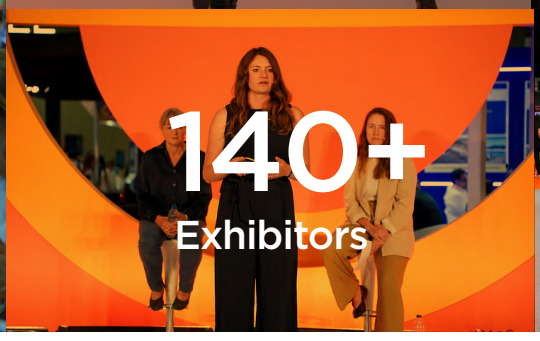
ERTICO ITS EUROPE

EUROPEAN CONGRESS
SEVILLE
19–21 May 2025

16TH ITS EUROPEAN POST-CONGRESS REPORT

Clean, resilient and connected mobility



ORGANISED BY ERTICO ITS EUROPE

IN COLLABORATION WITH

HOSTED BY NO8DO Ayuntamiento de Sevilla · Sevilla Feeling LAND

SUPPORTED BY Gobierno de España Ministerio de Transportes y Movilidad Sostenible · Gobierno de España Ministerio del Interior Dirección Gral. de Tráfico · Junta de Andalucía · ITS SPAIN

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Introduction

A Landmark Edition for ITS in Europe

The 16th ITS European Congress marks a bold step forward for Smart Mobility in Seville.

From 19 to 21 May 2025, the city transformed into a vibrant hub for Intelligent Transport Systems (ITS), welcoming industry leaders, policymakers, innovators, and researchers from across Europe and beyond to explore the theme: "**Clean, Resilient, and Connected Mobility.**"

Organised by ERTICO – ITS Europe, in collaboration with the European Commission, hosted by the City of Seville, and supported by the Spanish Ministry of Transport and Sustainable Mobility, the Ministry of the Interior, the Directorate-General for Traffic (DGT), the Junta de Andalucía, and ITS España, the Congress served as a strategic platform for accelerating digital and sustainable mobility across Europe. This strong public-sector participation underscored Spain's commitment—at local, regional, and national levels—to advancing clean, connected, and resilient transport systems.

Looking back over three decades of progress, ITS has evolved from single-purpose tools to today's connected, user-centric ecosystems. The current era is defined by its focus on reliability, adaptability, and resilience, extending across both land and air mobility. This year's Congress sent a strong signal: European ITS is ready to deliver mobility that is accessible and affordable for all—resilient and designed to achieve zero fatalities and zero emissions.

The Congress clearly outlined the road ahead: progress depends not only on technological innovation but also on deep, sustained collaboration between sectors, disciplines, and communities. With renewed momentum and a shared sense of purpose, the mobility ecosystem moves forward - ready to turn the vision of intelligent mobility into reality.

The following pages provide an overview of the main highlights and outcomes from the Congress, including sessions, exhibition activities, live demonstrations, and stakeholder engagement. Overall, the Congress offered extensive networking opportunities that fostered cross-sector collaboration, including the Welcome Reception, the exclusive VIP Dinner, and the ITS Dinner, which brought over 400 participants together at the historic Casino de la Exposición, blending Andalusian cultural flair with high-level professional interaction.

For those who couldn't attend—or who wish to revisit the experience—photos, videos, Congress proceedings, and press materials are available in this report and on the official **Congress website**.

A heartfelt thank you to everyone who contributed to the organisation, and to all participants who made this Congress such a success!

Facts & Figures

ORGANISED BY:

ERTICO ITS EUROPE

HOSTED BY:

NO8DO Ayuntamiento de Sevilla

Sevilla Feeling LAND

ITS European Congress 2025

Highlights

An Unmatched Showcase of Smart Mobility Leadership

A landmark edition defined by unprecedented industry presence and programme depth.

The presence of **José Luis Sanz, Mayor of Seville,** alongside **Fernando Grande-Marlaska, Spanish Minister of the Interior,** and **Rocío Diaz Jimenez, Minister of Development, Territorial Planning and Housing, Andalusia Regional Government,** underscored the strong political support behind the Congress.

Hear from the Participants

"At ITS Seville, we didn't just share ideas—we saw them in motion. It's where Europe's mobility community connects to collaborate, deploy, and deliver impact."

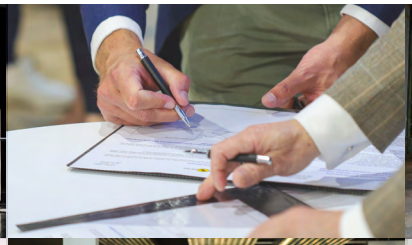












Photo gallery Day 1 Day 2 Day 3

YouTube Playlist

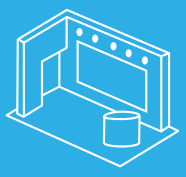
Congress at-a-glance

A Standout Moment for Europe's Smart Mobility future!

PRIVATE SECTOR
58%

PUBLIC SECTOR
42%

3,000+
attendees!



7,000 Sqm
exhibition

"Seville set a new benchmark for the ITS European Congress, with record participation, outstanding content, and the largest exhibition to date: over 140 exhibitors across 7,000 sqm, reflecting the accelerating momentum of smart mobility in Europe."

Didier Gorteman
Chief Financial and Operations Officer,
ERTICO-ITS Europe

140+
exhibitors!

showcasing the latest in Intelligent Transport Systems

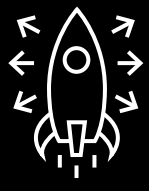
71
countries!

GLOBAL PARTICIPATION

500+
international speakers

112
technical sessions

700
registered delegates



DEPLOYMENT IN ACTION

11
exclusive technical visits: Live from Seville's Mobility Hubs

6
demonstrations: Innovation in Motion

20
ITS Arena sessions: Deployment Meets Dialogue

Who Attended ITS Seville 2025?

Audience breakdown

39%
HOST REGION

47%
REST EUROPE

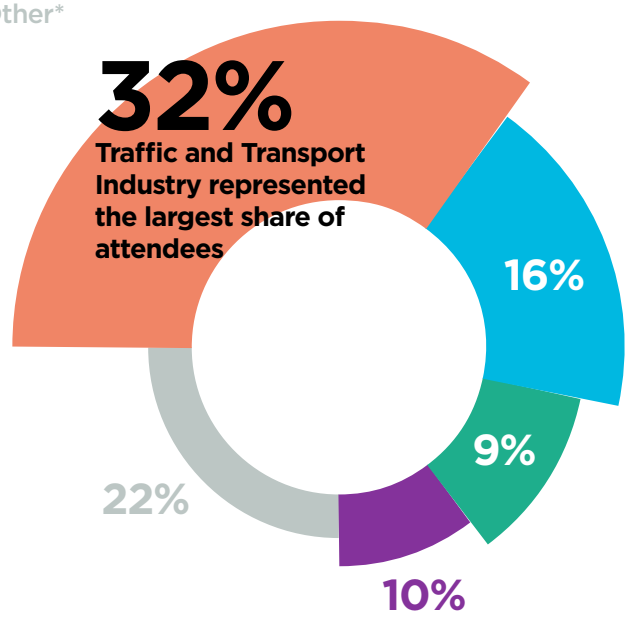
14%
REST OF THE WORLD

30% women attendees → **+40%** from previous edition

A CLEAR STEP TOWARDS GREATER GENDER BALANCE IN ITS.

Industry Breakdown

Traffic and Transport Industry
Service Providers
Connectivity Industry
Suppliers
Other*

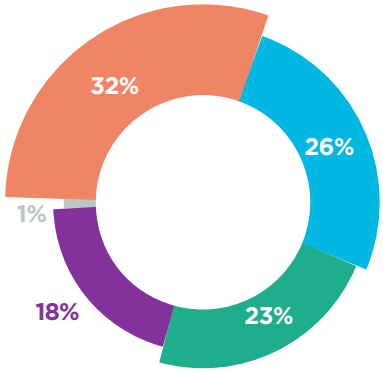


Diverse industry participation, from research to vehicle manufacturing, reflects the wide-ranging impactof ITS solutions.

*Research, Vehicle Manufacturers, Users, Other.

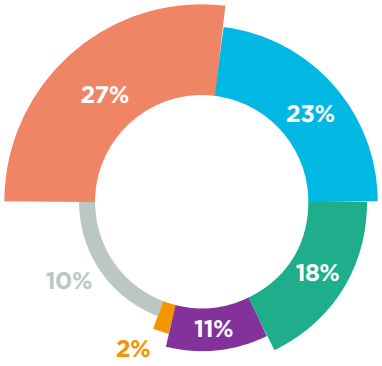
Participant Categories

Visitors
Exhibitors
Delegates
Speakers
Students



Congress Attendees

Experts & Advisors
Executive & Directors
Middle Management
Academia
City Officials (Mayors, Councillors)
Other



A balanced public-private mix, led by senior decision-makers and technical experts.

Featured Speakers

Policy Shapers, City Voices, Industry Experts United in Seville

500+ Experts from Across Europe and Beyond

Angelos Amditis
ERTICO - ITS Europe
RESEARCH & DEVELOPMENT DIRECTOR/CHAIRMAN

Jordi Casas
RACC
COORDINATOR OF RACC MOBILITY INSTITUTE

Mar Cogollos
AESLEME
DIRECTORA

Steve Dellenback
Southwest Research Institute
VICE PRESIDENT R&D

Rocío Díaz Jiménez
Andalusia Regional Government
MINISTER OF DEVELOPMENT, TERRITORIAL PLANNING AND HOUSING

Laura Eiro
Ministry of Transport and Communications of Finland
DIRECTOR-GENERAL

Marco Falcone
European Space Agency
HEAD OF FUTURE NAVIGATION PROGRAMMES DEPARTMENT

Ana Luz Jiménez
Traffic General Directorate. Ministry of Interior
HEAD OF SEVILLE UNITE. DGT COORDINATOR FOR ANDALUSIA REGION

Cesar Lorenzo Perez
Renault
DIRECTOR R&D SPAIN

Miguel Álvarez Martínez
Ministry of Transport & Sustainable Mobility
DIRECTOR GENERAL OF MOBILITY STRATEGIES

Jim Misener
Qualcomm Technologies, Inc.
SENIOR DIRECTOR, PRODUCT MANAGEMENT

Luis Moreno
CTAG
GENERAL MANAGER

Mario Muñoz-Atanet Sánchez
Junta de Andalucía
VICECONSEJERO FOMENTO, ARTICULACIÓN TERRITORIO Y VIVIENDA

Steve Phillips
CEDR
SECRETARY GENERAL

Martin Russ
AustriaTech GmbH
MANAGING DIRECTOR

Francisco José Sanchez Pons
Fudación CTAG
DIRECTOR ELECTRONICS & SMART MOBILITY

José Luís Sanz Ruiz
City of Seville
MAYOR

Karen Vancluysen
POLIS
SECRETARY GENERAL

Joost Vantomme
ERTICO - ITS Europe
CEO

Sarah-Jayne Williams
Google Maps
DIRECTOR, GLOBAL PRODUCT PARTNERSHIPS

Tina Wagner
City of Hamburg
DIRECTOR-GENERAL FOR TRANSPORT

Eric von Breska
European Commission DG MOVE
DIRECTOR OF INVESTMENT, INNOVATIVE & SUSTAINABLE TRANSPORT

Fernando Grande-Marlaska Gómez
Spain
MINISTER OF INTERIOR

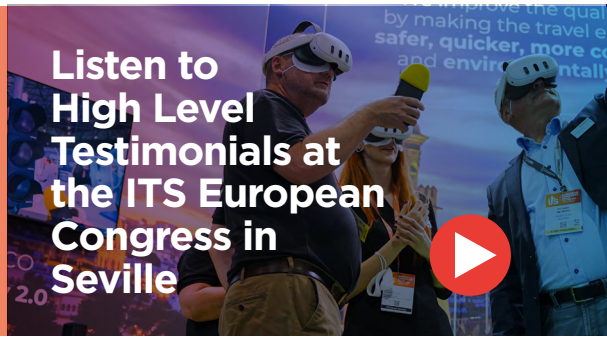
Discover all speakers

Closing Remarks

"In Seville, we saw more than innovation - we saw determination. The path forward is no longer about what we can create, but how swiftly we can deliver it. The ITS community must lead with conviction: not just smarter mobility, but fairer, safer, and shared. Now is the time."

Prof. Eric Sampson, Chief Rapporteur, ITS European Congress 2025

Read more



Programme highlights

OPENING WITH UNITY
Inspiring Collective Momentum.

Featuring speeches from **José Luis Sanz** (Mayor of Seville), **Dr. Angelos Amditis** (ERTICO Chairman), **Eric von Breska** (European Commission), and an announcement from **Apostolos Tzitzikostas** (European Commission), the Congress opened with strong messages on the urgency of transforming urban mobility.

SUMMIT
Smart Mobility Summit of Cities and Regions 2025

Municipal Leadership at the Heart of Europe's Mobility Future.

44 cities & regions | **16** mission cities | **70+** public leaders

A powerful exchange shaping climate-neutral mobility across Europe.

Discover more

PLENARY
Powerful Voices. Focused Dialogue. Real Momentum.

3 strategic plenaries | **15** high-level speakers | **500+** attendees

A true convergence of policy, innovation, and action.

Discover more

TECHNICAL PROGRAMME
From Insight to Implementation. Innovation Across Every Session.

100+ expert-led sessions | **400+** speakers and contributors

Transforming Mobility Together
Chairman of ERTICO – ITS Europe

Watch as Dr Amditis outlines the shared mission for smart, inclusive mobility.

Voices from ITS Seville 2025
Why this Congress was a turning point?

"Thank you for an inspiring and energising #ITSSeville2025! It's been a privilege to take part in the conversations shaping the future of mobility. Grateful to the organisers, speakers, and participants for creating such a dynamic space for collaboration!"

Laura Eiro
Director General of the Data, Safety and Security Department, Finnish Ministry of Transport and Communications

Turning ideas into action — bridging research deployment, and policy.

Discover the Congress Summary

Driving Value for our Partners

Our Main Partners:

CTAG

Qualcomm

Google Maps

14
Event Partners

View All Partners

600+
contacts exchanged through QR Code

1,000+
total App interaction

43%
decision makers

42%
public sector representatives

83%
sponsors satisfied with ROI

95%
would sponsor future ITS Congresses

600+
attendee reach via sponsored panels

"We get inspired, and hope to inspire in return. The technology and innovation we see, we want to be at the heart and soul of it, to help make it happen on our roads and in the ITS world. The Congress is what ERTICO is about: Turning innovation into real solutions that improve lives, especially in safety, mobility, and sustainability."

Jim Misener
Global V2X Lead
Qualcomm

"We're here to talk about sustainable ITS and the green shift because we've made a clear commitment to climate action. Our goal is to help users, cities, and partners save a gigatonne of CO_2 emissions per year by 2030 - a bold target that requires deep collaboration. Working with cities and authorities allows us to innovate and improve our map features in ways that truly help people move, explore, and navigate cities more sustainably."

Sarah-Jayne Williams
Director, Global Product Partnerships, Google Maps

Partnership highlights

ITS Nationals, associations, organisations, media partners.

Press Room

Press Conference

50+
Associations/ organisations represented

23
ITS Nationals partners

21
Media Partners

65+
Media and press on-site

"The ITS European Congress is a crucial platform for associations like POLIS to bring the voice of cities and regions into Europe's mobility dialogue. It's not only a place to exchange knowledge and showcase innovation, but also to strengthen alliances and ensure local and regional perspectives help shape the future of intelligent transport systems."

Karen Vancluysen, Secretary General, POLIS Network

"The ITS European Congress is where ideas become action - a vital meeting point for industry, cities, and innovators driving the next generation of mobility solutions. For ITS National Associations, it's an essential opportunity to engage with peers, influence policy, and spotlight national achievements on a European stage."

Soledad Perez-Galdós Enríquez de Salamanca, Chairwoman, ITS Spain

"ITS International is proud to partner with the ITS Congress and witness its evolution from a local showcase to a truly pan-European exhibition of cutting-edge mobility solutions. These events have become an essential part of the industry's ecosystem, which is why participation is so valuable."

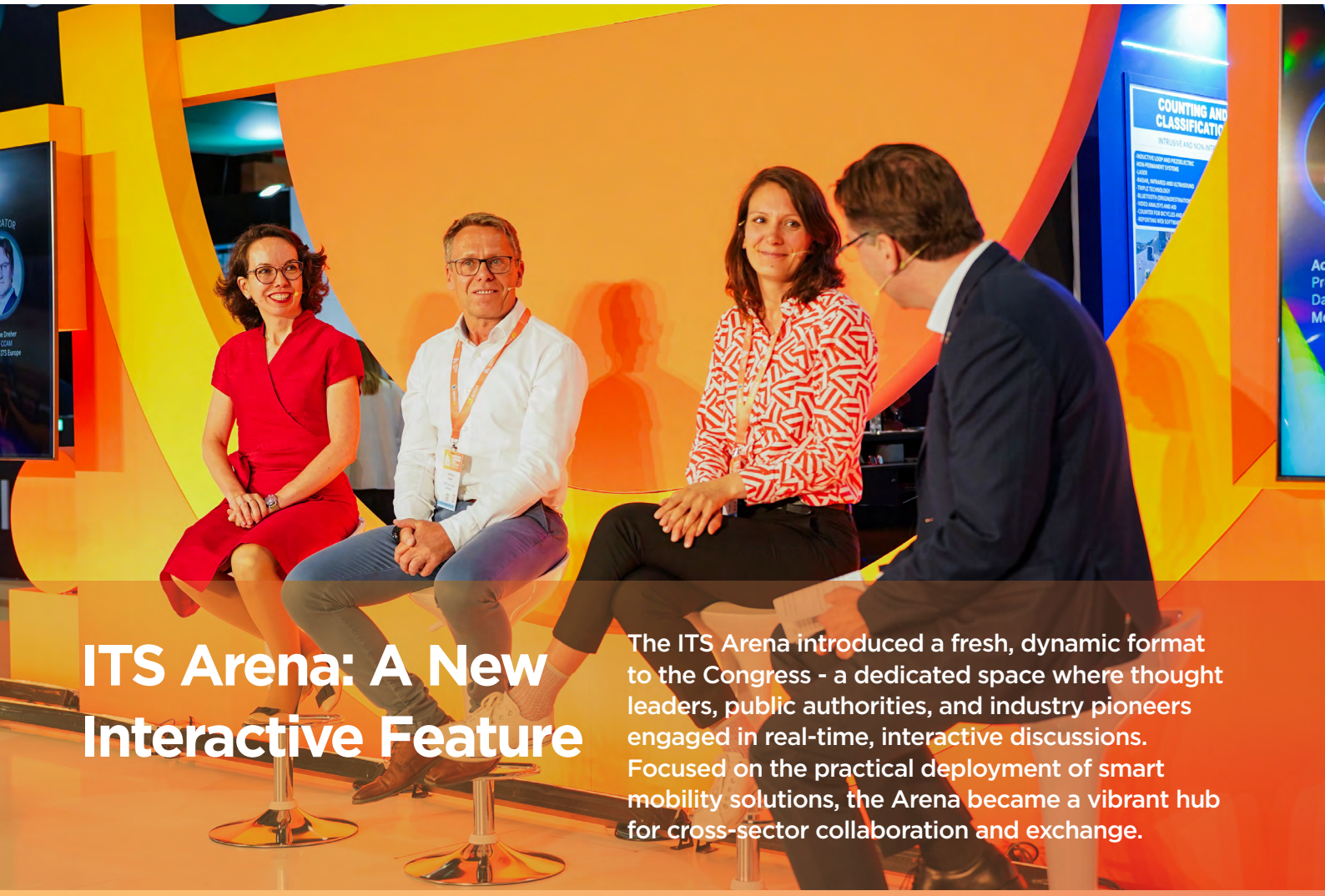
ITS International,
Main Media Partner
www.itsinternational.com

"Publishing the Digital Daily email news for the ITS European Congress in Seville this week has been a fascinating and exciting undertaking, with so many new technology announcements and new initiatives being discussed, it has been packed full of breaking news and video exclusives.

TTi, Main Media Parter
www.traffictechnologytoday.com

Exhibition highlights

A bustling exhibition showcasing a wide range of sectors, where visitors discovered the latest ITS solutions, experienced live demos, explored practical tools for mobility challenges, and connected with industry experts and potential partners.



ITS Arena: A New Interactive Feature

The ITS Arena introduced a fresh, dynamic format to the Congress - a dedicated space where thought leaders, public authorities, and industry pioneers engaged in real-time, interactive discussions. Focused on the practical deployment of smart mobility solutions, the Arena became a vibrant hub for cross-sector collaboration and exchange.

20+
Sessions

100+
Speakers

60+
Companies

30+
Industries

"At this unique and highly relevant Congress, we're showcasing some of our latest CCAM developments, including our last-mile autonomous ATOS, now operating in partnership with the Port of Sevilla, connecting the Aquarium to Torre del Oro. We remain committed to advancing smarter, safer, and more inclusive transport systems - and to building clean, resilient, and connected mobility together."

Luis Moreno
CEO, CTAG, Spain

The Impact of ITS Seville in Numbers

Attendee Satisfaction

88% delegates

83% speakers

79% exhibitors

75% willing to attend again

85% exhibitor recommandation

85% website satisfaction

95% speaker rating

83% overall participant satisfaction rate

The numbers speak for themselves— ITS Seville 2025 was an overwhelming success!

High satisfaction rates among attendees, exhibitors, and speakers show our shared commitment to transforming mobility.

We asked our attendees - and their answers say it all.

Programme summary

The Congress's principal theme "Clean, resilient and connected mobility" was chosen to focus on the pressing need for transport solutions that are sustainable, adaptable, and technologically integrated. As cities continue to grow and demands for mobility increase, the importance of a cleaner environment, adaptability to counter disruptions, and seamless connectivity for quality user experience become evident. This theme aimed to show how intelligent transport systems can help both passenger and freight services meet current and future challenges. The Congress was organised around four key Topics:

The European Programme Committee, chaired by Joost Vantomme, appointed rapporteurs for each topic tasked with capturing the key messages and outcomes from the Congress, the exhibition and the demonstrations. The headline theme was addressed by a wide range of different types of session, over 100 in total – Plenary, Special Interest, Strategic Futures, Technical, Research – as well as specialised workshops and the Smart Mobility Summit of Cities and Regions.

