



TRIREME

DIGITAL & GREEN SKILLS TOWARDS FUTURE
OF THE MOBILITY ECOSYSTEM



Co-funded by
the European Union

AUTOMOTIVE SKILLS AGENDA STRATEGY & OUTLOOK

ERASMUS+ Blueprint project TRIREME Partnership
Report

DOCUMENT INFORMATION

Report title	AUTOMOTIVE SKILLS AGENDA STRATEGY & OUTLOOK		
Responsible Project Partner	ACEA, ATEC	Contributing Project Partners	CECRA, CLEPA, TyresEurope, VSB-TUO, IndustriALL, CEEMET, ISCN, ITC, EUPPY, SPIN360, ASA, UCRS

Document data:	File Name:	TRIEME D3.2 – Sectoral Roadmap and Strategy – Release I		
	No. of Pages:	84	No. of Annexes:	0
	Status:	Final	Dissemination Level:	PUBLIC
Project Title:	Digital & Green Skills Towards Future of the Mobility Ecosystem	Grant Agreement ID/ Project No.:	101140001	
WP Title	Sectoral Skills Strategy Development and Update	Deliverable No.:	D3.2	
Due Date:	28/02/2026	Submission Date:	27/02/2026	
Keywords: Automotive-mobility ecosystem; Sectoral skills strategy; Skills intelligence & foresight; Automotive competence matrix; Modular education & training; Workforce transformation; Micro-credentials & recognition; Software-defined vehicles (SDV); Electrification & battery value chain; AI-enabled learning & digitalisation				
Reviewed by:	ASA Partnership and Network	Review Date:	19-25/02/2026	
Approved by:	Jakub Stolfa, ASA	Approval Date:	27/02/2026	

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
AI	Artificial Intelligence
ALBATTs	The Alliance for Batteries Technology, Training and Skills
AR	Augmented Reality
ASA	Automotive Skills Alliance
CaBatt	Capacity Building for Battery Teachers in Vocational Training
CCAM	Connected, Cooperative and Automated Mobility
CoVE	Centre of Vocational Excellence
DRIVES	The Development and Research on Innovative Vocational Educational Skills
EC	European Commission
ECSA	European Chips Skills Academy
EGF	European Globalisation Adjustment Fund
ELT	End-of-Life Tyres
EQF	European Qualifications Framework
ERASMUS+	European Community Action Scheme for the Mobility of University Students
ESCO	European Skills, Competences, Qualifications and Occupations
ESF+	European Social Fund Plus
EU	European Union
EURES	European Employment Services
EV	Electric Vehicle
FMA	Future Mobility Academy
GDP	Gross Domestic Product
HE	Higher Education
ICT	Information & Communication Technologies
Industry 4.0	Fourth Industrial Revolution (Smart Manufacturing)
Industry 5.0	Human-Centric Industrial Model
IRA	Inflation Reduction Act (United States)
ID	Identifier
IT	Information Technology
JTF	Just Transition Fund
KPI	Key Performance Indicator
MET	Metal, Engineering, and Technology
ML	Machine Learning
MTA	Mobility, Transport, Automotive

OEM	Original Equipment Manufacturer
OTA	Over-the-Air
QA	Quality Assurance
R&D	Research & Development
R&I	Research & Innovation
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SDV	Software-Defined Vehicle
Skills-OVATE	Skills online vacancy analysis tool for Europe
SME	Small and Medium-sized Enterprise
STEM	Science, Technology, Engineering and Mathematics
TaaS	Tyre as a Service
TRIEME	Erasmus+ Blueprint Project “Digital & Green Skills Towards Future of the Mobility Ecosystem”
UAS	Universities of Applied Sciences
US	United States
VET	Vocational Education and Training
VR	Virtual Reality
WP	Work Package

EXECUTIVE SUMMARY

The European automotive-mobility ecosystem is undergoing a profound structural transformation driven by decarbonisation, digitalisation, automation, artificial intelligence, and evolving regulatory and geopolitical conditions and change in demand. As one of Europe’s most strategic industrial ecosystems—with strong spill-over effects across energy systems, digital technologies, advanced manufacturing, materials, and mobility services—the automotive sector plays a system-shaping role for European competitiveness, innovation, and social cohesion.

The pace, scale, and complexity of this transformation are generating significant and growing skills challenges. Shortages and mismatches are already emerging across the value chain, particularly in software, AI, batteries, electronics, cybersecurity, advanced manufacturing, biobased materials and systems integration, while parts of the existing workforce face restructuring and role transformation. If not addressed in a coordinated and timely manner, skills constraints risk becoming a binding factor limiting investment, innovation uptake, and industrial deployment across Europe.

The **Automotive Skills Agenda Strategy & Outlook** sets out a coordinated, implementation-oriented European response to these challenges. It positions skills and human capital as a **core enabler of industrial competitiveness, workforce resilience, and a just transition**, in line with the Union of Skills, the Industrial Action Plan for the European Automotive Sector, and broader EU competitiveness and industrial policy priorities.

The Strategy establishes a structured framework organised around **five Areas of Action**:

1. **Skills Intelligence and Foresight** – to provide continuous, decision-grade intelligence on current and future skills needs at European, national, and regional levels.
2. **Education and Training** – to translate skills intelligence into agile, modular, scalable, and industry-relevant learning solutions, including rapid deployment through digital and AI-enabled methods.
3. **Tackling Workforce Transformation and Employment** – to support job-to-job transitions, high-quality employment, labour-market matching, and the attractiveness of automotive and STEM-related careers.
4. **Recognition** – to ensure skills are transparent, trusted, portable, and usable across employers, regions, and borders, including through micro-credentials and validation of prior learning.
5. **Governance and Collaboration** – to strengthen multi-level coordination, reduce fragmentation, and scale effective solutions by building on existing European, national, and sectoral structures.

Sectoral delivery and coordination are supported through a range of European and national instruments and partnerships. In the automotive-mobility ecosystem, this includes the **Automotive Skills Alliance (ASA)** under the Pact for Skills, which provides a platform for cooperation between industry, education and training providers, social partners, regions, and public authorities. Building on such structures, the Strategy supports the gradual development of shared approaches that can help connect, scale, and sustain upskilling and reskilling solutions in Europe across Member States, while fully respecting national competences in education and training and complementing formal systems as they adapt.

The Strategy recognises that automotive-mobility sector is a **convergence ecosystem**, with skills increasingly overlapping with batteries, semiconductors, cybersecurity, AI, energy systems, advanced manufacturing, bioeconomy, circular economy, and digital services. It therefore situates automotive skills within a wider European skills architecture, enabling cross-sectoral cooperation, reuse of competence frameworks, and mobility of skills across ecosystems.

The **Outlook** section moves beyond abstract future scenarios and instead focuses on **structural drivers already shaping the automotive value chain**, including evolving regulatory frameworks, technological convergence, global competition, supply-chain resilience, and demographic change. It highlights that uncertainty lies not in the direction of change, but in the speed, unevenness, and capacity of education and labour-market systems to adapt—reinforcing the need for continuous skills intelligence, agile learning systems, and coordinated governance.

Overall, the Automotive Skills Agenda Strategy & Outlook provides a **common European reference framework** to align skills intelligence, education and training systems, labour-market instruments, funding approaches, and industrial priorities. It is designed as a **living strategy**, open to iteration and continuous improvement, supporting coordinated action at European, national, and regional levels to ensure that Europe's automotive-mobility transformation is matched by a workforce capable of delivering it—sustaining competitiveness, innovation, and high-quality employment across all regions.

INTRODUCTION

The automotive-mobility ecosystem is one of the European Union’s most strategic industrial pillars and a cornerstone of its economic, technological, and social model. It supports over 13 million jobs across Europe, contributes around 7% of EU GDP directly and indirectly, and accounts for nearly one-third of private R&D investment in the Union. Beyond its direct footprint, the ecosystem generates a strong multiplier effect across a wide range of interconnected sectors, including steel, chemicals, textiles, batteries, semiconductors, ICT, repair, logistics, energy systems, and mobility services. As such, automotive and mobility are not only industries in themselves, but **system-shaping value chains** that anchor Europe’s industrial base, regional cohesion, and innovation capacity.

This system-shaping role also means that the transformation of the automotive-mobility ecosystem has **economy-wide implications**. Changes in vehicle technologies, production processes, and mobility services cascade across supply chains, regional labour markets, and adjacent industrial ecosystems. Decisions taken in automotive—on electrification pathways, software architectures, battery technologies, data access and use, or circular design—directly influence skills demand in energy, digital technologies, advanced manufacturing, logistics, and infrastructure. The sector therefore acts as both a **driver and an early indicator** of Europe’s broader industrial and workforce transformation.

A systemic industrial transformation with deep skills implications

The European automotive-mobility ecosystem is undergoing one of the most profound transformations in its history. Driven by the convergence of decarbonisation, digitalisation and automation, this shift is reshaping products, production processes and services across the entire value chain. While these changes open new opportunities for innovation, competitiveness and high-quality jobs, they are also unfolding against a backdrop of declining demand and significant structural stress.

Vehicle production has fallen sharply from around 16 million units in 2018 to approximately 11.4 million in 2024, reflecting both market uncertainty and the complexity of the transition. This downturn has already resulted in the loss of around 90,000 jobs in the automotive sector, with further impacts expected as the transformation continues. The effects extend well beyond vehicle manufacturers, creating ripple effects across suppliers, SMEs and regional ecosystems.

As a result, the transition presents a dual reality for the sector: a pathway towards a more sustainable, digital and competitive future, but also visible and immediate challenges for production capacity, employment and workforce stability. Managing this transition in a way that safeguards people, skills and industrial capacity in Europe has therefore become an urgent strategic priority.

On the product side, vehicles are evolving into **software-defined, connected, and increasingly automated systems**, embedded within broader mobility, energy, and data ecosystems. Electrification, battery technologies, alternative powertrains, connected vehicles and components, cybersecurity,

artificial intelligence, data analytics, bioeconomy and circular-economy approaches are redefining how vehicles are designed, produced, operated, maintained, and recycled.

On the process side, the transformation affects **R&D, engineering, manufacturing, logistics, aftersales, repair, maintenance, and mobility services (e.g., Tyre as a Service - TaaS)**, while also altering business models, supplier relationships, and interfaces with customers and public infrastructure. This is not a linear technological upgrade, but a **systemic reconfiguration of the automotive-mobility ecosystem**.

These changes have **direct and far-reaching consequences for the workforce**. Traditional roles are being redefined or phased out, new roles are emerging at pace, and hybrid profiles—combining engineering, digital, sustainability, and systems thinking—are becoming the norm. In the short to medium term, restructuring and job displacement coexist with acute skills shortages, particularly in digital, electrical, software, AI-related, battery, cybersecurity, and systems-integration roles. This dual challenge highlights a structural mismatch between the speed of industrial transformation and the adaptive capacity of existing education and training systems.

Education and skills as a driver for innovation and competitiveness

The transformation of the automotive-mobility ecosystem places unprecedented pressure on Europe's **education, training, and skills systems**, amounting to a profound **educational transformation** alongside the industrial one. The challenge is not limited to reskilling the current workforce; it spans the **entire skills pipeline**, from early education and STEM orientation to vocational education and training (VET), higher education, and—critically—lifelong learning throughout increasingly dynamic careers. This educational transformation is ultimately about equipping people with the capabilities to contribute to innovation, productivity, and value creation in a rapidly evolving industrial ecosystem, while maintaining employability and professional progression over longer working lives.

Across Europe, education and training systems are struggling to keep pace with the **speed, complexity, and interdisciplinary nature of technological change** in the automotive-mobility ecosystem. Curricula updates are often slow, fragmented, and uneven across Member States and regions, while institutional structures are not always designed for continuous adaptation. Access to modern equipment, industrial-grade technologies, and real-world learning environments varies significantly. Teachers, trainers, and academics frequently lack systematic opportunities to engage with cutting-edge industrial practices, emerging technologies, and new pedagogical approaches. At the same time, companies—especially SMEs—face constraints in releasing workers for training and navigating fragmented and short-term support schemes. Together, these factors limit the capacity of education and training systems to act as proactive enablers of industrial transformation.

Addressing this challenge requires not only innovation in technologies, but also **innovation in education and training itself**. To sustain competitiveness and ensure high-quality industrial jobs in Europe, learning systems must become **more agile, modular, cross-disciplinary and responsive**—integrating digital tools (including using AI for educational offer, way of learning), work-based learning, micro-credentials, and flexible pathways that support continuous upskilling and reskilling. Lifelong learning is no longer a complementary activity, but a **core pillar of industrial resilience**, enabling workers to transition between roles, technologies, and even sectors as the ecosystem evolves. From a human perspective, this ensures that technological progress translates into skills that people can realistically acquire, update, and apply in practice—supporting both individual performance and organisational competitiveness.

At the same time, the attractiveness of automotive-mobility careers is under pressure, despite the sector's central role in shaping Europe's green and digital future. Strengthening STEM education, improving gender balance, and making career pathways more visible and accessible are essential for securing future talent. The automotive-mobility ecosystem offers uniquely tangible and motivating examples of applied science and engineering—from artificial intelligence and robotics to energy systems, software, and circular design—that can inspire learners at all stages of education. By connecting education more closely to real-world innovation and societal impact, the sector can demonstrate that automotive-mobility careers combine technological excellence, sustainability, and the prospect of **high-quality, future-proof employment** in Europe.

We must act now—decisively, quickly, and with far greater agility and systemic approach—to keep pace with the speed of industrial transformation and safeguard Europe's competitiveness. The availability of people with the right skills is rapidly becoming a binding constraint on innovation, investment, and industrial deployment in the automotive-mobility ecosystem. Persistent weaknesses in skills supply—reflected in declining STEM performance, slow curriculum adaptation, and insufficient participation in lifelong learning—risk undermining Europe's ability to scale new technologies, attract investment, and retain value creation along the value chain.

Responding effectively requires a **much tighter connection across all levels of education and training**. Early education, VET, higher education, applied research, and continuous training must operate as an integrated system rather than as separate silos. Knowledge generated through innovation and industrial deployment must translate faster into curricula, training programmes, and practical learning environments, while education systems must be able to anticipate skills needs instead of reacting to them with delay. As such, clusters and regional ecosystems play a key supporting role as intermediaries for lifelong learning deployment, supporting implementation pathways, stakeholder mobilisation, and the consolidation of training offers in line with regional industrial specialisation and skills priorities. **Lifelong learning is not a social add-on, but a strategic productivity lever**, ensuring that the workforce can continuously absorb new technologies, methods, and business models as they

emerge, while enabling people to remain effective, adaptable, and confident contributors to industrial transformation.

In this context, closer interaction between skills development and research and innovation activities is increasingly important. Stronger links with European research and innovation frameworks, including the [Joint Research & Innovation EU framework](#), can help ensure that knowledge generated through R&I activities is translated more rapidly into skills intelligence and education and training content, while also supporting forward-looking assessment of industrial and societal impacts.

This acceleration must be pursued with a **clear focus on performance and outcomes**: faster skills development cycles – including streamlined agile update of competence frameworks, stronger alignment between education and industrial demand, practice-oriented learning, scalable training solutions and shared training infrastructures accessible to companies of all sizes – including SME and startups, recognition of skills and a workforce capable of sustaining innovation and high-quality industrial employment in Europe. Ensuring that people can acquire, update, and apply relevant skills throughout their careers is essential not only for managing transition but for enabling Europe to lead in the global race for automotive and mobility innovation.

Moreover, such transformation must be underpinned by strengthened train-the-trainer capacity, equipping educators and trainers with modern pedagogical approaches, digital and immersive tools, and the advanced and responsible use of AI as a support to teaching and learning processes.

