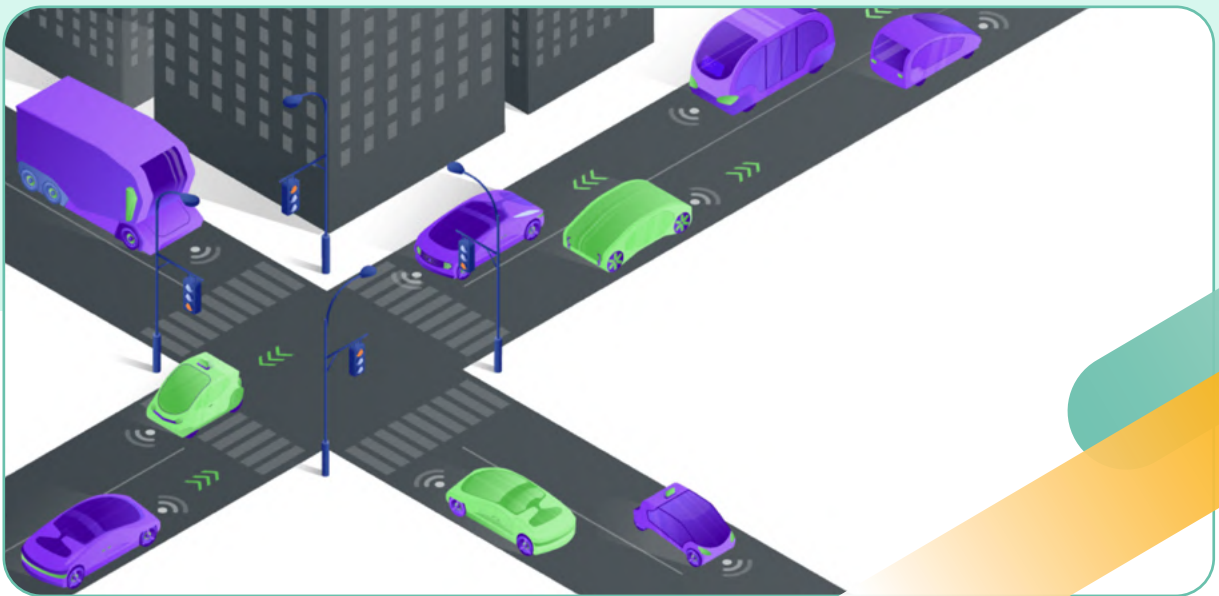


SHOW

Supporting Automation in Public Transport



The arrival of automated vehicles (AVs) presents a transformative opportunity for urban mobility, particularly when integrated into public transport networks. By incorporating AVs into shared and connected fleets, cities can significantly reduce the number of cars on the road, improving access to previously hard-to-reach areas and enhancing first/last-mile connectivity.



International Association of Public Transport (UITP)
Rue Sainte-Marie, 6 | B-1080 Brussels | Belgium

Tel: +32 2 673 61 00
info@uitp.org
www.uitp.org

© UITP – International Association of Public Transport, (July 2026)

All rights reserved / No part of this publication may be reproduced or transmitted in any form or by any means without the written permission of the International Association of Public Transport

TABLE OF CONTENTS

04

Introduction

10

Challenges

05

About SHOW

11

Recommendations & Guidelines

07

Pilot Sites

15

Looking Beyond SHOW

Introduction

Automated vehicles (AVs), integrated into public transport (PT), have the potential to transform urban mobility. By expanding coverage and delivering new services, AVs can increase accessibility and promote efficient, seamless, and sustainable mobility. In this context, UITP coordinated the Horizon 2020 project 'SHared automation Operating models for Worldwide adoption' (SHOW) to deploy shared, connected, automated vehicles in PT networks in cities around Europe. Operators, authorities, and other partners tested services in real-world environments, delivering real services to meet passenger needs. In over four years of testing, SHOW moved public transport closer to unlocking the transformative potential of AV integration.

In over four years of testing, SHOW moved public transport closer to unlocking the transformative potential of AV integration.