Part 1 of this Report summarises all the Congress proceedings. The second part paints a picture of discussions at the Plenary Sessions. The third part focuses mostly on the Technical & Research papers and the Special Interest and Strategic Futures Sessions. Finally, part 4 summarises the proceedings at the Smart Mobility Summit of Cities and Regions.

I give my profound thanks to the marvellous team of rapporteurs who helped me so much and without whom this report could not happen:

Topic 1
Risto Kulmala
Sven Maerivoet
Elina Aittoniemi

Topic 2
Tim Lewis
Vicente Tomas
Elina Aittoniemi

Topic 3
Carol Schweiger
Stefania Pesavento
Paula Claytonsmith

Topic 4
Rachael Quinn
Iain Macbeth
Paula Claytonsmith

My thanks also to Bart van Arem our Scientific Director and the moderators & rapporteurs of the Cities and Regions Summit:

Vassilis Agouridas
Vanessa Holve
Lidia Buenavida Peña
Martin Russ
Tamara Djukic
Peter Staelens
Axelle Griffon
Karen Vancluysen

My colleagues from ERTICO and MCI all deserve grateful mention for their quick and cheerful handling of my numerous enquiries and questions.

PROFESSOR ERIC SAMPSON
CHIEF RAPPORTEUR

THIRSK, JUNE 2025

Part 1

Topics overview

There were around 112 Congress sessions in all: 72 were Special Interest Sessions with 4 Strategic Futures Sessions. 167 papers were presented in 36 sessions divided roughly as follows – Topic 1: 47 papers; Topic 2: 62 papers; Topic 3: 28 papers; Topic 4: 30 papers. In the three Plenary Sessions senior public officials, industry executives and international experts shared their perspectives and extensive experience of ITS topics encompassing policy, strategic, economic, technical, organisational and societal aspects.

The Smart Mobility Summit of Cities and Regions was a key element of the Congress with a focus on supporting the local and regional authorities' agenda of driving innovation and implementing smart and sustainable mobility solutions for public benefit. The Summit focused on four topics chosen to highlight the role of ITS in helping the transition to climate neutrality and smart cities. The topics were:

- New Mobility Services (NMS) for transport of people and goods
- Mobility management in human centric design of space
- Transport electrification and the role of ITS
- Innovative aerial services and urban air mobility

The Summit brought together over 50 senior representatives of national and local governments from 30+ countries together with some of their suppliers of ITS services. There is a fuller description of the Summit in Part 4.

Here's a picture of what has happened under each of the 4 main Topics; the topics are addressed in Section 3 in detail.

The "**CCAM topic"** continued to be one of the most popular at the congress. It used to be dominated by research ideas and experiment results but we saw demonstrations, pilots, deployment reports and heavyweight evaluation papers. Perceiving the environment and adapting to challenging situations and edge cases (weather conditions, tunnels, urban junctions, etc.) for the automated vehicle received much attention. Many evaluation papers dealt with socioeconomic, sustainability and equity impact as well technical results. A steadily increasing role for artificial intelligence (AI) was also prominent. Automated shuttles and delivery robots were the most popular automated vehicle use cases in the congress.

Connected and Cooperative ITS was strongly represented as a topic on its own and also as a key feature in automated transport and mobility. Connectivity was clearly moving towards deployment although some use cases were in the development phase, for example collective perception where vulnerable road users especially can become more "visible" to the connected vehicles in urban areas, and thereby road safety can be improved.

The use of automated shuttles with driving speeds up to 80 kph on highways was a welcomed step forward. Other new ideas included integration of automated vehicle trajectory data into simulation models to enhance their fidelity; a novel methodology for evaluating onboard perception systems of automated vehicles on proving grounds and open roads; and leveraging Large Language Models (LLMs) to predict near-crash events using LiDAR-based tracking data.

An increasingly wide range of trials and pilots was reported including solutions in a port and its connected corridor to improve both mobility and logistics; intelligent intersection control for CCAM vehicles based on a digital twin of the intersection; and applications based on sensors and connected solutions to improve the safety of bicycles. Several sessions discussed insights from ongoing European research projects

focusing on different CCAM services including teleoperation in airports and remote operation of CCAM generally, enhancing traffic safety for VRUs, and integrating traffic management and CCAM.

"Emergent Technologies" was the busiest Congress topic reflecting the importance of digital transformation for enhancing traffic management and crisis response and showing the benefits in many different contexts – incident duration prediction, traffic information accuracy, emergency coordination, and smart city governance. Data sharing was a key topic, with sessions on its benefits demonstrating a clear shift towards modernising road and transport systems through the integration of digital technologies.

Data and information have become crucial to the deployment of new intelligent services especially for a connected and interoperable future where high-quality public information is needed to facilitate deployment. The EU Regulation on real-time and safety-related traffic information was the first step, but more and more data and information were being made public. The large number of traffic information sources highlighted the need to explore and develop mechanisms for efficiently gathering, standardising, and delivering traffic data to National Access Points and Mobility Data Spaces.

Across Europe there was a clear and growing effort to digitally transform mobility systems through advanced data integration, real-time analytics, and user-oriented digital platforms. Data sharing and interoperability were examined with a look at enhancement to the established DATEX II standards where modelling methodology has been enhanced to support a new generation of applications.

Public-private collaboration in traffic management was given a fresh look in anticipation of large-scale deployment of L4 CCAM freight vehicles on public roads increasing the need for both road authorities and logistics stakeholders to seek closer collaboration to achieve their goals in a safe, efficient and effective way.

Traditional approaches to mobility have been based on individual and fragmented communication, manual data handling, and isolated models so data has not been integrated and used in the most effective way. The new wave of solutions showed a shift toward integrated intelligent systems, combining different methods, such as AI or Digital Twins, to better predict and act. This technological support was also required to embed cycling into multimodal networks.

However the coexistence of multiple, potentially overlapping architectures or data models across initiatives and the lack of standards or alignment complicates integration efforts. There remains a need for an Open Europe-wide data exchange architecture in order to support the public exchange of information. MAAS technologies would be deployed within this architecture allowing them to generate synergies among each other, fostering a more integrated and efficient mobility ecosystem across Europe.

The busy "**Societal"** topic aimed to cover a number of areas including:

- Equity and accessibility for all (including cultural and geographical factors)
- Innovation in public transport systems and services
- New services for freight and logistics (including automation and robotics)
- Deployment barriers, lessons learned, opportunities and impact

In general this topic showcased a global effort to innovate and adapt mobility systems to

meet environmental, and social goals to foster sustainable, inclusive, and efficient transport solutions. Change in this area appeared to be incremental, but the technologies looked more stable and do-able than in previous Congresses.

Seville had many reports featuring "Living Labs" projects that emphasised collaboration, real-world testing, and scalability to address diverse mobility challenges. Sessions looked at how to accelerate innovation; designing accessibility solutions for persons with disabilities; cross-border collaboration to improve services in the Baltic region; and the last-mile logistics cluster supporting safe, sustainable delivery in urban areas.

A number of sessions discussed the integration of technology to enhance information accessibility and service delivery with interesting developments of the social model of disability, which seeks to remove societal barriers to mobility. Electric Vehicles and Electrification were frequent discussion subjects with a general acceptance that the claim of revolutionising transport has to be qualified as the lack of infrastructure to support EVs is delaying complete user acceptance.

We had a number of new activities: technology combined with bus franchising has been successful in London and Singapore in addressing issues such as financial stability, changes in travel behaviours (eg work-from-home policies) and environmental modifications such as electrification.

The integration of Sustainable Urban Air Mobility Indicators (SUAMIs) into Sustainable Urban Mobility Plans (SUMPs) is being facilitated by using non-core indicators from the Sustainable Urban Mobility Indicators (SUMI) and adding new ones such as Quality of Public Spaces, Commuting Travel Time, Mobility Space Usage and Security.

Overall there was a growing recognition of the need to actively involve persons with disabilities and other vulnerable groups in the design and implementation of mobility solutions and urban spaces. The importance of data and information in shaping mobility behaviour and creating seamless user experiences was strongly emphasised.

The **"Resilient and Safe"** topic also aimed to cover a wide area including:

- Social, business and regulatory aspects
- Data technology and reliability
- Modelling for resilient mobility

The overall situation demonstrated continued and generally complex challenges in resilient mobility, especially when trying to integrate getting and using data, technology developments and user needs. We mostly heard about incremental improvements based on existing technologies but using analytics and data as feeds to AI platforms was a growing interest.

Data was extensively explored by many papers with emphasis on identifying all potential data sources in order to better understand what was happening on the ground. A number of papers and sessions stressed the importance of including data on cycling – or micromobility generally – not least because in urban areas cycling traffic was an increasing user of road space.

The use of AI was frequently discussed. Key examples included AI and digital sensors used for analysing cycling and micromobility data; the potential identification of capacity issues; monitoring junctions with high accident risk; fusing several maintenance data sources into a predictive AI platform and training it to deliver a predictive and cost-effective road maintenance schedule; and reporting on SUMI requirements along the TEN-T network,

Understanding resilience is important for reducing carbon emissions and sessions highlighted the role cycling could play. Europe-wide data is needed to understand more about cyclists' journeys, not just flows but safety and the economic / social impact of cycling.

We saw less than expected on the difficulties of retrofitting technology, cybersecurity, and addressing resilience head-on as a systems problem.

But some exciting new ideas were reported:

- Using digital twins to plan developing resilience to extreme weather events.
- Pavement incident detection by leveraging images captured from vehicle-mounted equipment and very high-resolution satellite imagery combined with AI.
- Exploring how lanes can be switched from one direction to the other by remote control from a control centre or on-site to make much better use of the available road space.
- Developing more resilient infrastructure by analysing hotspots for accidents caused by animals to devise preventative measures minimising risk to road users and animals.
- Real-time vehicle-specific weather and safety information tailored to heavy vehicles.

The Congress showed that European ITS can deliver mobility that is:

- Accessible, Equitable and Affordable
- Resilient, Has zero fatalities Has zero emissions

The technologies for this were mostly ready but the policy making to enable delivery was lagging behind. Zero fatalities and Zero emissions were within our reach but the service providers and the national and international regulators needed to work faster and in a stronger cooperation and collaboration with each other.

Part 2

Plenary Sessions

Plenary 1: THE GREEN SHIFT – ACCELERATING A SUSTAINABLE FUTURE THROUGH ITS

Moderator	Karen Vancluysen	POLIS Network, Belgium
Keynote speaker	Miguel Álvarez Martínez	Ministry of Transport and Sustainable Mobility, Spain
Panellist	Tina Wagner	City of Hamburg, Germany
Panellist	Adam Wieczorek	City of Łódź, Poland
Panellist	Sarah-Jayne Williams	Google Maps, UK
Panellist	Matej Zakonjšek	Transport Community Treaty Secretariat, Serbia

Plenary 1 explored how intelligent transport systems (ITS) can drive green mobility and sustainable urban transformation. Central themes included reducing emissions, optimising public space, leveraging digitalisation, and placing citizens at the heart of policy design. Key discussion points included infrastructure deployment, open data, behaviour nudging, cross-sector cooperation, and cross-border connectivity. The moderator, **Karen Vancluysen (POLIS Network)**, introduced ITS as a catalyst for sustainable mobility across Europe. The keynote underscored the environmental and spatial challenges of current transport systems, advocating for mobility as a right and a gender-inclusive policy lens.

Speaker highlights

Miguel Álvarez Martínez (Spanish Ministry of Transport and Sustainable Mobility – public sector)

Outlined transport's central role and its environmental impact – contributing significantly to greenhouse gas emissions and health concerns. Emphasised the need to rethink public space dominated by private vehicles and ensure mobility becomes a citizen's right through new legislation. Highlighted the triple mandate for policy: combat climate change, foster economic growth, and ensure equitable outcomes. Stressed gender integration in policymaking and the vital role of public-private collaboration.

Adam Wieczorek (City of Łódź, municipal government)

Focused on managed city-level change through ITS deployment. Since 2015 Łódź had enhanced EV charging infrastructure, modernised its bus fleet, and integrated digital tools like real-time vehicle monitoring, passenger information, and adaptive traffic control. He emphasised community engagement – hosting climate talks, eco-weeks, and grassroots behaviour shifts *via* shared digital platforms.

Tina Wagner (City of Hamburg, municipal government)

Described Hamburg's strategy to drive green mobility, targeting 80% of travel *via* public transport, walking, and cycling by 2030. Autonomous bus and digitalisation projects included autonomous shuttles and driverless buses, alongside smarter train systems optimised for capacity, punctuality, and energy efficiency. She stressed a systems approach encompassing vehicles, infrastructure, regulation, and workforce planning.

SarahJayne Williams (Google Maps, private tech sector)

Highlighted Google Maps' capacity to influence billions of trips worldwide by using data and behavioural "nudges" to promote sustainable travel. Compiled in collaboration with cities, the mapping platform integrated updated route information, cycle lanes, speed limits, and supported embedded ticketing solutions such as Germany's DeutschlandTicket. Emphasised data sharing through maps as foundational for ITS-driven efficiency and planning.

Matej Zakonjšek (Transport Community Treaty Secretariat, regional/international organisation)

Discussed efforts to align EU member states with accession countries through policy integration and TENT network planning. Emphasised the importance of merging transport, digital, and energy networks to unlock wider network effects. Noted challenges including outdated institutional frameworks, skill shortages, and funding constraints – especially in Western Balkans.

In audience Q&A, queries on payment integration, EV sales trends, vehicle automation, and balancing individual vs societal needs were addressed. Panellists affirmed mobile ticketing integration, sustained focus on electric public transport despite market fluctuations, and the necessity for regulation to control fleet automation. The panellists' concluding message: cities must lead decisive action and navigate the tension between personal convenience and collective societal benefits.

Plenary 1 takeaways

1. **Integrated strategy first** – Technology must serve within clear sustainability, equity, and economic plans.
2. **Data-driven transparency** – Open data unlocks performance improvements through evidence-based governance.
3. **Behavioural nudging matters** – Mapping tools and real-time info can shift ~10% of urban journeys to greener modes.
4. **Collaboration is key** – Public-private partnerships and cross-sector planning are essential to implement infrastructure, ticketing, and automation.
5. **Regulation must keep pace** – Governance frameworks must evolve to manage EVs, autonomous vehicles, and network integration.
6. **Expand beyond borders** – Connecting regional and international transport systems confirms Europe's leadership in a green ITS future.
7. **City leadership drives change** – With political will, transparent communication, and tough choices, urban policymakers can align individual and collective mobility goals.

Plenary 2: RESILIENT BY DESIGN – SHAPING A COMPETITIVE MOBILITY VALUE CHAIN

Moderator	Steve Dellenback	Southwest Research Institute, USA
Keynote speaker	Mario Muñoz Atanet	Andalucia Regional Ministry of Development, Infrastructure, and Territorial Planning, Spain
Panellist	Laura Eiro	Ministry of Transport and Communications, Finland
Panellist	Marco Falcone	European Space Agency, France
Panellist	Martin Russ	AustriaTech, Austria
Panellist	Eric von Breska	European Commission DG MOVE, Belgium

This session addressed the important topic of reinforcing resilience in Europe's mobility and logistics systems to withstand environmental, technological and geopolitical uncertainties as well as direct attacks. The moderator, **Steve Dellenback (Southwest Research Institute),** led the discussion to explore how Europe can future proof its mobility value chain against climate, tech, and geopolitical volatility. The keynote framed resilient transport as foundational for socio-economic vitality, emphasising climate adaptation, route diversification, digitalisation, and public–private cooperation.

Speaker highlights

Mario Muñoz Atanet (Deputy Minister, Andalucía Regional Ministry of Development, Infrastructure & Territorial Planning – public sector)

Stressed the need for resilience in transport and logistics to handle climate-induced disruptions, geopolitical turbulence, and technological instability. Emphasised integrating climate risk into strategic planning, investing in resilient infrastructure, diversifying modal networks, deploying predictive and monitoring tools, and safeguarding digital systems with cybersecurity training and hardware upgrades.

Eric von Breska (Director, Innovation & Sustainable Transport, European Commission DG MOVE – European public authority)

Outlined the global competitive pressures on Europe's mobility ecosystem. Urged acceleration in digital and clean transitions, workforce re-skilling amid demographic challenges, and regulatory reforms – such as enabling cross-border automated mobility. Highlighted the development of low-carbon fuels across sectors and advocated techno-neutral support frameworks along with public–private investment collaboration.

Laura Eiro (Director General, Data, Safety & Security, Finland's Ministry of Transport & Communications – government)

Championed "Mobility as a Feature," she explained how mobility must integrate into broader societal services – housing, events, infrastructure – and not just transport systems.

Praised Europe's strong public transit and digital frameworks, but flagged the need for bold investments, unified digital markets, regulatory standardisation, and innovative PPPs to scale Mobility as a Service (MaaS) offerings.

Martin Russ (Managing Director, AustriaTech – national innovation agency)

Asserted that human resilience and trust are as crucial as technical robustness. Called for synchronising economic, energy, legal, and cybersecurity frameworks, and recommended system redundancy (for instance backup communication systems), the deployment of digital twins for infrastructure testing, and reliable multi-channel data exchange. He stressed not just data-based decision making but also using decision-based data to strengthen resilience across all layers.

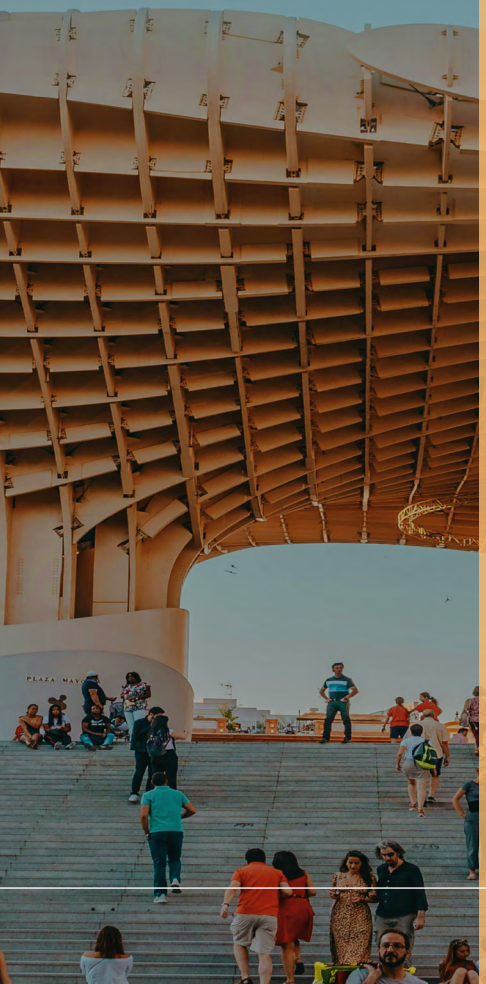
Marco Falcone (Head of Future Navigation Programs, European Space Agency – international agency)

Emphasised the vulnerability of satellite-based navigation and communication systems. Urged embedding cybersecurity – especially authentication – in satellite-ground interactions and protecting physical space assets. He positioned satellites as critical invisible infrastructure underpinning resilient mobility services.

The Q&A discussions set priorities – digital and clean transitions, data quality, redundancy, comms technologies, cybersecurity, and public–private collaboration. A broader dialogue linked technology with social sciences: all agreed on the importance of embedding behavioural, societal, and lifestyle insights to align services with user needs and secure social licence.

Plenary 2 takeaways

1. **Holistic resilience** requires technical, regulatory, human and spatial layers to be planned jointly to ensure adaptation to shocks and changes.
2. **Mobility intersects all services** – it must be a built-in feature of urban development, not an afterthought.
3. **Redundancy & digital twins** are invaluable tools for anticipating and mitigating systemic failures.
4. **Satellite and cybersecurity resilience** are non-negotiables for critical systems.
5. **Integrated PPPs** are essential to overcome funding constraints and institutional inertia.
6. **Unified digital market & regulation** will allow Europe to scale mobility innovation beyond local silos.
7. **Social science integration** ensures resilient systems are embraced and trusted by citizens.



Plenary 3: TOWARDS LEADERSHIP IN CCAM AND AUTOMATED DRIVING TECHNOLOGY

Moderator	Steve Phillips	CEDR, Belgium
Keynote speaker	Jim Misener	Qualcomm, USA
Panellist	Ana Luz Jimenez	Directorate General of Traffic, Spain
Panellist	Jordi Casas	RACC Mobility Club, Spain
Panellist	Francisco Sanchez Pons	CTAG, Spain
Panellist	Cesar Lorenzo-Perez	Renault Group, France

The moderator, **Steve Phillips (CEDR)**, launched a deep dive into how CCAM and automated driving can be scaled across European mobility landscapes by harmonising technology, infrastructure, and user readiness. The keynote anchored the session on connectivity. He detailed how C-V2X and ADAS must converge through layered communications, from roadside units to 5G-connected ecosystems, thereby enabling integrated safety, traffic efficiency, and messaging from infrastructure to vehicles.

Speaker highlights

Jim Misener (Senior Director & Global V2X Ecosystem Lead, Qualcomm – private tech sector)

Focused on the fusion of Advanced Driver Assistance Systems (ADAS) with cellular vehicle-to-everything (C-V2X) connectivity, emphasising real-time car-to-infrastructure and car-to-road-user communication. He highlighted the evolution from "Day 0" safety alerts to more sophisticated systems where vehicles predict collisions, signal phase timings, and cooperate for emergency route pre-emption and traffic flow optimisation. He stressed the importance of heterogeneous connectivity – 4G, 5G, roadside units, and cloud – to achieve trusted, safe, scalable driver assistance and automated mobility thereby positioning Europe as a leader through large-scale deployments.

Ana Luz Jimenez (City of Seville – municipal government)

Described leadership as the ability to innovate, scale, and harmonise new connected and automated mobility (CCAM) technologies across European standards. She emphasised deploying connectivity in real-world settings and integrating CCAM into public infrastructure with cross-border consistency. She also advocated embedding ADAS and automated driving elements into driver education and other public trust-building initiatives.

