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CORDIS Results Pack on

# Connected, Cooperative and Automated Mobility

A thematic collection of innovative EU-funded research results

March 2025

# Building European capacity for smart, sustainable transport systems

Research and Innovation

# Contents



# Editorial

## Building European capacity for smart, sustainable transport systems

New mobility solutions enabled by connected, cooperative and automated mobility (CCAM) will increase the safety, traffic efficiency and accessibility of Europe's road transport system. This CORDIS Results Pack highlights 15 EU-funded projects addressing the technological, regulatory and social challenges of automated transport systems, paving the way for more sustainable and equitable transport in the future.

The European Commission's Strategic Dialogue on the Automotive Industry, launched in January 2025, reflects its strong support for the transformation of the European automotive industry in a fast-changing and competitive world. CCAM technologies offer a path for achieving a more sustainable, safe, efficient and competitive mobility ecosystem.

CCAM is a key area of interest for CINEA, the European Climate, Infrastructure and Environment Executive Agency. Under Horizon 2020, EUR 300 million was awarded to research projects to advance connected and automated mobility. A further EUR 500 million is being delivered through the Horizon Europe Framework Programme for Research and Innovation, under its Cluster 5 on Climate, Energy and Mobility challenges, to support the development, demonstration and take-up of highly automated and connected driving systems.

The topics on automated mobility are co-programmed with the CCAM Partnership, a public-private partnership which aligns efforts of more than 200 stakeholders in academia, industry and policymaking to accelerate the development of CCAM technologies and services in Europe. This initiative aims to promote innovation, economic growth and environmental sustainability within Europe's automative sector and deliver large-scale, real-world demonstrations by 2030.

Main areas of research include vehicle technologies (such as hyper advanced perception, AI-based decision-making, and software development), validation methodologies, and socio-economic and environmental impact assessment, all working towards their integration and large-scale deployment within the transport system, providing users with cutting-edge and inclusive mobility solutions.

## Driving progress

As an interconnected road system serving over 250 million drivers, Europe's transition to CCAM requires a high degree of coordination. The 2016 Declaration of Amsterdam laid down the key principles for European cooperation in the development of CCAM, and established a structural dialogue between stakeholders, from both the private and public sectors. The most recent High-Level Dialogue on Connected and Automated Driving, held in Ghent in June 2024, underscored the need for continued collaboration between local, national and international players to harmonise research, standardisation and regulatory efforts, and reach the objective of large-scale deployment in Europe.

This EU-level collaboration continues today. In May 2025, the European Conference on Connected and Automated Driving will host its 5th edition, bringing policymakers from the European Commission and Member States together with high-level representatives of industry, scientific institutes, transport authorities and operators to discuss the most recent technologies, policy developments, lessons learned and challenges in the area.

This Pack highlights 15 CCAM projects that are delivering outstanding results, driving Europe forward to a safer and more sustainable transport system.

# Self-driving technologies need user-friendly AI

By making artificial intelligence trustworthy, understandable and user-friendly, the EU-funded AIthena project is helping to make automated transportation much more appealing.



Self-driving technologies have seen rapid advancements thanks to artificial intelligence (AI), which can process massive amounts of data to make safe and efficient driving decisions. However, citizen concerns over how or why AI systems make these decisions need to be addressed if the widespread roll-out of automated vehicles is to be successful.

"When we drive a car, we know why we steer in a particular direction, change lanes or brake," says AIthena project coordinator Oihana Otaegui from Vicomtech in Spain. "But when we are in an automated car, it is possible that we don't fully understand what is going on. The AI is like a black box – information goes in, and a decision comes out."

## Accountable by design

The AIthena project sought to crack open this black box, allowing humans in automated vehicles, as well as highway authorities and traffic managers, to understand why driving decisions are being made. To achieve this, the project team has pioneered a new approach to developing user-friendly AI in CCAM applications.

"Our methodology should help to ensure that AI systems are explainable to end users, and fully comply with European regulations such as the Data Act and AI Act," adds Otaegui.

The project's approach covers AI development across four key phases: data collection, training, testing and deployment. A key element is documenting key details such as intended use, ethical considerations and performance metrics. "We have also advanced methods to protect sensitive data while maintaining AI performance," continues Otaegui. "These methods included privacy-preserving techniques such as homomorphic encryption and federated learning, allowing AI to be trained without directly exposing raw data."

## Paving the road to better AI

This methodology will provide a foundation for further refinement of AI in automated vehicles, and will be tested in four practical use cases as the project enters its final year.

*The aim is to enhance transparency and trust in AI by explaining why specific driving decisions are made.*

The first of these case studies will focus on how AI systems perceive and act on raw data from sensors such as cameras, lidar and ultrasonics. A second case study will look at how information from different sensors can be integrated to create situational awareness. The project team is interested in understanding how AI interprets the driving environment, and takes account of factors such as the behaviour of other road users.

"The third use case will explore decision-making processes in autonomous driving systems, focusing on understanding the reasons behind AI-driven decisions," notes Otaegui. "The aim is to enhance transparency and trust in AI by explaining why specific driving decisions are made. This use case emphasises explainability and alignment with ethical principles."

A final use case will investigate AI-enabled traffic management systems, focusing on how automated vehicles interact with broader transportation networks. The goal here is to understand and optimise AI's role in ensuring smooth traffic flow, efficient resource use and cooperative mobility.

## A sustainable AI landscape

These case studies will be assessed through real-life driving situations, as well as simulations for more complex and potentially dangerous scenarios. The team will assess how AI perceives the environment, understands and communicates driving situations, makes decisions, and operates within broader traffic management systems.

"If we can show that our methodology is a viable way of developing trustworthy AI for CCAM applications, then this could form the basis for future projects," explains Otaegui.

"By focusing on explainability, privacy and accountability, our hope is that AIthena will help ensure that AI technologies are transparent, ethical and human-centric. This will ultimately contribute to a more trusted and sustainable AI landscape for autonomous transport."

**PROJECT**
**AITHENA – AI-based CCAM: Trustworthy, Explainable, and Accountable**

**COORDINATED BY**
Vicomtech in Spain

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101076754

**PROJECT WEBSITE**
aithena.eu

# All-weather sensors see driverless freight vehicles roll out at airports, ports and logistic hubs

The EU-funded AWARD project's automated driving system is already benefiting factory, airport, logistics and port operations, informed by data from multiple sensors and boosted by performance-optimising algorithms.


© EasyMile

Automated vehicles for carrying freight in ports and airports, and between logistics sites, must be able to safely and efficiently operate under varying, often extreme, environmental conditions. The AWARD project leveraged available sensing devices and cutting-edge software to develop a solution that can meet the challenges of the most exacting conditions.

After extensive testing in real-world conditions, the project lead EasyMile has successfully deployed the technology at various client sites.

"We are demonstrating how our sensor fusion technology for reliable and scalable autonomous systems can transform supply chain operations, increasing efficiency and reducing environmental impacts," says project coordinator Magali Cottevieille, innovation funding manager at EasyMile.

## Automated driving system architecture

AWARD aimed to deliver advanced situational awareness for level four of driving automation vehicles, which includes those operating without drivers in controlled spaces.

After extensive testing with various configurations, AWARD designed a sensor array, mountable on vehicles, which included

cameras, radar and lidar. The incoming sensor data is filtered to remove unnecessary information, before fusing the various data streams into one information source for the vehicle.

The technology was tailored for heavy-duty vehicles across four use cases: airport operations, especially EZTow, which tows baggage carts; roll-on/roll-off port terminals, for instance with EZTug for container transfer and vessel loading; hub-to-hub freight transport (including the KAMAG 'swap-body truck' operating in factory areas and on public roads); and warehouse operations with pallet and forklift automation.

## Real-world testing

Testing under real-world conditions took place across several sites, including EasyMile's test facilities in Toulouse, the Digitrans Austrian testing site, and at customer premises. As a certification body, project partner CertX helped ensure compliance with safety regulations.