SHOW was the largest and most holistic initiative of its time, piloting AVs in a range of environments. 72 vehicles were deployed over the course of the project at 20 mixed traffic sites and 4 controlled environments. Partners deployed a range of services, including fixed-line routes and on-demand offerings, serving a variety of passenger groups in dense urban environments, campuses and industry parks, and rural and peri-urban settings. SHOW also included a landmark advancement, with Society of Automotive Engineers (SAE) Level 4 (L4) operations at two pilot sites – services carrying passengers without an operator onboard the vehicle. However, putting vehicles on the road was only one of SHOW's objectives.

Along with technical advancements in vehicle and sensor technology, the project supported work on the development of use cases, business models, infrastructure, regulations, and operational guidelines, along with user engagement and acceptance.

72

shared AVs deployed

24

urban trials across Europe, including 20 in open traffic

160,000+

passengers carried

About SHOW

The project

- Timeline: January 2020–September 2024
- Budget: €30 million (allocated under Horizon 2020)
- Members - types and roles/responsibilities:
 - 68 partners from 13 countries: original equipment manufacturers (OEMs), retrofiters, public transport operators (PTOs), fleet managers, cities and authorities, research and academia, Tier 1 suppliers and service providers, and associations
 - UITP: Project coordinator
 - The Centre for Research & Technology Hellas (CERTH): Technical management and academic guidance