Jordi Casas (RACC Mobility Club, Spain – user representative)

Reported that many new car buyers were uninformed so had disabled ADAS. Following consortium-led half-day training sessions, user acceptance and understanding had increased significantly – demonstrating the critical importance of user education in CCAM deployment. He emphasised that closing the gap between industry innovation and user need required greater end-user involvement from design to deployment stages.

Francisco Sanchez Pons (CTAG – automotive research centre)

Argued that CCAM leadership was a long-term pursuit requiring consistent work across cybersecurity, AI, and software-defined vehicle architectures. He advocated digital validation, extensive cross-border pilots, and using connectivity to extend the vehicle's perception horizon. He called for pragmatic step-by-step deployment of available technologies as part of coordinated efforts.

Cesar Lorenzo-Perez (Renault Group – OEM perspective)

Highlighted the necessity of 5G and AI, stressing that V2X standardisation must match infrastructure readiness. He warned against repeating the misalignment seen in electrification and argued for gradual upgrades from Level 2 ADAS to Level 4 capabilities "L2+" in controlled settings. He cautioned on cost-benefit balance, user adoption issues (such as intrusive lane-keep assist), and noted that the slow turnover of vehicle fleets was affecting rollout effectiveness.

Audience questions reinforced common priorities: requiring safe fallback systems (Hi-Drive project), industry-wide trust, public–private collaboration, and embedding cybersecurity planning in all CCAM activities. The consensus messages: trust, user-centric design, standards alignment, and joint governance are essential.

Plenary 3 takeaways

1. **Connectivity is the foundation** – C-V2X combined with multilayer communications leads to safer and smarter mobility.
2. **Leadership spans multiple layers** – innovation, real-world deployment, regulatory influence, and public education.
3. **User training is key** – education significantly improves ADAS adoption and trust.
4. **Technical resilience is essential** – cybersecurity, AI architecture, and digital validation must be central to CCAM strategies.
5. **Coordination across sectors and borders** – multi-national pilots and standardisation are critical for scaling.
6. **Phased automation adoption works** – incremental L2+ applications before advancing to full automation.
7. **Holistic ecosystem approach** – stakeholder collaboration – from OEMs and regulators to academia and users – is vital for steering CCAM leadership.

Part 3

Discussion and papers sessions by Topic

Topic 1

Cooperative, connected & automated mobility (CCAM) deployment

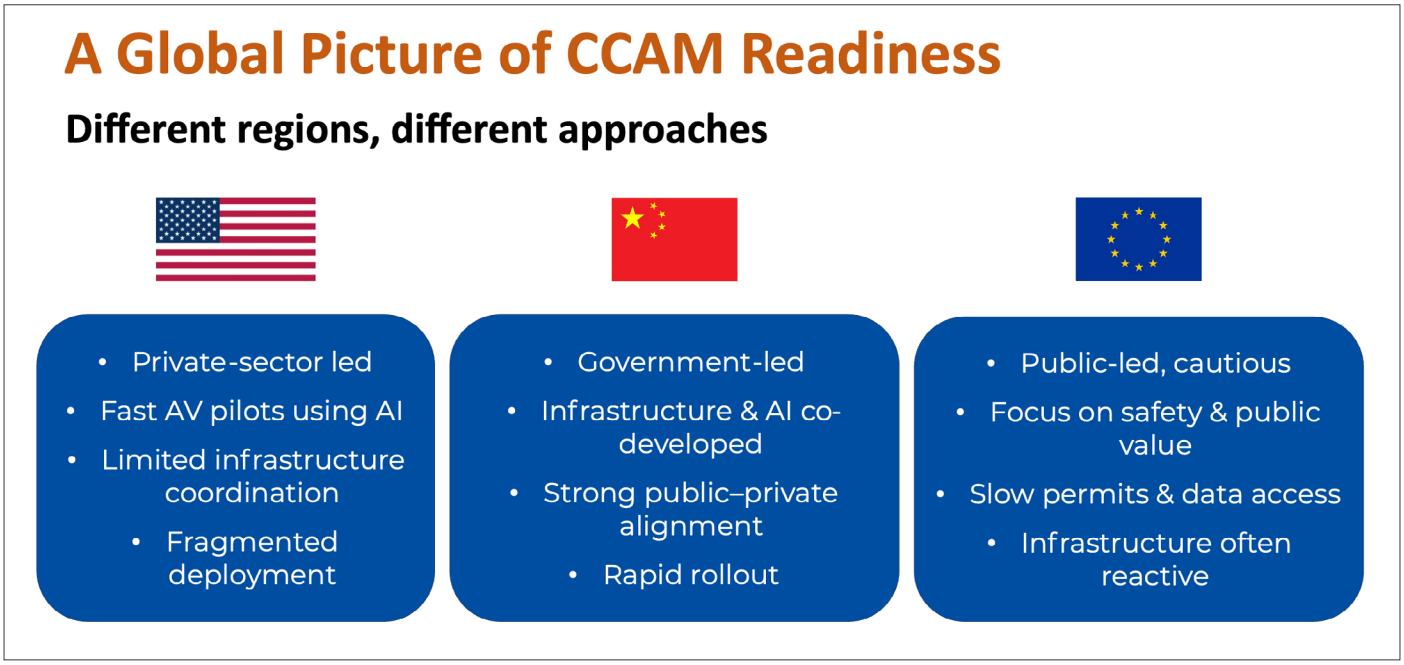
The overall situation

This topic at the Congress was expected to cover:

- CCAM impact assessment: societal implications, industrial & economic opportunities
- Innovative solutions: automated vehicles, technology enablers
- CCAM challenges: standards, regulation, legislation and policy
- Integration with existing infrastructure and networks
- Deployment and scaling up: business models, blocking points, lessons learnt
- Opportunities, challenges and implications of AI for CCAM

The topic of Connected, Cooperative and Automated Mobility (CCAM) was one of the most popular elements of the congress with about 30 sessions. It used to be a topic dominated by research ideas and results but Seville showed that it was clearly moving towards demonstrations, pilots, deployment, and evaluation papers describing lessons learned from larger scale deployments globally, as well as discussions on the feasibility of very large-scale deployment.

Presenters frequently expressed frustration with the slow pace of CCAM deployment. Too restrictive and too fragmented regulation across Europe were factors often cited. According to one expert we should focus on the essentials for deployment and go forward accordingly, instead of spending time trying to solve all secondary issues before starting deployment. The experiences from China and the USA were given as examples. We should also pay more attention to addressing human acceptance issues as we need user confidence and trust in the systems so that the ultimate customers were willing to acquire CCAM solutions and willing to use them daily.



CCAM readiness in Europe, the US and China by Agostina Massarini in SIS 65

What was popular and what was not

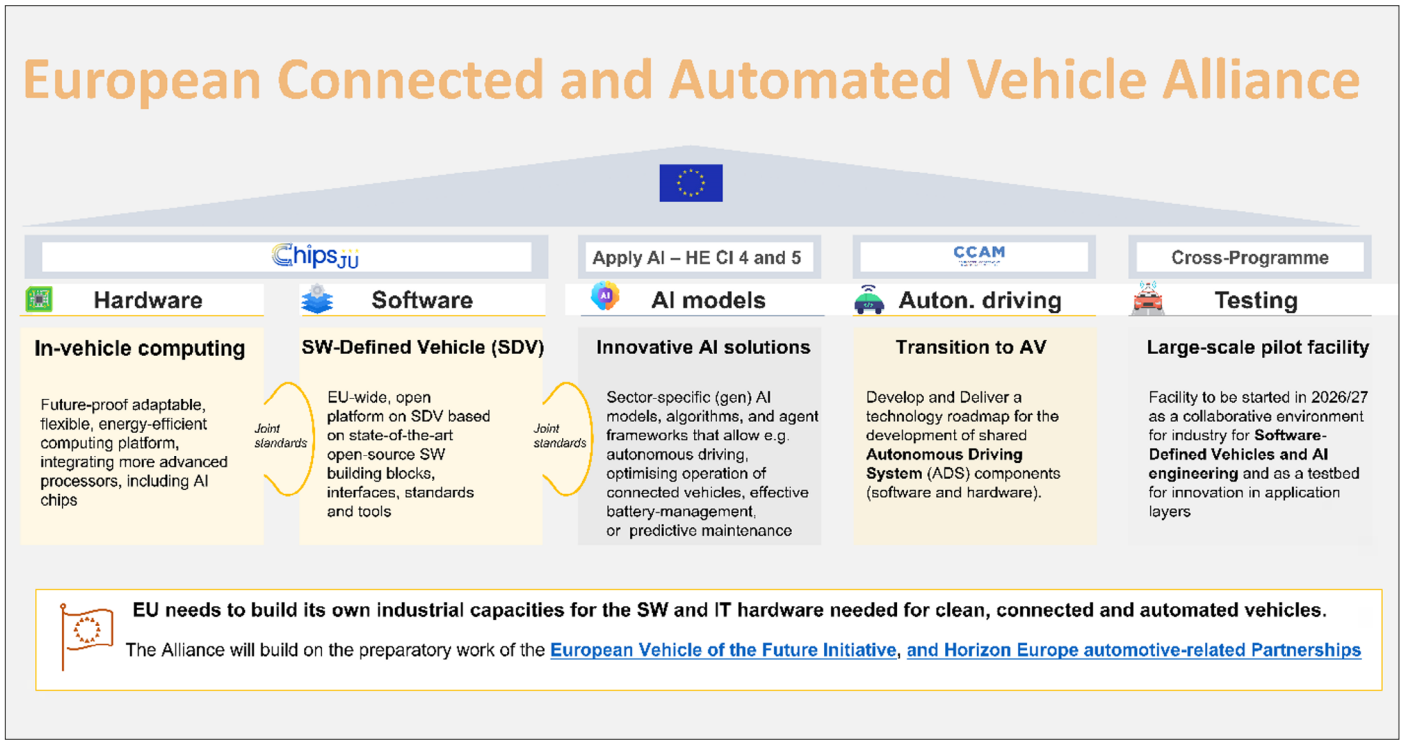
Automated

Perception of the environment and adaptation to various challenging situations and edge cases (adverse weather conditions, tunnels, urban junctions) for the automated vehicle received much attention. Many papers dealt with technical as well as socioeconomic, sustainability and equity impact evaluation methods and results. Simulation has played a major role in evaluation as well as being an automated driving system (ADS) functionality development tool. The role of artificial intelligence (AI) was also to the forefront.

Automated shuttles and delivery robots were the most popular automated vehicle use cases in the congress.

In contrast high-definition (HD) maps, robotaxis, probe-vehicle data for CCAM support, HMI, and ethical issues received minor attention in the congress.

In relation to societal perspectives and the potential impacts of CCAM new themes such as inclusivity and equity in the CCAM context gained attention and were the focus of several special interest discussion sessions, in addition to papers sessions discussing traffic safety and efficiency impacts of different CCAM services.



Key industrial CCAM development areas in Europe by Suzanna Kraak in SIS 4

Physical, digital, communication and operational infrastructure support for automated driving was discussed in a number of sessions. The common view was that infrastructure support was a necessity for road safety especially in high-speed road environments for extending the line-of-sight or electronic horizon of the automated driving system. One interesting view was that the infrastructure was an orchestrator providing the layer for balancing public and private benefits from CCAM. On low-speed urban streets the infrastructure support needs were much smaller.

For physical infrastructure, the kerb management issues were discussed. The automated mobility solutions need safe pick-up and drop-off points on the kerb for both passengers and goods.

With regard to digital infrastructure, digital twins and shadows providing real-time data on existing conditions and situations were often cited.

Many presentations described the national approaches in building up the prerequisites for CCAM deployment. Some countries have

based their actions on a top-down strategy while others have used a step-by-step method to move forward. The collaboration of the different stakeholders and building up ecosystems for deployment were common elements in the approaches. One key statement was: "we need alignment – not in thought but in doing". Success requires alignment of individual stakeholder actions to reach the common objectives beneficial to the goals and motivations of the individual actors.

Some experts emphasised the case for automated ridesharing to complement public transport rather than having self-driving private vehicles.

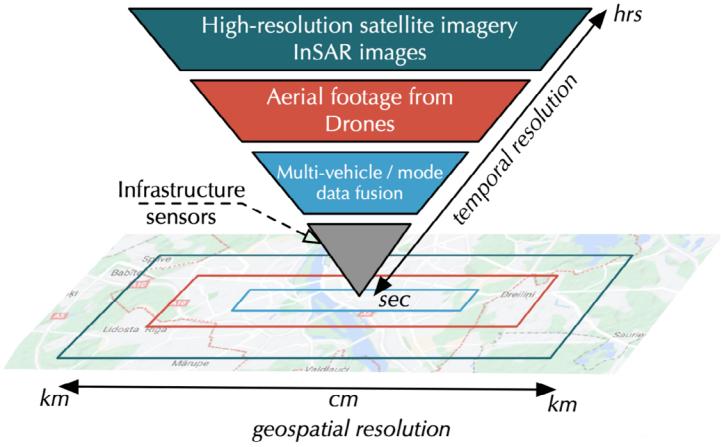
Connected

Connectivity and Cooperative ITS (C-ITS or just V2X) was strongly represented as a topic on its own and also as a feature in automated transport and mobility. Connectivity was clearly moving towards deployment although some use cases were in the development phase. Collective perception was such a use case, where especially vulnerable road users could become more "visible" to the connected vehicles in urban areas, and thereby road safety would be improved. The importance of infrastructure monitoring systems was stressed by a number of speakers as such systems are needed in several C-ITS use cases including collective perception especially.

Content adaptation of DATEX II and C-ITS messages was explored at the congress (DATEX is also discussed in Topic 2).

Sensing and Monitoring

- Advanced and Dynamic Cyber-Physical Infrastructure Monitoring Systems
- The road physical and digital infrastructure state
- Proactive warning for safety risks in complex environments
- Safety criticality between infrastructure design and road user behaviour
- Maintenance and warning



Resolution pyramid of infrastructure monitoring solutions

Road transport system monitoring by Tamara Djukic in SFS 5

New ideas

The use of automated shuttles with driving speeds up to 80 km/h on highways was a welcomed step forward. New ideas also included integration of automated vehicle trajectory data into simulation models to enhance their fidelity, a novel methodology for evaluating on-board perception systems of automated vehicles on proving grounds and open roads, and leveraging Large Language Models (LLMs) to predict near-crash events using LiDAR-based tracking data.

An infrastructure-based localisation system was shown to improve the accuracy of AV operations. The system used a solid-state LiDAR installed in the infrastructure to acquire high-resolution environmental data. A deep learning model specifically trained for

localisation tasks processed the LiDAR data to determine the vehicle's position with high accuracy.

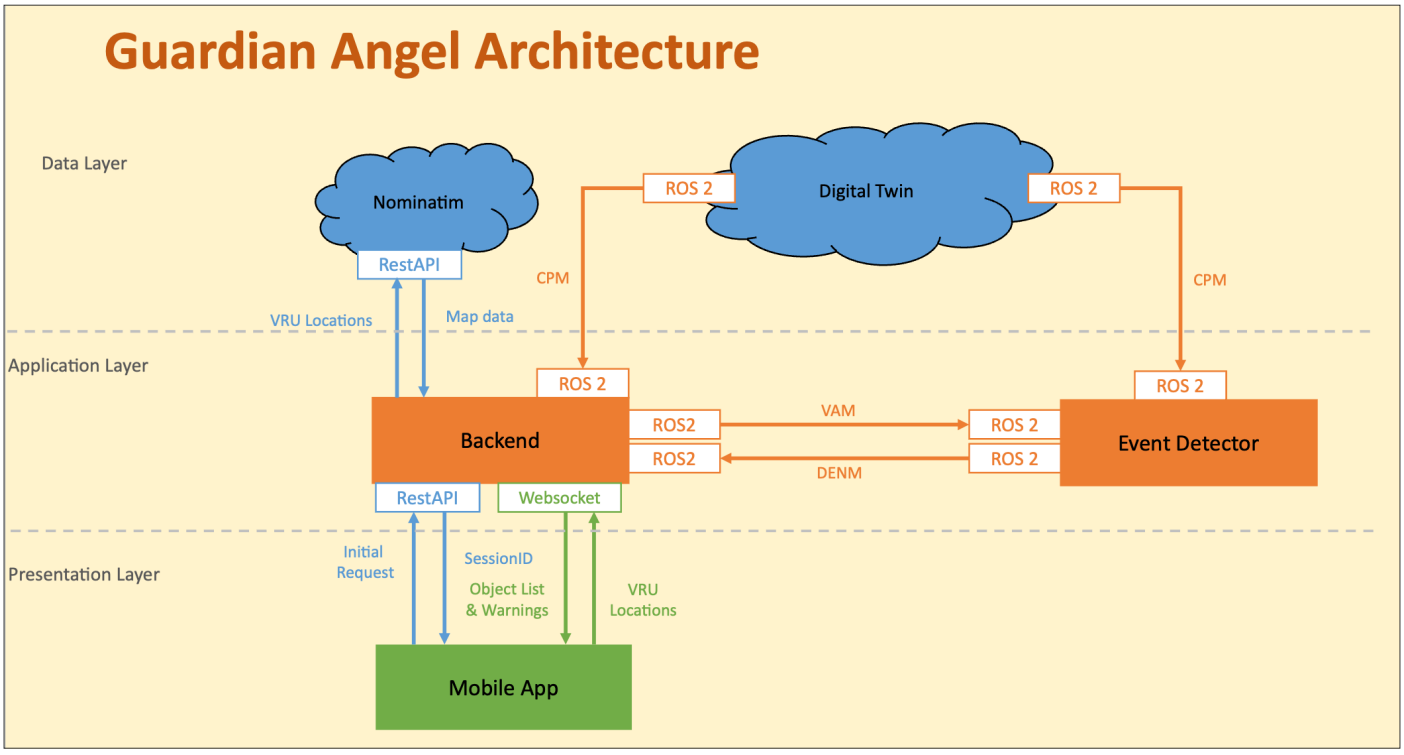
A fuzzy logic-based Safety Mode Decision algorithm designed to adaptively select the most suitable operational mode for the ADS based on situational risk assessments could assist in the situations where ODD termination is possible.

Remote operation was also becoming an increasingly popular theme, with real-world use cases (for example in airports). There was still much discussion regarding the needs and challenges (including technical aspects and human factors regarding the remote operators), and more importantly, the legislation involved to scaling such services from wider areas to remote assistance on public roads in Member States.

Special interest sessions discussed leveraging space-based technology for "safer and smarter" roads in collaboration with ESA, as well as the use of both terrestrial and non-terrestrial networks. The transformation of a conventional signalised intersection into a smart intersection using new sensors (such as new radars and AI cameras) enabling new applications with innovating cooperative functionalities showed much promise.

From 1 January 2026 all vehicles registered in Spain must carry a C-ITS connected warning light replacing the traditional warning triangle to signal immobilisation due to breakdown or accident without exiting the vehicle. This was a promising solution applicable to all driverless vehicles in countries where the current legislation, which mandate the setting up of warning triangles for vehicles having to stop on the carriageway, has prevented the use of driverless vehicles.

The congress introduced a Guardian Angel mobile application (see picture below for architecture) for active VRU safety enabled by a digital traffic twin – in a sense a collective perception C-ITS.



Guardian Angel architecture by Fabian Thomsen et al in RP 1

Trials and experiences of services

The trials and pilots reported at the congress included C-ITS and CCAM solutions in a port and connected corridor to improve mobility and logistics, intelligent intersection control for CCAM vehicles based on digital twin (shadow) of the intersection, vehicle implementation of smart Automated Emergency Braking (AEB) with V2X and on-board sensors, and the development of applications based on sensors and connected solutions to improve the safety of bicycles.

Research into public-private collaboration for L4 CCAM freight operations (with road authorities) was also ongoing in the context of the MODI project and TM2.0 frameworks, with preliminary results becoming available such that CCAM becomes a main component for future logistics (and its consideration in traffic management).

Lessons from a C-ITS pilot deployment in Florida contained data collection and management methods, the performance evaluation results, including participant feedback and a summary of lessons learned for future CV deployments. Alerts of wrong way drivers and red signal violation proved worthy I2V applications.

Speakers in sessions demonstrated how V2X communication could be integrated into the electrical and electronic (E/E) architecture of vehicles.

Another theme concerned V2X and I2V enablers for extending the operational design domain (ODD) of driving automation in complex real-world environments such as overtaking, merging, and hazard warnings on motorways. In addition, it was reported how relatively simple I2V applications could be used to mitigate challenges stemming from the relatively low speed shuttles driving in mixed traffic in their early deployment phase.

Another topic related to vehicle connectivity was cybersecurity which requires special attention in the CCAM domain, posing new attack surface with new challenges and vulnerabilities.

Connected vehicle services for emergency vehicles and especially ambulances had been deployed widely in the Netherlands and Belgium.

Use of CCAM in traffic management showed the potential to provide benefits in journey times, waiting times, network throughput, and carbon emissions, under the conditions studied.

A study had carried out assessment of the technical performance of three traffic detector technologies (multi-technology, radar-based and dual-camera) in different configurations and conditions, using video footage as ground truth. It also discussed the challenges and opportunities for integrating these technologies into C-ITS applications. The paper identified the need for further standardisation and harmonisation of the vehicle classification schemes and event detection configurations.

Several special interest sessions reported and discussed insights from diverse CCAM trials, featuring several ongoing European research projects focusing on different CCAM services. Trial contexts included teleoperation in airports and remote operation of CCAM generally, enhancing traffic safety for VRUs, and integrating traffic management and CCAM. In addition to trial results and direct experiences, issues hindering the scaling up of deployment were in focus. Many trials of CCAM services as part of the transport system had been held around Europe, but most of the services had ended after the project phase.

Lessons learned from pilot projects and early deployments related to topics such as regulation, infrastructure, connectivity, and societal and stakeholder needs. There was emphasis on the need to co-design use cases and services with the intended users and stakeholders, and to address citizens' concerns regarding accessibility and trust as well as potential negative effects such as workforce changes. The maturity of services could play a role in user acceptance. People participating in CCAM trials had been frustrated by minor traffic disruptions. The lack of harmonised requirements across the EU remained a barrier and responsibilities distributed among several, different level, authorities within a country level continued to pose challenges to acquiring the necessary permissions. Insurances for CCAM vehicles also need to be enhanced and clarified.