*We are demonstrating how our sensor fusion technology for reliable and scalable autonomous systems can transform supply chain operations, increasing efficiency and reducing environmental impacts.*

"We successfully integrated EasyMile's autonomous driving kit on four diverse vehicle types, each tailored to unique operational environments including our hub-to-hub scenario which extended to vehicle communication with infrastructure sensors," adds Cottevieille.

EZTow, the industry's first driverless electric tow tractor, was tested in snow at Oslo Airport to see if it could streamline operations. When assigned to tasks such as towing baggage carts, it performed consistently well, significantly reducing operational delays, when compared to human workers.

"The technology's performance exceeded our expectations, but challenges related to public road regulations underscore the fact that even if the technology is ready, deployment should prioritise private sites for now," notes Cottevieille.

## Building more sustainable supply chains

AWARD's system supports the EU's goal of reducing the carbon footprint of supply chains, while increasing efficiency and lowering costs. The system is also applicable to other automated electric vehicles.

"Adapting our technology to a range of supply chains will help ensure increased resilience and sustainability, while boosting European innovation, investment and upskilling," explains Cottevieille.

AWARD's technology is already being commercialised by TractEasy, with EZTow deployed at various customer sites through the joint venture between EasyMile and vehicle manufacturer Alvest/TLD.

Deployment includes major airports, including Singapore Changi and Narita International Airport in Japan. The technology is also supporting the assembly operations of European and American industrial sites, including the BMW Group Plant in Dingolfing, Germany and the Daimler AG Truck Assembly Plant in Wörth, Germany.

To scale further, the team continues to refine their sensors' performance, while also integrating advanced deep learning techniques to enhance the system's adaptability and reliability.

"Longer term we will develop a fully integrated freight/fleet management system, which collates information from subsystems, like other vehicles and road sensors, to coordinate operations more widely," adds Cottevieille.

**PROJECT**
**AWARD – All Weather Autonomous Real logistics operations and Demonstrations**

**COORDINATED BY**
EasyMile in France

**FUNDED UNDER**
Horizon 2020 – TRANSPORT

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101006817

**PROJECT WEBSITE**
award-h2020.eu

# Smart modelling leaves European gridlock in the rear-view mirror

Innovative traffic management solutions from the EU-funded CONDUCTOR project could help speed us towards a transport future where congestion, travel times, fuel consumption, emissions and costs are all reduced through improved connectivity.

Europe's urban populations continue to grow, so the road infrastructure becomes increasingly congested, negatively impacting the economy, public health and the environment. One study found that inefficiencies in urban mobility – road congestion in particular – cost the EU an estimated EUR 110 billion per year, more than 1 % of its GDP.

To mitigate this, the CONDUCTOR project has been developing an advanced transport management system to help authorities and operators such as public bus networks move people and goods more efficiently, making use of the growing availability of automated and connected vehicle capabilities.

"Driven by next-generation simulation tools, we are developing a prototype that dynamically assesses and prioritises the transport needs of various users, to optimise traffic flows," explains project coordinator Flavien Massi, senior project manager at Netcompany-Intrasoft in Luxembourg.

## Next-generation transport

At the heart of CONDUCTOR's solution lies a customised platform created by merging various pre-existing traffic and fleet management technologies, with computer models developed by the project.

These optimisation, simulation and prediction models are applicable to a range of real-life scenarios and are driven by algorithms trained on a variety of real-world traffic data using machine learning. These can also be used to evaluate cooperative routing strategies for large-scale CCAM vehicle fleets.

To ensure the solution's compatibility with others already deployed across European networks, APIs have been developed for exchanging critical data including General Transit Feed Specifications (such as transport routes, timings, stops, and locations) alongside information related to historical performance such as travel times and speeds, and incident management.

A portfolio of solutions is being deployed and tested across a range of use cases and pilot sites. These simulations model conventional vehicle traffic alongside that of CCAM on existing road infrastructure.

The first use case focuses on integrated traffic management and comprises three pilots. In Athens, bus, metro and tram schedules are synchronised to maximise passenger options. In Madrid, a model is being developed to better manage unexpected transport events and ensure efficient network recovery afterwards. While in Almelo in the Netherlands, a logistics corridor is being optimised by installing traffic prioritisation at designated intersections.

*Driven by next-generation simulation tools, we are developing a prototype that dynamically assesses and prioritises the transport needs of various users, to optimise traffic flows.*

The second use case is improving the transport platform of project partner GoOpti, which uses cooperative routing (identifying transport patterns to maximise fleet resources) to shuttle passengers to and from airports.

The third use case, also in Madrid, demonstrates how traffic swelled by surging demand for last-minute deliveries can be reduced by transporting passengers and goods in the same vehicles. Supply and demand is calculated using the FleetPy simulation environment, enriched with the project's transport control strategies and linked to Aimsun.next software which provides a realistic representation of traffic conditions.

"While we only recently started the validation phase, the initial results are extremely promising. Several models have already demonstrated improved traffic flow, shortened journey times and/or reduced emissions," says Massi.

## Future-proofing

CONDUCTOR contributes to the Europe-wide CCAM initiative, set up to create a more user-centred and inclusive mobility system increasing road safety while reducing congestion and environmental footprint.

To advance the technology, the machine learning tools used by the solution's various models are now being tweaked to refine the accuracy of modelling predictions of key metrics, such as traffic patterns, congestion hotspots and energy consumption.

While the team hasn't faced many technical challenges so far, privacy and security legislation has sometimes made it difficult to access real-time vehicle data necessary for the simulations.

Validation tests are currently under way to ultimately ensure a robust system capable of seamlessly connecting with the transport operators of any European city.

**PROJECT**
**CONDUCTOR – Fleet and traffic management systems for conducting future cooperative mobility**

**COORDINATED BY**
Netcompany-Intrasoft in Luxembourg

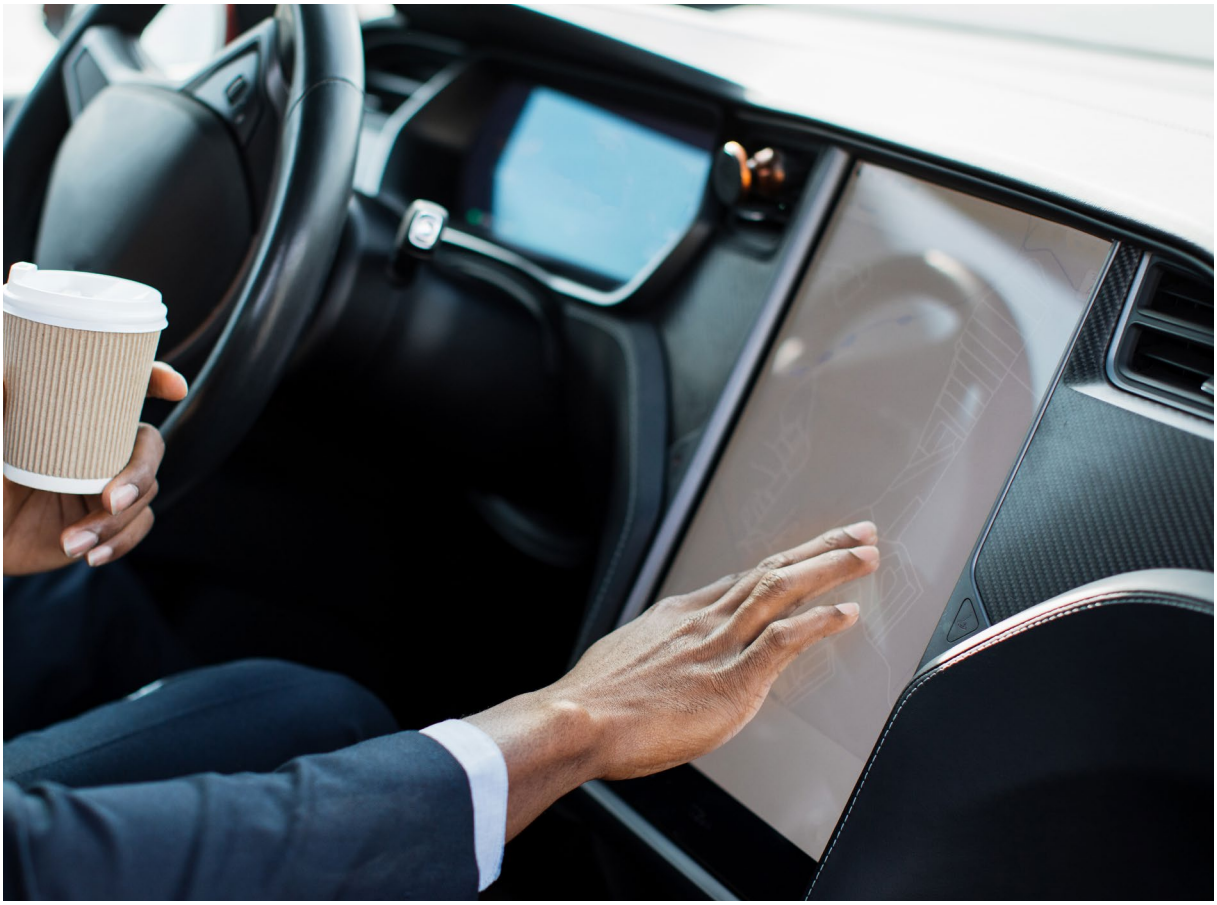
**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101077049