From Draghi to EU action: skills as a strategic response

The strategic nature of this challenge has been clearly articulated at European level. The **Draghi report on the future of European competitiveness** identified skills and human capital as a decisive factor for Europe's ability to remain competitive in an increasingly fragmented and technology-driven global economy. It highlighted that Europe's productivity, innovation capacity, and strategic autonomy depend not only on investment and regulation, but on the availability of a highly skilled, adaptable workforce supported by agile education and training systems.

Building on this diagnosis, the European Commission has responded with a series of mutually reinforcing initiatives. The **Industrial Action Plan for the European Automotive Sector** represents a direct reaction to the competitiveness challenges facing the ecosystem. It explicitly links innovation, clean transition, supply-chain resilience, and skills, recognising workforce transformation as a core pillar of industrial policy—on an equal footing with technology development and environmental performance.

In parallel, the **Union of Skills** establishes a horizontal, cross-sectoral framework to address structural skills shortages, mismatches, and governance fragmentation across Europe. It focuses on strengthening skills intelligence, improving the responsiveness of education and training systems, expanding lifelong learning, enhancing recognition and portability of skills, and ensuring that skills

policies are aligned with industrial and innovation priorities. The Union of Skills acknowledges that no Member State or sector can address these challenges alone and calls for coordinated European solutions.

Sectoral delivery

Within the broader European skills framework, sectoral delivery is supported through a combination of policy instruments, cooperation mechanisms, and stakeholder-driven initiatives that link European objectives with national and regional implementation. These arrangements aim to enable structured collaboration across industry, education and training providers, social partners, regions, and public authorities, while respecting existing competencies and governance structures.

For strategic industrial ecosystems such as automotive-mobility, this approach provides a space to translate European priorities into sector-relevant solutions, while maintaining alignment with cross-sectoral and cross-regional initiatives. It helps address persistent challenges in the skills landscape, including fragmentation of initiatives, limited scalability of solutions, and uneven access for companies and regions—particularly for SMEs.

Within this policy and governance architecture, **sector-specific initiatives and alliances play a key role in operationalizing skills transformation**. In the automotive-mobility ecosystem, the **Automotive Skills Alliance (ASA)** provides a structured platform for collaboration, bringing together stakeholders from industry, education and training providers, social partners, and regions to support cooperation, knowledge sharing, and practical implementation across the value chain.

ASA builds on and connects existing European projects, regional initiatives, and industrial strategies, and supports the development of common reference frameworks, shared tools, and collaborative solutions tailored to sector needs. Its activities are **supported by the Pact for Skills action**, as Automotive Skills Alliance is the Large-scale Partnership, as well as its regional working group is Regional Skills Partnership of the Pact for Skills Action. The Pact for Skills therefore establishes a bridge between **European-level strategy and on-the-ground implementation**, enabling structured cooperation on skills intelligence, competence frameworks, curricula alignment, micro-credentials, and training delivery across borders and regions.

Importantly, ASA does not replace national, regional, or sectoral responsibilities, nor does it operate in isolation. Its role is to **connect, align, and scale existing efforts**, while drawing on the enabling framework of the Pact for Skills and other European instruments. In this sense, ASA forms part of a wider ecosystem of European, national, and regional actions that together support the skills dimension of the automotive-mobility transformation.

Automotive-Mobility sector - Convergence with other sectors

The automotive-mobility sector is not only a sector with a complex value chain but also is a **convergence sector**: it integrates technologies, supply chains, and competences from multiple strategic ecosystems. This means that automotive workforce transformation cannot be solved “within the sector alone”. It must be designed as a **sectoral pillar inside a wider European skills architecture**, aligned with industrial and innovation priorities across Europe.

Energy system and net-zero technologies (charging, grids, storage, hydrogen, industrial decarbonisation): Automotive electrification directly couples the sector to Europe’s energy transition: vehicle charging infrastructure, grid integration, battery storage, energy management software, and lifecycle carbon accounting. The skills synergies are for example in power electronics; high-voltage safety; charging systems; energy management; digital monitoring; hydrogen/fuel-cell engineering (where relevant); industrial decarbonisation methods; sustainability reporting and product carbon footprint literacy.

Semiconductors, electronics, and deep tech (vehicle compute, sensors, edge AI): Modern vehicles are increasingly software-defined and electronics-intensive, relying on chips, sensing, communications, connected components (e.g., tyres) and in-vehicle computing. EU policy (incl. automotive industrial measures) highlights that **chips, software, and AI are core ingredients** for connected and automated vehicles, implying strong dependency on semiconductor capacity *and* talent.

At the same time, Europe’s semiconductor ecosystem is itself addressing talent shortages through dedicated skills strategies and academies, creating a natural cross-sector bridge between automotive and chips skills pipelines. The skills synergies are for example in embedded systems; functional safety; sensor fusion; microelectronics basics; hardware-software co-design; AI at the edge; test/validation; industrial electronics manufacturing and QA.

Cybersecurity, safety, and digital trust (vehicles as connected systems): Connected vehicles, charging interfaces, OTA updates, and data-driven mobility services expand the attack surface. This makes cybersecurity and resilience a workforce requirement not only for ICT firms but for mobility operators, suppliers, OEMs, and aftermarket actors. EU-level cybersecurity capacity-building increasingly links obligations to skills frameworks and role profiles. The skills synergies are for example in cybersecurity engineering; secure software development; incident response; risk management; compliance literacy; safety-security co-engineering; privacy-by-design; secure operations across supply chains.

Batteries & Tyres critical raw materials, and circular economy (from sourcing to recycling and reparability): Battery value chains connect automotive directly to raw-material sourcing, refining, cell manufacturing, reuse/second-life, recycling, and traceability. EU rules aim to make batteries sustainable across the full lifecycle and strengthen Europe’s competitive battery industry—creating demand for skills in sustainability, compliance, industrial processes, and recycling technologies. In parallel, the EU’s Critical Raw Materials agenda underscores the strategic importance of extraction,

processing, and recycling inside Europe—again with direct consequences for workforce needs relevant to mobility and beyond. The skills synergies are for example in battery diagnostics; battery repair and remanufacturing; recycling engineering; material science; due diligence and traceability; circular design; lifecycle assessment; safe handling of hazardous materials.

Tyre production in Europe also depends on access to critical raw materials, natural rubber, and others such as synthetic rubber, which is used also in other automotive rubber goods components which put together account for the same weight as the four tyres in a vehicle. Enhancing Europe's resilience requires diversified sourcing, traceability, greater use of recycled and renewable feedstocks also in other automotive components, including those recovered through advanced chemical recycling. This transition relies on a workforce equipped with modern sourcing, analytical and sustainability skills, also considering new regulation such as EU Deforestation Regulation which requires a thoughtful traceability of the supply chain. Circularity across the tyre value chain for example demands specialised technical expertise: engineers and logistics experts, ELT management operators who can optimise collection, sorting and high-quality recovery by using AI tools; and material scientists, process engineers and quality-assurance specialists able to validate recycled and bio-based inputs without compromising safety or performance.

Advanced manufacturing, robotics, AI-enabled production, and quality infrastructure: Automation, AI-assisted design and manufacturing, digital twins, and smart factories link automotive to wider advanced-manufacturing ecosystems. The automotive industrial transition is explicitly framed by the Commission as a race to lead in **AI-powered, software-enabled, connected and increasingly automated vehicles**—but the same technology stack transforms production systems across sectors. The skills synergies are for example in robotics and industrial automation; AI in manufacturing; digital twins and simulation; data analytics; quality engineering; predictive maintenance; human-centric automation and safety culture.

Transport & logistics, mobility services, and public infrastructure: Mobility transformation increasingly spans logistics, multimodal systems, fleet operations, data platforms, and public infrastructure integration. This creates strong skills interdependencies with transport operators, cities/regions, and digital service providers—making multi-level governance and regional ecosystems central to delivery. The skills synergies are for example in fleet electrification and operations; mobility data management; infrastructure planning interfaces; service design; customer experience transformation; platform operations.

Steel, Aluminium, other metals and advanced materials (lightweighting, safety, circularity, industrial decarbonisation): The automotive-mobility ecosystem is one of Europe's largest downstream users of **steel, aluminium, and advanced metallic materials**, creating a structural link with the steel and metals sector. Lightweighting, safety, durability, and recyclability are core automotive requirements, while the decarbonisation of steel production is a strategic priority for

Europe's competitiveness and climate objectives. As vehicle architectures evolve, skills increasingly shift towards **advanced materials engineering, simulation-driven design, and circular material management**, with automotive acting as both a key customer and deployment platform for low-carbon materials. The skills synergies are for example in advanced metallurgy; lightweight design; materials modelling and simulation; joining technologies; surface treatment; lifecycle and recyclability engineering; quality and safety standards; industrial decarbonisation processes; digital quality control and traceability.

Chemicals, plastics, rubber, and composites (materials innovation, sustainability, circular economy):

The automotive-mobility ecosystem is also tightly coupled with the chemicals, plastics, rubber, and composites sectors, which supply critical materials for interiors, exteriors, tyres, batteries, coatings, adhesives, thermal management, and insulation. These materials play a decisive role in vehicle performance, safety, comfort, energy efficiency, and cost, while also being central to sustainability, regulatory compliance, and circular-economy objectives. Ongoing transformation is reshaping skills demand across this interface. Bio-based materials, advanced polymers, chemical recycling, low-emission production processes, and new regulatory requirements are driving the need for cross-disciplinary competences that combine chemistry, materials science, engineering, digital tools, and sustainability expertise. Automotive requirements increasingly influence upstream material innovation, while material constraints and breakthroughs directly shape vehicle design and manufacturing choices. The skills synergies are for example in polymer and rubber engineering; composite materials; chemical process engineering; sustainable materials development; regulatory compliance (REACH, product safety); circular design; recycling technologies; lifecycle assessment; materials testing and validation; industrial safety and environmental management.

Aerospace and defence (safety-critical systems, resilience, and strategic autonomy): The automotive-mobility ecosystem increasingly converges with the aerospace and defence sector through shared technologies, system architectures, and regulatory approaches. As vehicles become software-defined, automated, and highly connected, they increasingly resemble other safety-critical platforms such as aircraft and defence systems. This convergence is reinforced by EU priorities on security, preparedness, and technological sovereignty.

Both sectors depend on advanced systems engineering, high-assurance software and hardware, rigorous testing and certification, cybersecurity, and resilient supply chains for critical components. Automotive increasingly benefits from aerospace and defence know-how while also serving as a large-scale deployment environment for safety- and security-critical technologies.

The skills synergies are for example in systems engineering; safety-critical software and hardware; functional safety and certification; cybersecurity and resilience; model-based design and verification; simulation, testing and validation; advanced sensing; secure communications; AI assurance; human-machine interaction; quality, compliance, and supply-chain risk management.

International dimension and global competitiveness (US, China, and Europe’s strategic positioning):

The transformation of the automotive-mobility ecosystem is unfolding in an increasingly competitive global environment in which skills development, workforce coordination, and talent availability have become decisive factors of industrial success. Major international players, notably the United States and China, are increasingly aligning industrial policy, innovation, and skills strategies to ensure that technological progress is matched by the availability of qualified people at scale.

In the United States, recent federal initiatives explicitly recognise workforce development as a strategic enabler of industrial competitiveness. Programmes linked to the Inflation Reduction Act and the CHIPS and Science Act are not limited to investment and manufacturing incentives but are accompanied by workforce requirements and targeted funding for skills pipelines, apprenticeships, reskilling programmes, and partnerships between industry, community colleges, universities, and regional authorities. Workforce provisions focus on rapidly expanding talent pools for semiconductors, batteries, advanced manufacturing, digital and clean technologies—skills that are directly transferable to the automotive-mobility ecosystem. This approach aims to reduce skills bottlenecks, accelerate industrial deployment, and ensure that public investment translates into domestic production capacity and long-term employment.

China has pursued an even more tightly integrated model, embedding skills development directly into long-term industrial planning. National strategies for new energy vehicles, intelligent connected vehicles, and advanced manufacturing are closely linked to education and training reforms, large-scale vocational programmes, and targeted upskilling initiatives. Strong coordination between ministries, industry groups, universities, vocational institutions, and regional authorities supports alignment of curricula, qualification standards, and training capacity with industrial priorities. This approach is intended to support fast scaling of new technologies by ensuring a continuous supply of engineers, technicians, and digital specialists aligned with sector needs.

In comparison, Europe’s challenge is not a lack of excellence, but fragmentation. Skills initiatives are often dispersed across regions, sectors, and funding instruments, limiting scalability and slowing response to rapid industrial change. No single Member State or region can match the speed, scale, or systemic coordination of global competitors acting through unified skills and industrial strategies. Europe’s competitive strength therefore depends on its ability to collaborate across borders, pool talent, and align education and training systems with shared industrial priorities.

This calls for a shift from intra-European competition towards structured European collaboration: connecting regional ecosystems, aligning skills intelligence and curricula, supporting cross-border mobility and recognition of skills, and scaling effective training solutions across the Union. A strong European skills architecture for the automotive-mobility ecosystem is not about centralisation, but about orchestration—leveraging regional strengths while achieving the critical mass, coherence, and agility required to compete globally.

In an international landscape where skills availability increasingly determines the pace of innovation and industrial leadership, coordinated skills development becomes a core instrument of European competitiveness, resilience, and strategic autonomy.

STRATEGIC FOUNDATION & METHODOLOGY

This Sectoral Skills Strategy is grounded in the recognition that **skills are a structural determinant of industrial competitiveness, social resilience, and strategic autonomy**. The transformation of the automotive-mobility ecosystem cannot succeed through isolated training actions or short-term projects alone. It requires a **systemic, long-term, and European approach** that:

- aligns industrial, innovation, and skills policies;
- strengthens the full education and training pipeline, from early STEM education to lifelong learning;
- integrates sectoral solutions within cross-sectoral frameworks;
- connects European, national, and regional levels of action; and
- ensures that workforce transformation supports both competitiveness and a just transition.

By situating sectoral initiatives within this wider European architecture, **the Strategy aims to provide a coherent framework for coordinated action—ensuring that Europe not only develops the technologies of future mobility but also equips its people with the skills to design, deploy, maintain, and continuously improve them.**

Because these interdependencies are structural, the automotive-mobility skills agenda cannot be addressed in isolation. The Sectoral Skills Strategy therefore positions automotive skills as a **sectoral anchor** within Europe’s wider industrial and skills transformation. This means combining a strong, ecosystem-specific response with systematic openness to cooperation across related sectors.

On one hand, the Strategy supports a **dedicated sectoral approach**, ensuring that the specific transformation needs of the automotive-mobility ecosystem are addressed through structured collaboration among industry, education and training providers, social partners, regions, and public authorities. Sector-based partnerships and instruments provide the scale, relevance, and implementation capacity required to translate technological and industrial change into concrete upskilling, reskilling, and workforce transition measures along the entire value chain.

On the other hand, the Strategy is designed to **interface seamlessly with adjacent ecosystems**, recognising that many of the competences required in automotive—such as those related to electrification, software, semiconductors, cybersecurity, advanced manufacturing, energy systems,

and circularity—are shared across strategic sectors. Creating effective “plug-in” points for cross-sector cooperation allows for alignment on common competence frameworks, modular and stackable learning pathways, micro-credentials, continuous skills intelligence, and support for educators and trainers. This approach avoids duplication, accelerates learning system adaptation, and strengthens mobility of skills across sectors.

This integrated logic reflects the evolving European policy framework, which increasingly combines **horizontal skills strategies**—addressing systemic challenges such as shortages, recognition, and lifelong learning—with **sectoral delivery mechanisms** that ensure practical relevance and impact. By embedding automotive skills within this dual architecture, the Strategy contributes both to the competitiveness of the automotive-mobility ecosystem and to the coherence and resilience of Europe’s overall skills and education system.