City representatives highlighted legal and financial aspects, inclusivity and effective use, acceptance and perceptions, and cooperation as the main success factors in CCAM implementation. From the city viewpoint CCAM was expected to improve both road safety and the local economy, and should be implemented as part of public transport rather than competing with it.

A city spokesperson stated that "*AVs are part of the solution, but not THE solution for mobility*" as active modes should be remembered as well.

Forwards vs Constrained

Key 'forward' issues

The importance of data for the deployment of CCAM services was clearly highlighted in the congress. This dealt with all use cases in cooperative, connected and automated mobility services. Data has to be trustworthy *ie* secure and of high quality and it has to be exchanged according to global standards. Several sessions reported on ongoing work on data standards for the various use cases, such as parking data and the digital map standards necessary for automated valet parking. Some key lessons learned were the importance of a reliable data sharing platform, using common standards, reliable data sources and security.

The data quality approach of the "Data For Road Safety" initiative by Mohanad Ismail in SIS 16

It was recognised that in addition to availability of data attention needs also to be placed on how to make best use of that data. Data should be provided in a harmonised format and include relevant metadata. Challenges included a large amount of data providers, data collection methods, data formats and protocols ("immature data culture"). The European Mobility Data Space aimed to become a source for harmonised data.

Another forward issue was impact assessment of CCAM services and use cases. Impact assessment was expanding to cover also broader societal themes such as equity. The recently published European Common Evaluation methodology for CCAM was promoted at the congress.

Several presentations also included results of impact evaluations of CCAM. Almost all of them were based on simulations. Some results were also based on actual pilots or Field Operational Tests involving human drivers. In those cases, the results related to short-term use and sometimes for a selected user group.

Artificial Intelligence (AI) was referred to in almost all CCAM sessions. Some experts pointed out that AI had been used for many years for automated incident detection, tunnel safety systems, traffic prediction, and operator decision support for example. Also in AI, the trustworthiness of data (quality, reliability, robustness and resilience) is essential. One conclusion was that AI is not a threat but may lead to safety critical situations if applied fully and without human oversight.

Some examples of promising use cases for AI tools were mentioned in different sessions. Large language models could be used to analyse certain datasets, and int*eg*rating CCAM and traffic management with AI could provide new opportunities for optimising the transport system in real time, for example by using large volumes of data from connected vehicles. Explainable and trustworthy use of AI in different CCAM components, including data anonymisation for model training, were currently being studied.

One presenter pointed out that whereas AI related tools and methodologies (such as machine learning) had already been widely used by companies, they were mostly novel to public authorities and their domain. How to use AI in (automated) decision making needed to be studied.

CCAM edge cases were also more present in the Seville congress. Several presentations and panels discussed interaction with vulnerable road users in complex urban environments, automated driving in non-standard and unstructured road conditions or in low visibility and adverse weather conditions.

The emergence of remote operations and teleoperation as complementary enablers for extending the operational design domain of CCAM services was a clear forward trajectory. Trials had illustrated that teleoperated vehicles could operate safely under controlled latency thresholds (such as maximum 150 ms), provided the infrastructure supported high-bandwidth, low-latency communication. These insights showed that infrastructure readiness was as much about connectivity (5G and beyond) as it was about physical design, hinting at the evolving orchestration roles for traffic management systems. Interestingly, teleoperation was also pitched as a realistic fallback mechanism to deal with edge cases like heavy-weather conditions (fog, wind, snow).

Generally the congress reflected a transition from traditional traffic managers to traffic orchestrators, especially in the logistics domain. This highlighted a conceptual evolution: traffic flows were no longer just guided but strat*eg*ically managed through digital platforms. Here, interactive and cooperative traffic management principles were reimagined to serve automated vehicle fleets within highly dynamic ecosystems. We went from physical to digital, and now to automated. Multimodal traffic management in the CCAM age, with coordinated control and optimisation of traffic flows (from car-centric to system level) was being addressed in many ongoing actions.

In addition to shuttle use cases in passenger transport several studies addressed the potential of combining passenger and freight use cases. With most passenger transport taking place during daytime the unused capacity at night times could be used for transporting goods. However, these were still trials and viable business models were lacking.

Key 'constrained' issues

Communication and sensing technologies and their performance comparisons received very little attention in the congress discussion sessions, whereas in the exhibition especially sensing solutions were well represented.

HMI, cybersecurity, l*eg*al, and ethical issues received less attention in this congress than during the previous ones.

One recurrent constraint pointed out at the congress was the lack of a viable business model for large-scale deployment post-project funding. Experts lamented that most demonstrations remained disconnected from long-term exploitation due to fragmented r*eg*ulatory frameworks, limited local authority readiness and willingness-to-pay (or even an inability to pay), and procurement difficulties. There was also a knowledge gap: public transport operators, municipalities, and r*eg*ional authorities often lacked training and operational clarity for tendering AV-based services.

Another notable constraint was the social acceptance barrier. While some pilot trials reported positive feedback once users had

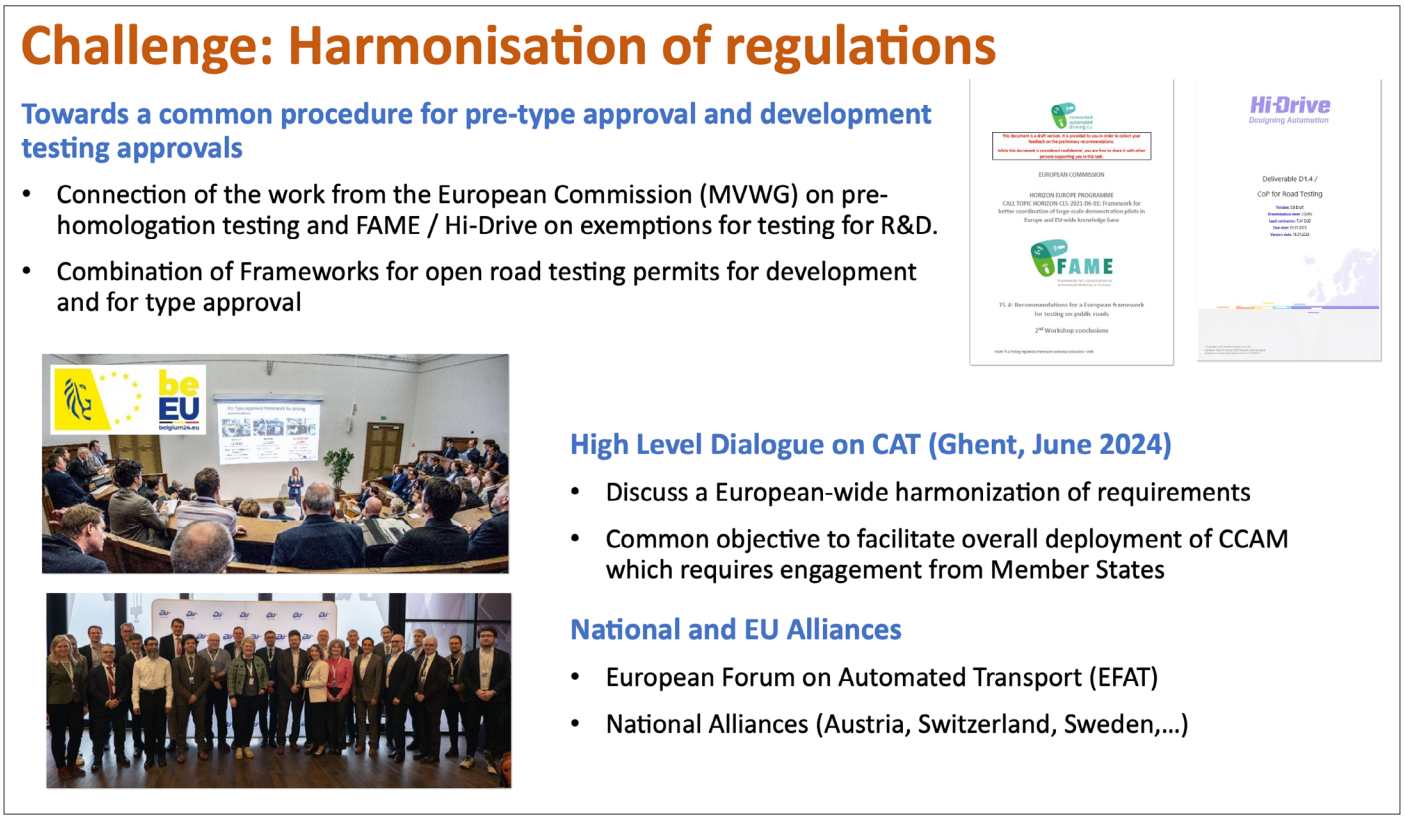
experienced automated shuttles, broader concerns remained around safety perception, digital exclusion, and equity. Audience engagement in sessions revealed significant latent anxieties around harassment, accessibility for disabled persons, and lack of trust in machine-driven transport.

Changes in the topic area

A clear change had occurred in the discussion of the topic area by moving more towards deployment and higher technology readiness levels of CCAM. The facts that some Level 3 automated driving systems were already on the global markets, and robotaxis were already providing commercial rides in some continents, were likely to be behind these changes.

An expansion into societal dimensions was also occurring. There was increasing attention to usability, diversity, and equal opportunities in AV deployments. The use of participatory formats revealed concerns about affordability, social safety, and personal freedom, especially for vulnerable or digitally excluded groups.

A notable trend was the shift from 'large-scale' to more 'long-term' deployment models (such as the metaCCAZE project) showing maturity in both the ambition and structural design of CCAM policy planning as now governance, fleet scaling, and regulation were integrated.



Challenges in CCAM regulation by Stéphane Dreher in SIS 65

Topic 2

Emergent technologies: data and services for mobility

The overall situation

This topic at the Congress was expected to cover:

- Mobility data and artificial intelligence (AI), virtual reality (VR), augmented reality (AR)
- Data sharing and interoperability
- Communications technology (5G and beyond)
- Cyber security challenges
- Clean & green technologies and services
- ITS for innovative aerial services (IAS)

Emergent technologies had been changing mobility through the integration of AI, IoT, digital twins, and real-time data platforms. Data had become the backbone of intelligent transport systems – and indeed of mobility services generally, enabling smarter decision-making, predictive management, and improved service delivery. Europe had been leading projects to create and define the foundations for a European mobility data ecosystem while trials, such as AI-based traffic management, digital road operations and MaaS platforms, had highlighted the growing momentum. However, data privacy, quality, interoperability, and the lack of clear business incentives for private data sharing remained major challenges.

Despite significant innovation widespread adoption of advanced systems such as digital twins looked unlikely before 2030. A wide range of application areas was needed. The transition to fully digital and interoperable systems had been constrained by fragmented architectures, legacy technology, and the slow pace of standardisation.

Nevertheless the way forward was clear: emergent technologies would play a key role in shaping safer, more efficient, and user-centred transport systems, and it was positive to see that the themes of resilience, sustainability, and collaboration were prominent throughout the congress sessions in the Emergent topic, providing a real focus for evolving connected mobility solutions.

What was popular and what was not

Data developments

Data and information had become crucial to the deployment of new intelligent services especially for a connected and interoperable future. High quality public information was needed to facilitate the deployment of these services as was agreement on the interpretation of publicly provided data by OEMs and mobility service providers. Data quality was key: quality must take precedence over quantity, and clear responsibilities must be established for data provision, processing, and distribution to ensure reliability and trust in the system. The EU regulation on real-time and safety-related traffic information was a key first step, but as more data and information was being made public there was a call for a renewed focus on getting the quality right.

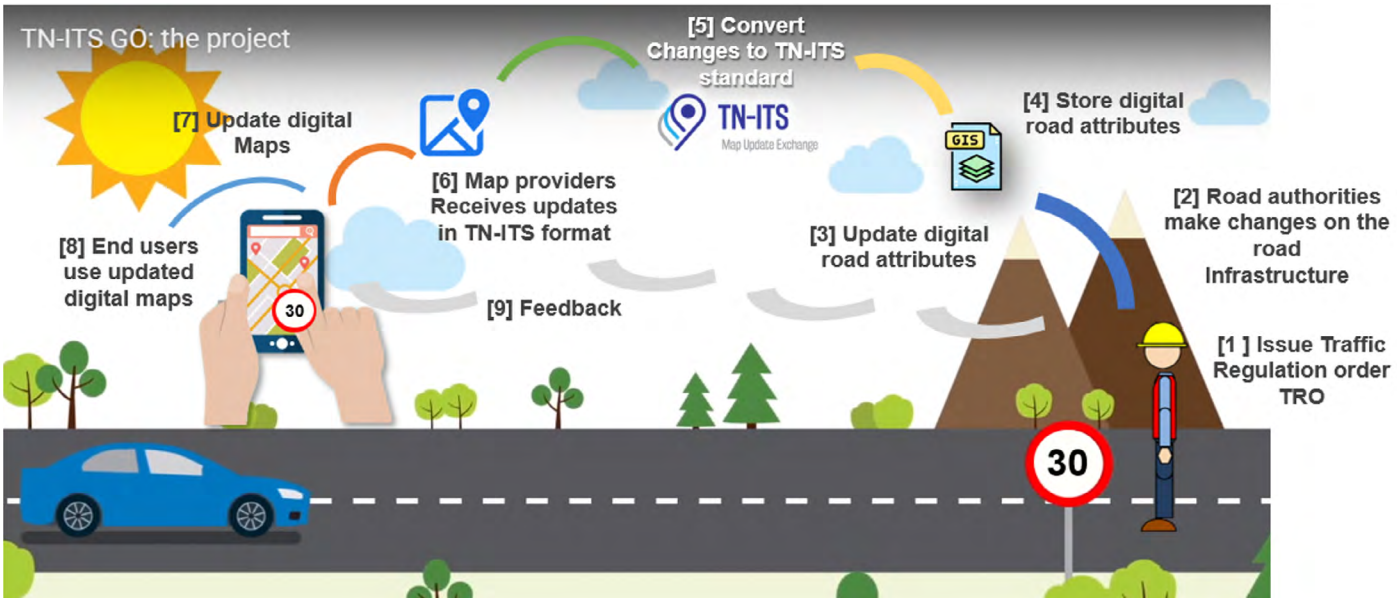
The large number of traffic information sources presented in sessions highlighted the need to explore and develop mechanisms for efficiently gathering, standardising, and delivering traffic data to National Access Points and Mobility Data Spaces. However, different sources can provide different data for the same situation. While similar data could sometimes be easily integrated, larger discrepancies made it challenging to determine how to combine the information. Several sessions highlighted the importance of comprehensive and harmonised metadata as a path to enabling efficient use of the different datasets.

Data collected from vehicles (built-in sensors, IoT beacons, even smartphones) was also shown to be relevant. These sources could provide reliable, scalable, and cost-effective alternatives to traditional methods.

Digital transformation was shown to play a key role in enabling road operators to effectively meet their road safety objectives, through data quality, smarter data use, real-time decision-making, and enhanced operational efficiency. It could also play a crucial role in the development of smart cycling – a part of the active travel and micro mobility landscape. In general this subject did not feature quite as much at the Congress as expected although it featured prominently in several sessions that discussed multi-modal integration.

In addition to vehicle and service-related data new data requirements have been posed by the delegated acts of the AFIR regulation. Its objective is to establish an open and interoperable data ecosystem to support reliable recharging and refuelling services in all EU member states. Related challenges include legal gaps and practical issues related to, for example, the mandatory collection and provision of various data by charging point operators, and the complexity of harmonising data across fragmented markets. It's a recurring theme, but clearly with good reason: standardisation is needed, as well as specific emphasis on cybersecurity.

There was a lot of focus on National Access Points (NAPs), and their ability to integrate interoperability between Datex, Siri and NetEx was specifically called out. The Dutch NAP has transformed data into context aware information thereby providing added value and giving the information an entity itself. Other EU projects such as NAPCORE and deploy EMDS had worked on the creation of the EU mobility data exchange world. The ability of data exchange in NAPs to facilitate multiple use cases was extensively discussed, with an example shown below.



Use Case speed limits by Christian Kleine in SIS 63

Across Europe there was a clear and growing effort to digitally transform mobility systems through advanced data integration, real-time analytics, and user-oriented digital platforms. The Technical Programme of the congress reflected the importance of digital transformation for enhancing traffic management and crisis response. Presentations covered many different contexts such as incident duration prediction, traffic information accuracy, emergency coordination, and smart city governance. Much of this work was associated with leveraging emerging technologies such as Artificial Intelligence, Mixed Reality, and integrated data platforms.

Data sharing was a key topic, with two technical sessions on its benefits, demonstrating a clear shift towards modernising road and transport systems through the integration of digital technologies from advanced tolling systems

and automated road maintenance to smart mobility platforms and big data-driven traffic analysis. The importance of effective use of different types of available data was discussed, while ensuring data privacy and security. Interoperability across systems relies on common data formats. Also, discussion of new services for public transport highlighted the role of integrating different data sources to enhance public transport services and deliver a better user experience.

The demand for real-time and accurate information, and the necessity of data-driven decision-making processes, were also identified. The common goal for the advances on emergent technologies was to create more efficient, safer, and user-friendly transport ecosystems.

The ability of satellite technologies to provide resilient and connected mobility services was discussed, with non-terrestrial networks being seen as capable of leveraging 6G standards to improve positioning accuracy. However it was stressed that challenges still existed and terrestrial redundancy would probably still be needed, for example dealing with obscured visibility conditions such as snow-covered roads. The need for ubiquitous connectivity featured, with hybrid terrestrial and non-terrestrial being seen as fundamental to next generation satellite enabled e call services.

The application of multimodal mobility data in Journey Planners was examined through Italian experience from data integration processes, with emphasis on the synergetic relationship between technological architecture and valid sustainable business models. A session on getting value from mobility data provided examples of different data utilisation in simulation and traffic management, aiming to help mitigate emissions and congestion.

Data sharing and interoperability was examined further with a look at enhancement to the established DATEX II standards. This would include modelling methodology enhanced to support a new generation of applications – data integration technologies that did not fully implement object-oriented features – going beyond established data publication web services while preserving investment in existing models.

Privacy continued to be seen as essential even though current privacy governance remains insufficient. As technology continued to evolve new privacy challenges would inevitably emerge. More data meant greater responsibility – robust frameworks and proactive oversight were crucial.

To address the issue of uncoordinated enforcement systems on urban and rural highways a unified and centralised software management model had been designed and developed in Turkey, aiming at integration of multiple types of enforcement subsystems, such as Parking, Red-Light and Average Speed, in a generic way and within a single framework.

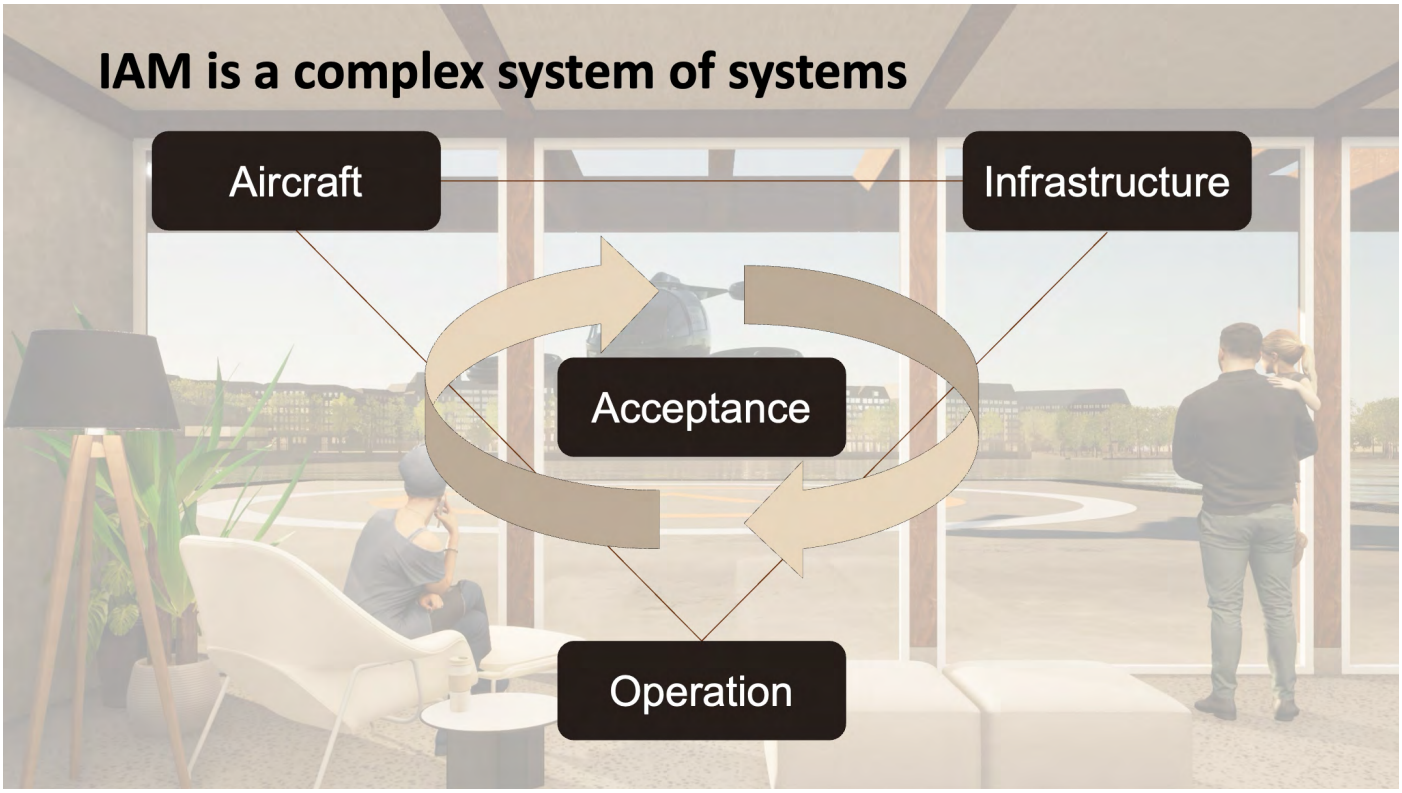
Mobility services

eCall services needed to be updated because of the "sunsetting" of 2G and 3G mobile networks. This was a clear example of how technological advancements required constant system updates, bringing challenges such as costs and compatibility issues. However it should also be seen as an opportunity to enhance the systems, improving their efficiency, capacity, and adaptability to new needs and contexts. Road safety was evolving toward V2X communications that alerted vehicles by using national connected vehicle platforms.