**PROJECT WEBSITE**
conductor-project.eu

# Trustworthy data is key to rolling out automated vehicles

For a safer, more secure future transport system, researchers for the EU-funded CONNECT project developed a novel solution to assess and ensure the trustworthiness of the data on which automated vehicles rely.





Lingering concerns about vehicle safety and security are a challenge to the progress of automated driving across the EU. Crucial to resolving these fears is guaranteeing the trustworthiness of the data generated and exchanged by driving technologies, both those on board vehicles and those embedded in roadside infrastructure.

"Data can be corrupted by mechanical defects, equipment degradation or computer failures, and there is also always the risk of deliberate cyber or physical attacks aimed at compromising security," says project coordinator Lisa Burgstaller-Hochenwarter, from Austrian research firm Technikon.

CONNECT is working to bolster the EU's ambition of CCAM, by developing a data model that captures all the trust relationships in the communications system, then assessing whether the data is reliable enough for processing.

The project benefits from the expertise of 16 partners from eight countries, representing the automotive industry and associated service providers, alongside research institutes and SMEs.

"We are building a system for cybersecure data sharing between data sources across the CCAM ecosystem, plugging the gaps where previously no, or only insufficient, trust relationships had been verified," explains technical lead Thanassis Giannetsos, from Greek research company Ubitech.

## Never trust, always verify

Guided by the principle of 'never trust, always verify', CONNECT's algorithm determines the origin and integrity of data, constantly verifying its plausibility and consistency. The assets that generate, transmit and use the data, such as sensors and software, are also evaluated for their trustworthiness.

*Data can be corrupted by mechanical defects, equipment degradation or computer failures, and there is also always the risk of deliberate cyber or physical attacks.*

"Our approach combines this evidence to make a judgement in the form of a single statement about how trustworthy a node or data is, alerting system operators to any potential vulnerabilities," notes Frank Kargl, scientific lead of the project and professor at Ulm University in Germany, a project partner.

Given the amount of data that future automated and connected vehicles will store, some of it sensitive, CONNECT is exploring the application of secure data processing domains known as trusted execution environments. These contain a protected compartment within a computer's central processing unit that shields data and programs from attack by blocking access to them even if the rest of the computer is compromised.

Additionally, combining the vehicle's systems with cloud-based information about the wider environment offers comprehensive situational knowledge that improves automated driving through perception sharing, route planning, real-time local updates and coordinated driving.

"As an alternative to most of today's technology, our cybersecurity system spans infrastructure, hardware and software, onboard units, all augmented by cloud and edge computing. Combined, this offers a novel trust architecture for the secure deployment and operation of safety-critical CCAM functions," adds Giannetsos.

## Network traffic

CONNECT's vision of ensuring a communication system that enhances the mobility and safety of transport networks has been demonstrated in three use cases.

The first is 'intersection movement assist', a complex cooperative driving scenario where effective communication is crucial. Work was led by IRT SystemX.

The 'cooperative adaptive cruise control' use case, led by Denso Automotive Germany, models the complex in-vehicle network and captures the need for trustworthy data extraction and management.

And the 'slow-moving traffic detection' scenario, supported by the Fiat Research Centre Stellantis and the Technical University of Turin, showcases through a real-world demonstrator how multiple trustworthy data sources can generate representative mobility maps.

"As one of the first to demonstrate the integration of affordable, advanced and trusted technologies into automated vehicles, CONNECT is focused on demonstrating its advantage over existing tools," concludes Giannetsos.

**PROJECT**
**CONNECT – Continuous and Efficient Cooperative Trust Management for Resilient CCAM**

**COORDINATED BY**
Technikon in Austria

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101069688

**PROJECT WEBSITE**
horizon-connect.eu

# Decision-making tools for smarter, safer mobility

Connected and automated vehicles have the potential to revolutionise transportation, but they struggle to manage real-world complexities. The EU-funded EVENTS project addressed this challenge, enabling automated vehicles to navigate unpredictable scenarios such as vulnerable road users, unstructured roads and adverse weather.




The vision of the EVENTS project is to create safer, smarter and more reliable automated vehicles. By equipping vehicles with advanced perception and decision-making systems, it hopes to reduce accidents and enable connected and automated vehicles (CAVs) to handle adverse and unstructured environments.

"EVENTS set out to ensure that automated vehicles can navigate not just the ideal conditions they were designed for but also the unexpected and challenging scenarios of the real world," says project coordinator Angelos Amditis, R&D director from the Institute of Communication and Computer Systems at the National Technical University of Athens in Greece.

The project focuses on developing next-generation perception algorithms and decision-making systems that enable vehicles to sense and respond to their environments with greater precision. A key aspect is expanding the operational design domain (ODD) of autonomous systems, enabling them to perform safely in challenging driving conditions.

EVENTS also introduces self-assessment systems to monitor and detect sensor malfunctions or errors, enhancing operational reliability. These advancements are supported by smarter decision-making tools capable of dynamically adapting to complex driving environments.

## From research to real-world solutions

The EVENTS approach combines rigorous research with practical applications. This includes targeted experiments to test the performance of autonomous systems' suboptimal conditions, such as unstructured roads, adverse weather conditions such as fog or low winter sun, and the presence of vulnerable road users such as pedestrians and cyclists.

Central to the project are machine learning algorithms developed for perception, motion prediction and decision-making. Prototype vehicles equipped with sensor suites were used to collect data and validate these solutions through a combination of simulations and real-world testing, ensuring both scalability and reliability.

A fusion of sensors delivered high performance without relying on expensive hardware, while adaptive algorithms enabled vehicles to handle even the most complex and unpredictable scenarios.

By sharing its findings with international bodies to guide the development of rigorous industry standards, the project is helping to nurture global standardisation. The work will build trust in autonomous technology and help ensure its widespread adoption.

"Our goals are more than technical milestones – they are stepping stones to safer roads and a more sustainable future of mobility," Amditis adds.

The consortium faced challenges such as the scarcity of real-world data for rare edge cases, difficulties in replicating adverse weather conditions, and regulatory barriers. Despite these obstacles, EVENTS continued to thrive. "We were tested in many ways," Amditis remarks. "But every challenge was an opportunity to adapt and improve. This resilience is what makes EVENTS stand out."

## The road ahead

EVENTS has already achieved many of its key milestones, including simulation-based data generation, innovative datasets and advanced algorithms. And as the project enters its final phase, its innovative methodologies are set to shape the future of automated driving.

"Our work is not just about advancing technology – it's about making transportation safer, more accessible and more sustainable for everyone," concludes Amditis.

*Our goals are more than technical milestones – they are stepping stones to safer roads.*

**PROJECT**
**EVENTS – ReliablE in-Vehicle pErception and decisioN-making in complex environmenTal conditionS**

**COORDINATED BY**
Institute of Communication and Computer Systems in Greece

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101069614

**PROJECT WEBSITE**
events-project.eu

# Establishing a European framework for connected, cooperative and automated driving

The EU-funded FAME project is enhancing automated driving solutions across Europe by improving the scalability, comparability and complementarity of research and innovation projects.