The Strategic Foundation provides the common framing for the Automotive Skills Agenda Strategy. It aligns stakeholders around a shared understanding of the sector’s transformation, the skills challenges it creates, and the need for coordinated action across European, national, and regional levels.

It defines the **context** shaping skills demand in the automotive-mobility ecosystem, identifies the **core challenge** that requires timely and systemic response, and sets the **collective ambition** guiding the Strategy. Together, these elements provide the rationale for prioritisation and ensure coherence between analysis, strategic choices, and implementation.

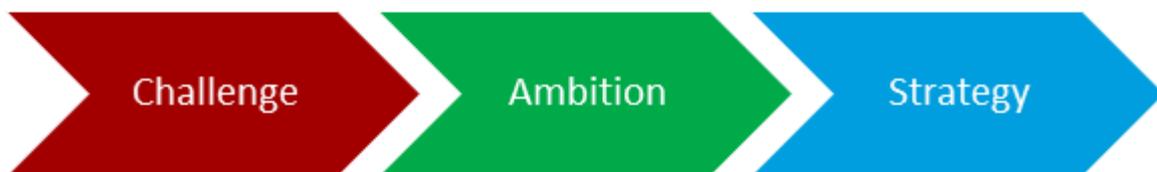


Figure 2 Schematic representation of the Strategic Foundation

Challenge

The transformation of the automotive-mobility ecosystem is occurring at a scale and speed that reflect a broader shift in Europe’s industrial model. As digitalisation, decarbonisation, and new technologies reshape value creation across sectors, the availability of people with the right skills is becoming a decisive factor for Europe’s competitiveness and strategic autonomy. Europe risks facing growing mismatches between **technological ambition and human capacity**—not only in automotive, but across interconnected industrial ecosystems. This would constrain innovation, slow industrial deployment, and weaken the resilience of regional economies and the internal market at a critical moment of global competition.

Ambition

To establish a **European approach to skills and education** for the automotive-mobility ecosystem that connects European, national, and regional levels of action, strengthens the competitiveness and innovation capacity of European industry, and supports the creation and retention of high-quality jobs.

The ambition is to **mobilize all relevant stakeholders**—industry, education and training providers, social partners, regions, and public authorities—around a shared skills agenda that addresses both **sector-specific and cross-sectoral needs**. By aligning skills development with industrial transformation, the Strategy aims to enable the automotive-mobility ecosystem to adapt at speed, scale innovation, and sustain its long-term, sustainable growth within Europe.

The Challenge and Ambition together define the guiding logic of the Strategy. They outline the conditions the sector faces and the direction it seeks to pursue. The following section translates this foundation into a structured framework of priorities and actions, organised through Areas of Focus and Actions. These constitute the operational form of the Strategy and serve as the central reference for coordination within the Automotive Skills Agenda Roadmap & Strategy.

Basis and Development of the Strategy

The Automotive Skills Agenda Strategy builds on **existing analytical work and stakeholder engagement** carried out at European level in the automotive-mobility ecosystem. In particular, it draws on the results and insights generated through the **TRIEME Erasmus+ Blueprint project**, which has explored skills needs, job roles, and education and training challenges linked to the sector's ongoing transformation.

The Strategy takes into account TRIEME activities such as **desk research, stakeholder interviews, and expert workshops**, which helped to identify key trends, emerging skills requirements, and areas where education and training systems face adaptation challenges. These inputs provide a shared evidence base for understanding how technological, regulatory, and market developments affect skills demand across the automotive-mobility value chain.

In addition, the Strategy is informed by **wider dialogue and exchange within the Pact for Skills**, notably through the **Automotive Skills Alliance (ASA)**. This broader collaboration helps to reflect practical perspectives from industry, education and training providers, social partners, and regions, and supports alignment with ongoing European, national, and regional initiatives.

Overall, the Strategy combines analytical inputs with stakeholder perspectives to offer a **common reference framework** for skills development in the automotive-mobility ecosystem. It is intended to

support coordinated action and continued cooperation across levels and stakeholders, while remaining flexible and open to future updates as conditions evolve.

This document presents an initial strategic overview of the key challenges, drivers, and priority actions related to skills development in the European automotive-mobility ecosystem. It reflects the current state of analysis and collaboration at the time of drafting and is intended to serve as a **foundation for further discussion, refinement, and coordinated action**.

How to approach the Strategy

The Strategy is designed to evolve through continued engagement with sectoral and cross-sectoral stakeholders, supporting agile adaptation in response to technological, economic, and policy developments. It builds on the collaboration and findings of the ERASMUS+ Blueprint project TRIEME and remains open to feedback, further contributions, and iterative improvement.

The purpose of the Strategy is to contribute to the identification and implementation of concrete actions and to support the overall growth of the industrial ecosystem and its evolving skills needs at European, national, and regional levels, while fully respecting the subsidiarity principle and the independent role of Member States and regions in developing their own education and training strategies and systems.

Structure and Methodology of the Strategy

The Strategy is established as a structured, implementation-oriented framework for advancing a coordinated skills agenda across the European automotive-mobility ecosystem. It is designed to provide a clear thematic architecture, translate priorities into deliverable interventions, and support consistent planning, coordination, and monitoring across European, national, and regional levels.

The Strategy is organised into five Areas, which define the thematic domains of transformation addressed by the skills agenda. These Areas set the scope of the Strategy and provide a stable organising structure for all interventions, ensuring thematic completeness, internal consistency, and alignment across stakeholders.

The Areas are:

- A. Skills Intelligence and Foresight
- B. Education and Training
- C. Tackling the Workforce Transformation and Employment
- D. Recognition
- E. Governance and Collaboration

Each Area consolidates a distinct set of topics relevant to the sector’s transformation and provides the reference framework within which the Strategy’s Actions are formulated and positioned.

Implementation is operationalised through ten Actions. Actions constitute the Strategy’s primary delivery instruments and represent defined interventions intended to generate measurable progress within the relevant Area, while contributing to the Strategy’s overall direction. This approach ensures that the Strategy remains actionable and results-oriented, with each Action designed to support coordinated implementation and to facilitate effective cooperation among stakeholders.

Actions are structured to promote coherence across the Strategy. They are designed to be mutually reinforcing, enabling synergies where interdependencies exist and reducing the risk of fragmented initiatives. This supports a programme approach to implementation, where progress is generated through a set of aligned measures rather than isolated activities.

To ensure clarity, comparability, and operational consistency, each Action is presented using a standard specification. This common structure supports implementation planning, enables transparent governance arrangements, and provides a consistent basis for monitoring and review. Each Action includes the following elements:

1. **Goal:** the intended outcome to be achieved.
2. **Rationale:** the underlying justification and strategic need addressed by the Action.
3. **Impact:** the expected effects and contribution to the Strategy’s objectives.
4. **Items:** the specific tasks and deliverables through which the Action is implemented.
5. **Status and best practices:** the implementation state and relevant approaches that can support effective delivery and replication; descriptive section on what already is; including TRIEME project implementation.
6. **Stakeholders:** the actors responsible for delivery and those contributing to implementation.
7. **Timeframe:** the indicative implementation horizon and sequencing considerations.
8. **Recurrence:** the planned frequency, update cycle, or ongoing nature of the Action, where applicable.

How to read the Strategy

The Strategy is designed to support structured implementation and continuous improvement. The five-Area architecture provides stability, while the Action-based format enables systematic monitoring of delivery and outcomes. The use of defined properties and actionable Items enables consistent progress assessment, facilitates the identification of gaps and emerging needs, and supports the incorporation of lessons learned and effective practices. This approach allows the Strategy to remain responsive over time.

This Sectoral Skills Strategy represents the collective work and strategic alignment of the TRIEME partners. While it does not imply individual endorsement of every proposed

measure, it serves as a joint call for dialogue, cooperation, and solution-oriented action across the sector.

The strategy provides a robust framework where the Actions might evolve, in the iterative joint development. The strategy might be read per Area, Action, or by stakeholder involvement.

1 AUTOMOTIVE SKILLS AGENDA STRATEGY

This section presents the Strategy as an implementation-oriented framework translating the Automotive Skills Agenda into a coherent set of priorities and deliverable interventions. It sets out the thematic architecture through five Areas and specifies the corresponding Actions through which the Strategy will be implemented. Together, the Areas and Actions provide a structured basis for coordination among stakeholders, support consistent planning and monitoring, and enable a clear line of sight between strategic intent and operational delivery.

Overview of Areas and Actions

A. Skills Intelligence and Foresight

- A.1. Systematic Skills Intelligence Gathering and Anticipation
- A.2. Joint Description of Competence Matrix for the Sector and beyond

B. Education and Training

- B.1. Prepare education and training offer reflecting the skills intelligence
- B.2. Effective Education and Training Solution Delivery
- B.3. Future Mobility Academy

C. Tackling the Workforce Transformation and Employment

- C.1. Attractiveness of STEM Education
- C.2. Education and Career Guidance

D. Recognition

- D.1. Sector-Endorsed Mutual Skills Recognition

E. Governance and Collaboration

- E.1. Multi-level European Sectoral and Cross-sectoral Skills Collaboration
- E.2. Financial Mechanisms to Support the Implementation

Overview of Stakeholders



Industry

OEMs and vehicle manufacturers; Tier 1–3 suppliers, SMEs and micro-enterprises; Aftermarket, repair, maintenance and mobility service companies; Technology providers (software, AI, batteries, electronics); Industry associations, business federations, and sector organisations; Industrial clusters and value-chain networks

Education & Training

VET providers and VET networks; Higher education institutions and alliances (universities, UAS); Adult learning and continuous training providers; Private and sectoral training organisations; Centres of excellence, competence centres, and training networks; Education and training alliances and platforms

National & Regional Authorities

National ministries (education, employment, industry, innovation); Regional governments and development agencies; Local authorities and municipalities in automotive regions; Public employment services; National qualification, accreditation, and recognition bodies

Social Partners

Trade unions at European, national and sectoral level; Employer organisations and business associations; Sectoral social partners at national and EU levels; MET (Automotive) platforms and observatories

European Commission

Relevant Commission services (skills, employment, education, industry, research, regional policy); EU agencies and coordination bodies; EU-level expert groups, platforms, and observatories; Managing authorities and structures for EU programmes and funding instruments

Sectoral Skills Collaboration

Automotive Skills Alliance (ASA) as the large-scale Pact for Skills partnership for automotive-mobility; Regional skills ecosystems, partnerships, and clusters; Other relevant Pact for Skills partnerships and sectoral alliances; European, national and regional industry and skills associations; Clusters, innovation ecosystems, and regional skills partnerships; Sectoral platforms, academies, and coordination networks enabling cross-border and cross-sector cooperation

A SKILLS INTELLIGENCE & FORESIGHT

The automotive ecosystem is experiencing a transformation of unprecedented speed and scope—electrification, software-defined vehicles, AI, connectivity, cybersecurity, circularity, change in demand, and new mobility services are reshaping job roles across OEMs, suppliers, logistics, retail/aftermarket and repair. When technology cycles compress, the traditional time lag between emerging competence needs and curriculum updates becomes a strategic risk: skills mismatches translate directly into delayed innovation, reduced productivity, and weaker competitiveness. For this reason, skills intelligence and foresight are not a “nice to have”; they are the steering mechanism that allows education and training systems to remain relevant and enables companies and workers to navigate transition with confidence.

EU policy has recently reinforced this point. The Union of Skills explicitly identifies improved skills intelligence and foresight as a prerequisite for effective, targeted policy and investment, proposing stronger EU-level intelligence structures to reduce fragmentation and accelerate decision-making. In parallel, the Industrial Action Plan for the European automotive sector calls for anticipating employment and transition impacts in the automotive value chain, including through better data and monitoring.

In practice, a modern sectoral intelligence approach combines three layers:

1. **Real-time signals** from labour demand (online vacancies, rapidly changing task profiles).
2. **Forward-looking foresight** from technology roadmaps, R&D trajectories, regulation, and industrial investment plans—translated into evolving occupational profiles (e.g., battery value chain, AI engineering, cybersecurity, data/vehicle architecture, automated driving testbeds).
3. **Regional and value-chain** granularity, because the transition will not impact all regions equally; effective foresight must identify “hot spots” and tailor responses (reskilling pathways, provider capacity, funding absorption).

For education and training, the value is direct: intelligence turns into curriculum triggers (what to update), programme design requirements (how modular, how fast, which equipment/teacher upskilling is needed), and participation strategies (which worker groups to reach).

A1 SYSTEMATIC SKILLS INTELLIGENCE GATHERING AND ANTICIPATION
A1 Systematic Skills Intelligence Gathering and Anticipation

Goal To establish a **continuous, systemic, EU-aligned sectoral skills intelligence capability** for the automotive-mobility ecosystem, covering current skills shortages, emerging occupational profiles, and forward-looking cross-sectoral skills demand driven by technological, regulatory, and investment developments. This capability should provide a **single, credible evidence base at European, national, and regional levels**, consistent with the strengthened skills intelligence and foresight priorities of the [Union of Skills](#)¹ and the coordination objectives set out in the [Transition Pathway for the EU mobility industrial ecosystem](#).²

The goal is to enable the automotive-mobility ecosystem to **anticipate and respond more rapidly to changing competence needs** through data-driven and AI-supported analysis, and to support **earlier, better-targeted decisions** at European, national, and regional level by public authorities, industry, and education and training providers on training priorities, provider capacity, and workforce transition measures, in alignment with EU-level transition monitoring mechanisms.³

Rationale The automotive transition is compressing technology and business-model cycles, increasingly shaped by electrification, digitalisation and AI-enabled development and operations, while education and training systems typically adapt more slowly; **this widens the risk of persistent skills mismatches that directly affect productivity, innovation and competitiveness**, as noted in a [2025 report on sectoral skills intelligence](#).⁴ The pace and direction of change is already reflected in reported restructuring impacts and shifting demand towards **software, data and AI-related roles** alongside new manufacturing profiles,⁵ and is consistent with estimates that a material share of current skill sets may become obsolete by 2030 and that employers face difficulties finding workers with relevant digital and green skills.⁷ [The Union of Skills](#) identifies fragmented governance and insufficiently coordinated skills intelligence, specifically lack of consolidation, foresight and collaboration between intelligence actors, as a **core barrier to matching future skills**

¹ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 4, 18–20.

² European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

³ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

⁴ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 55–56.

⁵ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 24–25

⁶ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 28–31

⁷ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

demand and supply,⁸ and proposes strengthened EU-level intelligence mechanisms, including mechanisms providing strategic data, foresight and early-warning alerts for concrete sectors and regions to support informed policy action and funding prioritisation.⁹ Additional labour-market evidence underscores the **significant scale of mismatches and inactive labour reserves**, including that nearly 18% of Europeans aged 25–65 are neither working nor actively seeking a job and that 12.3% of workers report being under-skilled while 25.5% report being over-skilled.¹⁰ In parallel, the [Industrial Action Plan for the European automotive sector](#) stresses the need to anticipate employment and transition impacts across the value chain and at sectoral and regional level, combining projections with demographic data to identify future “hot spots” and inform forward-looking interventions.¹¹ As part of the TRIEME project, 30 new [Skill Cards](#) on emerging and evolving occupational profiles together have been released, together with the detailed report forming a part of this document.