SHOW Consortium

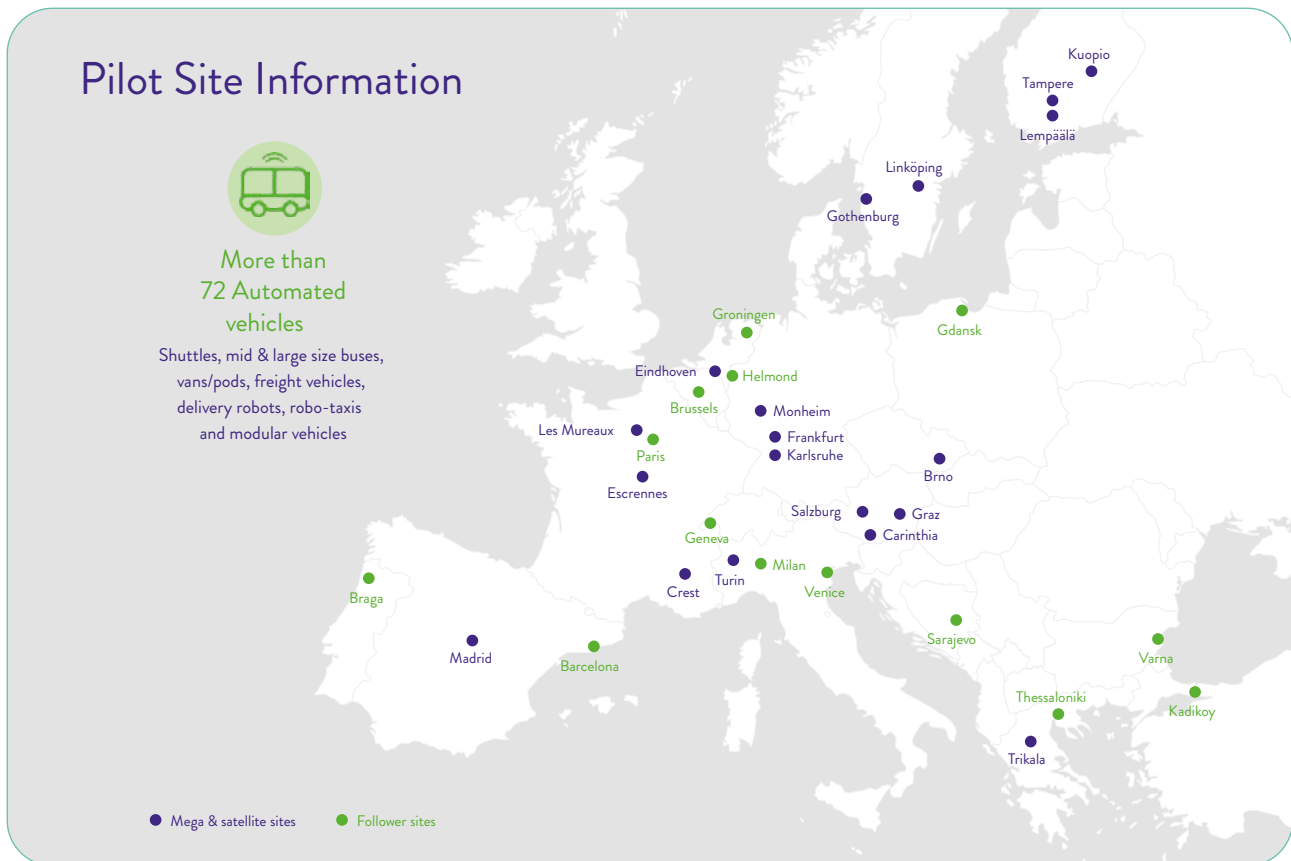


Focus areas, objectives, and activities

Focus areas	Objectives	Activities and results
Cooperative, connected, and automated mobility (CCAM) deployment	Deploy AV fleets, infrastructure, and connected services in real-life urban demonstrations in PT, with at least 12 months of service operation.	Development of pilot plans, tools, and ecosystem/public engagement strategies to ensure societal readiness. Real-life CCAV demos and operations. 166,383 passengers carried, 5,457 packages transported.
Business model development and impact assessment	Identify priority automated mobility scenarios and use cases for testing. Identify new business models. Assess AV services' city-level impact. Share knowledge and replicate services at other pilot sites.	18 use cases developed, with the most promising identified: 1. First- and last-mile connectivity using shuttles & smaller vehicles 2. Door-to-door passenger services in lower density areas 3. AVs in mass transit scenarios (e.g., automated bus rapid transit) 4. Robotaxis operating in a shared mobility scenario Structured knowledge sharing with interested cities/regions outside of SHOW. Analysis of AVs' impact on the overall transport system for 10 representative pilot sites –including traffic speed and volume, occupancy, travel time, vehicle/person kilometres (km) travelled, and cost per km. Impact assessments on road safety, traffic efficiency, energy & environment, social & equity issues, employability, logistics, UX, awareness, and acceptance. SHOW Dashboard with all key user acceptance and performance results, overall and per site.
Software and hardware development	Develop open, modular, and inclusive system architecture and tools. Improve vehicle functionality to adapt to local operating conditions and deliver safe services.	Development of standardised safety protocols, data collection, and inclusive artificial intelligence (AI) service planning and design. Development of <i>SHOW CCAM Marketplace</i> & related solutions, e.g. accident detection, mobility pattern identification, and energy management services. AI toolboxes to facilitate deployment of six AI big data-based services.
Recommendations and guidelines	Channel results and learnings into actionable recommendations. Foster international cooperation on automated mobility.	Policy recommendations and roadmap. 12 public transport authority (PTA) and PTO guidelines and 42 industry guidelines. <i>SHOW Policy Support Tool</i> to analyse impact of automated mobility & related policies. <i>Simulation Suite</i> built on pilot site data, allowing the broader ecosystem to conduct traffic, safety, and environmental analyses based on SHOW results. <i>Training courses</i> for different stakeholders. 73 publications in specialised journals and at international conferences. Joint workshops, webinars, and meetings with affiliated European projects and initiatives from Japan, China, the United States, Australia, South Korea, Singapore, and Chinese Taipei.

Pilot Sites

SHOW pilot operations took place across 'Mega' and 'Satellite' sites, designed to cover a wide range of use cases and business models, traffic environments, and geographical areas. 'Follower Sites' were cities and regions external to the project that followed its progress closely, visiting pilots and transferring SHOW insights and developments to their own AV pilots.



Urban last-mile shuttles (Frankfurt)

Rhein-Main-Verkehrsverbund (RMV), the PTA in the Rhine-Main region, has been working on automated PT systems since 2019. From November 2022 to October 2023, RMV operated a free on-demand service with two automated EasyMile electric shuttles in the Riederwald district of Frankfurt. Operating six days per week as a first-/last-mile feeder service, the AVs linked a metro station with local amenities and services along a 3km route. The service was very popular – particularly so with the elderly, a demographic traditionally more resistant to new technology – as it brought an effective mobility solution to an underserved area.

This pilot represented an important step towards driverless on-demand services in the region. Alongside the passenger service, the pilot tested important technical aspects, including an app-based booking system and remote monitoring and passenger communication systems, with a view towards fully-driverless future operations. RMV has built on the success of this pilot, bringing insights and knowledge to the [KIRA Project](#), which has deployed an autonomous on-demand service in parts of Darmstadt and Offenbach.