Leveraging the achievements of the previous Horizon project ARCADE, the FAME project addresses key challenges in advancing automated mobility, including a lack of harmonised legislation and stakeholder alignment across Member States.

It also supports the commitment of the European Commission and the CCAM Partnership to provide a long-term coordination framework for large-scale testing and evaluation activities in Europe.

"The mission/goal of FAME is to align research and innovation results on automated mobility in Europe, bringing them more visibility and making more efficient use of future R&I funding," explains Stephane Dreher, FAME project coordinator and head of CCAM at ERTICO.

## Building tools for success

FAME is developing a comprehensive European framework for CCAM testing on public roads. This framework integrates a standardised taxonomy, a common evaluation methodology (CEM), a CCAM Test Data Space for secure and efficient research data sharing, and a legal and ethical framework to guarantee compliance and cross-border alignment.

The project also manages the Connected Automated Driving Knowledge Base that consolidates information related to CCAM R&I and testing based on results from European and national projects in the field. The platform centralises resources for researchers, policymakers and industry professionals across Europe. This holistic approach ensures that said resources and research results are used effectively for scaling up and deploying innovative solutions that benefit all of the EU.

## Collaboration and knowledge sharing

FAME's success lies in its capacity to build partnerships across Europe, and beyond. Working with 23 partners and over 2 000 stakeholders from the Joint Connected Automated Driving network, including industry leaders, policymakers and researchers, as well as international cooperation (Australia, Japan, South Korea, United Arab Emirates and United States), the project has established a strong network for collaboration and knowledge sharing, and supports the active participation of EU experts in international events and exchanges.

Regular events such as workshops, webinars and the biennial EUCAD conference facilitate the transfer of insights and best practice as well as the alignment on future research priorities. The project also has strong cooperation with the Member States Representatives Group (SRG) from the CCAM Partnership which meets twice a year during each EU Council presidency. Member States are actively contributing to the Knowledge Base: today, 50 % of the R&I, testing and demonstration initiatives referenced on the platform are national.

*Creating consensus on common challenges is vital.*

"Creating consensus on common challenges is vital," notes Dreher. "We have developed a good approach to bring stakeholders together to share operational experiences.

## The future of automated mobility

As the project nears completion in June 2025, its tools and frameworks have already made a tangible impact. The first draft of the EU-CEM Handbook and the CCAM Test Data Space are available for proof testing.

FAME also made a key contribution to the High-Level Dialogue meeting held under the EU-Belgium Presidency in June 2023 in Ghent, co-organising a session with the Flemish Ministry of Mobility on testing regulations and enhancing collaboration.

"It's gratifying to see Member States take our recommendations into account," Dreher remarks. "It shows that FAME has reached beyond the research community and into real-world uses."

**PROJECT**
**FAME – Framework for coordination of Automated Mobility in Europe**

**COORDINATED BY**
ERTICO in Belgium

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101069898

**PROJECT WEBSITE**
connectedautomateddriving.eu/about/fame

# Developing robust self-driving vehicles that can go the distance

The EU-funded Hi-Drive project focuses on advancing the operational design domain of automated driving systems, enabling them to handle complex scenarios such as urban traffic, adverse weather and varied road cultures across Europe.




Despite significant advancements, current automated driving systems remain limited in scope. Today's systems manage tasks such as lane-keeping and adaptive cruise control, but struggle with complex situations such as navigating roadworks or sudden accidents.

By improving connected automated driving (CAD), the Hi-Drive project aims to reduce human intervention and support safer mobility – an essential objective given human error accounts for the vast majority of traffic accidents globally.

Hi-Drive's approach was to expand the operational design domain (ODD) of automated systems, enabling them to function reliably in real-world conditions. Through the integration of cutting-edge communication, artificial intelligence and cybersecurity technologies, the project is equipping vehicles to tackle the complex demands of everyday driving.

"Automated driving still has many gaps," says project coordinator Aria Etemad from Volkswagen Group Innovation. "You can't drive from your origin to your destination without interruption. The idea of the project was to close those gaps."

## Reading the road

Central to this goal were what the project calls "enablers" – innovations designed to overcome current limitations. These include enhanced communication technologies for real-time information exchange, improved positioning systems for precise navigation, and robust cybersecurity to protect against malicious interference.

Hi-Drive tested these capabilities in challenging environments. One of their automated vehicles successfully navigated an eight-kilometre tunnel in Germany, overcoming radar interference and GPS signal loss, conditions that may confound traditional sensors.

In Finland, another breakthrough was highlighted in the use of Hotspot MapCloud and Landmark Signature Recognition Maps to enable autonomous driving in adverse weather. These systems, which rely on artificial landmarks rather than visible lane markings, enabled vehicles to navigate rural and urban roads at speeds of up to 50 kph.

## Building trust, accelerating adoption

Hi-Drive recognised that advancing technology alone is not enough. Public awareness and standardised regulations are vital for the success of automated vehicles. To achieve this, the project worked with mobility clubs from multiple European countries to develop driver training programmes tailored to their unique languages and driving cultures.

"Awareness is one of the key issues," adds Etemad. "We worked with mobility clubs to develop driver training curriculums in 11 different countries and languages."

The team has further engaged the public through roadshows showcasing the project's advancements. These events highlighted key achievements, such as vehicle-to-vehicle communication in highway merging scenarios, automated driving in adverse weather conditions, user acceptance studies, and demonstrations of complex real-world use cases such as tunnel navigation.

These activities, combined with dissemination through the Hi-Drive website and their YouTube channel, made advanced automated driving concepts accessible to a broader audience.

## Collaboration for safer roads

Collaboration was also central to Hi-Drive's success. The project brings together 40 partners from across the mobility ecosystem, including automotive suppliers, research institutes, associations, traffic engineers, deployment organisations and mobility clubs. This diverse consortium has drawn on expertise from engineering, policymaking and even psychology. Insights from psychologists were instrumental in better understanding driver behaviour and effective communication methods.

*Automated driving still has many gaps. You can't drive from your origin to your destination without interruption. The idea of the project was to close those gaps.*

As it approaches its conclusion in late 2025, Hi-Drive aims to support the delivery of reliable, robust high automation. However, Etemad emphasises that this is only the beginning. "Extending today's limited ODD will have a tremendous impact on the future of automation, but we will need to continue optimising these systems," he concludes. "This will not be our last project on automated driving."