Impact

Earlier and continuous **identification of skills gaps and restructuring risks** across the European automotive-mobility ecosystem, supported by a **shared and regularly refreshed evidence base** that converts R&I, regulatory and market signals into timely updates of occupational profiles, curricula and training provision. Through structured stakeholder input, consistent **forecasting methods usable at EU, national and regional levels**, the action strengthens decision-grade skills intelligence and makes regional transition hot spots and exposure patterns more visible and comparable across Member States. By integrating real-time labour-market signals and improving evidence on training uptake, retraining outcomes and labour-market absorption, supported by secure and anonymised company data-sharing, it enables coherent prioritisation of interventions and coordinated follow-up among public employment services, education systems and industry, **strengthening resilience and competitiveness** and providing a reusable model for other industrial ecosystems.

Items

1. Facilitate coordination for skills intelligence and forecasting future workforce demand, skills gaps across the automotive-mobility ecosystem, supported by shared up-to-date analysis, forecasting and skills assessment approaches usable by Member States, regions, industry, and training providers, while supporting and extending already working best practice examples, on EU-level from the Automotive Skills Alliance.
2. Complement the continuous intelligence cycle with regular stakeholder inputs (industry, SMEs, education and training providers, IT & Tech clusters, social partners),

⁸ European Commission. (2025). [The Union of Skills](#) [Communication], p. 4

⁹ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 18–20.

¹⁰ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 13–14.

¹¹ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

scenario development and monitoring of social-transition indicators to increase decision-grade relevance.

3. Support and encourage companies to share information on skills gaps and technological change, supporting evidence-based intelligence cycles and policy responses while respecting confidentiality and intellectual property rights.
4. Encourage alignment of the skills intelligence structure with industry recognised methods, such as competence matrix, to ensure the direct usability in industry, as well as easy way inputs from the industry.
5. Enable systemic collaboration and skills intelligence sharing with the [Joint Research & Innovation EU framework](#) to support Forward-looking insights and to support assessment of societal impact.
6. Facilitate that skills and training, and societal impact, are considered systematically as an element of automotive-mobility relevant projects funded through EU research programmes, such as Horizon Europe projects, to support Forward-looking insights of the skills intelligence so that the knowledge gained through these projects is used to build up the skills and training offers in the EU
7. Support a structured national and regional layer for skills intelligence and forecasting through coordinated national and regional partnerships and networks, enabling consistent inputs from member states and regions and regional “hot spot” identification. Integrate national and regional labour market and workforce data from automotive regions into a shared European data layer for skills monitoring, enabling consistent national and regional views and inter-national/regional comparison of skills pressures and transition exposure.
8. Where appropriate and supportive integrate real-time labour-demand signals by connecting to [Cedefop’s Skills-OVATE](#) (online vacancy analysis) to capture rapidly changing task and skill requirements and feed these insights into the sector intelligence cycle.
9. Align with EC to strategically connect to the sectoral-based solution for the automotive-mobility sector with overall cross-sectoral European view, such as [European Skills Intelligence Observatory](#). Ensuring that European solution is connected to well defined and structured detailed information from the sector, as well as providing back to the sectoral solution cross-sectoral link and aspects.
 - 9.1. Embed mechanisms that enable systematic cross-referencing and coordination across sectoral frameworks and observatory structures, reflecting the integrated nature of the industrial and mobility transformation and supporting interoperability of intelligence outputs
10. Support and improve at all levels systemic data-sharing between public employment services, education and training systems, and industry on job vacancies, training uptake

and retraining outcomes, strengthening the evidence base for intelligence cycles and improving decision-grade monitoring.

11. Support strong operational linkage between skills intelligence analytics and education and training system, including train-the-trainer initiatives, to reinforce the practical translation of foresight into relevant and up-to-date educational and training practice

Status & Best EU Level Situation

Practices

At the EU level, foundations for skills intelligence and forecasting exist through Cedefop tools (skills forecasts, Skills Panorama, Skills-OVATE) and related EU data sources, providing comparable labour-market and skills information across countries. However, these instruments are largely **horizontal and general**, not fully tailored to the automotive-mobility ecosystem. Sector-specific intelligence is still mostly project-based, updated irregularly and unevenly connected to regional data and industry inputs. Data-sharing between public employment services, education and training systems, and industry remains fragmented, and real-time labour-demand signals are not yet systematically integrated into sectoral decision-making. As a result, Europe lacks a **continuous, coordinated EU-level automotive skills intelligence and forecasting system** that consistently links EU, national and regional perspectives and supports timely, decision-grade action.

TRIEME and ASA Practice

Rather than relying on irregular, project-based updates (e.g. DRIVES, ALBATTI, TRIEME), the Automotive Skills Alliance (ASA) demonstrates a best-practice, systematic approach to sectoral skills intelligence through building summary of all the relevant projects available in the ecosystem and bridging it as well to Automotive Competence Matrix, and publicly offer via [Skills Hub](#). Building on TRIEME and related initiatives, the Skills Hub connects structured sector-specific job roles and skills concepts with real labour market intelligence (e.g. desk research, survey, workshops, current reports and papers). ASA provides an industry-driven, ecosystem-aware model that reuses and maintains intelligence outputs beyond individual project lifecycles, links EU-level priorities with national and regional needs and translates insights into usable intelligence for companies and training providers. In line with the European Commission’s announced European Skills Intelligence Observatory under the Union of Skills, ASA acts as a dedicated sectoral node, supporting the overarching observatory by capturing, structuring and maintaining automotive-mobility skills intelligence, while providing a basis for further systemic scalable solution, as foreseen in this action.

Stakeholder

Key role



Sectoral Skills Collaboration (ASA)



European Commission

Supporting role



Education & Training



Industry



National & Regional Authorities



Social Partners

Timeframe	Mid-term
Recurrence	Continuous

A2 JOINT DESCRIPTION OF COMPETENCE MATRIX FOR THE SECTOR AND BEYOND
A2 Joint Description of Competence Matrix for the Sector and beyond

Goal The goal is to encourage the promotion of the **Automotive-Mobility Competence Matrix** as the **shared reference layer for the automotive-mobility sector**, enabling faster and more consistent translation of skills intelligence into modular training design, curriculum updates and learning pathways across providers, regions and Member States. This should be set up at the appropriate level.

It is reflecting the need to deepen the ongoing efforts, as stressed by the [Industrial Action Plan for the European automotive sector](#).¹² It will provide a continuously updated baseline of job profiles, competences and proficiency levels, **improving labour-market transparency for employers and learners and supporting comparability across the value chain**, in line with the [Union of Skills](#) objective to tackle fragmentation and strengthen linkages between initiatives,¹³ and reflects the [Transition Pathway for the EU mobility industrial ecosystem](#) call to reinforce coordination across skills initiatives.¹⁴

Rationale A **shared competence reference is a prerequisite for scaling skills delivery** and recognition in a sector where job roles and task profiles are changing rapidly and unevenly across value chains, regions and Member States, particularly as **digitalisation and AI reshape work content and competence requirements**.^{15,16} The evidence base already points to the scale and granularity challenge: more than 200 skills and 180 job roles have been identified and mapped against industrial megatrends, with high-frequency links to connected vehicles, Industry 4.0/5.0 and sustainability, and additional strong links to AI and machine learning and digital-twin/simulation trends, underscoring that **competence needs are both sector-specific and increasingly cross-sectoral**,¹⁷ as corroborated in a recent [skills report](#).¹⁸ In parallel, participation and outcomes remain uneven across Member States, with employers reporting persistent difficulty sourcing digital and environmental skills and industrial lifelong-learning participation below target levels, **reinforcing the need for a standard reference** that can be used consistently across systems.¹⁹ [The Union of Skills](#) explicitly frames

¹² European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), p. 15.

¹³ European Commission. (2025). [The Union of Skills](#) [Communication], p. 11.

¹⁴ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

¹⁵ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 56–57.

¹⁶ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), pp. 30–31.

¹⁷ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 56–57.

¹⁸ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 44–46.

¹⁹ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

fragmentation and weak linkages between initiatives as a barrier and calls for strengthened cooperation in strategic sectors to improve knowledge and resource sharing along the value chain, explicitly including skills intelligence, occupational profiles, curricula and training modules.²⁰ A jointly described competence matrix operationalises this by providing the stable “reference layer” that allows intelligence signals to be converted into **consistent occupational profiles, modular curricula and training outputs across providers and countries**, rather than parallel taxonomies.²¹ It also supports the [Union of Skills](#) direction that micro-credentials should be trusted, digitally issued and comparable across sectors and countries, linked where relevant to qualification frameworks and supported by quality assurance to strengthen employer take-up.²² Finally, it **reinforces Member State-led implementation by improving transparency and portability through EU tools** (EQF, Europass, ESCO, EURES), which meets the [Transition pathway for the EU mobility industrial ecosystem](#) calls for more standardised, modular and transparent recognition of skills and for reinforced links between education/training providers and the mobility ecosystem in some countries.²³

Impact

Improved comparability and portability of learning outcomes through a single, **shared competence reference for automotive-mobility job profiles, competences and proficiency levels**, aligned with EU transparency instruments (EQF, Europass, ESCO) and usable by Member States, regions and providers as a common baseline for recognition and recruitment. By enabling modularisation of curricula and learning pathways and supporting trusted, digitally issued micro-credentials that are comparable across sectors and countries, the **action strengthens employer uptake in recruitment, workforce planning and career progression** and improves transparency for learners. Through joint governance, version control and structured stakeholder maintenance, it **reduces fragmentation and duplication across initiatives**, accelerates updates of occupational profiles and training content in response to technology, regulation and AI-driven change, and supports cross-sector and cross-border mobility by providing reusable competence “building blocks” that can be adapted for other strategic industrial ecosystems.

The **Automotive Competence Matrix** will provide the necessary job roles and skills for future mobility and reflect the latest technological trends affecting the sector. It is used directly to be used by industry, as it is designed to “**speak industry language**” and provides direct reference to education and training providers “what to focus on”, while acting as a **specific sectoral layer** connected to ESCO.

²⁰ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 11–12.

²¹ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 56–58.

²² European Commission. (2025). [The Union of Skills](#) [Communication], pp. 11–12.

²³ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), pp. 29–30.

Items

1. Promote the Automotive Competence Matrix as a shared reference for defining current and emerging job profiles and skills across the automotive-mobility ecosystem, while supporting and extending already working best practice examples, such as from the Automotive Skills Alliance.
2. Support the establishment of an update cycle for the competence matrix, ensuring continuous revision based on sectoral skills intelligence and foresight, and ensuring consistent version control for use across the sector.
3. Utilise the competence matrix as the common reference for occupational profiles, curricula triggers and modular training design, enabling consistent description and translation of intelligence into updated training modules and learning pathways across the value chain.
4. Support an interoperability layer by aligning competence descriptors, where relevant, with EU transparency and labour market tools (EQF, Europass, ESCO), to improve comparability and transparency for employers, learners and providers across borders.
5. Clarify governance responsibilities for the updating, maintenance, and methodological alignment of competence matrices and related reference frameworks, with defined roles and coordination mechanisms across European, national, and regional levels to ensure coherence, sustainability, and reduced fragmentation.
6. Link competence definitions to modular credentials by mapping micro-credentials and other learning outcomes to competence descriptions, to support comparability, faster updates and increased employer usability in recruitment and career progression in strategic sectors.
7. Establish interfaces with adjacent strategic domains where competences are synergic (e.g. batteries, digital/ICT), to enable cross-sector reuse of competence building blocks while maintaining automotive specificity.

Status & Best EU Level Status
Practices

Across Europe, multiple competence frameworks, occupational profiles and skills taxonomies exist for the automotive-mobility ecosystem, often developed through EU-funded projects, national initiatives or sectoral programmes. While these efforts have generated valuable outputs, they remain fragmented, unevenly updated and only partially interoperable. The Automotive Skills Alliance has built a first European Automotive Competence Matrix with joint governance, targeting then the version control and systematic links to skills intelligence and foresight. Alignment with EU transparency tools such as EQF, ESCO and Europass is progressing in principle, but is inconsistent in practice and rarely applied in a coordinated, sector-wide and cross-sector manner. Micro-credentials and modular learning outcomes are expanding, yet their linkage to shared competence definitions and employer-recognised profiles remains limited. Cross-sector competence reuse (e.g. with batteries or digital domains) is mostly ad hoc, project-based and not

structurally embedded. Overall, Europe has strong building blocks and policy support for competence transparency and modularisation, but lacks an integrated, automotive-specific competence reference system that is governed, interoperable, regularly updated and systematically used across education, training and labour-market actors at European, national and regional levels.

TRIEME and ASA Practice

The Automotive Skills Alliance (ASA) provides a practical best-practice model for developing and maintaining a European Automotive Competence Matrix by building on legacy Blueprint, sectoral projects and emerging trends, including TRIEME. It has established structured automotive job roles and competence concepts that function in practice as a shared sectoral reference and are operationalised through the Skills Hub, where competences are linked to concrete job profiles, training offers and learning pathways. The competence structures are maintained through ASA’s partnership governance and Topic Committees, enabling coordinated and continuous updates aligned with evolving industry needs, even though a fully formalised EU-wide versioning system is not yet in place. The Skills Hub uses the shared competence matrix as a common reference to organise, describe and compare training content, supporting modular curricula design and consistent updates across the automotive value chain. It has competence and skills concepts designed to be compatible with EU transparency and labour-market tools (e.g. ESCO-aligned concepts and EQF-aware levels), and links competences to modular courses and micro-credentials to improve employer recognition and training flexibility. In addition, ASA cooperates with adjacent strategic ecosystems such as batteries, microelectronics and chemicals, enabling structured reuse of coherent competence building blocks while preserving automotive-specific requirements.

The latest set of Job roles that will serve for an update of the European Automotive Competence Matrix, developed and released by TRIEME project are available [here](#).

Stakeholder	Key role		Sectoral Skills Collaboration (ASA)
			European Commission
	Supporting role		Education & Training
			Industry
			National & Regional Authorities
			Social Partners
Timeframe	Short-term		
Recurrence	Continuous		

B EDUCATION & TRAINING

Education and training are the **production system of skills**. In a rapidly transforming sector, the challenge is not only what the workforce must learn, but **how quickly and effectively learning systems can adapt**. The automotive-mobility transformation spans the full skills spectrum: basic digital and STEM foundations; technician and craft skills for electrified powertrains, batteries, and new materials; advanced engineering capabilities in software, cybersecurity, artificial intelligence, and system integration; and transversal competences such as systems thinking, sustainability literacy, safety, quality, and cybersecurity awareness. Because these needs cut across VET, higher education, and adult learning, education and training must function as a **continuous, lifelong skills pipeline**, rather than as disconnected silos.

From the **learner's perspective**, the most critical capability is no longer mastery of a single static skill set, but **adaptability**—the ability to continuously learn, unlearn, and apply new knowledge in changing technological and organisational contexts. As roles evolve faster and career paths become less linear, education and training must equip learners with the capacity to navigate change, work across disciplines, and remain effective in environments characterised by digitalisation, uncertainty, and rapid innovation.

The Union of Skills frames this challenge as a **competitiveness imperative**: Europe must strengthen foundational skills (including digital and STEM), modernise VET and higher education, and significantly increase effective participation in lifelong learning, as the speed of industrial transformation increasingly exceeds the responsiveness of existing systems. For the automotive-mobility ecosystem, the EU industrial action plan further highlights the strategic importance of digitalisation and software-driven innovation (including AI and automated mobility), clean mobility and infrastructure, supply-chain resilience (batteries, materials, circularity), and the skills dimension of transition—each with direct implications for **what learning programmes must deliver and how rapidly they must evolve**.