Satellite-based tolling was examined with a look at the use in the USA of smartphone geolocation for distance-based road user charging. This work leveraged the advanced geo-positioning capabilities already built into modern smartphones thereby eliminating the need for dedicated OBUs and significantly reducing both capital and operational costs.

Innovative air mobility services for passengers were discussed, with examination of some of the challenges of deploying the technology. There was a view that services needed to be specific to a city; with challenges being city, or country, specific. A "crawl, walk, run, then long-jump" approach was suggested to ensure solutions were operable in individual environments. There was also a focus on how to integrate passenger drone services into existing, standardised airport operations, as it was evident that aircraft manufacturers and airlines were considering their own role in a future UAM ecosystem.

The graphic below highlights the complexity of bringing together different systems within an overarching framework for acceptance of passenger drone services as a realistic option for travel. Discussions about funding challenges tended to revert to the well-known "chicken and egg situation" meaning how to convince governments to back investment to accelerate Urban Air Mobility (UAM) activities when a defined operational framework doesn't exist? The feeling was that autonomy would be the answer to demonstrating a profitable operating environment.



Innovative Air Mobility Bianca Schuchardt in SIS 19

In Saudi Arabia eVTOL services were close to taking off in a Red Sea archipelago, where the plan was to build zero-emission passenger services powered by solar farms – thereby triggering the question: how do we integrate sustainable power more widely in to Traffic Management centres?

Smart cities needed efficient, interconnected, resilient, and sustainable multimodal transport systems. The current gap between research deployments and real-world applications for managing multimodal passenger and freight traffic had to be reduced. Moreover new policies must support data integration to develop broader urban mobility systems, including smart cycling. In the public transport domain the complexity of integrating new technology and different data types with the purpose of enhancing services was highlighted.

Public-private collaboration in traffic management, previously explored in the context of Traffic Management 2.0, was given a fresh look in anticipation of large-scale deployment of L4 CCAM freight vehicles on public roads increasing the need for both road authorities and logistics stakeholders to seek closer collaboration to achieve their goals in a safe, efficient and effective way. In the European innovation project MODI several potential benefits of increased public private collaboration for L4 CCAM freight operations were explored and translated into a functional and high-level technical collaborative architecture. It was hoped that this would serve as a blueprint for new TM2.0 collaboration schemes for logistics and/or CCAM vehicle fleets. Future Congresses should track this work to see how it is translated and applied in future pilots and trials.

New ideas

Traditional approaches to traffic and transport management and control had been based on individual and fragmented communication, manual data handling, and isolated models. Decision-making had often been reactive and based on siloed indicators. Data, while increasingly available from different sources, had not always been integrated and used in the most effective way.

The new wave of solutions showed a shift toward integrated intelligent systems, combining different methods, such as AI or Digital Twins, to better predict and to take actions ahead of traffic situations developing. This technological support was also required to embed cycling into multimodal networks. As a new use case of AI, generative AI techniques were proposed for protecting privacy in images made by automated vehicles.

All the solutions described had been closely intertwined with the use of crowd-sourced data from connected vehicles and enhanced vehicle-user interaction, including using the driver's smartphone as an interface.

Digitalising transport was considered essential to enhance efficiency, connectivity and sustainability. To reach full digitalisation of road operation actions had to be developed in all layers of the operation model: from technology to services. Many speakers stressed the importance of not forgetting the vision and purpose of why we want to do something – because if we do forget we will not be aligned!

A look at the potential for IoT devices and edge computing to manage energy provision more efficiently in ports suggested digitalisation was a promising solution for helping ports and terminals with their decarbonisation goals. IoT can provide continuous monitoring of energy usage, allowing for real-time, data-driven decision-making, whilst edge computing can support the processing of data locally, enabling immediate adjustments to meet fluctuating demand without overloading central systems.

Still with digitalisation the concept of the Digital Road Operator was defined as a road operator that actively leveraged digitalisation to enhance the operation and management of the road network. This would include the use of digital models, shadows, or twins, the integration of third-party data, and the deployment of digital road infrastructure to optimise operational processes and decision-making.

An important part of the digitalisation of road transport was related to digital traffic regulations. Collecting, harmonising and digitising existing traffic regulations, often still paper based and local, was time consuming and costly but seemed to be necessary for deploying new mobility concepts including CCAM. Collaboration between countries would enable the combining of resources and ease cross-border interoperability. A stepwise approach was envisioned but it seemed to be too early to give timelines for legally binding electronic traffic legislation.

Digital Twins were given a great deal of attention in a look at how modelling of air pollution dispersion coupled with traffic flow simulation, as a digital twin, could be used for the correct implementation of low emission zones. This was an interesting and innovative approach for smart cities. Sticking with clean air, in Finland innovative traffic management measures using microsimulation modelling integrated with emission evaluation tools had been assessed for active traffic management optimisation on adaptive signal-controlled corridors.

In another development related to clean air monitoring of real-world vehicle emissions using new fixed remote sensing devices in Spain, was presented. This work suggested that remote sensing devices could revolutionise emission monitoring programmes worldwide – reducing operational costs, simplifying logistics and providing scalable, unattended solutions for real-time vehicle emissions monitoring.

There continued to be a need for an EU data exchange architecture in order to support the public exchange of information. MAAS technologies could be deployed within this architecture, allowing them to generate synergies among each other, fostering a more integrated and efficient mobility ecosystem across Europe.

Cross-border collaboration between Baltic states for better mobility services was presented and discussed. It was positive to see high levels of motivation and commitment to bring together digital expertise and shared challenges across the Baltic and Nordic regions.

Pre-emptive action was increasingly becoming a priority in the development of new systems, which have traditionally focused on reactive approaches.

The fatal five behaviours, known to be the major contributors to road trauma [drunk and drug driving, distraction and inattention, speeding, fatigue and failure to wear a seatbelt] were assessed in a world-first enforcement programme in Western Australia, scheduled for deployment in 2025. To tackle the 1.3 million deaths which occur globally on roads due to these behaviours a multi-function enforcement solution has been developed, with artificial intelligence capabilities to detect mobile point-to-point (average speed), spot speed, seatbelt non-compliance and distracted driving – addressing three of the fatal five behaviours.

Trials and experiences of services

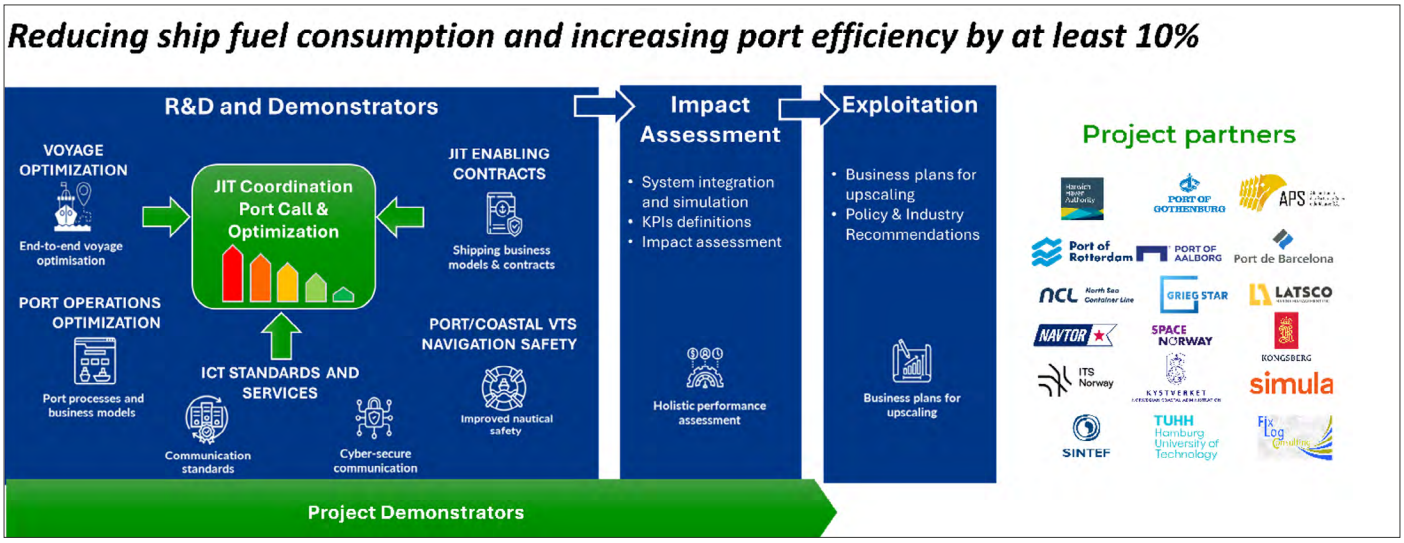
It was clear to see the strong pipeline of collaborative trials and demonstrations happening right across Europe and globally, though it was equally clear that scalability and commercialisation of solutions and services were still a significant challenge.

The Dutch NAP and National Data Warehouse were a good example of high-quality public information. In another trial on Dutch roads the responsiveness of navigation systems to roadworks was tested, to demonstrate how government provided data on roadworks is ingested and processed by navigation system suppliers. The findings demonstrated variations and inconsistencies in how different routing algorithms interpreted the presence and start and end times of roadworks, suggesting improvements to government roadworks datasets could be beneficial in helping coordinate consistent and timely re-routing due to roadworks.

A new European project, X_HeERO was being developed to identify Vulnerable Road Users, advanced and better data exchange between third party telematics services and public eCall.

The potential of multimodal traffic management, integrating freight and passenger traffic and new mobility such as CCAM, was outlined in a dedicated session organised in collaboration between EU projects (SYNCHROMODE, ACUMEN, and DELPHI) within the Multimodal Traffic Management Cluster (MTMC). The Multimodal Traffic Management Roadmap for 2030 and beyond introduced by the cluster highlighted key challenges in multimodal traffic management and proposed actionable strategies to address them, while establishing a shared vision for 2030 and beyond. Discussions underscored the importance of governance frameworks, stakeholder cooperation, and integration of different modes including active modes and ferries.

Staying with multi-modal freight, a look at sustainable and efficient waterborne transport services shared progress on the Dynaport project, which brought together 19 partners across 7 demonstrators which were suitable for all ports. End-to-end voyage optimisation and maximising port berthing windows, through the concept of ‘slower at sea and faster in port’, was promoted as a good opportunity to develop globally applicable standards. A determination to realise long-term benefits was evident: a true uniform language was needed to ensure globally applicable specification updates. The first demonstrations were planned for August 2025, and it was expected that the multiple stakeholders would quickly see added value.



Voyage and port call optimisation by Alv Øidvin in SIS 23

Self-driving transport solutions for ports and industrial facilities were also covered, with a challenge highlighted relating to the difficulty of securing insurance for trials due to the variations in data points in OEM solutions. This meant that currently there was not a common model that could be applied across port and industrial environments.

Turning to active travel, projects MegaBITS and MERIDIAN will introduce the European Roadmap for Smart Cycling. The main purpose of this road map was to highlight the advantages of smart cycling in driving sustainable and intelligent mobility across Europe.

Several more data driven trials were presented. For example in Spain and Japan, AI and big data models improved road damage detection and traffic planning. Slovenia had tested drones and LIDAR for infrastructure monitoring. In the city of Madrid (Spain), a MaaS system was piloted to enhance urban mobility, while video-tolling solutions were deployed to modernise toll collection. Moreover, in a comprehensive overview of recent C-ITS & Connected Services related studies conducted in the UK and Finland were presented.

The application of AI to in-vehicle navigation and information systems was demonstrated, with a look at how Augmented Reality, combined with 3D visualisations and AI, could enhance the visitor experience at new locations. This type of application could also offer benefits for commercial operations, such as delivery drivers who were struggling to locate addresses using more traditional navigation platforms that used 2D visualisations.

Incident detection leveraging the application of floating vehicle data was demonstrated in the SmartRoads project, which had transformed traffic management by significantly reducing incident detection time. Leveraging real-time Floating Car Data (FCD) and AI-powered video analytics, it detects real-time incidents and identifies hazardous patterns with a 90% success rate during pilot tests on the N279 highway in the Netherlands. Following the integration of crowd-sourced platforms like Waze, SmartRoads successfully demonstrated the potential of adaptive, multi-source solutions for modern traffic challenges.

Intelligent Transport Systems (ITS) had been developed to address the issue of wrong-way driving (WWD) in a test undertaken in the USA. The wrong-way driving detection system featured radar detectors, cameras, and WRONG WAY signs with red flashing LEDs, and was deployed and tested on a one-way road primarily used by university buses. Analysis focused on WWD drivers' self-correction behaviour, with statistical analyses revealing a significant 20% increase in self-correction rates when LEDs were activated. LEDs were most effective during break and summer semesters but less effective on Saturdays, suggesting AI-based detection algorithms could be applied to improve LED patterns in periods of low-effectiveness.

Technical sessions presented more experiences and systems related to connected vehicles. Cyprus had implemented a digital ITS maintenance system, while Spain was deploying

IoT V-16 beacons connected to DGT 3.0 for improved roadside safety. In the Netherlands, Sweden, and Catalonia, connected vehicle data was proving to be effective for monitoring road conditions. Smartphone-based tolling solutions were also being tested as scalable, low-cost alternatives to traditional onboard units.

Initiatives of digital evolution in cities and regions were presented In other technical sessions. They included Austria's Graph Integration Platform-GIP 2.0 and National Mobility Data Space, Cologne's daily modal share estimation through sensor fusion, and Madrid's integrated Smart Mobility Platforms powered by Big Data and AI.

In the public transport domain trials were related to vehicle occupancy monitoring with smart card data and (TP12 – New services for public transport).

The accuracy of connected vehicle data in measuring road condition, compared to conventional laser-based methods, was assessed in two studies undertaken jointly in the Netherlands and Sweden, showing that connected vehicle data was a cost-effective, accurate way of assessing road structure in real-time. Floating Car Data had also been used in road monitoring trials in Catalonia, Spain, resulting in similar cost saving findings.

Combatting the trend towards increased size and mass of cars one session discussed the role of ultra-compact electric vehicles in the mobility system. The ZEV-UP project presented main barriers (battery depletion, safety and cost concerns, cultural issues) and drivers (advancement in rapid-charging technology, driving comfort, government subsidies, policy support) identified.

Forwards vs Constrained

Key 'forward' issues

A strong forward development continued to be transformative and disruptive approaches that could speed up changes from traditional systems to new ones, and that integrated existing knowledge and practices with new technologies such as AI, to develop and enhance predictive modelling.

The new wave of systems was characterised by automation, digital integration, and user-centric design. In this context of growing interconnection the development of a common architecture for data exchange across the EU should be actively promoted. Furthermore, using vehicles as mobile sensors to monitor road conditions opened up new avenues for predictive maintenance.

The roadmap for Multimodal Traffic Management and Smart Cycling charted a progressive path forward showcasing best practices and enabling dialogue to scale solutions across Europe.

Congestion due to crash incidents was examined in a novel categorisation scheme for post-crash congestion patterns aiming to provide a structured understanding of the complex dynamics involved, and leading to a categorisation that encapsulates both theoretical insights and data-driven evidence.

Sustainable Logistics as a Service (LaaS) was tackled from a demand prediction viewpoint, leveraging deep learning-based prediction models to conduct the logistics demand prediction efficiently and accurately for last-mile deliveries in the UK.

IoT devices, in the form of IoT V16 light signals, were presented as a measure to reduce pedestrian accidents on high capacity, from the physical placement of hazard triangles in the event of an accident or vehicle breakdown. In Spain a public-private project had developed a collaborative system to enable every vehicle in circulation in Spain to signal these circumstances digitally, meeting mandatory requirements from 2026, and avoiding the need for walking in the road. A further look at IoT services analysed their potential to augment security and the in-vehicle experience, examining how next generation short-range communications can unlock new mobility innovations.

Key 'constrained' issues

Digitalisation demanded a fundamental redesign of existing workflows to fully integrated digital platforms. This transition affects not only technical infrastructure but also organisational routines and decision-making practices.

The process to validate crowd sourced data with official data was long and arduous. Data and information seta were deemed too large; there were lot of feeds, with overlapping information and different locations leading to map matching problems.

Despite technological advancements the full development of digital twins was not expected to

be achieved by 2030. Instead, a digital shadow was expected – covering elements such as speed limits, incident detection, and access control. In the meantime application areas such asset management and road works were likely to reach only the level of a digital model.

The lack of standards or alignment complicated integration efforts and delayed the development of a unified European data exchange framework. The coexistence of multiple, potentially overlapping architectures or data models across initiatives needed to be addressed.

On the constraint part, scalability, interoperability and data quality issues, such as redundancy and inconsistency posed real limitations to widespread deployment. Additionally, consideration needed to be given to timeliness and accuracy of the data, data privacy and security, and data integration expertise.

Another important aspect concerned the maturity of the technologies involved and their continuous evolution. Uncertainty in viable business models was also an identified constraint.

Upgrading infrastructure (*eg.*, moving from 2G or 3G to new services in eCall) was a complex task, as these changes were essential not only to support the expanded capabilities of the new system but also to ensure the continued functionality of legacy systems during the transition period.

Smart cycling still faced several barriers, including the need to align stakeholders, integration into existing road and digital infrastructure, increased funding for implementation, the need to ensure data interoperability and quality, and creating awareness and acceptance between cyclists and other road users.

The conversation on ITS for maritime transport applications picked up on the shared need for navigational standards for highway and marine transport and the potential for modal harmony, with trust between businesses and operators being identified as key to operational success but somewhat lagging in today's landscape.

It was suggested that public-private collaboration in traffic management could create "win-win" outcomes for all stakeholders. However, the benefits for private companies from sharing their data had still not been defined very clearly.

The testing of the response of in-vehicle navigational systems to roadworks information demonstrated significant variances in the way different providers interpret information from different sources, highlighting that we still have some way to go to get to a 'single source of truth'.

Changes in the topic area

A suggestion that success would require a change in approach was an interesting change in direction for data-centric scalable solutions. The need to move to a scalable data ecosystem was promoted, but with the caveat regarding benefits that it was not enough to talk about societal impacts, we needed to focus on the return on investment too. Other industries and sectors did this, why not ITS! There was a suggestion that it might be more astute to ask, "what are the costs of <u>not</u> doing something ?" in order to secure commitment and backing for faster deployment of scalable solutions. The example was given of connected ambulances in the Netherlands, where preventing just one collision could result in the delivery of huge cost savings.

The need for urgency and a strengthening of the message to potential investors was also clear in another call to deploying connected solutions for safety applications: there had been too much thinking, not enough doing! That's where we are today - we need to get moving! Minimum Viable Products were seen as a strong starter on this pathway, and it would be good to see if this approach could be followed through at future congresses.

Besides the suggested change of approach to drive scalability, a message arising in the Emergent topic was evident across multiple sessions: we will not get far without focused collaboration. It was needed not just for collaboration's sake, but with real intent and purpose it was essential for realising shared goals of interoperability and common consensus on data standards and quality, in order to achieve the societal goals of greater sustainability, equity, and resilience in our transport services and networks.

Compared to previous congresses, Seville felt like a shift in ethos towards collaborative innovation that future congresses will be able to leverage to propel the ITS community further forward to truly integrated mobility ecosystems.

Topic 3

Societal Aspects of Mobility for People and Goods

The overall situation

This topic at the Congress was expected to cover:

- Equity and accessibility for all (including cultural and geographical factors)
- Deployment barriers, lessons learned, opportunities and impact
- Innovation in public transport systems and services
- New services for freight and logistics (including automation and robotics)
- User acceptance/embracement and workforce implications
- Responsible and sustainable logistics

In practice there was overlap with the other Congress topics: Connected Cooperative and Automated Mobility deployment, Emergent Technologies: Data and Services for Mobility, and Resilient and Safe Mobility for Today and of the Future. And the two activities "user acceptance/embracement & workforce implications" and "responsible and sustainable logistics" were significantly less visible than the others. Overall this topic showcased global efforts to innovate and adapt mobility systems to meet environmental, social, and technological goals, fostering sustainable, inclusive, and efficient transport solutions. The various sessions and papers addressed diverse challenges and opportunities in mobility, sustainability, and inclusivity across urban, peri-urban, and rural contexts. The key themes included:

Inclusive Mobility: We saw a clear shift towards balancing technological advancements with social equity and inclusivity together with a focus on leveraging innovations to create sustainable, efficient, and accessible transport systems. This involved addressing challenges such as the digital divide, ensuring equitable access for vulnerable populations, and aligning mobility solutions with societal needs and behaviours. Other specific initiatives focused on enabling access to transport, women as users of mobility, women working in mobility, and "Inclusive Spaces" (a project focused on co-designing accessibility solutions). A common feature was removing the barriers for people with disabilities, older adults, and gender-diverse groups. There was strong advocacy for "Co-creation" or co-design approaches, universal design principles and inclusive policies to ensure equitable access to transport systems.

Technological Innovations: Solutions such as digital twins, artificial intelligence (AI)-powered bus stop enforcement, and Intelligent Speed Assistance explored the application of cutting-edge technologies to enhance safety, efficiency, and accessibility in mobility systems. These tools leveraged AI, the Internet of Things (IoT), and data analytics to optimise operations and improve user experiences. The use of telematics was seen as critical for an intelligent access solution – one described as "right vehicle, right cargo/freight on the right road at the right time."

Freight / Logistics: Solutions like FOR-FREIGHT showed the feasibility of integrating freight delivery into established metro operations without compromising passenger services. EU projects under the Sustainable Last-Mile Logistics Cluster, an initiative focused on scaling safe, sustainable delivery systems, addressed urban freight challenges by integrating metro networks, electric vehicles, and micro-hubs to reduce congestion and emissions while improving delivery efficiency. Some of the freight-related discussions emphasised covering "new services" for freight logistics (including some elements of automation but not robotics) and responsible and sustainable logistics.

Collaborative and Practical Frameworks: Projects like the Baltic Mobility Collaborative (BMC) and Benelux C-ITS Ecosystem emphasised cross-border collaboration, governance, and standardisation to create cohesive and scalable mobility solutions. Further, these additional frameworks were shown to be practical for in-country users and combining complex lessons from across Europe. For example, there was a thorough framework for maximising deployment of EV charging infrastructure and related services, and another combined complex intermodal freight areas that would allow operators to consider increased automation – in that the framework went beyond technology and into policy/wider concepts and more.