**PROJECT**
**Hi-Drive – Addressing challenges toward the deployment of higher automation**

**COORDINATED BY**
Volkswagen Group Innovation in Germany

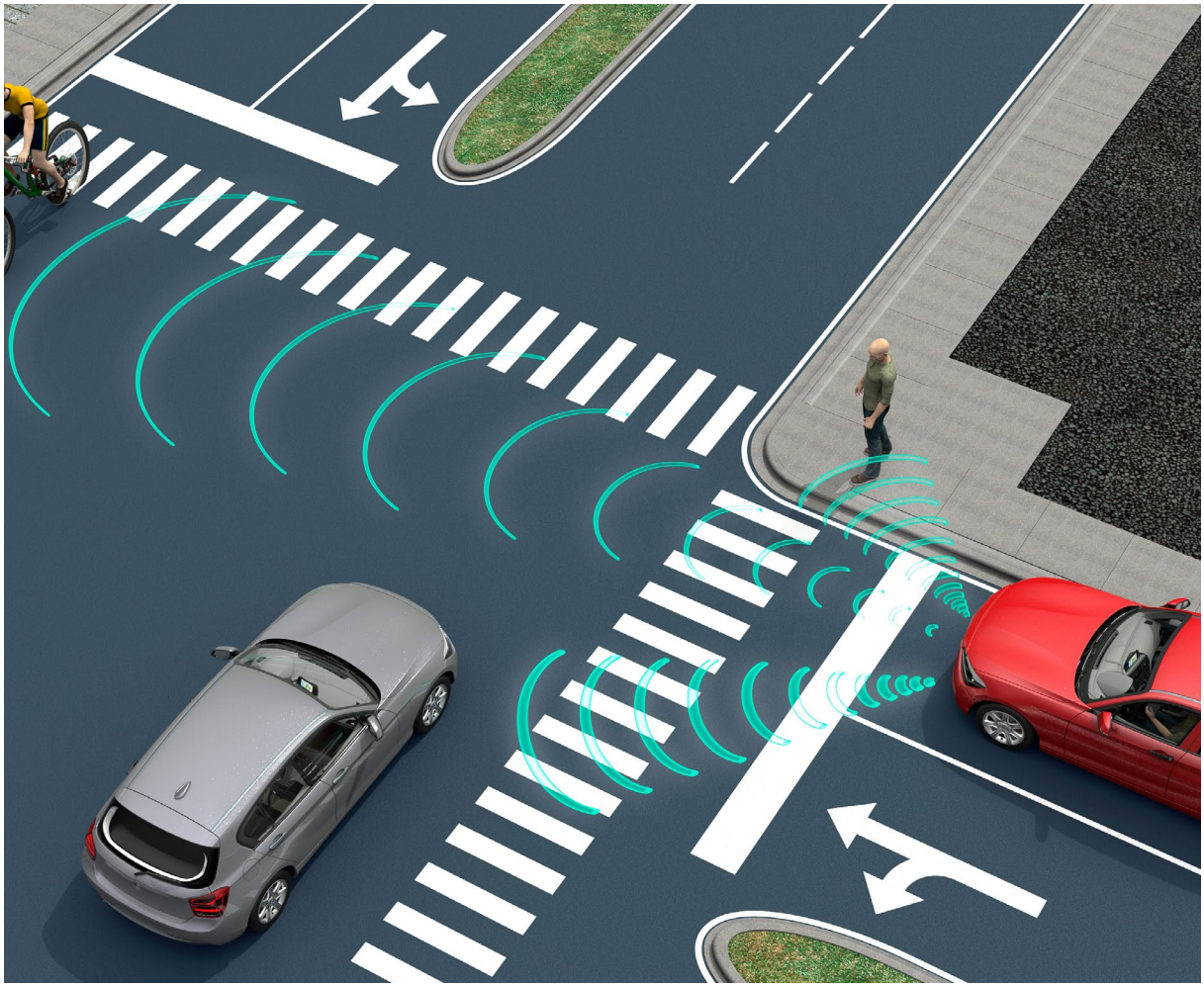
**FUNDED UNDER**
Horizon 2020 – TRANSPORT

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101006664

**PROJECT WEBSITE**
hi-drive.eu

# A model library of driving behaviours

A new library of models of human driving behaviour developed by the EU-funded i4Driving project will serve as a road safety baseline for assessing automated driving functions.





Before autonomous vehicles can hit the road, they first need to prove that they are as safe as human drivers.

"The safe and efficient coexistence of automated and human-driven vehicles poses a profound, interdisciplinary challenge to transportation science," says Maria Rodrigues, senior project manager for transport and mobility at Panteia.

To meet this challenge, transportation science relies heavily on virtual simulations to run tests. But to work, these simulations need to be built on credible models of human driving behaviour.

This is where the EU-funded i4Driving project comes in. "Our goal is to develop a new model library of human driving behaviour that will serve as a human baseline for road safety, against which automated driving systems (ADSs) and functions can be

compared and evaluated," explains Vincenzo Punzo, i4Driving scientific coordinator and professor at the University of Naples Federico II in Italy.

## Assessing critical situations

For the i4Driving project, a new library doesn't necessarily mean new models. Instead, it means developing a combination of new and existing models that can be used to assess ADSs in both scenario- and traffic-based safety simulations.

According to Punzo, such combinations will ensure that virtual simulations accurately reflect the complexity of driving behaviour in realistic road traffic systems.

"On the one hand, by incorporating the heterogeneity of drivers and driver behaviours, our models can mimic both the non-critical and safety-critical situations found in daily traffic," he adds. "On the other hand, 'proper' system complexity is needed to make a robust and meaningful analysis of road safety."

Although the project is still ongoing, several important results have already been achieved. Groundbreaking experiments based on the models have been carried out on four driving simulations. The experimental design combines driver and environmental characteristics – such as age, gender, driving experience or lighting conditions. They also use different operational design domains – urban and extra-urban – in different locations across Europe.

*The safe and efficient coexistence of automated and human-driven vehicles poses a profound, interdisciplinary challenge to transportation science.*

"Unlike traditional driving simulator experiments, which investigate specific scenarios, i4Driving's experiments expose a driver to complex road and traffic sequences similar to those encountered in naturalistic driving studies," explains Punzo. "This allows us to characterise both the heterogeneity of drivers and driving behaviour in realistic traffic conditions."

## Safer, more sustainable transport

Once the project is complete, its models will immediately be able to serve as a human baseline for defining the required safety level of automated driving systems. Ultimately, the same models will support the automotive industry, its research partners, certification bodies and consumer testing organisations to realistically simulate the behaviour of other human-driven vehicles in mixed traffic.

"The i4Driving models will serve as a reference for the design of human-like and therefore easily predictable and acceptable behaviour of automated vehicles in mixed traffic, enabling safe and trustworthy interaction with conventional vehicles," concludes Rodrigues. "The net result will be a safer and more sustainable transport system and a better use of road infrastructure capacity."

**PROJECT**
**i4Driving – Integrated 4D driver modelling under uncertainty**

**COORDINATED BY**
Panteia in the Netherlands

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101076165

**PROJECT WEBSITE**
i4driving.eu

# Reshaping mobility for all

By designing, developing and implementing the infrastructure that will enable cooperative, connected and automated mobility, the EU-funded IN2CCAM project looks to make transportation safer, sustainable and inclusive.



Automated vehicles have the potential to make transport safer, more sustainable and more inclusive by reducing accidents, decreasing emissions and increasing access. However, turning this potential into performance requires new technologies, new infrastructure and new regulations.

"By accelerating the implementation of innovative connected, cooperative and automated mobility technologies and systems, IN2CCAM aims to pave the way towards a cleaner, safer and smarter way of transporting both goods and people," says Maria Pia Fanti, a professor of System and Control Engineering at the Polytechnic University of Bari, the project's coordinating partner.

## Designing and developing new infrastructure

The heart of the project is the design and development of enhanced road infrastructure. This includes updating the physical environment, such as road signs, road layout, dedicated lanes and traffic lights. It also involves proposing suitable operational solutions, such as fleet management strategies, traffic planning and forecasting models, and new rules and regulations.

Another core focus of the project is developing the digital infrastructure that will enable automated mobility. This includes everything from the communication technology that will improve connectivity to road sensors and cameras, high-definition maps, static and dynamic data, new optimised services, digital twin networks, and consensus algorithms.

"Thanks to innovations in automation, our suite of services and technologies will contribute to reducing the number of road accidents caused by human error," explains Fanti. "They will also have a positive environmental impact, reducing congestion and emissions and avoiding unnecessary trips."

## An opportunity to rework the rules and regulations

While important, designing infrastructure is only the first step. To have its intended impact, it must be implemented – and that requires extensive testing. "Because much of the infrastructure we are designing is safety-critical, the rules and regulations for validating it are very strict," notes Fanti.

Making this process more complicated is that each EU Member State has its own set of rules and regulations for automated vehicles. This meant that each technology would have to be tested in a different way in each country.

"We saw an opportunity to work with regulators and develop uniform rules for the testing of automated vehicle infrastructure within the EU," adds Fanti. "Because this enables the streamlined testing of not only our own infrastructure, but also the technologies and solutions developed by other initiatives, it will likely be the project's main legacy."

## Testing now happening across Europe

The project is currently busy testing its solutions via living labs, putting automated vehicles through real-traffic operations. With a focus on last-mile mobility, the living lab in Tampere, Finland is building a mobility hub that looks to connect public transport with micromobility devices, bicycles and pedestrians. The tests involve automated vehicles equipped with environment perception sensors that can exchange information for automatically manoeuvring or deviating.