Education and training in the automotive-mobility ecosystem should therefore be guided by the following **design principles**:

1. **Agility and modularity** - Learning provision must be structured around short, stackable, and updateable units that can be rapidly adapted to changing skills needs and combined into recognised pathways. **Micro-credentials** are a key instrument when they are quality-assured, interoperable, and aligned with sectoral competence frameworks.
2. **Work-based and practice-intensive delivery** - Faster and more effective skills acquisition requires strong integration of learning with real industrial environments, including apprenticeships, labs, testbeds, pilot lines, and employer–provider co-delivery. This is particularly critical for emerging technologies where practical experience determines employability.

3. **Rapid use of digital and AI-enabled learning solutions** - The pace of transformation requires **systematic use of digital and AI-based tools** to accelerate learning design, delivery, and updating. This includes AI-supported content creation and updating, personalised learning pathways, adaptive assessment, simulation-based training, and virtual or hybrid labs. These tools must be deployed **in close collaboration with industry** to ensure technical validity, relevance, and trust, and to translate fast-evolving technologies into usable learning content at scale.
4. **Trainer and teacher capability as a structural bottleneck** - Education systems cannot modernise without **continuous upskilling of trainers, teachers, and academics**. This requires structured access to industrial technologies, modern software environments, AI tools, and regular industry exposure through placements, joint projects, and co-development of training content. Train-the-trainer actions are therefore a prerequisite for system-wide impact.
5. **Skills-intelligence-driven programme development** and use of existing excellence
The creation and updating of education and training programmes must be systematically driven by sectoral skills intelligence, ensuring alignment with current and emerging competence needs. At the same time, this should build on existing knowledge, capacities, and centres of excellence across Member States and regions, strengthening networks between VET providers, universities, academies, and industry rather than duplicating structures.
- F. **Adaptability, learning capability, and transversal competences** - Beyond technical expertise, learners increasingly need strong transversal capabilities that support long-term employability and performance. These include adaptability, problem-solving, collaboration in multidisciplinary teams, digital confidence, critical thinking, and the ability to learn continuously. Education and training programmes should embed these competences alongside technical skills through project-based, work-based, and interdisciplinary learning approaches.

B1 PREPARE EDUCATION AND TRAINING OFFER REFLECTING THE SKILLS INTELLIGENCE
B1 Prepare an education and training offer reflecting the skills intelligence

Goal The goal is to establish a reliable, scalable, and continuously refreshed education and training offer for the automotive-mobility ecosystem, enabling education and training providers (VET, HE, adult learning and private providers) to systematically translate sectoral skills intelligence into reference frameworks, curricula and deployable learning solutions, and to ensure that emerging and priority skills needs (e.g. CCAM, SDV, AI, electrification, service and aftermarket digitalisation) are rapidly converted into industry-validated, modular and updateable education and training offers, jointly developed with industry and regions, and deliverable consistently across Member States and regions. This includes strengthening centres of skills excellence, reinforcing STEM pipelines, and accelerating content development through AI-enabled and modern learning methods. This supports the [Union of Skills](#) direction on reducing fragmentation through stronger cooperation on skills intelligence, occupational profiles, curricula and training modules,²⁴ aligns with mobility ecosystem implementation priorities,²⁵ and responds to the automotive [Industrial Action Plan](#) emphasis on reinforced sectoral capacity and large-scale delivery mechanisms.²⁶

Rationale The automotive-mobility transition is accelerating the pace at which **education and training content must be created, updated and aligned with labour-market signals**, while current provision remains fragmented and uneven across Member States, regions and provider types. Sectoral evidence shows that **skills intelligence increasingly exists**, but is not yet **systematically translated into reference frameworks, curricula and scalable education and training solutions**.²⁷ Structural challenges persist: only **39% of industrial workers participate in lifelong learning** against an EU target of 60% by 2030; access gaps remain pronounced for SMEs; and vocational and higher-education provision often lags behind technological change, including persistent gaps in **digital, software-defined vehicle, battery, AI and cybersecurity competences**. These weaknesses indicate that the core challenge is no longer awareness of skills needs, but the **capacity of education and training systems to convert intelligence into deployable offers at speed and scale**.²⁸ The [Union of Skills](#) sets the policy requirement to reduce fragmentation and strengthen linkages between initiatives by improving value-chain cooperation on skills intelligence, occupational profiles, curricula and training modules, and it flags the need to integrate AI and digital technologies effectively

²⁴ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 11.

²⁵ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), pp. 30.

²⁶ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

²⁷ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 55–57.

²⁸ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

into education while teacher preparedness remains limited.²⁹ The [Industrial Action Plan for the European automotive sector](#) situates skills as a strategic pillar under restructuring pressure and highlights the need to reinforce sectoral delivery capacity, making it operationally important that centres of excellence specialise, co-develop and reuse high-quality modules rather than duplicating effort.³⁰ The Transition Pathway for the EU mobility industrial ecosystem further reinforces this implementation logic by calling to map and connect initiatives, strengthen coordination across ongoing skills actions, and promote transparency and mutual acceptance of competences, which in practice requires structured networks that can share, adapt and scale reference curricula and training assets across territories.³¹ [Delivery evidence](#) also points to the scaling constraint: limited consolidation and visibility on what is produced and used, and insufficient capacity to coordinate and monitor numerous projects, slows replication and disadvantages smaller actors—supporting an ecosystem approach that accelerates joint creation, continuous updating (including AI-enabled content development and barrier reduction such as language), and cross-regional reuse of training solutions.³²

Impact

A more responsive, coherent and scalable education and training offer across the automotive-mobility ecosystem through faster conversion of skills intelligence into deployable, industry-validated curricula, modules and learning pathways. Faster creation and continuous updating of training content through shared reference frameworks, modular design principles and AI-enabled development tools, improving consistency and reducing time-to-deployment across Member States and regions. Reduced duplication and higher quality through joint creation, reuse and cross-regional adaptation of training assets across specialised centres of skills excellence and provider networks. Higher relevance and uptake by companies, including SMEs, through closer alignment with evolving occupational requirements across the value chain, including service and user-facing competences. Stronger STEM pipelines and clearer links between education pathways and future mobility careers, improving attractiveness and participation, including for underrepresented groups. Greater consistency and trust in outcomes across Member States, supporting portability, employer confidence and effective use of modular learning outcomes in recruitment and career progression. Continuous adaptation capacity to technological, regulatory and AI-driven change through strengthened excellence networks and modern learning methods, reducing reliance on episodic project-based updates.

²⁹ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 8, 11.

³⁰ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

³¹ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), pp. 30.

³² ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 76–77.

Items

1. **Systematically translate skills intelligence in emerging domains** (such as CCAM, SDV, AI, and electrification) into reference education and training frameworks aligned with the sectoral competence matrix and agreed standards.
 - 1.1. Define, and maintain common competence definitions, learning outcomes, and reference curricula that provide a shared baseline for programme development at the appropriate level.
 - 1.2. Aim to ensure that this translation mechanism supports the development of industry-validated, modular and regularly updated curricula, addressing fragmentation and slow update cycles in training provision, improving accessibility for all kind of industry, including SMEs and startups, and promoting the systematic reuse and adaptation of existing training solutions and assets.
2. **Support the joint creation of education and training solutions** by education providers, industry, clusters and regions based on shared reference frameworks and skills intelligence, including the co-development of curricula, modules, and learning paths in priority domains.
 - 2.1. Enable functional specialisation of centres of skills excellence by encouraging regional stakeholders, including industry, clusters, education and training providers, to lead on competence areas where they host relevant expertise and industrial capacity, building excellence through depth.
 - 2.2. Promote structured collaboration between centres—through networks, alliances and in the automotive-mobility ecosystem through dedicated structure such as the Future Mobility Academy—to facilitate reuse, adaptation, and cross-regional creation of training modules and solutions.
 - 2.3. Assessment of lessons learned and experience from existing education and training solution, including competence centres, EU Skills Academies, etc. to bring the most effective sectoral and cross-sectoral solutions
3. **Strengthen STEM education as a strategic pipeline for future mobility skills** by shaping coherent STEM pathways across schools, VET, higher education, and lifelong learning, grounded in long-term mobility and industrial transformation needs.
 - 3.1. Revisit and support on the European, Member States and regional level financial support of STEM education
 - 3.2. Support, where relevant – including at European, national, and regional level – the creation and adaptation of STEM curricula that increase the attractiveness and inclusiveness of STEM pathways, including for underrepresented groups, while ensuring alignment of STEM policy signals at EU, national, and regional levels to enable stable, long-term curriculum development.

4. **Promote** and support, where relevant – including at European, national, and regional level – the use of AI-enabled and digital technologies to **accelerate the creation of new training content, continuous updating of curricula, and reduction of barriers** (such as language) in line with evolving skills intelligence and reference frameworks.

4.1. **Support** education and training providers in integrating advanced technologies—such as VR/AR, simulators, remote labs, digital twins, and blended or hybrid models—into programme design and development.

Status & Best EU Level Status

Practices

Across the European automotive-mobility ecosystem, education and training provision remains fragmented and uneven in its ability to reflect skills intelligence, despite rapidly growing up-skilling and re-skilling needs driven by electrification, digitalisation, automation, software-defined vehicles and circular-economy requirements. While numerous initiatives generate valuable skills intelligence and pilot training solutions, systematic translation into shared reference frameworks, curricula and reusable learning assets remains limited. Provision is still largely project-based, nationally bounded and slow to update, with duplication of curriculum development, limited cross-regional reuse, insufficient specialisation of centres of excellence, persistent access barriers for SMEs and constrained capacity among trainers and educators with up-to-date industrial experience. Although modular learning, micro-credentials and digital delivery methods are gaining policy attention, their impact remains constrained by gaps in comparability, trust, quality assurance and alignment with occupational needs, as well as by slow uptake in mainstream education and training provision.

TRIEME and ASA Practice

Within this context, the Automotive Skills Alliance has been established as a key sector-level coordination platform under the Pact for Skills and the Union of Skills, progressively addressing the gap between skills intelligence and education and training offers. Through the consolidation of sectoral competence definitions, structured job-role profiles and ESCO-aligned skills cards, ASA provides a foundation for reference education and training frameworks. Within the Trireme project, 30 [Skill cards](#) on new occupational profiles have been released. These skill cards support shaping targeted training for both new and evolving roles. The ASA Skills Hub functions as a shared sectoral gateway that catalogues training offers and providers, links curricula and modules to competence definitions and supports micro-credentials, structured learning pathways and recognition of prior learning. Competence definitions and training assets are updated through ongoing sectoral projects, with more systematic update cycles under development. ASA also supports joint creation and reuse of training solutions to reduce duplication and sustain publicly funded results beyond project lifetimes (via the learning platform as a repository of existing training material), promotes centres of skills excellence and specialised delivery capacity through scalable train-the-trainer models such as CaBatt and the Hydrogen Teachers Forum, and

pilots AI-enabled and immersive learning solutions through initiatives including TRIEME and MTA. These digital approaches are complemented by the use of physical infrastructures, company-based learning, study visits, cross-border expert and learner mobility and student programmes. Together, these practices demonstrate a pathway toward a coherent and continuously updated education and training offer, while further enhancement and expansion of the Skills Hub and centre-of-excellence networks will be critical to achieve scale and consistency across the automotive-mobility ecosystem.

Stakeholder
Key role

Education & Training

National & Regional Authorities
Supporting role

Industry

Sectoral Skills Collaboration (ASA)

European Commission
Timeframe

Mid-term

Recurrence

Continuous

B2 EFFECTIVE EDUCATION AND TRAINING SOLUTION DELIVERY
B2 Effective Education and Training Solution Delivery

Goal The goal is to establish an effective delivery capability for automotive-mobility education and training that can scale across Member States and regions through **train-the-trainer/teacher/academics capacity, modular and stackable learning offers** (including micro-credentials), and **work-based and blended delivery**, supported by **responsible AI-enabled learning** to improve personalisation, feedback and efficiency at scale. This reflects the [Union of Skills](#) direction to expand trusted, quality-assured micro-credentials and to strengthen the effective use of digital technologies and AI in education,³³ [Industrial Action Plan for the European automotive sector](#) emphasis on building capacity to train and attract new profiles during transition,³⁴ and more generally the focus on coordinated ecosystem implementation,³⁵ as well as overall delivery improvements need as highlighted in [sectoral skills intelligence report](#).³⁶

Rationale The pace of technology and business-model change in automotive-mobility increasingly outstrips the capacity of traditional delivery models, making **delivery capability** (not only programme design) a binding constraint: provision must be refreshed frequently, delivered consistently across regions and provider types, and accessible to workers, unemployed learners and SMEs. Sectoral skills intelligence points to concrete delivery bottlenecks, including that **micro and small enterprises often lack access to upskilling programmes** and that **vocational provision is frequently outdated**, including gaps in digital and battery-system content—conditions that require scalable delivery formats and systematic upgrading of teaching capacity rather than isolated course pilots.³⁷ TRIEME study further highlights that effectiveness and reach depend on modern training methodologies—blended learning, microlearning, and technology-enabled learning—and explicitly describes the role of **AI-powered learning systems** in personalising learning and adapting to individual needs, reinforcing the rationale for responsible AI use as an educator support tool rather than a substitute for expertise.³⁸ The [Union of Skills](#) reinforces the same gap from an institutional perspective: it notes that education systems still lack effective frameworks to integrate AI into learning and that teacher preparedness for digital technologies remains limited, while the Commission simultaneously sets expectations for scalable, **trusted modular provision**

³³ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 8, 11.

³⁴ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

³⁵ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

³⁶ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), p. 35.

³⁷ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

³⁸ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 35–36.

through micro-credentials that are digitally issued, comparable and supported by quality assurance to strengthen employer take-up.³⁹ The need for work-based and practice-intensive delivery is strengthened by the sector’s rapid transformation and the requirement to “train and attract new profiles” under skills shortages and restructuring pressures, which the [Industrial Action Plan for the European automotive sector](#) highlights as a core transition requirement.⁴⁰ Finally, delivery capacity must be **organised for scale** rather than fragmentation: recent study highlights limited consolidation and visibility on what is delivered and insufficient capacity to coordinate and monitor a growing number of initiatives, slowing replication and disadvantaging smaller actors—supporting the case for a **structured delivery approach that builds trainer capability, enables modular cross-provider pathways, and applies AI- and digital-enabled delivery models consistently** across Member States and regions.⁴¹

Impact

Capacity building will be achieved through higher reach, consistency and speed of upskilling and reskilling delivery across Member States and regions by strengthening train-the-trainer, teacher and academic capabilities, supported by quality-assured delivery models and reinforced links between existing centres of excellence and training providers. The training system capacity will be further enhanced through faster refresh and wider uptake of training offers based on modular, stackable learning units (including micro-credentials), enabling combination across providers, adaptation to different learner profiles and improved portability and employer trust in learning outcomes. Institutional and infrastructural capacity will be increased through blended, hybrid and work-based delivery models making use of shared infrastructures such as labs, testbeds, workshops and company facilities, improving access for SMEs and ensuring strong practical and labour-market relevance. Digital and technological capacity will be strengthened through the responsible use of AI-enabled support for learning personalisation, feedback and assessment, improving learning efficiency, completion rates and learner progression while keeping human expertise, pedagogical oversight and quality assurance at the core.

Items

1. **Support train-the-trainer, train-the-teacher and train-the-academics programmes** to enable large-scale, continuous, and consistent delivery of sector-relevant education and training with focus on **scalability and quality assurance**, enabling rapid rollout across regions and provider types.
 - 1.1. Work towards a state where trainers, teachers and academics are equipped to deliver new and rapidly evolving content (e.g. CCAM, SDV, AI, electrification), use

³⁹ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 8, 11.

⁴⁰ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

⁴¹ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 76–77.

modern pedagogical approaches and digital tools effectively, and collaborate closely with industry in regard to education.