Gender and Cultural Diversity: Projects integrating gender-neutral needs into mobility apps and the EU project Diversify-CCAM explored how gender and cultural factors influenced mobility behaviours and the acceptance of new technologies. The results emphasised the need for inclusive design and equitable access.

Mobility as a Service (MaaS) Governance and Data Exchange: MaaS was not as prominent in this Congress as in earlier events but it played a key role in advancing governance and continued efforts to improve data exchange. The MaaS Summit at the Congress discussed two regulations, Multimodal Digital Mobility Services (MDMS) Regulation and Single Digital Booking and Ticketing Regulation (SDBTR), "to ensure that Europeans can buy one single ticket on one single platform and get passengers' rights for their whole trip". The need for improved data exchange to support these regulations, but also to improve MaaS efforts, was emphasised (see also below).

The "InclusiveSpaces" approach by Floridea Di Ciommo in SIS 43

What was popular and what was not

Popular:

"Co-creation" was almost mentioned in every session in the topic. This applied to developing inclusive urban mobility solutions with stakeholders to achieve climate neutrality and enhance accessibility for vulnerable groups; designing collaborative solutions for sustainable last-mile logistics; building inclusive cities; testing sustainable last-mile multimodal deliveries; and developing collaborative Business Innovation and Governance Models (BIGMs) for zero-emission mobility.

Topics coming across strongly were:

- Solving freight and congestion challenges through newer and more stable forms of technology without much mention of AI or analytics as we have seen before.
- User-centred design and inclusive mobility solutions that prioritised accessibility and the needs of diverse user groups.
- The integration of technology to enhance information accessibility and service delivery.
- The social model of disability, which seeks to remove societal barriers to mobility.

A number of Living Labs projects were cited with emphasis on collaboration, real-world testing, and scalability to address diverse mobility challenges, ranging from accessibility and inclusivity to sustainable logistics and cross-border integration. We heard about work in the cities of Helsinki, Amsterdam, Munich, Limassol and Tampere ; the InclusiveSpaces project (designing accessibility solutions for persons with disabilities and older adults); the Sustainable Last-Mile Logistics Cluster (safe, sustainable delivery systems in urban areas); the Baltic Mobility Collaborative (cross-border collaboration to improve mobility services in the region); and the REALLOCATE project (an expanded version of the 'Living Lab' concept in which specific urban areas were dedicated to piloting mobility solutions with a focus on co-designing and co-developing technologies and interventions to promote a modal shift towards more active travel).

Less Popular:

ITS in a rural context was only discussed in one SIS and focused less on ITS and more on the rural mobility challenges which had not improved over the last several years. In most locations rural bus services had declined resulting in socio-economic isolation and reduced access to services. Nevertheless ITS was being trialled to create an integrated, inclusive, and sustainable transport system for rural areas in Europe including the Rural Mobility Project., 2028.

As we have seen in the last few years, Mobility as a Service (MaaS) has fallen in popularity from the time when many MaaS pilots were being deployed. Other related topics such as mobility budgets and innovations within public transport were also not very visible.

Exciting new ideas or papers (plus developments in established areas)

The use of technology combined with bus franchising had proven successful in London and Singapore in addressing issues such as financial stability, changes in travel behaviours (such as following work at home policies) and environmental modifications such as electrification. Technology played a vital role in enabling franchised systems by providing transparency including access to operational data (for instance vehicle location, on-time performance, and missed trips) and aligning operator incentives with passenger needs.

Whilst "intelligent access" was not fully new as a concept it had become a more advanced area (once differing technologies were combined) because of the capabilities of the approach and the benefits in addressing road capacity (whilst using newer forms of data/vehicles technologies).

Development of inclusive mobility concepts, frameworks for integrating mobility on demand (MOD), and the application of the social model of disability to transport planning along with co-creation and universal design were frequently referred to in sessions.

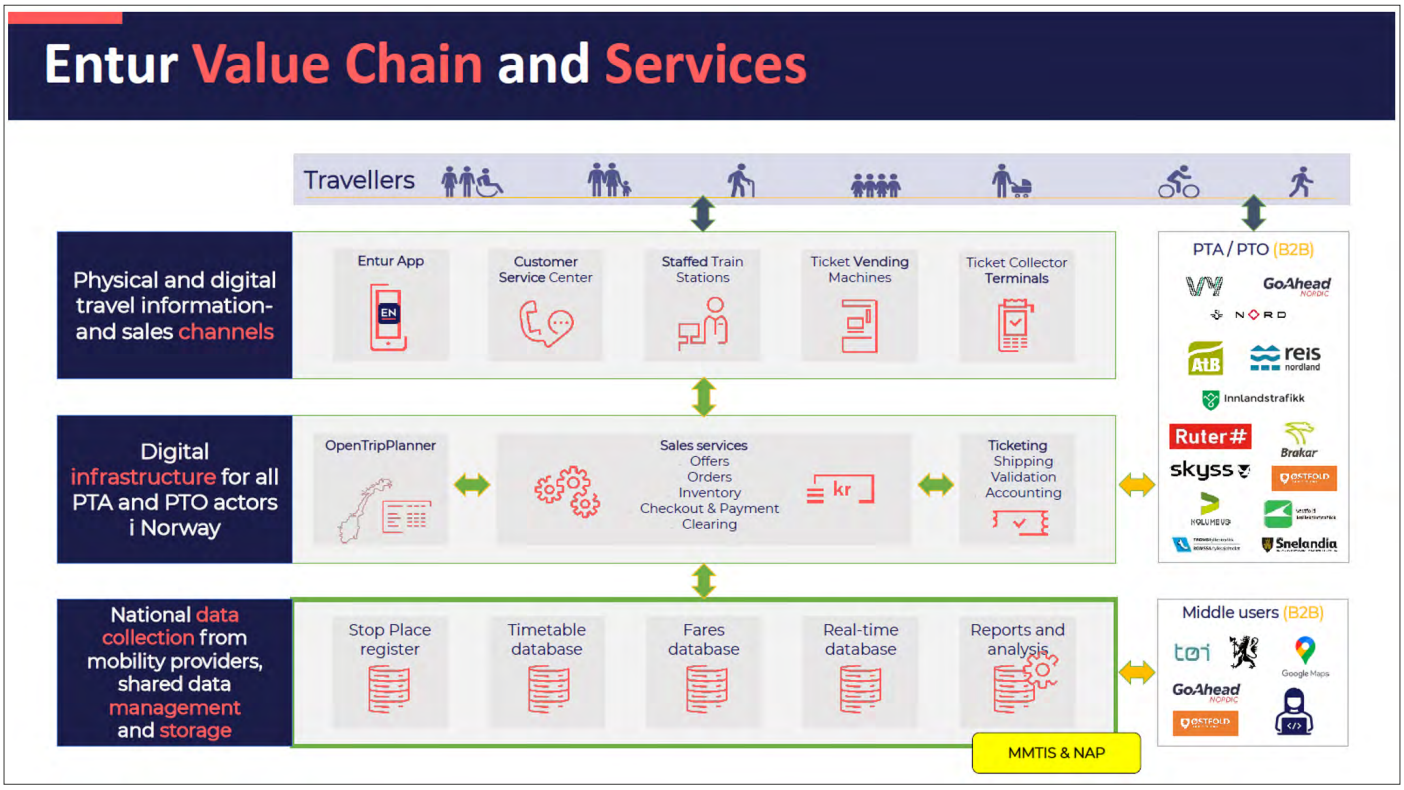
While investment in mobility data was a relatively recent concept it was emphasised in this Congress because of the very popular coverage of digital data infrastructure featuring in almost every session in the Societal topic area. For example in the Netherlands mobility data was and will continue to be critical to making improvements in traffic safety, traffic flow and air quality. The new idea of digital road management depending heavily on an investment in mobility data had been created and incorporated three key processes: digital infrastructure management, digital traffic management and digital road network governance.

Several trials and demos were noted:

- Mobility Lab Helsinki and Lyyli Living Lab Tampere focused on smart mobility testbed activities, studying three key aspects: approaches and offered services, common challenges and realities, and benefits and impacts. Recommendations were made to maximise desired impacts based on lessons learned.
- Trailblazer Living Labs (T-LLs) formed part of the metaCCAZE project and aimed to implement and demonstrate innovative, shared, and zero-emission mobility solutions using prototype Use Cases (UCs) and Business Innovation and Governance Models (BIGMs).
- Safe & Sustainable Mobility Labs (SSML) were carrying out pilots in 15 urban and peri-urban areas with the focus of the pilots to contribute to greater safety, inclusivity, affordability, as well as the cities' carbon neutrality objectives. The solutions developed were in four different categories: (1) innovative urban design; (2) behavioural nudging; (3) smart technology; and (4) data-driven solutions.
- The Aruba Happy One Pass (AHOP) Mobility Wallet was created for sustainable tourism/ travel through the use of Digital Twin technology. It provided carbon footprint tracking using real-time airport and flight data, providing travellers with a personal, verifiable carbon footprint stored in their wallet. It also calculated a local carbon offset to create, certify, and control carbon credits. These credits were linked to traveller identities and stored securely . Green Perks provide benefits for individuals and corporate events based on carbon offset participation. Secure data management ensured that traveller data remained secure and under full control and consent, enabling functionalities like border control, hotel check-ins, payments, and carbon offsetting directly from a mobile device.
- The use of NFC technology in public transport was not new but Barcelona's public transport system had implemented a new contactless ticketing and validation system. It included an NFC mobile app and farecards along with secure tokenisation to protect user data and transactions, and cloud-based infrastructure to manage data and update the system in real-time. Future expansion will include expanding the system's role in the larger transport ecosystem in Barcelona (*eg.*, interoperability with payment for other mobility services).
- Pilots across four regions in Austria were evaluating the impact of improved mobility information on the willingness of people to change their behaviour to more environmentally friendly modes. The project aims to create targeted information offers for different user groups so that they can be serviced and influenced with regard to sustainable travel.
- In Antwerp several limited speed enforcement zones were introduced in 2022 to increase the quality and safety of pedestrian areas. These "Intelligent Speed Assistance" (ISA) applications for shared micromobility resulted in an overall effectiveness of the speed enforcement implementation, although a speed limit was more respected among shared micromobility users. User acceptance had been positive, mainly impacting safety perceptions among pedestrians. Based on these results further development would contribute to increase overall safety for mixed use roads.
- In 2024, the Flemish cities Hasselt and Leuven experimented with subsidising a mobility budget for citizens. The study finished in March 2025 and concluded (1) the modal shift enabled by the mobility budget remained limited; (2) the mobility budget improved inclusivity and reduced transport poverty; (3) a significantly higher budget would probably result in more usage of shared cars; (4) the higher the mobility budget, the more trips and expenses; and (5)

the allocation method for most cost-efficient usage of the budget was distributing the budget at once for a longer period of time (six months or a year, for example).

- Regional initiatives like the Baltic Mobility Collaborative (BMC) and Benelux C-ITS Ecosystem emphasised governance, standardisation, and interoperability in cross-border situations. The BMC is an innovative, cross-border, institutional platform initiated in 2024 by the Baltic ITS organisations that is jointly testing and scaling mobility solutions across cities and regions with the aim of addressing the lack of cohesion between the States in the mobility field. The Benelux C-ITS Ecosystem served millions of road users and realised societal benefits and offers opportunities for businesses through



Open standards and open-source multimodal NAP by Brede Dammen in SIS 5

well-constructed governance, the use of standards, testing and certification, and a transparent split between private and public actors.

- An example of how a Nordic ticketing marketplace had been created is shown below.
- How collaborative and innovative last-mile freight delivery solutions could address the challenges faced by cities, courier companies and other stakeholders was discussed in the Congress. Real solutions including electric delivery vehicles, cargo bikes, drones, droids, and urban- and micro-consolidation centres were described along with innovations such as Logistics-as-a-Service, multimodal delivery systems, dynamic re-routing, and optimisation tracking. Multiple EU projects including URBANE (Upscaling Innovative Green Urban Logistics Solutions Through Multi-Actor Collaboration and PI-Inspired Last Mile Deliveries), DECARBOMILE and GREEN-LOG (Cooperative and Interconnected Green delivery solutions towards an era of optimised zero emission last-mile Logistics) are identifying challenges and learnings: (1) bureaucratic hurdles and the importance of local stakeholder engagement have been identified; (2) political changes and technical limitations can impact project success; and (3) the need for adaptive approaches and early involvement of stakeholders is critical.
- Drones and their deployments in traffic management, innovations, regulations, and lessons learned from various case studies were

covered in one SIS. Deployments by Spain's Directorate General of Traffic (DGT), Belgium and Coruña were described along with lessons learned and future considerations. Challenges identified included: environmental protection areas and national security zones imposed operational limitations; public education on benefits and safety was crucial for acceptance; and there was strong counselling – "to build trust, you need time," and "Clueless and careless can take the (drone) industry backwards and then regulations increase."

Forwards vs Constrained

Forward

Digital twins were not new but the use of them in ITS was becoming much more widespread. In Seville we learned about Local Digital Twins (LDT) and associated Data Spaces (LDT-DS). LDTs are digital replicas of cities that represent their current state, enabling simulations to understand urban needs. An EU LDT Toolbox was described which provided tools for urban management challenges like mobility planning, energy optimisation, pollution modeling, and sustainability. Other digital twins were presented in this Congress to develop low-emission zones and reduce CO_2; facilitate cost-effective electrification of transport through enhanced fleet management, predictive maintenance and vehicle optimisation; manage dangerous goods transport; and create a unified, digitalised freight transport information exchange across the EU.

Using a Local Digital Twin by Antonio Jara in SIS 55

The metaCCAZE project's prototype Use Cases (UCs) and Business Innovation and Governance Models (BIGMs) formed the foundation for innovative, shared, and zero-emission mobility solutions. Successful technologies and activities would be shared and implemented with six follower cities: Athens, Krakow, Gozo, Milan, Miskolc, and the Poissy area in Paris.

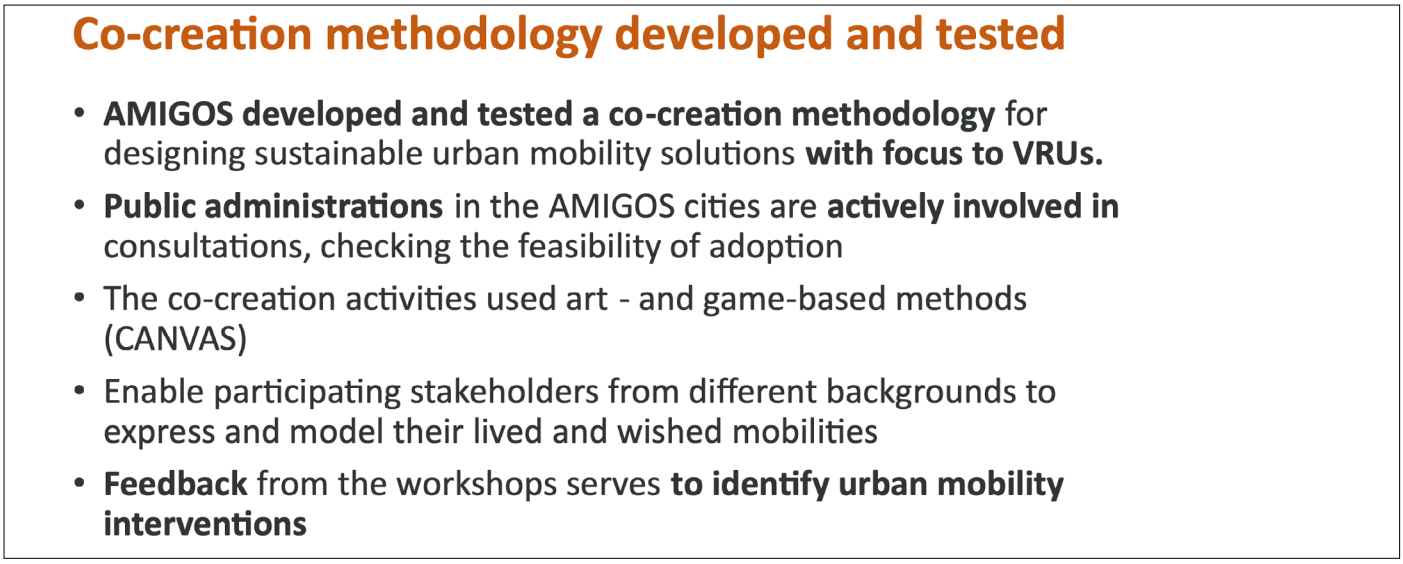
Collaboration on multimodal mobility data sharing and standardisation to enhance sustainable transport across Europe was seen as forward-thinking, particularly to support legislation. The discussions about data sharing covered the National Access Point Coordination Organisation for Europe (NAPCORE) Initiative which was working on data standardisation (DATEX II, TN-ITS, Network Timetable Exchange [NeTEx], Service Interface for Real Time Information [SIRI]) and interoperability of National Access Points for harmonised mobility data access throughout Europe, and a

cross-border approach which utilises national ticketing solutions and shared open-source components for transparency. Further, the challenge associated with integrating data from numerous small EV charging point providers was discussed, emphasising the need for the integration of charging point data to support MaaS solutions.

The World Bank had developed a smart mobility guideline to prepare implementation readiness assessments and action plans for cities across Latin America, the Western Balkans, and East Asia. The guideline includes five steps that use international best practices and local data sources to support cities adopting and implementing Smart Mobility solutions.

There was a strong emphasis on integrating social equity, accessibility, and user-centric design into mobility solutions and recognising inclusive mobility frameworks. For example:

- "Inclusive Design" was a key phrase in several sessions and presentations describing projects such as ELABORATOR (The European Living Lab on Designing Sustainable Urban Mobility Towards Climate Neutral Cities), AMIGOS (Active Mobility Innovations for Green and Safe Solutions), JUST STREETS, SPINE (Smart Public transport Initiatives for climate-Neutral cities in Europe), and REALLOCATE, among others. The phrase highlighted the benefits from including the largest number of user personas/user segments at the decision-making table. The ELABORATOR project highlighted the importance of aligning public needs and design principles to achieve sustainable mobility. Co-creation involving diverse user groups was key.



Co-creating future mobility with stakeholders by Erzsébet Földesi in SIS 11

Constrained

Mobility on Demand (MOD) was experiencing a range of challenges associated with data integration and interoperability including:

- Limited integration and inconsistent data structures
- Lack of policy directives to guide integration efforts
- High costs of traditional standards development
- Difficulties in integrating fare systems across multiple travel modes
- Limited standardisation of data sharing protocols
- Fragmented multimodal partnerships
- Lack of familiarity with emerging technologies that could facilitate interoperability
- Security concerns
- Confusion between deep linking (requiring

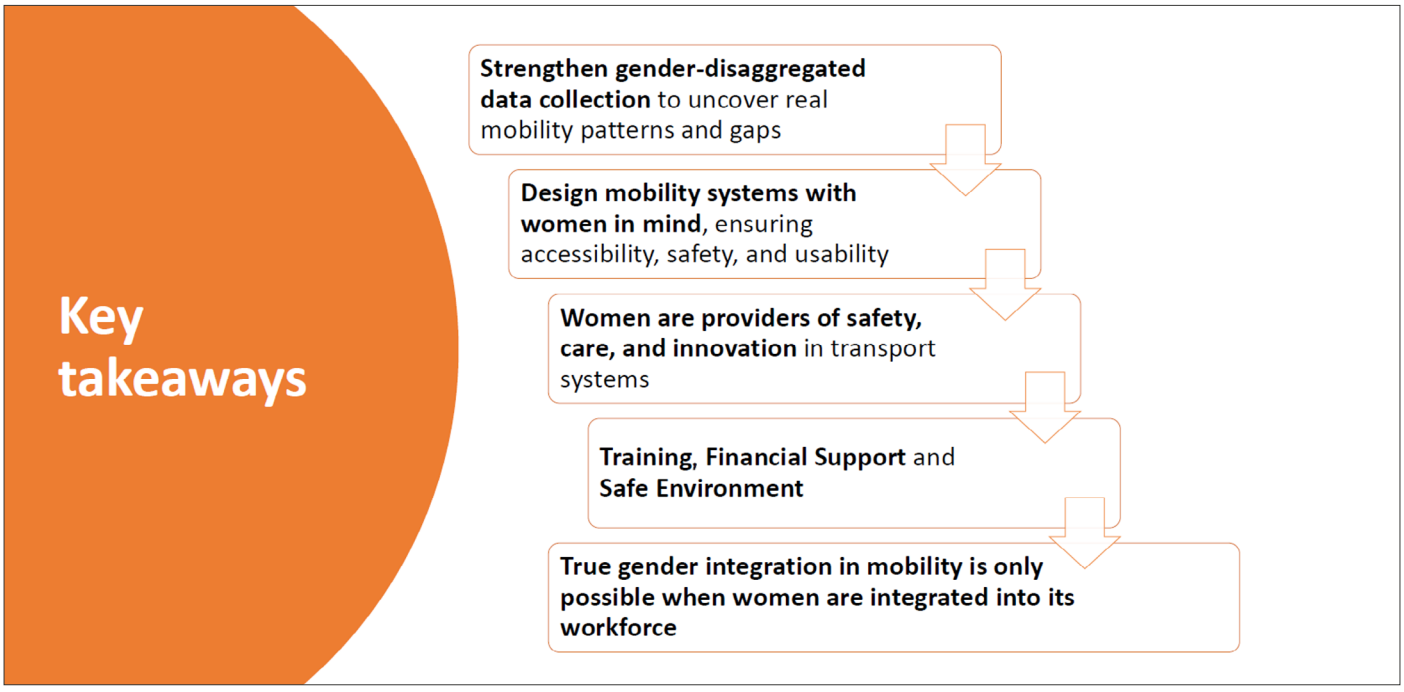
separate operator apps for booking and payment) and deep integration (seamless booking and payment within a single app).

There was a way forward to address these challenges, but it required collaborative efforts across borders and regions using lessons learned to ensure that MOD would be scalable and user-centric.