*Our suite of services and technologies will contribute to reducing the number of road accidents caused by human error.*

In Trikala, Greece, researchers are using a fleet of automated shuttles to connect a suburban area with the city centre, facilitating the mobility of workers who live in this peripheral area and other vulnerable groups. Further labs are in operation in Italy and Spain.

"This work highlights how IN2CCAM is reshaping mobility to not only be safer and more sustainable, but also ensure that it is inclusive and accessible for everyone," concludes Fanti.

**PROJECT**
**IN2CCAM – Enhancing Integration and Interoperability of CCAM eco-system**

**COORDINATED BY**
Polytechnic University of Bari in Italy

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101076791

**PROJECT WEBSITE**
in2ccam.eu

# Assessing societal impacts of new CCAM interventions

Mobility planners need to take account of the social impacts of connected, cooperative and automated mobility technologies. The EU-funded Move2CCAM put citizens at the heart of this conversation.


© Move2CCAM

In the near future, connected and automated vehicles will interact directly with one another and with road infrastructure. Large-scale demonstration projects have seen significant advances in this field, and the potential societal impacts of this technology cannot be overlooked.

"It is important that the human factor is not left behind," says Move2CCAM project coordinator Héctor Cañas from BABLE in Germany. "Up until now, there has been little research focusing solely on this aspect."

Move2CCAM was launched specifically to take account of how connected and automated mobility solutions might affect society, the economy, health and the environment. The project team wanted to centre these conversations on the interests of citizens and civic organisations, making it easier for decision makers to take account of societal impacts.

*Citizens came up with some really cool ideas for how automated mobility could benefit their communities.*

The team gathered the views of stakeholders across Cyprus, France, Germany, Greece, the Netherlands, Poland, Spain and the United Kingdom. "These regions were selected because they have different transport systems and needs," explains Cañas.

Co-creation activities were organised to better understand current perceptions of automated mobility. These activities included online and in-person meetings. In total, over 8 000 citizens were involved.

"From this we were able to identify mobility needs and challenges in each of the regions, and to co-create specific mobility use cases," adds Cañas. "Citizens came up with some really cool ideas for how automated mobility could benefit their communities."

These ideas included rural automated shuttle buses, medicine-delivering drones, and automated long-distance freight lorries. "The freight industry is having a hard time replacing retired drivers, so this was seen as one solution," explains Cañas.

## Online CCAM resource

Starting with 50 identified use cases, a priority shortlist of 15 was identified by the project team, and a deeper analysis of the various social and economic impacts of these carried out.

This research work then fed into the project's key deliverable – the Move2CCAM impact assessment tool. This online resource is designed to give city planners and researchers a better perspective of how new CCAM technologies will have an impact across eight categories such as job creation, the environment and public health.

The tool allows users to select the region they want to evaluate. Currently these include Helmond in the Netherlands, the Upper Silesian Basin metropolis in Poland, and the North Aegean in Greece. "You then select the use case you want to evaluate, for example, self-driving taxis," notes Cañas.

Using baseline data gathered during the first few years of the project, the tool shows the impact these use cases might have across eight categories, through to 2050. There is also the possibility of exporting the data behind the online summary, in order to analyse scenarios in greater detail.

## Future large-scale demonstrator

A training course designed to help people use the tool, and recommendations for large-scale demos, will be launched over the next few months. Currently the team is in discussions about the best way to move forward.

"One of the most important aspects to define is how we can sustain the tool after Move2CCAM," says Cañas. "We are exploring the possibility of licensing the tool with different fee options, including for example a free version for university research projects."

The project team also want to ensure that the assessment tool is available for use in future large-scale demonstrator CCAM projects. "All large-scale demos will need to evaluate societal needs and impacts," adds Cañas. "We see this tool as an asset for these projects, and hope to include more scenarios and end-use cases as we move forward."

**PROJECT**
**Move2CCAM – MethOds and tools for comprehensive impact Assessment of the CCAM solutions for passengers and goods**

**COORDINATED BY**
BABLE in Germany

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101069852

**PROJECT WEBSITE**
move2ccam.eu

# Automated mobility starts with physical and digital infrastructure

The EU-funded PoDIUM project is advancing a range of technologies and solutions that will play a key role in the connectivity and cooperation needed to achieve smart mobility and autonomous driving.



Hear the term 'smart mobility' and the first thing that springs to mind is probably an autonomous vehicle, not the road it runs on. But when it comes to CCAM, you can't have one without the other.

"Autonomous driving doesn't happen with a snap of the fingers, it requires a complex infrastructure comprised of both physical and digital technologies," says Angelos Amditis, R&D director from the Institute of Communication and Computer Systems at the National Technical University of Athens in Greece.

*Autonomous driving doesn't happen with a snap of the fingers, it requires a complex infrastructure comprised of both physical and digital technologies.*

The PoDIUM project is helping to deliver such infrastructure. "With a focus on multi-connectivity and hybrid data management, PoDIUM aims to unlock real-world connectivity and cooperation solutions that will enable higher levels of CCAM," explains Amditis, who serves as the project coordinator.

## Prerequisite conditions

Although still a work in progress, the project has already delivered a blueprint for future CCAM systems while also developing several new automated mobility services.

One early achievement was the specification of a high-level platform architecture that provides a robust framework for CCAM services. During its first year, the project also delivered a comprehensive CCAM market analysis that details key actors, roles, relationships and revenue streams.

"These early successes are testament to the excellent collaboration among all project partners, which allowed us to make significant progress and deliver impactful results," adds Amditis.

Among those results is a real-time, reconfigurable, multi-connectivity solution that can be used to optimise available short-range and cellular communication channels. This innovation ensures that the physical and digital infrastructure provides the necessary level of reliability, availability and redundancy.

The project also developed a hybrid data management architecture that can fuse data coming from multiple sources, including vehicles and road infrastructure. "Having ready access to such data allows us to create advanced environment perception models and digital twins, both of which enable interoperability between vehicles and are prerequisites to autonomous operations," notes Amditis.

## Navigating roadblocks

With these technologies in hand, the project next looked to test them in real-world environments. They soon discovered that doing so was easier said than done. "Due to the relatively immature EU legislation on autonomous mobility, the project encountered obstacles related to obtaining permission from authorities for automated vehicle and road tests," remarks Amditis.

The project was unable to secure the necessary permits from the local road authority for cross-border trials between Spain and France. So, instead, they split the related use case into two scenarios, one simulating the telecommunication cross-border conditions on a highway near Barcelona, the other demonstrating the benefits of its mobility as a service app at the border areas of La Jonquera in Spain and Le Boulou in France.

The project is currently conducting high-value use cases in urban and highway environments in Germany, Spain and Italy.

## Safe and seamless transport

As the project enters its final year, it looks to further refine and expand its tools, with a focus on integrating them into real-world applications. They also plan to explore opportunities for collaborating with industry partners to test and scale the PoDIUM platform.

"These final efforts not only advance the tools we need to achieve safer, more seamless automated transportation systems, they also contribute to building public trust in autonomous mobility," concludes Amditis.

**PROJECT**
**PoDIUM – PDI connectivity and cooperation enablers building trust and sustainability for CCAM**

**COORDINATED BY**
Institute of Communication and Computer Systems in Greece

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101069547

**PROJECT WEBSITE**
podium-project.eu

# Protecting Europe's connected cars against cyberthreats

A suite of security tools developed by the EU-funded SELFY project will help ensure Europe's connected traffic systems are protected against digital attack.



Europe's transport system is becoming increasingly digital. Estimates suggest the number of connected cars in Europe will reach 50 million in Europe by 2026, as the integration of smart, automated vehicles advances.

Safety will be paramount in this expanding network, characterised as CCAM, and EU regulations will require cybersecurity certificates to defend against any external threats.

"CCAM is one of the next big trends in the automotive industry which has the potential to improve the transport sector in Europe, leading to a safer, more accessible, sustainable, cost-effective and demand-responsive transport everywhere and for everyone," says Fanny Breuil, SELFY project coordinator at the Eurecat Technology Centre in Barcelona, Spain.

Against this backdrop, the SELFY project developed a series of collaborative tools to enhance network resilience, data sharing, situational awareness and trust in connected cars. The tools will feed into a broader, global software solution which will manage responses to cyberattacks and other malicious hazards.