→ EASY (Electric Autonomous Shuttle for You) service in Frankfurt. © VGF

Bus depot automation (Madrid)

At the Madrid mega site, the municipal bus operator EMT Madrid trialled depot automation at its Carabanchel bus depot from November 2022 to November 2023. A 5-stop shuttle service for staff was developed using retrofitted vehicles – a Tecnobus minibus and a full-size 12 metre (m) Irizar bus. Including such a large vehicle was a significant step forward for SHOW. The shuttle service was designed as a precursor to open-road services in Madrid and carried almost 6,000 passengers during the pilot.

The Irizar bus was also involved in teleoperation, auto-parking, and platooning testing. This technical testing was a first step in demonstrating the feasibility of automating bus manoeuvres inside depots. Such automation can improve personnel safety and vehicle security in the depot and also enable increased efficiency for the bus operator, allowing drivers to spend more time serving passengers and less time moving buses around the depot.

Building on developments in SHOW, EMT Madrid has continued testing the depot automation use case. While permitting issues prevented the planned open-road operations from taking place, two public AV demos in Madrid generated significant interest and contributed to the creation of the ‘Madrid Mobility Sandbox’ by the City Board, paving the way for further AV testing and deployment.



→ Tecnobus minibus at the Carabanchel bus depot in Madrid. © EMT Madrid

Fully driverless operations with remote supervision (Les Mureaux and Escrennes)

The Les Mureaux and Escrennes pilots focused on fully driverless operations with remote supervision. They represented significant advancements towards the key milestone of achieving SAE L4 operation in Europe – this automation level is key to unlocking AVs' potential in public transport.

Les Mureaux

The Les Mureaux pilot, launched by mobility company Transdev, was a groundbreaking demonstration of three EasyMile shuttles running without an onboard operator. The service was piloted at the ArianeGroup campus near Paris, with the vehicles operating in dense traffic in a complex industrial environment.

Achieving L4 operation from October 2022 to November 2023 was a technical leap forward. Cybersecurity was a critical focus of the pilot, with ArianeGroup conducting audits to ensure the system's security and resilience, as well as the protection of sensitive passenger and operational data. Remote vehicle supervision was conducted from within the industrial site.

The challenging traffic environment was a significant obstacle for the driving software, along with changing weather conditions and other road users' behaviour. However, the pilot confirmed the system's ability to make complex decisions without human intervention, laying the groundwork for more robust L4 operations in the future.



→ Navetty service on the ArianeGroup campus in Les Mureaux: open-road trial and remote control station. © Transdev

Escrennes

In Escrennes, PTO Beti tested a fully autonomous L4 service with two EasyMile shuttles at an FM Logistics industrial site. In addition to operations without an on-board safety operator, remote vehicle supervision was also carried out, from a 'hypervision' centre 400km away.

The service operated from June to October 2024 in a closed industrial area with mixed traffic. It covered three stops on a 2km route that was designed to reduce the distance employees were required to walk every day for their work (10–15km). In its short operational period, the service carried more than 3,000 passengers and delivered 98.7% service reliability.

Carrying out remote supervision at a distance required developing novel procedures with on-site FM Logistics staff to conduct basic vehicle start-up/shutdown routines. The pilot confirmed that a full L4 service in a busy closed environment is technically feasible and has a strong business case. The pilot's success and its benefits for employees led to discussions between FM Logistics and Beti regarding continuing operations on a commercial basis beyond the project's lifetime.



→ Service on the FM Logistics site in Les Escrennes. © Beti



Challenges

There were a number of common challenges across SHOW pilot sites:

Ineffective regulation: Two pilot sites, Madrid and Turin, were unable to deliver passenger services on open roads as expected, as permits could not be obtained. The primary barrier was a lack of formal procedures for obtaining permits – decisions were made on an ad hoc basis, or did not advance at all, as rules were not defined. The pilot site leaders were ultimately unable to navigate this process.

Vehicle technology: In achieving L4 driving, SHOW pushed forward the limits of AV technology in Europe. However, the project also demonstrated that the application of L4 technology in open-road driving remains a distant goal. Furthermore, vehicles' inadequacy in terms of robustness and capacity to handle the daily operations expected in PT was often a limiting factor.