Digital twins can support the electrification of transport, in particular for electric trucks design and manufacture, fleet operation and predictive maintenance. However standardisation remained a barrier to universal adoption and interoperability and scalability were additional challenges across the value chain. The Congress outlined benefits for original equipment manufacturers (OEMs), fleet customers, and logistics operators, including faster product validation and lower maintenance costs. Finally, the importance of a full value chain transition to achieve zero-emission medium and heavy-duty vehicles (M/HDV) was described including the fact that it was not just about electrifying the trucks themselves but also about the flow of energy and the flow of goods from stakeholders' perspectives.

MaaS in South Africa had the potential to improve mobility and reduce reliance on private car ownership, but it required tailored solutions that addressed local infrastructure, cultural, and economic realities. Some of the unique challenges and opportunities included (1) existing informal MaaS-like systems were not subsidised and relied on hand signals for communication; (2) cultural aspirations to own cars as incomes rise could hinder MaaS adoption; (3) inconsistent electricity, limited GSM network coverage (often 2G), and a lack of cycling infrastructure; (4) payment clearinghouses were relatively well-developed, but cash-based transactions dominated; (5) institutional frameworks for data sharing and service-level agreements were required; and (6) encouraging local entrepreneurship and creating structures for innovation was vital.

In terms of gender recognition in ITS constraints were discussed along with forward-thinking ideas. There were arguments supporting "more and better-qualified, segmented data" and also "True gender integration is essential as the most impactful examples occur when women are in power. We need to create space for women to express their power and a safe environment for self-expression." In the same session it was stated that women's involvement "led to more accessible and sustainable transport solutions", but "this is not yet the norm."



Women in Mobility by Lidia Buenavida in SIS 43

Scaling options will be the key to seeing tangible global impact from a variety of ITS in this theme. Further, there are constraints such as data availability, funding, and the practical implementation of theoretical concepts, which pose challenges to progress.

Projects aimed at reducing the number of cars circulating (*eg.*, Cologne), using geofencing to reduce the allowed speed and thereby promoting sustainable mobility, seemed not to be as successful as expected. Cologne had said the geofences project had "no further development" as it was considered "citizens will never accept voluntarily applying geofences to limit control to the car."

What has recently changed in the topic area?

Change in this topic area appeared to be incremental, but the technologies felt more stable and more do-able in many more countries. There was a growing recognition of the need to actively involve persons with disabilities and other vulnerable groups in the design and implementation (*ie* co-creation) of mobility solutions and urban spaces. A number of mega-trends were visible –

- The importance of data and information in shaping mobility behaviour and creating seamless user experiences was emphasised with mobility increasingly being viewed through a social lens, as well as a technical one, with a focus on removing barriers and promoting equity.
- ITS by women, for women, to address gender disparities in mobility and ITS workforce, was a recent development – and recognising trends and introducing counter-strategies strategies to mitigate gender bias in mobility apps was a very recent development.
- Subsidising mobility budgets to improve inclusivity in mobility was becoming more common.
- Examining cultural factors influencing mobility behaviour/choices and acceptance of cooperative, connected and automated mobility was accepted in a majority of locations.
- New road safety optimisation methodology using automotive technology was able to identify high-risk traffic conflicts and optimise road designs before physical implementation.
- A modified Dijkstra algorithm was being used for eco-routing to incorporate ethical and climate performance indicators (ECPI) thereby ensuring route recommendations were efficient, environmentally compliant, and safe for vulnerable road users.
- AI-powered enforcement, while not new in illegal parking detection, was being deployed in more locations around the world, such as on buses in Braga, Portugal which detected illegal parking in bus stop zones. This enabled improvements to accessibility and safety for passengers, especially those with disabilities; speeding up bus services; and improving sustainability by reducing barriers to bus ridership.
- Detecting parking violations at bus stops was presented in a very sharp way as much more than a traffic flow problem – "Illegal parking is an equity issue, not just a traffic problem. Unsafe bus stops exclude people with disabilities, seniors, and caregivers from public life. If we accept obstruction of bus stops, we accept exclusion from public life."

Topic 4

Resilient and safe mobility for today and of the future

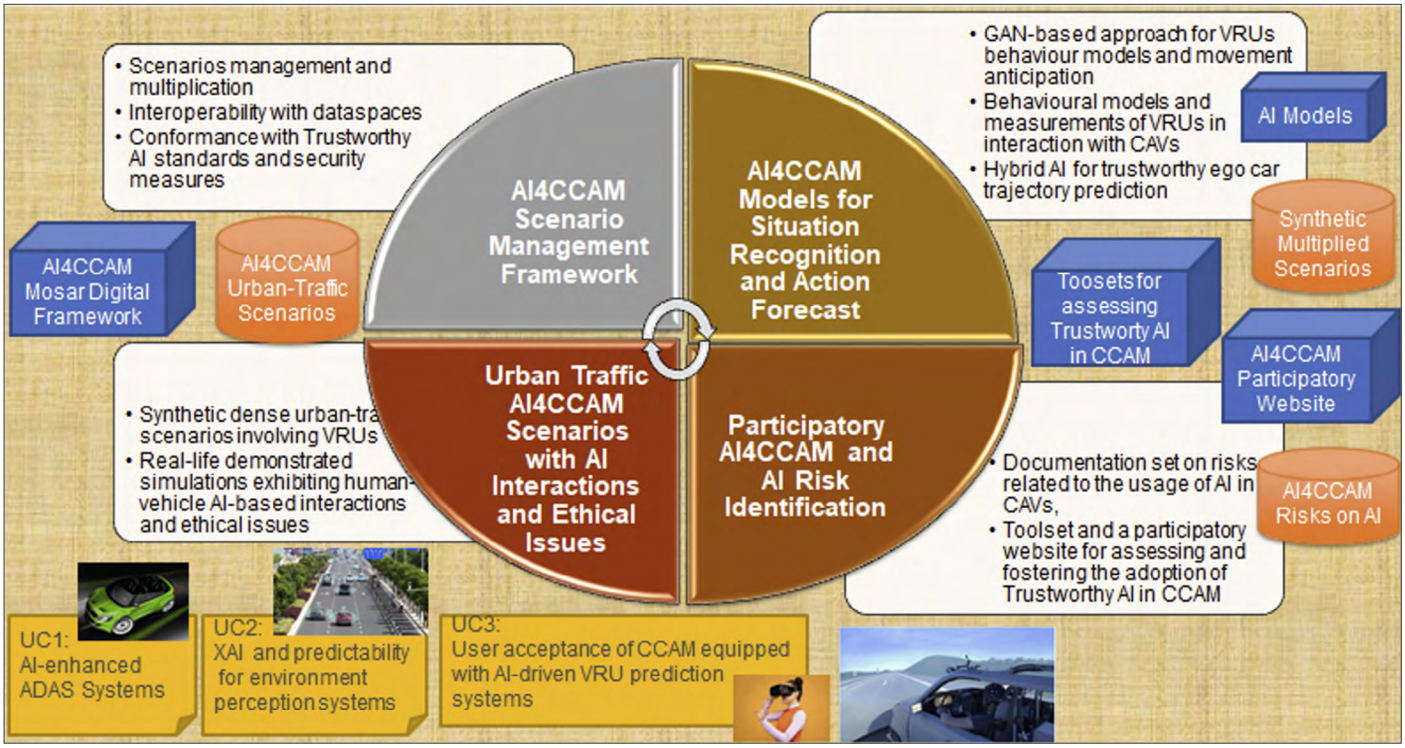
The overall situation

This topic was expected to cover the following areas at the Congress:

- Data technology and reliability for resilience
- Modelling for resilient mobility
- Social, business, legislation and regulatory aspects
- Adapting mobility for changing climate and infrastructure
- Lifecycle sustainability
- Cyber security solutions for smart infrastructure

In many of these areas the resilience thread was present but not as the dominant feature.

The overall situation demonstrated continued and generally complex challenges in resilient mobility, especially across data, technology developments and user needs. Not all the studies that reported involved 'hard technology' – the contributions of pedestrians and cyclists to overall environmental resilience featured strongly. The A14 C_CAM project looked at ethical, cultural and human-machine interaction with three use cases and included VR experiments with pedestrians. Layering the experiments with KPIs, interview, questionnaires generated an in-depth look at how pedestrians cross roads which was presented in the A14 CCAM concept below:



Trustworthy AI for Connected and Cooperative Automated Mobility by Karla Quintero in SIS 58

Cycling data was featured with suggestions that it could make a substantial contribution to environmentally resilient mobility. This also raised the potential need for a standard adapted to floating bike data (FBD). AI and digital sensors for cycling and micromobility data, potential identification of capacity issues, accident/ junctions with high risk and reporting on SUMI requirements along the TEN-T network were all highlighted in sessions.

Data technology and reliability for resilience featured extensively with a broad spectrum of discussions covering LiDAR, digital twins, digitalisation, integration, digital systems, and AI. There was less emphasis than expected on cyber security however this subject featured in CCAM and Emergent Technologies as well.

For the first time since Hamburg there was a small but wide-ranging waterborne transport element.

The use of the term 'soft mobility' was linked to consistent appeals that it was important not to leave anybody behind with the new mobility thinking.

What was popular and what was not

We mostly saw incremental improvements on existing technologies, but analysis and ingestion to AI platforms was growing. A great deal of resilience thinking was based around secure collection, access and use of data and the downstream technology solutions. Digitalisation was recognised as an essential to progress but there were warnings of the need to focus on useful solutions at a reasonable cost. The TEN-T network in Cyprus had delivered semi-automated/digitised information to improve the accuracy of reporting metrics and it was hoped that in the long-term it could be trained to provide analysis and operating scenarios for ports, airports and road network. Currently it was only partly digitised and was a relatively short network overall but potentially data could be fed into a platform to determine ODD data for the network such as volume of trucks from ports onto local highways and impact on maintenance requirements.

The Cyprus work was a good example of deeper thinking about the methods used to understand how people interact with transport and infrastructure in order to get a better grip on resilience measures. There were many examples given in sessions and technical papers:

- Enabling open data sources
- Understanding the benefits of digital twins
- Enabling data fusion into platforms and the use of AI for analysis
- How to improve safety / safety resilience.
- How data can be used to support safer outcomes with regards to vehicle safety.
- The power of in-car data and heavy goods vehicles
- Using simulations to determine long-term performance and impact on road safety.
- Applying AI analytics to road safety to help Authorities understand large amounts of data and explore the nature of accident black spots.

The movement of people and goods in a city was a frequent discussion subject often associated with looking at international best practice. Speakers stressed the importance – and the challenges – of ensuring that human factors were considered right from the conception of problem studies. Techniques such as User Centred Design and co-creation were presented along with encouragement for the public sector and industry to continue to work together. Joint working was essential for building robust commercial models for data for smart infrastructure.

As an extension of co-creativity cities were urged to do more to promote the arguments for sustainability and try to widen public interest in the potential benefits of urban EVs.

Although we had reports of a number of studies regarding individual and specific problems there was little about looking at a systems approach – possibly as authors were uneasy about public descriptions of sensitive issues. Until resilience is regularly tackled head-on there would continue to be a gap in the provision of properly robust resilient solutions to the transport challenges we face today and tomorrow. Adaptive technologies were mainly still in development so remained unproven with less clarity around holistic benefits. Similarly we did not have much about the costs of technology including its installation and maintenance.

Mobility as a Service had featured in Congresses for almost a decade and still seemed to be struggling with business cases and the suggestion that, like Cold Fusion, the big breakthrough would always be two years ahead. There was a very similar situation with "small city" or microcars.

There were lively discussions about procurement and overly-simple assessment protocols requiring acceptance of the cheapest offer. It was emphasised that until we change the system to add sustainability and innovation as criteria we will keep getting the same limited function solutions. In this area it was essential for the public sector not just to have more dialogue with the market but also to raise its knowledge level in order to be a fully informed client. There were a number of references to cities not fully realising what they were, and were not, buying!

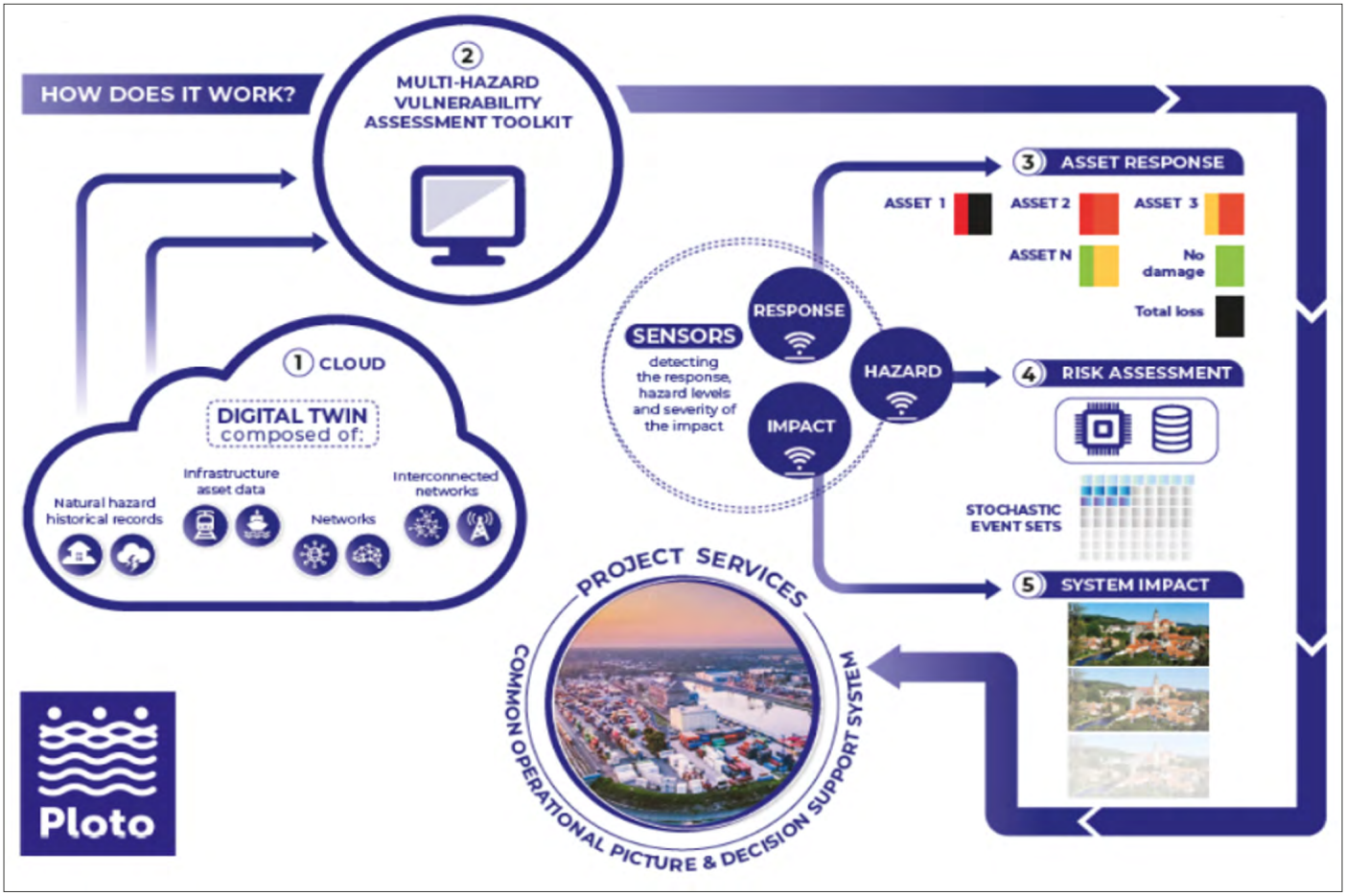
Specific areas

Waterborne

A lively session talked about the challenges that waterborne transport faced from economies of scale that could affect ports negatively.

Unusually, this session was not exclusively for one mode and discussed the appreciation and importance of gaining different perspectives and experiences from other areas of transport, perhaps highlighting the siloes we may still work in.

There was an encouragement to see all modes (including waterborne) as part of an entire transport system in order better to understand the co-dependencies and thereby learn how much we do work together and how we could increase that. This approach featured in the PLOTO project which considers a multi-hazard environment and has a robust methodology, see below:



Towards resilient and adaptive inland waterways by Nikolaos Tsampieris & Audry Maulana in SIS 53

Maintenance

A study had looked at AI and the concept of fusing several maintenance data sources into a predictive AI platform then training it to deliver a predictive and cost-effective road maintenance schedule. This linked to other projects which used LIDAR and other advanced imaging techniques for axle counting and vehicle classification in free-flowing toll scenarios, in that weight and axle load had correlations to carriageway wear and defects.

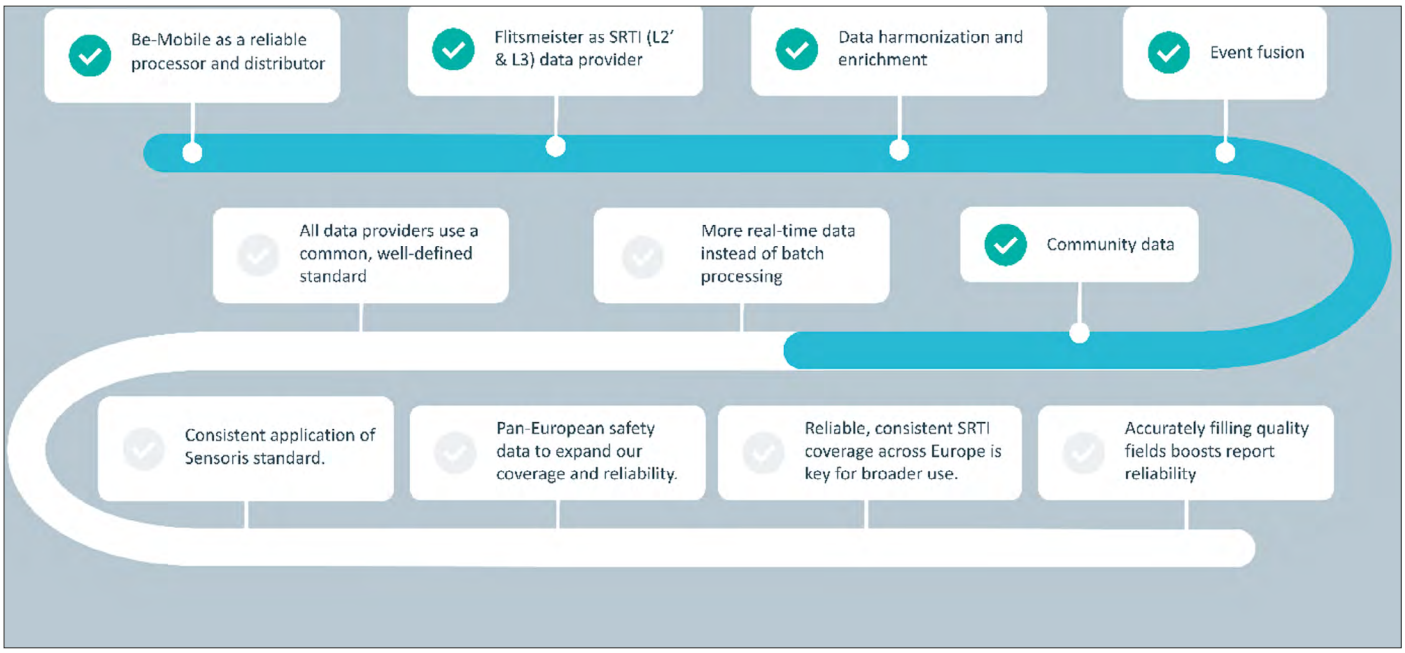
AI had been applied to the digitalisation and maintenance of highways in Spain where a contractor had incorporated disruptive AI technologies into its contracts to improve road asset control and mitigate risks to road works and road users. The results had dramatically reduced the time to do an inventory of road assets or complete an autonomous road inspection. It was interesting to note that developed countries dedicated an average of 1% GDP to highway maintenance and that precautionary messages aimed to reduce fatalities were nearly always directed at drivers as if their behaviour was the only cause of accidents.

An autonomous road inspector was presented that was being used to analyse infrastructure's role in accidents as part of a drive to improve overall network resilience. The system collected data using geofenced automated recordings, covering traffic signs, road markings, safety barriers, pavement conditions, and geometric data like lane width and road curvature. Information was processed automatically, identifying defects such as degraded signs, worn markings, damaged barriers, and pavement irregularities like cracks and potholes. The data was geolocated and stored with visual evidence for detailed analysis.

We heard about an innovative approach to pavement incident detection by leveraging images captured from vehicle-mounted equipment and very high-resolution satellite imagery combined with artificial intelligence. The proposed system automated the inspection of interurban roads, addressing challenges associated with traditional manual methods, such as high labour costs, prolonged inspection times, and safety risks for field personnel. By training AI models with these data sources the system could achieve high precision in detecting pavement anomalies, enabling faster and more reliable maintenance interventions and consequently improved network resilience.

Smart infrastructure

There was a busy session focused on smart infrastructure which derived from the European Commission's Delegated Regulation 'Safety-Related Traffic Information' to exchange and disseminate data in regard to enabling data sharing for road safety, with an emphasis on public-private cooperation across Europe. It had been frequently said that bad data in equals bad data out, so a lot of work had been put into the collection of data in the right formats, enriching outputs with different layers. This had highlighted the need for a 'big data ecosystem' to ensure clarity of roles. Some interesting examples highlighted were mobile projects such as the Dutch drivers being sent warnings of ambulances passing, or the end of a traffic jam and even a slow-moving vehicle. The presentation extract below showed the importance of improving progress with SRTI.