"It has been really interesting to deploy the tools in simulations and the laboratory," adds Víctor Jiménez, technical coordinator of the SELFY project. "The cooperation and collaboration of all the tools provided an extra layer of security, privacy and resilience to the CCAM, acting as a technology enabler."

## A toolbox for connected cars

The development of the tools included several stages. First, the team carried out an analysis and definition of the SELFY toolbox architecture and requirements. This was followed by research and development of the algorithms needed to implement the tools. Finally, prototypes of the tools and technologies were developed and tested.

Each of the tools was individually validated in the laboratory in 12 different use cases. "SELFY's main ambition is to become the main European provider of collaborative tools for the self-management of security and resilience of the CCAM sector, facilitating its adoption at all stages of the value chain," explains Jiménez.

*SELFY's main ambition is to become the main European provider of collaborative tools for the self-management of security and resilience of the CCAM sector.*

Through the project, the team created a suite of 21 tools which can be easily integrated into existing automobile manufacturer systems and deployed in cloud systems spread across vehicles, infrastructure and traffic management centres. These tools are grouped into three main systems, which foster situational awareness, cooperative resilience, and trust and secure data exchange.

The Situational Awareness and Collective Perception macro tool analyses the CCAM system environment, integrating cutting-edge connected and intelligent infrastructures and in-vehicle sensors to gather detailed insights into the overall CCAM ecosystem. Tools in this system aimed to facilitate the aggregation and fusion of shared perception data between connected vehicles.

The Cooperative Resilience and Healing System safeguards CCAM environments from cyberattacks and security breaches, and is orchestrated by a Vehicle Security Operation Centre (VSOC).

Finally, the Trust Data Management System (TDMS) includes tools that build a secure and trusted environment for data, mainly based on cryptographic algorithms and technologies.

## Validation in real-world environments

In early 2025, the SELFY team will conduct a validation of the tools in a controlled environment, through either simulations or real-world environments. "SELFY has responded to emerging risks and threats requiring a global, distributed, decentralised and collaborative solution, functional amongst static and mobile assets and actors of the CCAM ecosystem," says Breuil.

**PROJECT**
**SELFY – SELF assessment, protection & healing tools for a trustworthY and resilient CCAM**

**COORDINATED BY**
Eurecat Technology Centre in Spain

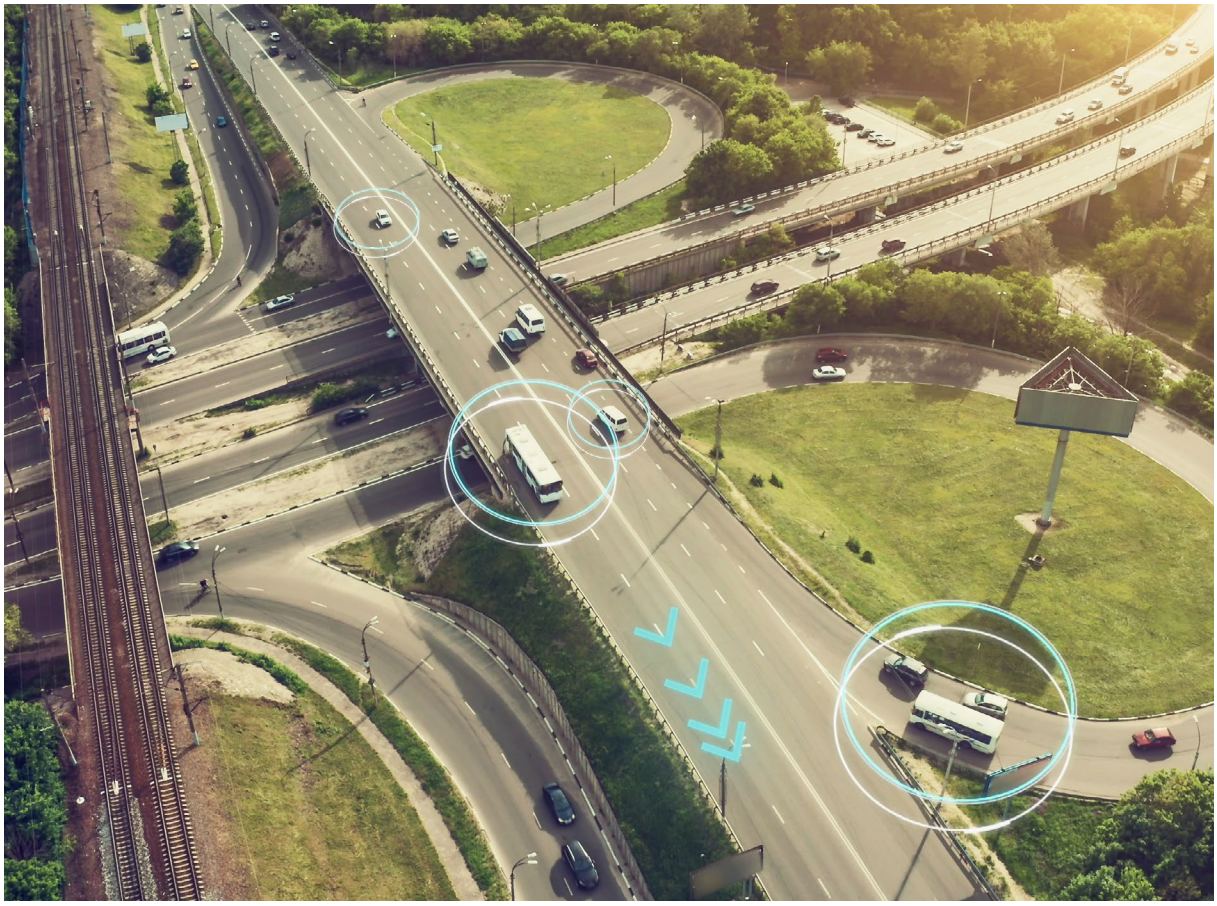
**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101069748

**PROJECT WEBSITE**
selfy-project.eu

# Showcasing the benefits of automated vehicles for sustainable urban transport

A multi-city project carried out by the EU-funded SHOW project tested an integrated fleet of public automated vehicles, highlighting the potential for greener mobility.





Some of the most profound changes in Europe's transportation will come in its cities. Urban traffic brings a range of challenges, including congestion, competition for space, environmental impact and health problems. Automated and intelligent vehicles could offer more sustainable, efficient and user-friendly public transport systems throughout Europe's urban centres.

The EU-funded SHOW project sought to demonstrate the benefits that an integrated fleet of automated vehicles (AVs) could bring to urban transport.

"We took as a starting point the concept that automated vehicles represent a unique opportunity for a fundamental change in urban

mobility, but only when AVs are integrated into public transport networks," explains project coordinator John McSweeney.

Coordinated by the International Association of Public Transport (UITP) in Belgium, SHOW conducted large-scale trials that involved over 160 000 passengers, and more than 3 000 cargo deliveries. The project deployed 74 connected AVs including shuttles, buses, robo-taxis and cargo vehicles across 20 European cities.

*Replacing privately owned cars with privately owned automated cars is not progress.*

"In most of the SHOW pilot sites, vehicles operated on public roads, in mixed traffic, carrying real passengers and serving real mobility needs," says McSweeney. "This was the key – to put vehicles on the road in real conditions, learn what it takes to do this successfully, transform that experience into concrete deliverables and share that knowledge so it can be built on and replicated elsewhere."

## Building a path to smart mobility

Run by a consortium of 69 partners across Europe, SHOW sought to understand the needs of a CCAM system in Europe. The team mapped out existing ideas of business and operating models for AVs, and analysed the ethical, legal and regulatory conditions for AV operations.

Alongside this, significant work took place laying the technical groundwork for AV deployment – from creating a common system architecture and data collection framework, to improving vehicle functions, to work on digital and physical infrastructure.

## Concrete benefits

The SHOW project produced a range of real, tangible benefits at all levels for Europe's CCAM ecosystem. As the fleet being tested in real-world conditions, public transport operators and equipment manufacturers gained valuable experience in running public AV services.