- 1.2. Support setting up a mechanism for a continuous closer connection of industry and education and training sectors, via activities such as ‘re-insertion’ of trainers and teachers into the industrial environment to ensure consistency of up-to-date knowledge and skills.
2. Enable **modular, blended, hybrid and flexible delivery models** allowing flexible learning paths, adaptation to different learner profiles (workers, SMEs, unemployed, students), and combination of modules across providers and regions to maximise reach and accessibility while maintaining practical relevance.
 - 2.1. Strengthen work-based and practice-oriented learning, including apprenticeships, traineeships and on-the-job training, use of company facilities, living labs, testbeds and workshops.
 - 2.2. Support the delivery models, methods, and approaches to be in close integration with existing physical infrastructures (labs, workshops, living labs, testbeds) to enhance reach, flexibility, and learning effectiveness while **complementing, not replacing, hands-on training**.
 - 2.3. Help to make delivery models accessible to SMEs and Start-ups through shared infrastructures and adapted formats.
 - 2.4. Support the establishment of structured dual-learning models and apprenticeships **co-designed by industry** and providers for emerging needs ensuring SMEs and stakeholders can access and collaborate on work-based learning through shared infrastructures and adapted delivery methods.
 - 2.5. Support integration of inclusive and human-centred learning approaches to support participation across different workforce groups.
 - 2.6. Support education and training design to not only reflect emerging technical skills but also evolving task profiles, work organisation changes and transversal capabilities required in digital and green transitions.
3. **Utilize and promote the use of AI to increase effectiveness and efficiency of delivery** by personalising learning pathways, supporting trainers and learners with feedback and assessment, overcoming language barriers, and increasing efficiency and learning outcomes at scale.
 - 3.1. Encourage **responsible and transparent use of AI as a support** to educators, not a replacement for human expertise.

4. **Encourage lifelong learning and learner agency** by allowing individuals to enter, pause and re-enter education and training over time, accumulate recognised learning outcomes, and **adapt their skill profiles** as technologies and job requirements evolve.
5. **Prevent the loss and under-utilisation of skills and training developed through EU-funded innovation projects or public funding** by ensuring they are systematically recognised as sector-relevant and converted into sustainable, deployable training offers.

Status & Best EU Level Status
Practices

At EU level, the delivery of sector-relevant education and training in the automotive-mobility ecosystem remains uneven in scale, consistency and effectiveness, despite growing recognition of the need for faster and more flexible upskilling and reskilling. While policy frameworks increasingly emphasise modular learning, blended and work-based delivery, and the use of digital and AI-enabled methods, implementation across Member States and provider types is fragmented. Train-the-trainer, train-the-teacher and train-the-academics approaches are not yet systematically embedded, resulting in limited delivery capacity for rapidly evolving domains such as CCAM, software-defined vehicles, TaaS, artificial intelligence and electrification. Many trainers and educators still lack access to up-to-date industrial exposure, modern pedagogical approaches and digital tools, constraining both quality and speed of rollout. Modular and flexible delivery models exist in pockets, but their combination across providers and regions remains limited, and work-based learning opportunities are unevenly accessible, particularly for SMEs that often lack the capacity or infrastructure to engage individually. The use of AI to personalise learning, support assessment and improve efficiency is largely experimental and project-based, with limited guidance on responsible, transparent use, meaning that its potential to scale delivery and learning impact across the ecosystem is not yet fully realised.

TRIEME and ASA Practice

Within this landscape, TRIEME and the Automotive Skills Alliance provide concrete sector-level practices that directly address these delivery challenges. ASA promotes and coordinates scalable train-the-trainer, train-the-teacher and train-the-academics approaches, building delivery capacity that enables consistent interpretation and rollout of new content across regions and provider types, drawing on examples such as the CaBatt model and its adaptation to other emerging domains. Through TRIEME and related initiatives, educators and trainers are increasingly equipped to deliver rapidly evolving content using modern pedagogical approaches, digital tools and immersive methods. Both TRIEME and ASA actively support modular, blended and hybrid delivery models, enabling flexible learning paths tailored to different learner profiles and facilitating the combination and reuse of modules across providers and regions. Strong emphasis is placed on work-based and practice-oriented learning, including the use of company facilities, living labs, testbeds and workshops, with shared infrastructures and adapted formats helping to lower

access barriers for SMEs. In parallel, TRIEME pilots and ASA promote the responsible use of AI to enhance delivery effectiveness, including personalised learning pathways, learner feedback and assessment support, and efficiency gains at scale, while clearly positioning AI as a tool that supports educators rather than replacing human expertise. Together, these practices demonstrate how sector-level coordination can translate policy ambitions into deployable, high-quality and scalable education and training delivery across the automotive-mobility ecosystem.

Stakeholder	Key role	 Education & Training
		 National & Regional Authorities
	Supporting role	 Industry
		 Sectoral Skills Collaboration (ASA)
 European Commission		
Timeframe	Mid-term	
Recurrence	Continuous	

B3 FUTURE MOBILITY ACADEMY

B3 Future Mobility Academy (FMA)

Goal The goal is to enable the faster and wider development of dedicated collaborative “enable-type of academy” the Future Mobility Academy (FMA), which operates as a collaborative digital academy platform rather than a traditional training provider or academy by itself. It does not develop or deliver its own courses; instead, it **enables universities, VET providers, private academies, training centres, EU-funded course providers, and other organisations to publish, structure and disseminate their existing education and training offers or receive solutions, including train-the-trainers from others through a shared European infrastructure.** Through the platform and tools of FMA, participating academies can increase the visibility and accessibility of their courses, map learning outcomes to the competence framework, and connect their solutions to sectoral skills needs and emerging competence requirements. This approach allows education and training providers to retain full ownership of their content and business models while benefiting from improved market reach, interoperability, comparability of skills, and access to new collaborations with industry and other providers and regular updates and train-the-trainers activities. By acting as an **enabling layer that connects existing academies, education and training providers, rather than replacing them,** FMA accelerates uptake of high-quality training solutions, **reduces fragmentation, and supports faster scaling of skills development across the European automotive-mobility ecosystem.**

The FMA provides **sector-specific solution to support the transformation of the sector to future mobility,** tackling needed topics **focusing on priority domains to such as connected and automated mobility, software-defined vehicles, AI across the value chain, quality, safety and security – including cybersecurity of the automotive-mobility solutions, electromobility – including electric vehicles, hybrids, new business models, and circular economy.**

This platform is not calling for “re-inventing the wheel” or creating new isolated academy focusing on own development of the courses and its offer, but the academy would be acting as the **platform for connecting existing solutions, boost, triggering new collaborations,** accelerate uptake of modular training, learning pathways, train-the-trainer provision, work-based and blended delivery, and recognition via micro-credentials, while assuring the close and well working coordination and cooperation among industry, including SMEs and startups, education and training providers, social partners, member states and regions in the field of education and training provision for the current and future automotive-mobility workforce and to equip people with the right skills to drive the future of the sector.

This would in parallel **boost existing structures across members states and regions,** such as Universities, University Alliances, VET schools, centers of excellence, academies, projects and initiatives on the practical level, or another education and training providers by ensuring

direct connection to relevant train-the-trainer solutions, direct reuse of the offer allowing to faster uptake and reaction to the development in the sector, while on the other hand ensuring the support of individual approach and their business model.

Rationale

The **automotive-mobility transition is progressing at high speed**, while skills shortages, ageing-workforce pressures and restructuring **risks are intensifying**, creating material risks for competitiveness and for timely deployment of clean, digital and AI-enabled technologies; TRIEME’s [skills intelligence study](#) characterises the transition as driven by electrification, rapid digitalisation/AI adoption and regulatory pressure, with **direct implications for job roles and skills needs**.⁴² The scale is already visible in headline indicators, including reported restructuring impacts (approx. 54,000 job cuts in 2024) and **rising demand for roles linked to robotics, data and AI/ML**, alongside estimates that **39% of current skill sets may become obsolete by 2030** and that 45% of employers report difficulty finding workers with digital/environmental skills.⁴³ These pressures are consistent with TRIEME’s broader [trend research](#), which points to accelerating technology and policy drivers (including AI, software-defined mobility, cybersecurity and electrification) that raise the pace at which competence requirements evolve across the value chain.⁴⁴ The [Union of Skills](#) frames skills shortages, insufficient transformation speed and fragmented and inefficient governance as constraints on EU competitiveness, and calls for strengthened EU-level delivery mechanisms that simplify and consolidate action, including centralising granular and comparable data in a “one-stop-shop” to support faster coordinated follow-up with Member States and stakeholders.⁴⁵ **Reinforcing the sectoral-specific solutions and improving also linkages between them, while implementing EU Skills Academies.** In parallel, the [Industrial Action Plan for the European automotive sector](#) identifies skills shortages and mismatches, an ageing workforce and expected further job losses as major concerns, and points to reinforced sectoral action through the Pact for Skills and targeted EU support instruments (including ESF+ mobilisation at Member State level and targeted Erasmus+ support for Large-Scale Skills Partnerships, including automotive).⁴⁶ Delivery evidence reinforces the case for an operational platform: an [external workforce analysis](#) highlights limited consolidation and visibility on who is supported, at what scale and with what impact, sectoral alliances operating in silos, and insufficient capacity to process, coordinate and monitor the growing number of projects—factors that slow scaling and disproportionately

⁴² TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 9–10.

⁴³ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

⁴⁴ TRIEME Project. [Desk Research on Trends in Automotive-Mobility Sector \(Deliverable D2.1\)](#), pp. 7–12.

⁴⁵ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 2, 18–20.

⁴⁶ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

disadvantage smaller actors such as SMEs.⁴⁷ An FMA-type platform therefore **addresses a practical implementation gap by providing stable, reusable capacity to connect initiatives** step by step, **support cross-sector skill needs** where relevant (e.g., digital, software, AI, cybersecurity), and accelerate consistent deployment of training solutions across Member States, regions and value-chain actors, in line with the mobility ecosystem’s coordination priorities, set out in the [Transition Pathway for the EU mobility industrial ecosystem](#).⁴⁸

Impact

Faster and more coherent skills transformation across the automotive-mobility value chain through the Future Mobility Academy (FMA), building on the **Automotive Skills Alliance (ASA)** as a **shared European backbone** that connects industry, education and training providers, social partners, Member States and regions to **disseminate, implement and scale training solutions, reducing fragmentation, duplication of pilots and inconsistent deployment**. By improving visibility, accessibility and comparability of training offers, supporting modular and updateable learning paths, train-the-trainer delivery, blended and work-based training, and recognition via micro-credentials, **FMA strengthens alignment between innovation, skills development and labour-market needs**, including targeted support for SMEs and supply-chain actors with limited training capacity. By providing a stable delivery and governance layer that increases the reuse, impact and sustainability of Erasmus+ and Horizon Europe training outputs, **FMA reinforces competitiveness, innovation and resilience of the European automotive ecosystem** through long-term operation of a shared European skills infrastructure. In the short term, these actions support the rapid creation and delivery of training solutions while remaining fully coherent with Member State competences in formal education. The Academy provides a **complementary, bridging mechanism** that enables immediate upskilling and reskilling where needs are most acute, while **buying time for formal education and training systems to adapt** curricula, capacity, and delivery models in a structured and sustainable manner.

Items

1. **Support faster and wider development the Future Mobility Academy (FMA)**, as being already established via Automotive Skills Alliance and TRIEME project, as a sector-based European collaborative academy and platform that provides essential solutions to the automotive sector, a key European strategic industry currently undergoing significant transformation, innovation, and competitiveness challenges. It delivers forward-looking solutions and prepares a workforce ready to support this transition. At the same time, it offers a de-fragmentation approach to existing initiatives and provides a foundation for cross-sectoral collaboration on horizontal topics.

⁴⁷ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 76–77.

⁴⁸ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), pp. 30–31.

2. **Support building coordination interfaces and linkages to multi-level structures across regional, national and European level** to enable long-term delivery and scaling, while supporting existing structures and subsidiarity principle across them.
3. **Support FMA as EU-endorsed solution** in Future Mobility sector which is connecting point towards different fragmented initiatives, such as European University Alliances, Centres of Vocational Excellence, EU Skills Academies, various projects and initiatives, which are relevant to the sector and its needs, in order to provide streamlined, updated and aligned solution for industry, education and training providers, teachers, students, to cooperate with, to use and to build on.
4. **Assess possibility for FMA as a reusable service layer for EU programmes and projects** (e.g., ERASMUS+, Horizon Europe) to support dissemination, exploitation and sustainability of training outputs beyond project lifecycles, reducing the need for each project to build its own platform and audience reach, while allowing the project partnership more focus on the project content work.
5. **Support delivery infrastructures connecting the stakeholders and underpinning FMA**, by enlarging existing tools (such as the [Skills Hub](#)) towards a gateway for the future mobility and maintaining a structured inventory of European training offers, enabling visibility, comparability and reuse of courses, modules and learning pathways across regions and Member States. Infrastructure includes forward looking approaches such as facilitation of AI agents and AI-led connecting and delivery methods for e.g. learning paths offering smart combination of courses from different existing providers.

Status & Best Practices **EU Level Status**

Across Europe, the **implementation of these actions is partial and uneven**, with clear progress at pilot and coordination level but no fully institutionalised, long-term solution yet. Elements of the **Future Mobility Academy (FMA)** vision are being implemented mainly through **flagship initiatives under the Pact for Skills and the Automotive Skills Alliance (ASA)**, where coordination platforms, communities of practice, and shared tools (such as the Skills Hub) already function as *de facto* one-stop collaboration points. Several **Erasmus+ and Horizon Europe projects** increasingly include skills, curricula, and training outputs, and some reuse common frameworks, taxonomies, and platforms, but this remains **project-driven rather than systematic**. The idea of FMA as a **reusable service layer** is emerging in practice through shared repositories, skills intelligence tools, and dissemination platforms, yet **projects still largely build parallel infrastructures**, and integration into EU R&I programmes is not mandatory.

The **Skills Hub and similar European, national and regional training inventories** are expanding, improving visibility and comparability of offers, but coverage across regions and Member States is incomplete and interoperability with national systems varies. Crucially, **sustainable governance and resourcing** remain the main gaps: coordination currently relies

on time-limited EU funding and voluntary stakeholder commitment, with no permanent EU-level support ensuring long-term collaboration, operation, maintenance, and scaling.

TRIEME and ASA Practice

The establishment of a **Future Mobility Academy (FMA)** is **partially as pilot implemented through the Automotive Skills Alliance (ASA) and its TRIEME project**. ASA already operates as a pan-European coordination framework under the Pact for Skills, connecting industry, education and training providers, regions and social partners, while the Skills Hub functions as a shared entry tool for collaboration, dissemination and exchange of training and education solutions.

The TRIEME Project is building this collaborative platform linking and structuring training offer across the sector. It acts as a repository of project-developed and external courses and supports multiple training providers. It defines and recognizes skills, offers structured learning pathways toward specific job roles, and issues micro-credentials with progress tracked through individual learning accounts. Looking ahead, this model may serve as one of the potential solutions — or the selected solution — for the future Academy. At this stage, it functions as a showcase, demonstrating how such a system can operate and how it can be further developed and scaled. There is a clear need to accelerate its development and expand its scope, which is precisely the purpose of this action, in order to support the wider impact for the sector and beyond, supporting the future mobility via skilled current and future workforce.

Stakeholder

Key role	 Sectoral Skills Collaboration (ASA)
	 European Commission
Supporting role	 Education & Training
	 Industry
	 National & Regional Authorities
	 Social Partners

Timeframe

Short-term

Recurrence

Continuous

C TACKLING THE WORKFORCE TRANSFORMATION & EMPLOYMENT

A sectoral skills strategy must address workforce transformation as a **labour-market system challenge**, not only as a training challenge. The automotive-mobility transition will create new roles while fundamentally transforming or reducing others, and it will **redistribute employment across regions, value-chain segments, and occupational profiles**. Without active transition management, the sector risks facing **simultaneous skills shortages and workforce displacement**—with growing demand in areas such as software, batteries, electronics, cybersecurity, and data, alongside declining demand for tasks and roles most affected by technological and process change.