Safety related traffic information: data sources and dissemination by Jan Cools in SIS14

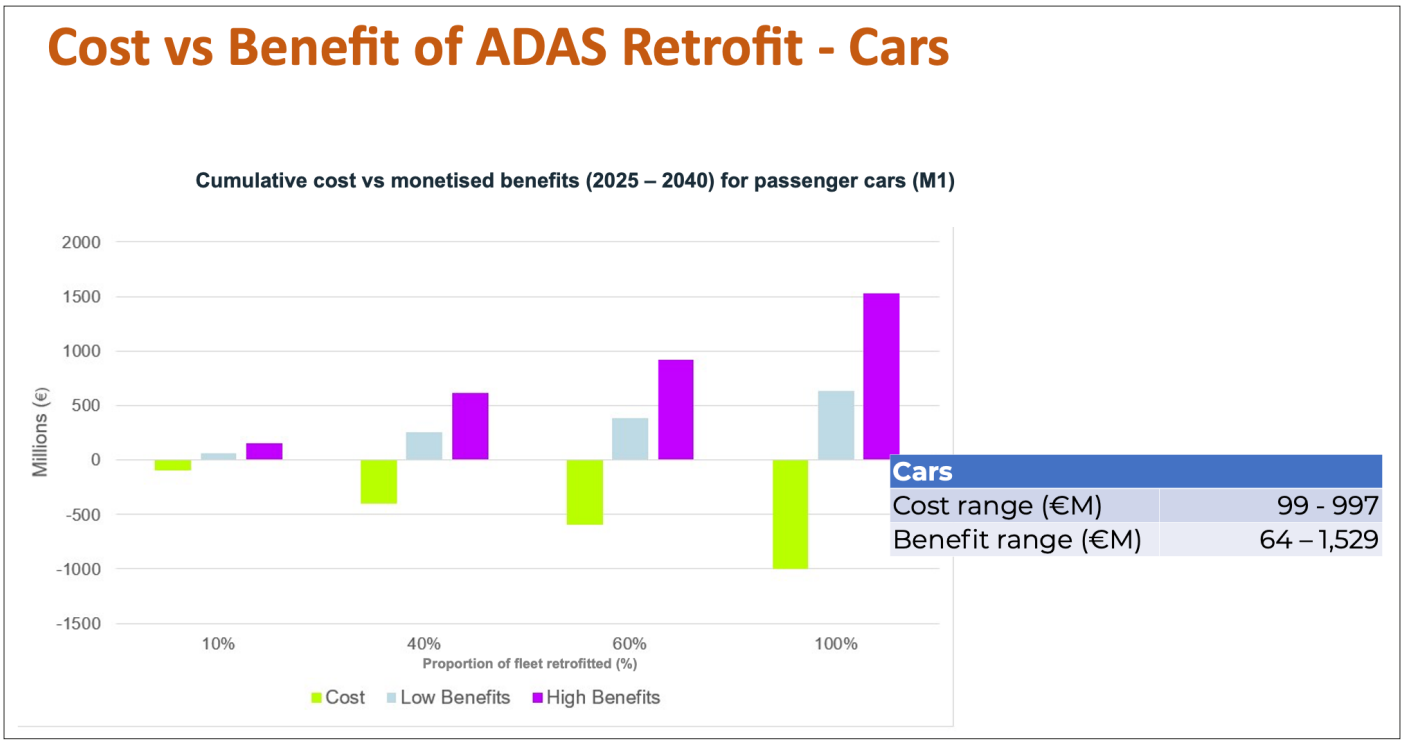
Technology innovations for resilient mobility

It was clear that technology had continued to advance in many cases by enabling support services for human intervention. Many examples were essentially retrofitting technology for example using LIDAR to collect data on road assets or increasing the effectiveness of the management of HOV lanes. A trial reported enforcing the use of carpooling in high occupancy vehicle (HOV) lanes to minimise the false positives from them being misused, and to improve the effectiveness of such lanes as support for sustainable mobility. Ways to reduce limitations were discussed, including lighting condition, tinted windows on vehicles and the limitation of having human operators counting occupancy. We were shown a digital twin of a viaduct to support predictive maintenance and optimise performance. Benefits noted included reducing operational costs and enhancing safety by reducing on-site visits.

A new design of electric vehicle targeting urban micro transportation, the BEEMOB, attracted much interest. It was designed to have good interior space with emphasis on the perception of safety rather than any technology breakthrough and is aimed at the 16+ market. It may be a disruptor to the more traditional public transport and active travel. The BEEMOBs are attracting tele-operators for vehicle delivery in car sharing platforms.

All accidents on the network disrupt flows and so impact resilience. A number of studies have looked at animal wildlife accidents investigated using the 'monitor, model, predict, act' model for the calculation and identification of high frequency incidents. This has led to ideas on how to reduce accidents caused by animals by adopting preventative measures where they are needed, minimising risk to road users and animals. A question in the session revealed that there was no one counter-measure, and that a combination of interventions tended to work best.

Ireland was exploring ADAS with an aim of halving road fatalities and injury collisions by 2030. Ireland's average vehicle age exceeded nine years, so the cost/investment benefits were explored within a backdrop of other considerations such as financial incentives and awareness campaigns. The study focused on warning only systems.



Cost-benefit analysis of retrofitting ADAS in Ireland by Joe Castle & Mohamed Samra in TP 7

We had an innovative presentation on devising a multi-stage, use-case oriented framework for validating dynamic driving simulators. The work recognised that universal validation looked unrealistic due to inherent simulator limitations such as limited ranges of motion. The framework tailored the validation to specific use cases through sequential stages: Subjective, Behavioural, and Physical.

The critical importance of traffic safety was seen as a societal concern – it being essential for road authorities, consumer organisations, insurers, and developers of industrial safety solutions to be able to quantify the impact of various safety measures. The V4SAFETY project aimed to provide a comprehensive procedure for conducting computer simulations to determine the long-term performance and impact of road safety measures.

Just about every traffic authority across Europe recognised the importance of reducing carbon emissions and increasingly the humble bicycle was being seen as having a large part to play. To help develop and strengthen this proposition it was recognised that reliable data was essential to understand more about the cyclist's journey, from flows, safety and the economic / social impact of cycling. A presentation described the challenges of integrating cycling data within the National Access Points (NAPs) and identifying different cycling use cases to appreciate priorities and needs with experts and institutional stakeholders. The project's aim was to use gathered data to inform transport policies that promoted the use of cycling.

The MOTUS platform for monitoring the implementation of Sustainable Urban Mobility Plans was cited in a number of sessions. MOTUS is designed to visualise, monitor and register the evolution of key Sustainable Urban Mobility Plan (SUMP) actions and indicators related to implementation. It is planned to scale the platform to municipalities at a European level.

Agile network management was a key tool for resilience and presentations showed how one or more lanes could be switched from one direction to the other by remote control from the traffic control centre or on site. The switching process took less than 10 minutes, allowing a lane to be added for the direction with the higher traffic volume as required. Switching could take place several times a day. For example, in the morning towards the city centre for incoming commuter traffic in the evening out of town, then for the evening football match or concert back into town, after the event was over back out of town and the

next morning back into town. This type of real-time management enabled much better use of the available road space.

The Zen-up project looked at increasing mobility resilience in a city by lessening car dependency by reducing car parking spaces as a theoretical exercise and there was associated research into how far people were willing to walk. This prompted questions about whether human behaviours had been considered such as drivers taking up two spaces. It was noted that cultural aspects of this approach differed significantly depending on country.

Weather resilience

It was recognised that winter traffic accidents with heavy vehicles involved could be a destructive combination, both in terms of human casualties and material losses. The Safe Trucks project described making safety improvements by applying advanced dynamics and road weather services to test the concept of real-time vehicle-specific weather and safety services tailored to each vehicle, partially based on the vehicle's own sensor observations and dynamics.

Inclusive mobility and social factors <see also the Topic 3 section previously>

It was estimated that 1.3 Bn people live with some form of disability (World Health Organisation 2024) and for this cohort 'resilience' had many different implications. One project described deployment of systems for assistive crossing and auxiliary communication. Sensor-based technology was used to help people with disabilities to cross the road safely through the use of a mobile phone app that talked to the traffic lights to increase the duration of the green light for crossing. For people with sensory impairments who board public transport this same technology had also been developed to activate auxiliary signals in the vehicle. A key innovation was that these sensors were automatic in their operation. Although the project had not yet finished it seems to hold great potential.

There had been a shift in terminology, suggesting we were now looking at **smart societies** rather than smart cities. This idea was thought to be worthy of further exploration in future Congresses. In a number of sessions we were reminded of the need for action – while we have lots of promises that things will be safer, cleaner and more resilient to gain these benefits we first need to deploy solutions and to be effective we must consider best to measure effectiveness.

Legislative and regulatory

There was clearly a desire to bridge a perceived gap between the public and private sector. This was discussed extensively in a broad ranging session that encouraged collaboration and sharing of insights – and that you need to understand what you are doing to work out how to cooperate.

Innovative business models and concepts were explored with a quip about the 'wild west' of scooters. There seemed to be a lack of progress when looking at urban mobility hubs, MaaS, etc. where many of the topics that have been discussed over the last 10 years or so. Business models seemed to have been bolted on at the end of an initiative rather than factored in during the early stages. There did not seem to be any new technology innovations in this area, more of an economic lens to determine chance of success.

An interesting argument was that connectivity was not new; it's moving data around. It was pleasing to hear the fusion of data from multiple sources being considered (own infrastructure, meteorological, traffic management system, etc.). There remained questions around who owned what data, and who used what data. There was a need to test solutions and get feedback from real users (living labs were good examples of this) and agreement that while we needed to solve problem for our societies we must also recognise society was ageing and avoid the digital gap.

New ideas and developments in known areas

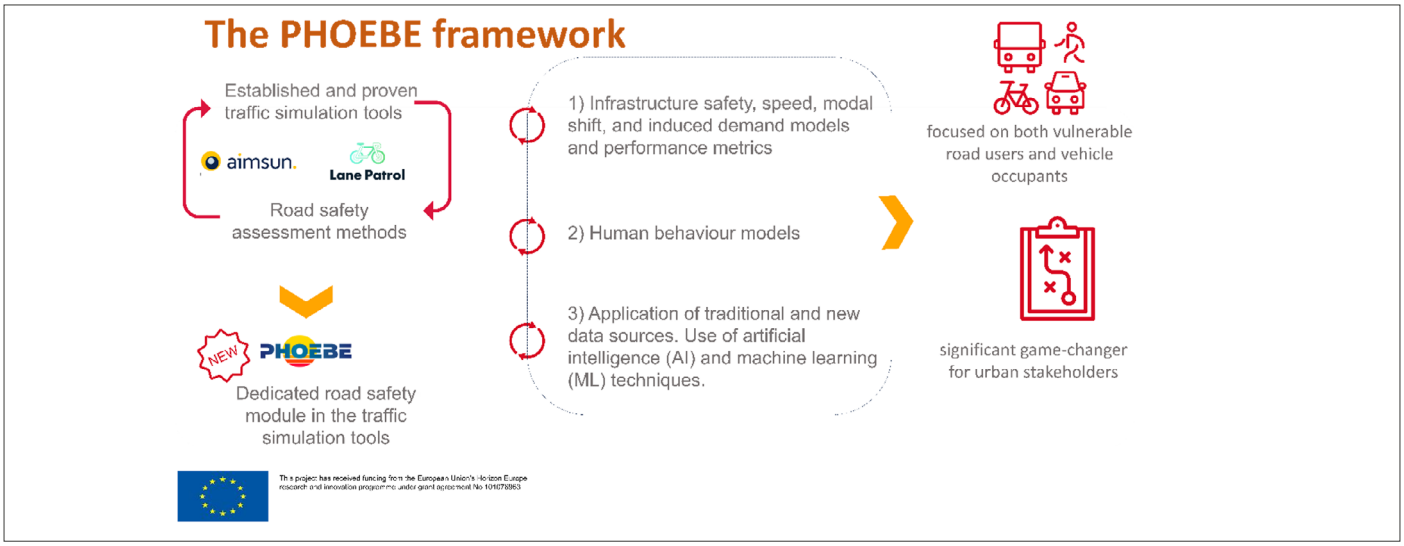
- Cycling certainly wasn't a new idea but how we integrated cycling into city mobility management plans was a new approach. There was also work to explore daily usage to create much deeper understanding of cyclists needs. It was not new to look at use cases for any kind of service, however, perhaps the key to cycling policies was

engaging with stakeholders who didn't cycle to understand how it might be encouraged.
- Although digital twins were not new, the idea of using them more to consider resilience to extreme weather events was discussed.
- Looking more closely at animal accident hotspots was interesting and should be monitored.
- AI was not very new but asking the right questions to feed large volumes of data into platforms to be ingested by the AI algorithms was significant. A key question was whether authorities had the capacity to analysis and/or act upon the data. There were also alerts that the energy impacts of storing large volumes of data in data centres were starting to increase significantly.
- AI was being used by many companies to identify defects, analyse asset condition, and then use the data to understand and respond to safety issues. However, with worldwide ageing assets and safety being a concern any systems that could support this should be encouraged.
- Retrofitting technology was not new; however, accelerating safety benefits by technological means demonstrated the ambition to improve safety.

Trials and systems in service

Many of the technical papers presented work that was beyond "proof of concept" and had reached development or trial stage. The FOREMAST project described three living labs in Belgium, France and Romania for automation, zero emissions and Digital Twins that enabled real-time study, reflection and adaptation to some key areas. The SOTERIA concept was a Horizon Europe initiative focused on deploying safety solutions in a complex urban environment for vulnerable road users (VRUs). They had four living lab communities to explore VRU people's characteristics.

Project PHOEBE looked at predictive approaches for safer urban environments. It suggested that urban traffic systems were increasingly complex with models very much focused on vehicular movements but not so much VRUs and vehicle occupants. This project had been looking at AI and ML techniques for human behaviour models aiming to have a blueprint for cities to establish and apply a cost-effective safety assessment framework with a theoretical view of operation. The use cases for this were in Athens, Valencia and the West Midlands.



Enhancing road safety for vulnerable road users by Marc Figuls in SIS 58

- The EVENTS CAV vehicle perception project had a set of objectives using a variety of traffic scenarios to collect and test resilient traffic management scenarios and using 4D radars for perception in adverse weather. Use cases covered complex, non- standard environments and adverse weather. The system architecture included maps, perception, motion.
- Talinn was bringing in regulations which impact on the business models of the micromobility operators. The regulatory framework also influences tendering.

- The IDI platform (drones and eVTOL) introduced drone services integration into surface mobility management.

Forwards vs constrained

Key 'forward' issues

- Integration of data to understand a bigger picture of mobility incorporating cycling.
- Understanding the technological risks with geofencing – how to achieve accurate geofencing as interference from other equipment could reduce its accuracy.
- Having the capability of providing significant volumes of interesting data.
- Feasibility and costs of retrofitting.
- Cyber security – when were we going to address it properly as a systems issue?
- The usual challenges such as funding, incentives, stakeholder engagement, change management, liabilities, insurance demonstrate there are some key barriers to address.
- User scepticism towards automation
- 'We can all be users, just for one day' when looking to enhance solutions.
- Making headway with MaaS business models.
- Managing the increasing volume of data and making it meaningful.
- Using rivers to move freight and reduce pollution.
- Introduction of drones into ITS discussions.

Key 'constrained' issues

Across the whole of transport there was a challenge of fragmentation, an importance of managing transition and the need to be network ready. An example from one of the sessions was managing transitions and there were some views we are not ready for CCAM development as the technology is not network ready. How do we change this secure and meet all the other demands to make CCAM possible as part of highly resilient services? There are many challenges and much investment needed when the public and private business cases are not always clear. On safety, sustainability and resilience it is not always clear how technology meets these goals. This demonstrates a gap in thinking for us all to address – what outcomes are we looking to achieve, how do we problem solve the right solutions and how do we decide which technologies might play a part in an overall answer.

Overall there were benefits from adopting new technologies and this Congress Report showed how they could create a lasting difference in the transport system. Nevertheless some specific barriers to a wider range or resilient solutions are:

- Basic data and standards for cycling have historically been almost non-existent.
- Understanding the possibilities for full remote automated monitoring of technology.
- Physical lane markings, etc. may hinder new technologies.
- Switching lanes may only be appropriate for certain countries and roads.
- Data quality and assurances, false information and how to remove it.
- Ageing infrastructure
- Cost of electrification of vessels against conventional powertrains
- Partial satellite coverage leading to potential errors and delayed responses.
- Limited technical resources in public authorities
- Emerging in-vehicle safety/information services direct to drivers.

Possible priority areas for the future

- Developing stakeholder engagement with people who don't cycle and understanding what the barriers are so we really understand the motivation behind people who don't use bikes.
- Ensuring independent evaluation of new technology.
- Encouraging decision makers to first consider the problem and look at all the potential options, with technology perhaps playing a part after that stage of deliberation.
- Encouraging new ideas on strengthening resilience in infrastructure, systems, security, etc.
- Agreeing a standard for the term 'digital twin' which had many different meanings.
- Agreeing standard data formats for data sharing linking to National Access Points
- Having standards for the validation of data.
- ADAS that can intervene in vehicle control due to cybersecurity issues.

Part 4

The Smart Mobility Summit of Cities and Regions

A highlight of the 17th ITS European Congress was the **Smart Mobility Summit of Cities and Regions.** This was ERTICO's seventh Summit**,** an open forum where invited influential public authority representatives have shared smart mobility-related best practices, successes, and existing and emerging gaps, and discussed potential solutions with their peers. The Summits have focused on supporting local and regional authorities' agendas for innovating and implementing ITS solutions for public benefit. This year's event brought together a wide range of public sector officials – including administrators, mobility directors and project managers from cities and regions, national governments and European Commission members.

The topics of focus for the Summit were prepared in cooperation with the EU's ambitious **Mission Cities initiative**, which aims to create 100 climate-neutral and smart cities by 2030, 100 cities from the 27 EU Member States and 12 cities from Horizon Europe associated countries have set targets to implement sustainable transport solutions to reduce emissions, enhance air quality, and increase the overall resilience of urban infrastructure. The Congress Summit provided a collaborative platform for cities sharing common goals to exchange knowledge, discuss policies, and share information about successful mobility projects with a view to accelerating the adoption of smart, data-driven technologies and integrated transport systems.

The 2025 Summit focused on four topics that illustrated the role of ITS in helping the transition to climate neutrality and smart cities. The 50+ delegates took part in four parallel moderated discussions:

- **Inclusive and sustainable mobility: progress vision by 2030**
- **Mobility and human-centric space management: progress vision by 2030**
- **Electrification of transport and mobility: progress vision by 2030**
- **Innovative aerial services: progress vision by 2030**

In his opening keynote **Mr Moumen Hamdouch, Head of Sustainable and Intelligent Transport in the European Commission,** highlighted the importance of ITS to the EU's Mission Cities initiative. 100 cities from the 27 EU Member States and 12 cities from Horizon Europe associated countries had set targets to implement sustainable transport solutions to reduce emissions, enhance air quality, and increase the overall resilience of urban infrastructure in their bid to transition into smart and climate neutral cities by 2030. A total of 16 Mission Cities were at the Summit: out of the seven Spanish Mission Cities, five (Seville, Madrid, Barcelona, Valencia and Vitoria-Gasteiz) were also represented.

The **ERTICO-Chairman, Dr Angelos Amditis** addressed the priority areas for ITS innovation in urban mobility. He commented: "By 2030, the vision is clear: we are striving toward a mobility system that is inclusive, sustainable, smart, and resilient. A system that leaves no one behind – not rural communities, not ageing populations, not the next generation. And this vision is no longer a distant goal, it is the work we must do now, together".

The major conclusions from the tables were as follows:

For inclusive and sustainable mobility, matching policy goals with societal goals, integration of physical and digital services, and finding the right balance between too lax and overly prescriptive procurement and tendering processes was seen as key. The need for cooperation, still as relevant as ever, was essential. A good example is the Mobility Pact. The public and private sectors need to also cooperate for better regulation of mobility aspects that are considered 'must have' versus 'good-to-have'. Inclusive mobility is sometimes difficult to measure and calibrate and data-based decision making should perhaps be balanced by decision-based data.

Mobility and human-centric space management was teamwork: the essential need for cities to coordinate with different stakeholders and across different levels of governing authorities essential. While there were high expectations that for AI and machine learning would turn predictive elements into proactive ones, the human aspect remained central in data analysis. Traffic management has a digital backbone, but data alone cannot always explain use patterns as cultural aspects may account for the use of different modes and different timings. Using existing solutions and platforms to optimise

speed of progress and reduce costs was highly recommended.

Cities were making progress on transport electrification through collaborative governance, strategic investment, and improved data sharing, though challenges remained in planning infrastructure and ensuring equitable coverage. The importance of aligning with energy stakeholders, investing wisely amid evolving technologies, and leveraging national platforms like National Access Points (NAPs) for data coordination was stressed. Despite improvements city centres often lagged in deploying charging infrastructure. Better forecasting tools and public engagement strategies were needed to ensure inclusive, resilient, and future-proof electrification.

Innovative aerial services and urban air mobility are emerging technologies with great potential. However their integration into urban life raised complex governance, societal, and ethical challenges. The discussions emphasised that readiness must go beyond technical maturity to include public acceptance, regulatory clarity, and urban relevance. To avoid past mistakes from too much or too little regulation cities must lead with inclusive, context-sensitive strategies that prioritised co-creation, stakeholder coordination, and transparent impact assessment.

The delegates agreed a number of action points. Themes such as cooperation across government levels and with the private sector, balanced policymaking, the need for investment, and citizen awareness, resonated among the four roundtable discussions.

The consensus was that cities alone cannot do all that is needed. To ensure a just and successful transition they called upon national governments, private sector leaders and European institutions to strengthen partnerships, align policies, and co-invest in the future of urban mobility. The frameworks, incentives, and safeguards that would enable sustainable, citizen-centred progress and adoption of the right ITS solutions had to be developed together.

In a closing address **Ms Minerva Salas López**, **Deputy Mayor of Seville City** Council (European Funds, Sustainability, Strategic Plans, and City Projection) commented "The climate emergency must be addressed in and from the cities, because this is where most emissions are generated –and where solutions must begin. Transforming Seville into a climate-neutral and smart city requires the commitment of all: public institutions, private partners, and citizens alike. Seville has committed to becoming climate-neutral by 2030, not as a symbolic gesture, but through concrete projects that reshape how we move, build, and live."

Joost Vantomme, CEO of ERTICO-ITS Europe, who hosted the event said: "This Summit was about empowering cities to take the lead in shaping the mobility systems of tomorrow. The level of expertise and commitment in the room has given us real momentum toward achieving the Mission Cities vision. ERTICO is committed to helping cities reach their mobility objectives of digitalisation and decarbonisation be it through our joint EU-funded projects, the ERTICO City Moonshot or through events such as this one during our ITS Congresses."

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We extend our sincere thanks to all attendees, partners, sponsors, and participants for making ITS Seville 2025 a remarkable journey towards smarter mobility.

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