SHOW produced practical guidelines for the transport industry and cities and will soon finalise policy recommendations for the European Commission. SHOW also identified priority business cases for AV deployment, which can be built on in future large-scale demonstration projects.

Thanks to a framework that ensured data compatibility across sites, the team could create a Simulation Suite, which models the impact of AVs both city-wide and at the street level.

"Personally, the most surprising aspect of the operations has been how quickly people adapt to, and use, these new services," notes McSweeney. "Public acceptance was incredibly high, and passenger numbers were very encouraging."

## Vision of automated public transport

The vast majority of SHOW pilot sites will continue in some format, either as commercial operations or as part of research projects. The team hopes the project demonstrates that the benefits of AVs are best delivered when they are integrated into a public transport mix.

"Replacing privately owned cars with privately owned automated cars is not progress," adds McSweeney. "AVs can help public transport reach more people and more places, so we hope that future works on AVs in Europe ensure that public transport is at the heart of that discussion."

**PROJECT**
**SHOW – SHared automation Operating models for Worldwide adoption**

**COORDINATED BY**
International Association of Public Transport - UITP in Belgium

**FUNDED UNDER**
Horizon 2020 – TRANSPORT

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/875530

**PROJECT WEBSITE**
show-project.eu

# Putting citizens at the heart of the transport revolution

Understanding the needs of citizens will help Europe to develop inclusive transport systems for the future. The EU-funded SINFONICA project is helping to ensure nobody is left behind.



Road vehicles will soon be able to interact directly with each other and with road infrastructure. Such CCAM will help to alleviate urban congestion, extend the reach of public transportation and improve road safety.

It is critical that this transition is inclusive, and that every European citizen can benefit from this coming technological revolution.

"The field of CCAM has tended to focus on the technological aspects, leaving social issues related to inclusion and equal opportunities in the background," notes SINFONICA project technical coordinator Giulia Renzi, from the University of Modena and Reggio Emilia in Italy. "SINFONICA wanted to address this challenge, and steer CCAM research and innovation towards the topics of inclusiveness and accessibility."

## Co-creating research

The SINFONICA project relied heavily on social engagement to co-create research activities and gather opinions, fears and views that could help to identify people-oriented solutions.

Groups of users and stakeholders were established in four different locations – the Province of Noord Brabant in the Netherlands, the municipalities of Trikala in Greece and Hamburg in Germany, and the West Midlands region in the United Kingdom. Key issues were discussed, and the results reflected in a preliminary report for more inclusive CCAM services. These highlight the need for passenger assistance, good communication between service provider and passenger, and inclusive transport payment methods (i.e. not only via an app).

"These groups were formed to reflect as much as possible the diversity and heterogeneity of the needs, concerns and expectations of future mobility users, citizens and stakeholders," explains Renzi. "Particular attention was paid to people with mobility challenges."

## Charting attitudes towards CCAM

Opinions from these groups have been gathered through interviews, focus groups and workshops, as well as an EU-wide online survey that was translated into eight languages.

*This work will help to lay the foundation for a new research approach to CCAM, combining technology with the humanities.*

"This enabled us to collect more than 4 500 datasets," adds Renzi, "providing us with an important baseline on which to carry out analyses during the second phase of our project."

During the remainder of SINFONICA, which runs until August 2025, this data and information will be put to use. Materials such as guidelines, best practices and recommendations will be drafted and made available to policymakers and industry. The aim of these is to stimulate decision-making and to guide choices towards more inclusive and accessible CCAM solutions.

"This work will help to lay the foundation for a new research approach to CCAM, combining technology with the humanities," says Renzi. "Our recommendations and best practices will come not just from analysis or theories, but from people, citizens, associations, and so on."

## Tools for transport authorities

The SINFONICA project also aims to develop tools to support transport authorities and policymakers. These will include a generic simulation model for CCAM solutions that will enable fairness and inclusiveness to be incorporated in the management of traffic flows.

A Knowledge Map Explorer will also be developed. This will be an intuitive interface for consulting tailored recommendations for specific categories of stakeholders.

"Another aim of the project is to serve as an inspiration for future projects dealing with CCAM," says Renzi. "Our hope is that aspects of the social sciences and humanities will be increasingly explored on the path towards innovation in this area. This will ultimately make public transport more sustainable, inclusive and accessible, so that no one is left behind."

**PROJECT**
**SINFONICA – Social INnovation to FOster iNclusIve Cooperative, connected and Automated mobility**

**COORDINATED BY**
University of Modena and Reggio Emilia in Italy

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101064988

**PROJECT WEBSITE**
sinfonica.eu

# Ensuring AVs can safely navigate everything in their path

Conventional testing methods struggle with the demands of highly automated vehicles. The EU-funded SUNRISE project's virtual testing systems will contribute to safety on Europe's streets.



Ensuring the safety of CCAM systems in all possible driving scenarios is a significant challenge, particularly as the underlying technology increases in complexity.

Validating systems with higher levels of automation isn't always possible with conventional assessment methods, which rely heavily on physical testing.

"The number of scenarios that automated vehicles have to master increases exponentially with their automation level," explains Stefan de Vries, SUNRISE project coordinator at IDIADA in Spain.

Depending on the environment in which the vehicles are expected to operate, from highways to urban areas, the number of scenarios that require testing can run into the tens of thousands.

To address this, researchers with the SUNRISE project developed a Safety Assurance Framework (SAF) for the validation of highly automated vehicles that includes virtual simulation.

"Virtual simulation allows many test scenarios in a short time and at low cost and risk, making it an essential tool in the safety assessment procedures of highly automated and connected vehicles," says de Vries.

## CCAM Safety Assurance Framework

The SAF developed under SUNRISE was designed to fulfil the needs of key international users, to the greatest possible extent.

The team defined the terminology of the framework, and devised a method and a tool for scenario selection, a method for the creation of subspaces within each scenario, a way to allocate scenarios to specific test environments, and a variety of metrics and rating procedures.

They then defined a suite of tools for safety assessment of CCAM systems, ranging from virtual simulation to hybrid and physical test environments.

Finally, de Vries and his colleagues designed the SUNRISE Data Framework, available as an online platform which provides centralised access to a growing number of external scenario databases, allowing its users to extract safety-relevant scenarios, allocate these scenarios to test environments and manage the test results.

## Adoption of the SAF

On schedule to complete in August 2025, the project has already delivered a range of outputs, including a draft version of the SAF and its underlying methods, which are available on the SUNRISE website.

The project also created an online SAF handbook, which offers users guidance on the SAF, explains each step of the framework, and is enriched with application examples and links that dive into further details.

The team hopes that after the project ends in August 2025, key results will feed into European regulations, standards and policies. "That would greatly facilitate SAF adoption by the target users," adds de Vries. "In parallel, SUNRISE partners will stimulate the uptake of the SAF by target users, so they can fully exploit the SAF for their own commercial and non-commercial benefits."

*Virtual simulation allows many test scenarios in a short time and at low cost and risk.*

The long-term goal of the SUNRISE project is for the SAF to be adopted by target users: vehicle safety bodies, certifiers, and industry entities such as vehicle manufacturers and their suppliers, facilitating the safe introduction of CCAM systems across Europe.

"Achievement of that goal is expected to significantly accelerate the large-scale introduction of CCAM systems on European public roads and thereby bring citizens a few steps closer to enjoying their benefits – including increased road safety," notes de Vries.

**PROJECT**
**SUNRISE – Safety assUraNce fRamework for connected, automated mobIlity SystEms**

**COORDINATED BY**
IDIADA Automotive Technology in Spain

**FUNDED UNDER**
Horizon Europe – Climate, Energy and Mobility

**CORDIS FACTSHEET**
cordis.europa.eu/project/id/101069573

**PROJECT WEBSITE**
ccam-sunrise-project.eu

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# RESULTS PACK ON GREEN MANUFACTURING

Europe's manufacturing sector occupies a central position to drive sustainability and digitalisation agendas across the region. This CORDIS Results Pack highlights six EU-funded research projects contributing to waste reduction, improved product quality and optimised energy use.


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