This is why tackling the workforce transformation and employment must combine **anticipation, transition pathways, job quality, and attractiveness**. Skills development only delivers impact when it translates into real employability, job-to-job mobility, and workforce retention, and when the sector remains capable of **attracting new talent** into emerging and evolving roles. A purely supply-driven approach—focused on training volumes alone—is insufficient if workers cannot access transition pathways, if skills are not recognised across roles and employers, or if working conditions, career prospects, and the perceived attractiveness of automotive-mobility careers undermine recruitment and retention in critical occupations.

Recent EU policy strongly reinforces this perspective. The **Industrial Action Plan for the European automotive sector** recognises the combined challenge of skills shortages, mismatches, an ageing workforce, and restructuring pressures, and calls for improved data, targeted transition support, and stronger coordination between skills, employment, and industrial measures. Wider EU labour-market evidence further shows that persistent recruitment difficulties are shaped not only by skills availability, but also by **employer practices, career development opportunities, working conditions, and job quality**. Addressing shortages therefore requires not only “training more,” but **training smarter**—aligning skills development with retention strategies and with measures that improve the sector’s ability to attract and keep qualified workers.

For education and training systems, this pillar is critical because it defines the **demand-side contract** of the skills agenda—clarifying how learning connects to employment outcomes and career pathways in practice. In particular, it frames:

- **Which training and upskilling pathways lead to concrete job opportunities**, and in which regions and sub-sectors.
- **How quickly workers can transition between roles**, through job-to-job mobility, recognition of prior learning, and modular upskilling.
- **How limited training capacity should be prioritised**, focusing on critical occupations, transition hotspots, and value-chain bottlenecks.

- **How SMEs can be supported**, given that they face the greatest constraints in recruitment and training, through shared infrastructures, sectoral academies, and collaborative delivery models.
- **How the sector presents itself to current and future workers**, including young people and career switchers, by offering visible pathways, meaningful work, and credible long-term prospects.

A robust workforce transformation pillar therefore goes beyond forecasting and training provision. It integrates:

- **Transition-oriented programme planning**, identifying which groups need reskilling, towards which roles, and with what forms of support.
- **Regional deployment and partnerships**, linking training providers, companies, employment services, and regional authorities to reflect territorial impacts of transformation.
- **Measures that strengthen job quality, career progression, and retention**, recognising that skills shortages intensify when experienced workers leave the sector.
- **Actions to enhance the attractiveness of automotive-mobility careers or industrial jobs in general**, showcasing the sector as a space for technological innovation, sustainability, and high-quality employment, and making career pathways clearer and more accessible.

By addressing workforce transformation in this systemic way, it should support not only adaptation to change, but the **creation, retention, and renewal of a skilled workforce** across the automotive-mobility ecosystem—ensuring that industrial transformation is matched by employment pathways that are competitive, attractive, and sustainable over time.

C1 ATTRACTIVENESS OF STEM EDUCATION
C1 Attractiveness of STEM Education

Goal The goal is to **strengthen the attractiveness, participation and completion of STEM** pathways as a key feeder into the automotive-mobility workforce, improving the visibility of STEM-enabled careers across manufacturing, engineering, software and digital services, aftersales and repair.

As set out in the [Union of Skills](#), this responds to persistent STEM gaps and the need to **increase STEM talent supply in sectors increasingly relying on digital tools**, including AI, and to widen participation, notably for girls and women.⁴⁹ In the mobility ecosystem context, the [Transition Pathway for the EU Mobility Industrial Ecosystem](#) reinforces the need to strengthen **talent pipelines and better connect education pathways** to evolving mobility needs through coordinated ecosystem action.⁵⁰ For the automotive sector specifically, the [Industrial Action Plan for the European automotive sector](#) situates skills and workforce availability as enabling conditions for competitiveness during rapid **structural transformation and technology adoption**, supporting sustained measures that improve **STEM inflows alongside upskilling/reskilling**.⁵¹

Rationale The **STEM talent pipeline is increasingly a binding constraint** on the automotive-mobility ecosystem’s ability to deliver electrification, digitalisation, automation, cybersecurity and AI deployment at scale, as reflected in the [TRIEME skills intelligence report](#) highlighting the shift towards AI-enabled engineering, software-defined development and more data-driven work content;⁵² recent [workforce analysis](#) similarly points to **acute shortages** in roles linked to **EV maintenance, robotics/automation, cybersecurity and AI**, and notes that automotive firms struggle to attract digital talent relative to tech/IT, with shortages more severe in Eastern Europe and rural regions.⁵³ [The Union of Skills](#) states that Europe “does not produce enough skilled graduates” and faces **rising demand for STEM talent** in strategic and “traditional” sectors increasingly relying on digital tools, at the present time notably including AI; there are also **structural weaknesses** that reduce the effective pool, including there being almost twice as many men as women studying STEM in both higher education and VET, and that **between 2015 and 2022 doctoral graduates in STEM declined** overall (-7%), with a sharper fall in ICT doctorates (-25.5%), while only 40% of teachers are prepared

⁴⁹ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 3, 6–9.

⁵⁰ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), pp. 28–31.

⁵¹ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

⁵² TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 31–32.

⁵³ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 39–42.

⁵⁴ TRIEME Project. [Desk Research on Trends in Automotive-Mobility Sector \(Deliverable D2.1\)](#), pp. 7–10.

to use digital technologies and 68% of teenagers already use AI.⁵⁵ The TRIEME study [insights](#) also point to delivery-side constraints that affect the pipeline: **vocational provision is often outdated**, including **gaps in digital and battery-system content**, and micro and small enterprises frequently lack access to upskilling opportunities.⁵⁶ The scale of workforce adaptation required in passenger-car manufacturing by 2030 further implies that **upstream STEM inflows must increase in parallel with adult upskilling and reskilling** to sustain the ongoing transition.⁵⁷

Impact

A **stronger and more resilient STEM talent pipeline** for the automotive-mobility ecosystem, increasing progression into relevant VET and higher education programmes, **expanding the pool of entrants into STEM-related occupations** and **strengthening Europe’s capacity to compete globally for talent**, consistent with the Industrial Action Plan’s emphasis on competitiveness pressures and intensified competition for skills during rapid sector transformation. By improving the visibility of modern roles across digital, engineering, AI and sustainability profiles, linking education pathways to quality future-oriented jobs, and aligning schools, VET, higher education and industry at EU, national and regional levels, the action supports **earlier and more effective orientation for young people and wider participation of underrepresented groups** and career changers. It modernises STEM curricula through exposure to applied innovation and real industry practices, strengthens coordinated outreach and employer branding across the value chain, improves recruitment quality and retention through clearer role expectations and promotion of human-centred, adaptive work environments, and **increases workforce readiness for automation, robotics, AI and Industry 5.0 human–machine collaboration**, including awareness of responsible, ethical and explainable AI, contributing to EU priorities under the Green Deal, Digital Decade and long-term sector competitiveness and resilience.

Items

1. Jointly promote STEM education pathways linked to the automotive-mobility ecosystem as an example of industrial employment or possibility for entrepreneurship, positioning them as routes to quality jobs and future-oriented careers across the value chain, and increasing the attractiveness of STEM studies to young people and career changers.
 - 1.1. Organize sector-wide campaigns that support STEM orientation and highlight industrial career pathways by showcasing applied innovation and sustainability practices, including examples of jobs in the automotive-mobility and other relevant industrial sectors.

⁵⁵ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 4, 7–8.

⁵⁶ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

⁵⁷ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), pp. 29

- 1.2. Embed the automotive and mobility ecosystem as a flagship application context for STEM, translating AI, robotics, data, software, electrification, and sustainability into concrete learning outcomes, curricular elements, and career pathways.
2. Support the implementation of structured, EU-wide and national/regional engagement measures (including coordinated campaigns, events) with schools, VET and higher education stakeholders to strengthen awareness of STEM-driven occupational profiles in the automotive-mobility sector, including digital and engineering roles linked to new technologies and services.
 - 2.1. Facilitate sharing of effective communication (best) practices between the stakeholders across the ecosystem regarding awareness of STEM education and STEM-related occupational profiles.
 - 2.2. Support to facilitate closer, pedagogically structured cooperation with industry ‘beyond simple exposure’ to support contextualised problem framing, skills visibility, and career pathway transparency.
3. Promote the sector’s modern work content and human-centred workplace capabilities as part of STEM attractiveness, including skills linked to collaboration, adaptation, and responsible deployment of new technologies (e.g. skills for robotics and automation, Industry 5.0 human-machine collaboration, practical understanding of ethical AI, AI governance and explainable AI in automotive workplaces) to support both recruitment and retention of STEM talent.
4. Organise European-level student forums and industry-linked competitions to promote STEM education, building on the experience of existing teacher and trainer events and supporting elementary and secondary schools.
5. Promote inclusive pathways into STEM and technical occupations, ensuring participation across age groups, genders and diverse workforce backgrounds.

Status & Best EU Level Status**Practices**

Across Europe, the automotive-mobility ecosystem faces a growing mismatch between rapidly evolving skills needs and the attractiveness of STEM education pathways. While demand is increasing for digital, engineering and sustainability-related profiles linked to electrification, automation, software and AI, many young people and career changers still perceive automotive careers as traditional, manufacturing-centred and insufficiently aligned with future-oriented values. Engagement with schools, VET providers and higher education institutions remains fragmented, uneven across regions, and largely driven by isolated company or national initiatives rather than coordinated EU-wide approaches. As a result, awareness of modern, STEM-driven occupational profiles and human-centred workplace practices is limited, best communication and outreach practices are not systematically shared, and the sector struggles to attract and retain sufficient STEM talent to support its green and digital transformation.

TRIEME and ASA Practice

The attractiveness of STEM education and automotive-mobility careers is increasingly recognised as a **strategic enabler of workforce renewal**, diversity, and long-term skills availability. It is closely linked to the sector’s ability to attract new learners and workers into roles shaped by digitalisation, electrification, and sustainability.

Within this context, the **Automotive Skills Alliance (ASA)** provides a sectoral coordination space where attractiveness, diversity, and social aspects are gaining importance alongside skills development. Building on its role in skills intelligence and stakeholder alignment, ASA is initiating dedicated work through a **Topic Committee on Attractiveness, Diversity & Social Elements** to structure dialogue, exchange practices, and support coordinated sectoral approaches.

At the operational level, these topics are addressed through the **TRIEME project**, particularly its work on social elements, which focuses on gathering and analysing best practices and recommendations across Europe. This work aims to inform **practical, evidence-based actions** that can be taken up by sectoral, national, and regional actors to strengthen the attractiveness of STEM education and automotive-mobility careers.

Selected Practices

A more operational example of integrated education and career pathway support can be found in the European Chips Skills Academy (ECSA), established under the EU Chips Act to address skills shortages in the microelectronics and semiconductor ecosystem. ECSA places strong emphasis on early-stage talent pipelines and career orientation, notably through coordinated outreach to STEM students via summer schools, academies, bootcamps and hands-on learning formats developed in close cooperation with industry, universities and research centres. These activities expose learners to evolving job roles, emerging technologies and concrete career opportunities at an early stage, while strengthening links between education provision and labour market demand. By combining skills development with structured guidance, mobility opportunities and visibility of sectoral career pathways, ECSA demonstrates how sectoral initiatives can go beyond strategic coordination and deliver practical, scalable actions that support informed career choices and smoother transitions into high-demand industrial sectors.

Stakeholder

Key role	 European Commission
	 National & Regional Authorities
Supporting role	 Education & Training
	 Industry
	 Social Partners
	 Sectoral Skills Collaboration (ASA)

Timeframe	Mid-term
Recurrence	Continuous

C2 EDUCATION & CAREER GUIDANCE
C2 Education & Career Guidance

Goal The goal is to ensure that **workers, learners and jobseekers can navigate changing education and career pathways** in the automotive-mobility transition through **coherent guidance** and **practical transition-support measures that reduce participation barriers** and improve matching to training and jobs.

This responds to the [Union of Skills](#) emphasis that time constraints, financial considerations and care responsibilities prevent adults from taking part in further learning, and to its call for **clearer, more navigable education and career pathways** as work and innovation evolve.⁵⁸ It also aligns with the [Industrial Action Plan for the European automotive sector](#) focus on **supporting workers affected by restructuring**, including those seeking opportunities outside the sector alongside reskilling.⁵⁹

Rationale **Education and career guidance underpins effective workforce transformation** by translating changing job requirements into practical decisions by workers, learners and jobseekers, and by **improving the match between training choices and employment outcomes**, especially during restructuring and occupational change.^{60,61} Participation barriers make this more binding: the [Union of Skills](#) notes that time constraints, financial considerations and care responsibilities prevent adults from taking part in learning, **reinforcing the need for guidance paired with practical support measures** that reduce friction and enable informed choices.⁶² The scale of transition support required in the mobility sector is significant: it is estimated that **2.4 million passenger-car industry workers will need retraining or upskilling by 2030**, implying that guidance must support large volumes of people to identify feasible pathways and navigate transitions across regions and Member States.⁶³ [Sectoral intelligence](#) similarly signals that restructuring impacts are already visible (around 54,000 job cuts in 2024), reinforcing the need for **earlier, actionable guidance** for job-to-job transitions and targeted reskilling choices.⁶⁴

⁵⁸ European Commission. (2025). [The Union of Skills](#) [Communication], p. 3.

⁵⁹ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

⁶⁰ TRIEME Project. [Desk Research on Trends in Automotive-Mobility Sector \(Deliverable D2.1\)](#), pp. 78–79

⁶¹ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 62–63.

⁶² European Commission. (2025). [The Union of Skills](#) [Communication], p. 3.

⁶³ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 29.

⁶⁴ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

Recent [labour-market analysis](#) further shows why guidance matters for efficiency and fairness: almost 18% of Europeans aged 25–65 are neither working nor actively seeking a job (with higher rates among women), while **skills mismatch remains widespread** (12.3% under-skilled; 25.5% over-skilled), indicating that **better matching mechanisms are needed** alongside training supply.⁶⁵ In the automotive ecosystem, the [Industrial Action Plan for the European automotive sector](#) frames the transition as deep and ongoing and explicitly highlights support for workers seeking job opportunities outside the sector alongside reskilling, reinforcing that **guidance must be operational, accessible and connected to real labour-market demand**.⁶⁶

Impact

More reliable transition capacity in the automotive-mobility ecosystem through earlier and better-informed decisions by individuals and firms, **higher uptake of suitable training**, and **reduced disruption during restructuring**. Increased effectiveness of job-to-job and sector-to-sector transitions through **clearer pathway information**, individual skills assessment, targeted referral to modular upskilling/reskilling options, and follow-up support that reduces dropout risk. **Stronger alignment between guidance, training provision and employer demand** by integrating early-warning signals, outcome tracking and evidence-based targeting of pathways with demonstrated labour-market value. Improved feasibility and fairness of transitions through better linkage to relevant income, relocation and wellbeing supports and **more consistent use of EU and national reskilling and employment instruments**, reducing social and economic costs while improving the efficiency of public funding and strengthening workforce and regional resilience.

