seated occupants, pedestrians and cyclists are available as an outcome of the project. Furthermore, it has made tools and procedures openly available for conducting virtual safety assessment. OpenVT platform provides all the components needed for Virtual Testing (VT). A non-profit organization, OVTO, has been established to make the OpenVT and all the material available after the end of the project and contribute to the further development of virtual testing.

VT has the potential to optimise adaptive safety systems and reduce female injuries by up to 32% by closing the optimisation-gap between female and male drivers.

Virtual and physical models of humans and vehicles were created. Bicycle and tram structures developed within the VIRTUAL project representing vehicle occupants and VRUs, are both average female and male.

Project full name: Open access virtual testing protocols for enhanced road user safety

Project coordinator: The Swedish National Road and Transport Research Institute (VTI)

Duration: from June 2018 until November 2022)

EU funding: € 6 997 843,75 under SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Project website: www.projectvirtual.eu

Project deliverables: www.projectvirtual.eu/dissemination/deliverables/