Scaling beyond pilots: SHOW brought valuable experience to pilot site operators, and many sites intended to continue pilots and testing as part of other projects. However, limited technology, regulation, and funding made it difficult for sites to scale up to sustainable, mature services.

These challenges, together with the real-world experience gained by operators, authorities, and city administrations, were the basis for SHOW recommendations for policymakers and guidelines for PTOs, PTAs, cities, and industry.

SHOW Recommendations & Guidelines¹

Policy recommendations and a roadmap for large-scale AV deployment

At a strategic level, the SHOW project demonstrated AV integration into PT. Project partners were able to offer new services, cover new areas, and expand PT's reach to better serve communities. The project showed AVs can improve road safety, accessibility, and societal equity, reduce solo car trips, fill mobility gaps, and improve travel experiences.

At a political level, SHOW identified key challenges and proposed specific policy actions for scaling pilot projects to sustainable automated mobility services:

1. Technological readiness – to enable scaled L4 service provision

→ Bring advanced AV technology to market in Europe

- Identify priority areas for European Union (EU) investment, including technical components (sensors, cameras, etc.), vehicles, and platforms, especially those designed for public transport.
- Securely introduce 'non-European' automated driving system (ADS) technology, backed by common standards on cybersecurity, data collection and storage, and operation in sensitive areas.

→ Prioritise L4 ADS technology in future funding, research, and deployment projects

- Specific focus areas should include improved perception, object classification, vehicle behaviour, and dynamic pathfinding.

→ Invest in digital infrastructure

- Robust cybersecurity, connectivity, and data reliability are critical to successful AV deployments.
- The creation of shared, global HD maps by infrastructure managers, together with PTAs, can speed up AV deployment and reduce costs.

2. Societal readiness – to ensure AV acceptance by users

→ AV deployments should be user-centric, with a clear focus on accessibility, affordability, safety, and inclusivity.

→ PTOs and PTAs should actively promote AV services through citizen engagement.

→ Clearly define the roles and responsibilities of different actors in automated mobility – e.g., operators, OEMs, and integrators.

→ Align deployment priorities of operators and OEMs with national/regional/local roadmaps, as well as climate and sustainability goals.

→ Develop standardised and certified national/EU training for AV deployers and new roles in remote supervision and field intervention.

¹ More details on SHOW policy recommendations and guidelines are available here:
<https://show-project.eu/media/deliverables/>

3. Governance and business models – to provide sustainable services beyond pilots

- Future deployments must focus on promising use cases:
 1. Campuses and confined environments
 2. Suburban feeder services covering first-/last-mile and door-to-door passenger services
 3. CCAM for logistics – standalone or mixed with passenger transport
- Deployments should deliver mature L4 services, including remote supervision.
- Develop common roadmaps and collaboration mechanisms for the entire AV value chain, to achieve large-scale deployment.
- Policymakers and governments must help unlock new funding mechanisms to incentivise long-term AV investment.

4. Regulation and standardisation – to provide predictable paths to deployment

- The EU must develop a harmonised, flexible testing framework for new vehicle and automated mobility concepts.
- The small series cap (limited to 1,500 vehicles) in the current type approval regulation (EU Regulation 2022/1426) should be removed.
- A harmonised European framework for deployment of all types of automated driving systems should be developed.
- Together, these developments would create a single European market for AVs and related services, facilitating scaled-up testing and deployment.
- National and local authorities should focus their attention on complementary regulations, such as defining service conditions and mandating integration into PT networks.
- Establish European standards for AV and service design. These should include mandatory accessibility standards and standardised passenger security protocols to ensure equitable access to AV services, along with interoperability standards to enable operators to deploy mixed vehicle fleets.



→ Ride the Future service in Linköping. ©VTI.

Based on the detailed policy recommendations, SHOW developed a roadmap for AV deployment up to 2050, covering technology, infrastructure, regulation, and societal needs.

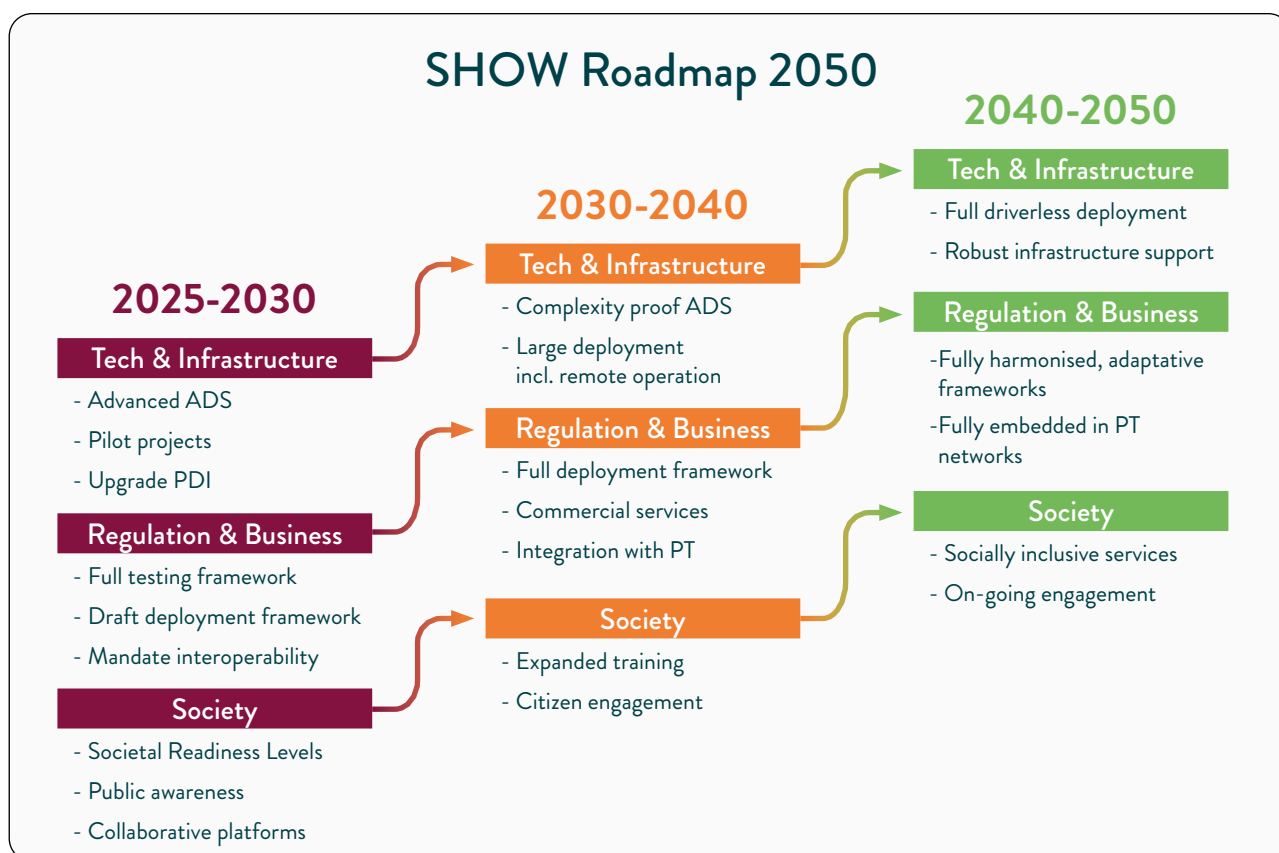
Guidelines for public transport operators, authorities, and cities

Beyond high-level policy recommendations, SHOW built on the solutions developed by project partners to address local challenges in AV deployment. The resulting guidelines, aimed at local decision-makers and planners, address four distinct layers:

- Service planning
- Governance
- Accessibility and inclusive services
- Safety

Service planning

- Cities should ensure that AV services align with their Sustainable Urban Mobility Plans (SUMP), while providing a reliable framework that justifies investments by operators and others in AV services.
- Cities must develop a trusting ecosystem that fosters the collaboration needed for AV deployment.
- Ensuring AV fleets are integrated into PT requires strong support from local authorities, in everything from infrastructure adaptation to data-sharing protocols and incident reporting.
- A 'learn-by-doing' approach will be essential for cities and PTOs, while partnerships with the private sector and research organisations can help build knowledge more quickly.



Governance

- Local partnerships, such as demonstration boards, can help raise awareness and demonstrate confidence in the services, while also providing a forum for relevant stakeholders to discuss operational limits and challenges.
- In the absence of harmonised EU-wide regulation, cities and local authorities will continue to play an essential role in making AV deployers aware of regulatory and administrative frameworks.
- Regulatory frameworks should enable feedback loops by operators, to ensure services are delivered smoothly.
- AVs will present challenges to traditional PT procurement processes. Thorough market research, clear procurement criteria, and robust contract negotiation will be required.

Accessibility and inclusive services

- Cities and PTAs should actively promote AV services within PT as an alternative to private car usage.
- Building trust with the public will be essential and will require comprehensive marketing campaigns, information sessions, and educational outreach.
- Cities should mandate that AV services be accessible to as wide a population as possible. This includes putting in place vehicle requirements adapted to users with additional mobility needs, as well as ensuring AV services extend to low-demand zones and off-peak hours.
- Widespread AV deployment in PT will create new roles in remote supervision, fleet maintenance, and field support. Operators should be prepared for a significant change in the types of roles they will need to fill and establish proactive measures to manage the workforce's evolution.

Safety

- PTOs depend on high-quality physical infrastructure (e.g., lane markings and signage) for their operations. This will be especially true for AV operations.
- Alongside providing adequate infrastructure, local PTAs must ensure operators' access to essential information on issues such as road maintenance, closures, and urban cleaning schedules. This will help keep AV operations safe and reliable.
- For AV services, intelligent transport systems (ITS), high-quality connectivity, and data accessibility will be essential. Connectivity enhances operational safety through real-time monitoring and communication, while data access optimises routes, schedules, and passenger flow.
- Local administrations will need to ensure high-quality digital infrastructure in their area, while also establishing protocols around access to critical data, data ownership, and open ITS architecture. Standardisation will be an important step in this regard.

Looking Beyond SHOW

The SHOW project was a sea-change for the integration of automated vehicles into public transport. Deploying more than 70 vehicles of all sizes – from delivery robots to full-size buses – in a variety of use cases covering urban, rural, and industrial environments, it delivered a straightforward message: automated mobility in public transport works.

The pilots' scale and duration enabled generation of massive amounts of data and, consequently, impact assessment and future modelling. Experience and insights from a range of geographical environments were shared among the pilot sites and with a wider network of interested cities and regions. Most significantly, the pilots delivered real mobility solutions to real people in real-world situations, safely carrying more than 160,000 passengers during the project.

Public transport operators and other partners gained important experience in SHOW and have built on that success since the project closed. The Horizon Europe [ULTIMO Project](#) is the next step in this evolution. A new generation of L4-capable vehicles are being launched in Europe, as operators look to move towards larger deployments. Preparations are underway for the next phase of European-funded large-scale demonstrations, which plan to deliver long-term, sustainable services that have a significant impact on mobility systems. SHOW was a decisive milestone in the journey to this critical point in CCAM development.

UITP has incorporated many of the learnings and recommendations from SHOW in its [2026 Position](#) on automated mobility in public transport. The experience gained in coordinating SHOW brought the topic of AVs to the fore within UITP, spurring the creation of an Automated Mobility Working Group in 2022. The Automated Mobility Working Group brings together a diverse range of UITP members actively deploying AV services around the world, to share knowledge and build global expertise. This group played a key role in consolidating and further developing the UITP position on automation and will be crucial in supporting the activities of UITP's current CCAM projects. An additional UITP Insights publication is under development and will detail further learnings shared by the group.

SHOW has paved the way towards a better understanding of the role that AVs can play in transforming public transport. Delivering better mobility solutions to more people over a wider area is the first and most evident advantage. Supporting and freeing the workforce from more tedious, routine tasks will improve working conditions and reduce workload, helping address, where needed, the lack of workforce in the sector, and bringing new technology and services closer to users. Automation can give us a new mindset and ways of interacting, whether as PT users or employees, and the PT sector can help people embrace it and get comfortable with the new horizons it brings. Important work remains to be done, but SHOW has lived up to its name; it has shown the promise of automated mobility and highlighted what authorities and the mobility sector must do to make this once-in-a-generation transformation a reality.



This is an official publication of UITP, the International Association of Public Transport. UITP has more than 2,000 member companies in 100 countries throughout the world and represents the interests of key players in this sector. Its membership includes transport authorities, operators, both private and public, in all modes of collective passenger transport, and the industry. UITP addresses the economic, technical, organisation and management aspects of passenger transport, as well as the development of policy for mobility and public transport worldwide.



**Funded by
the European Union**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 875530.