Items

1. Help to provide structured career and learning guidance that helps individuals identify skills gaps, understand job-role evolution, and navigate available upskilling and reskilling opportunities, including guidance for transitions into adjacent jobs or sectors where relevant.
 - 1.1. Encourage structured, forward-looking workforce planning aligned with transition scenarios and evolving skills demand.
2. Help to facilitate fair transition support for workers at risk, combining retraining opportunities with practical enabling measures (income protection, relocation support, and psychological/wellbeing support) to increase feasibility of transition and reduce dropout during restructuring.
 - 2.1. Aim to align guidance and transition support with available EU and national instruments aimed at enabling reskilling and employment transitions, including

⁶⁵ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 13–14.

⁶⁶ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16

mechanisms that bring relevant actors together and support workers seeking opportunities beyond the sector.

- 2.2. Facilitate and support alignment and close connection with [ESF+ Piloting a Skills Guarantee for Workers in Transition](#) pilot projects, supporting mutual exchange on skills intelligence and labour-market analysis, job-to-job transition methodologies, and the identification, sharing, and replication of best practices across regions and relevant types of stakeholders and partnership—facilitating peer learning and the transfer of effective transition solutions to other relevant and affected regions and stakeholders across Europe. Build on existing ASA structures for collaboration.
- 2.3. Promote development of internal mobility and redeployment pathways across adjacent occupational roles within the automotive and mobility value chain.
- 2.4. Support the use of common role-cluster mappings and skills assessment approaches to facilitate comparability, career progression and mobility.
- 2.5. Help to facilitate and support coordination between employers, social partners, employment services and regional stakeholders in managing workforce transitions.
3. Support integration of training outcomes tracking into guidance services to improve evidence-based recommendations and targeting of pathways.
4. Support integration of workforce early-warning monitoring on restructuring and regional exposure to trigger timely guidance and support mobilisation.
5. Promote a human-centred approach to digital and green transitions, integrating task redesign, supportive learning environments and managerial capability for change.

Status & Best EU Level Status

Practices

Across Europe, efforts to strengthen career guidance and support for upskilling and reskilling are gaining momentum, but implementation remains uneven across Member States and regions. The EU’s **Union of Skills** provides a strategic framework to improve lifelong learning, skills recognition, and the responsiveness of education and training systems, supported by major funding instruments such as **ESF+** and initiatives including **Upskilling Pathways**.

Despite this policy progress, adult participation in lifelong learning and the systematic integration of career guidance and transition support into labour-market systems remain below ambition. Public employment services and EU instruments such as **EURES** provide job-matching and mobility support, but the extent to which countries combine these services with early-warning mechanisms, structured guidance, and evidence-based job-to-job transition support varies significantly.

Overall, while EU-level strategy and funding increasingly prioritise skills development and workforce transitions, **practical delivery and uptake continue to lag behind policy ambition,**

highlighting the need for stronger integration of guidance, skills intelligence, and transition mechanisms.

Selected Practices

A more operational example of integrated education and career pathway support can be found in the European Chips Skills Academy (ECSA), established under the EU Chips Act to address skills shortages in the microelectronics and semiconductor ecosystem. ECSA places strong emphasis on early-stage talent pipelines and career orientation, notably through coordinated outreach to STEM students via summer schools, academies, bootcamps and hands-on learning formats developed in close cooperation with industry, universities and research centres. These activities expose learners to evolving job roles, emerging technologies and concrete career opportunities at an early stage, while strengthening links between education provision and labour market demand. By combining skills development with structured guidance, mobility opportunities and visibility of sectoral career pathways, ECSA demonstrates how sectoral initiatives can go beyond strategic coordination and deliver practical, scalable actions that support informed career choices and smoother transitions into high-demand industrial sectors.

Stakeholder	Key role	 Social Partners
		 National & Regional Authorities
		 European Commission
	Supporting role	 Education & Training
		 Industry
		 Sectoral Skills Collaboration (ASA)
Timeframe	Medium-term	
Recurrence	Continuous	

D RECOGNITION

Recognition is the **infrastructure that makes skills usable**. In a fast-changing automotive-mobility ecosystem, competences are increasingly acquired through diverse pathways—formal qualifications, company training, vendor certifications, short courses, and learning-by-doing. Without transparent, trusted, and portable recognition, these skills remain fragmented and underutilised: labour mobility is constrained, companies—especially SMEs—face recruitment bottlenecks, and individuals struggle to translate learning into career progression.

Recognition is therefore a precondition for an effective and competitive skills ecosystem.

Recognition matters for three core reasons.

- **First, it enables modular and lifelong learning pathways.** Recognition allows smaller learning units to be combined into larger, meaningful outcomes, supporting continuous upskilling and reskilling as technologies and jobs evolve. This is the purpose of the EU approach to **micro-credentials**, which sets common requirements on learning outcomes, assessment, and quality assurance to ensure usability across education and labour-market systems.
- **Second, it supports labour mobility and efficient skills allocation.** Comparable and understandable credentials allow employers to assess skills consistently and enable workers to move between jobs, companies, regions, and countries where demand exists. The **European Qualifications Framework (EQF)** provides the backbone for this comparability, acting as a translation reference between national qualification systems.
- **Third, recognition is becoming digital by default.** **European Digital Credentials for Learning**, supported by **Europass**, enable secure, verifiable, and portable digital proof of skills, including micro-credentials. This reduces administrative burden and allows skills to be integrated directly into recruitment, career development, and workforce management systems.

In practical terms, recognition is what converts **learning into deployable capability**. It is a precondition for scaling modular training, enabling job-to-job transitions, and ensuring that skills developed across multiple providers, companies, and countries can function as a **single, coherent skills pipeline** for the automotive-mobility ecosystem.

D1 SECTOR-ENDORSED MUTUAL SKILLS RECOGNITION
D1 Sector-Endorsed Mutual Skills Recognition

Goal Support the establishment and endorsement of a **transparent, trusted recognition model for skills and qualifications across Europe, applicable to the automotive-mobility ecosystem**, as part of a cross-sectoral European approach, while fully respecting the subsidiarity principle of the Member States and addressing sector-specific needs.

In the [Union of Skills](#)⁶⁷ action aims to support the “circulation” of skills in the single market by strengthening **portability, validation and recognition**, building on EU transparency and labour-market tools (EQF, Europass, ESCO, EURES), in alignment with the planned Skills Portability Initiative.⁶⁸ At operational level, it reflects sectoral guidance that **recognition should link learning outcomes to EU comparison tools** and integrate European guidelines for validation of non-formal and informal learning.⁶⁹ It also aligns with the mobility ecosystem priority to **promote transparency of qualification requirements and reinforce mutual acceptance of skills and competences** across Europe, as set out in [Transition Pathway for the EU mobility industrial ecosystem](#).⁷⁰

Rationale **Recognition and portability are increasingly critical enablers for workforce transition** in the automotive-mobility ecosystem, because skills are acquired through multiple routes (formal VET/HE, employer training, project-based provision, short courses) and must be understood and accepted **across employers, regions and Member States** to support **mobility and redeployment**. Sectoral evidence points to a practical bottleneck: fragmented systems and uneven recognition hinder mobility and the use of qualifications, while specialised, job-relevant provision is often not valued because it lacks formal recognition, limiting uptake and progression pathways for adults.^{71,72} [TRIEME’s desk research](#) further operationalises what recognition-ready provision requires, linking recognition to clear learning outcomes and systematic use of EU comparison tools such as ESCO, alongside EU and international recognition instruments, to support consistent understanding of skills across organisations and borders.⁷³ [The Union of Skills](#) frames this as a **single market constraint**: many individuals struggle to have skills recognised when moving within the EU or arriving from third countries, resulting in underused skills, and it positions strengthened **validation, portability** and

⁶⁷ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 3–4.

⁶⁸ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 13–14, 16–17.

⁶⁹ TRIEME Project. [Desk Research on Trends in Automotive-Mobility Sector \(Deliverable D2.1\)](#), pp. 72, 79.

⁷⁰ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

⁷¹ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

⁷² TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 37–38.

⁷³ TRIEME Project. [Desk Research on Trends in Automotive-Mobility Sector \(Deliverable D2.1\)](#), pp. 71–72

recognition as priorities supported by EU transparency and labour-market tools (EQF, Europass, ESCO, EURES), **interoperable digital credentials** and a forthcoming Skills Portability Initiative.⁷⁴ It also sets a practical expectation for recognition at scale through micro-credentials that are **trusted, digitally issued** and **comparable** across sectors and countries, linked where relevant to qualification frameworks and supported by **quality assurance** to strengthen employer use in recruitment and career progression (Union of Skills, 2025, p. 11).⁷⁵ [Transition Pathway for the EU Mobility Industrial Ecosystem](#) calls to promote transparency of qualification requirements and reinforce mutual acceptance of skills and competences, reinforcing the **need for a sector-led recognition model** that improves acceptance and portability across Member States and stakeholders.⁷⁶

Impact

A recognition environment in which automotive-related micro-credentials and other learning outcomes are digitally issued, quality-assured and comparable across borders, strengthening employer trust and uptake in recruitment and career progression, consistent with the Union of Skills direction to expand micro-credentials as trusted, understandable, digitally issued and cross-country comparable learning solutions supported by quality assurance guidance. Reduced barriers to cross-border hiring and redeployment through mutual recognition and digital portability of credentials, lowering administrative burden via standardised mapping to EU transparency tools and interoperable credential formats. Improved utilisation of existing talent through systematic validation of prior, non-formal and workplace learning, reducing unnecessary retraining and shortening time-to-placement. Stronger modular, stackable upskilling and reskilling pathways aligned with labour-market needs, supporting faster matching of skills to jobs and reinforcing competitiveness and resilience during rapid sector transformation.

Items

1. **Support mutual recognition of skills at sector level**, coherent with EU transparency tools (EQF, ESCO, Europass), ensuring comparability of learning outcomes and facilitating links with national qualification frameworks and formal recognition pathways, involving industry, education and training providers, social partners, regions and Member States to build trust and acceptance of recognised skills. This could build on existing sectoral solutions, such as industry-led recognition, as being developed via the TRIEME project, with a prepared link to formal recognition schemes.
2. **Encourage cross-sector interoperability**, allowing sector-specific competence frameworks to connect with other strategic ecosystems while preserving automotive-mobility specific requirements.
3. **Strengthen validation of non-formal, informal and workplace learning**, enabling recognition of existing competences and supporting workforce transitions.

⁷⁴ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 4, 12–14.

⁷⁵ European Commission. (2025). [The Union of Skills](#) [Communication], p. 11.

⁷⁶ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

4. **Promote digital portability of credentials**, including micro-credentials and modular learning outcomes, supporting sectoral and cross-border mobility and reducing administrative barriers through interoperable and quality-assured formats.
5. **Outline shared quality assurance principles** to reinforce employer trust and consistent recognition practices across Europe.

Status & Best EU Level Status
Practices

Across Europe, the automotive-mobility ecosystem is making fragmented but tangible progress toward mutual recognition of competences, with strong policy alignment but uneven implementation. At EU level, frameworks such as EQF, ESCO, the Council Recommendation on micro-credentials, and validation of non-formal and informal learning provide a solid foundation, and several sectoral alliances (e.g. automotive, batteries, digital) are piloting competence matrices, learning-outcome mapping, and micro-credentials to improve transparency and comparability. However, mutual recognition is not yet systemic: recognition rules, quality criteria, and accreditation practices remain largely national or project-based, employer acceptance varies, and cross-border “community recognition” mechanisms are still emerging rather than operational. Quality assurance and accreditation for strategic technologies are developing through guidelines and voluntary schemes, but lack a shared, sector-wide trust label that is usable for both large providers and SMEs. Validation of prior and workplace-based learning is widely recognised as essential for transitions and restructuring, yet workflows, evidence standards, and employer uptake differ significantly across Member States. Overall, Europe has the policy instruments and pilots in place, but scaling them into clear, repeatable, employer-trusted recognition systems across borders remains the key gap.

TRIEME and ASA Practice

The ASA Skills Hub provides a pilot, sector-specific implementation of micro-credentials with shared quality assurance and recognition processes linked to common automotive competence reference definitions. In collaboration with Pact for Skills partnerships, companies, training providers and other stakeholders, the [Skills Hub](#) supports the unification of credential processes, including AI-supported mapping of courses and learning outcomes to a single sectoral ontology. This approach is complemented by initiatives such as the [AutoCredify](#) project, which tests and refines credential models in repair and maintenance domains using the [Skills Hub](#) as a common infrastructure. In parallel, the [TRIEME](#) project, together with the [Automotive Skills Alliance](#) under the Pact for Skills, pilots a model of “community/industry-led recognition”, whereby employers and ecosystem stakeholders formally recognise and accept credentials through cooperation agreements and memoranda of understanding. The [Skills Hub](#) integrates a growing portfolio of sectoral courses, with a strong focus on industry-driven and R&I-related training, all structured against a shared automotive-mobility competence layer and issued using the same quality and recognition format. In addition, the [Skills Hub](#) enables structured learning pathways and recognition of

prior learning, as demonstrated for example in the [CaBatt](#) project, where teachers who had already acquired relevant competences were exempted from repeating introductory modules, ensuring efficient, competence-based progression.

Stakeholder
Key role

Industry

Education & Training

European Commission

National & Regional Authorities
Supporting role

Social Partners

Sectoral Skills Collaboration (ASA)
Timeframe

Medium-term

Recurrence

Continuous

E GOVERNANCE & COLLABORATION

Governance is what makes the Sectoral Skills Strategy **executable at speed and at scale**. Skills and education outcomes in the automotive-mobility ecosystem depend on coordinated action across **European, national, and regional levels** and across multiple policy and delivery domains—education and training systems, labour markets and employment services, industrial and innovation ecosystems, regional development, and funding programmes. When coordination is weak, the result is predictable: fragmented initiatives, duplicated pilots, parallel competence frameworks, slow curriculum updates, and limited scaling of what works. The EU’s **Union of Skills** explicitly identifies fragmented governance as a barrier to competitiveness and calls for stronger coordination, supported by improved skills intelligence and structured stakeholder involvement.

At the same time, **Member States retain primary responsibility for education and training systems**. The governance challenge is therefore not to centralise competences, but to **create effective coordination and collaboration spaces** that enable faster adaptation, interoperability, and mutual reinforcement of investments. Such spaces are essential to ensure that European, national, and regional initiatives do not operate in parallel silos, but function as parts of a coherent skills architecture. This includes systematically building on existing outputs—such as competence frameworks, modular learning units, micro-credentials, educator support schemes, and skills intelligence—and enabling successful pilots to be mainstreamed rather than repeatedly reinvented across regions.

In the automotive-mobility ecosystem, this collaborative foundation **already exists**. The **Automotive Skills Alliance (ASA)** has been established as a [large-scale sectoral skills partnership](#), pioneering in the [Pact for Skills](#) action, bringing together industry, education and training providers, social partners, regions, municipalities, and other stakeholders, complemented by its growing [Regional Skills Partnership](#). Building on Erasmus+ Blueprint projects, including **TRIEME**, and on sustained cooperation under the Pact for Skills, ASA provides a practical governance framework to connect stakeholders, align priorities, structure skills intelligence, and support cross-border and cross-regional cooperation.

The strategic task ahead is therefore to **strengthen and systematise this existing governance**, rather than create new parallel structures. This requires reinforcing coordination mechanisms, improving continuity, and providing more stable and fit-for-purpose support—including financial support—so that collaboration can operate faster, at greater scale, and with stronger impact. Boosting what already works allows the ecosystem to reduce fragmentation, accelerate innovation in education and training, and ensure that skills development keeps pace with industrial transformation.

In practice, effective governance for this Strategy should achieve three objectives simultaneously:

1. **Align priorities** across industry, education and training providers, social partners, and public authorities at European, national, and regional level, based on shared evidence and agreed transformation priorities.
2. **Translate intelligence into action**, ensuring that skills intelligence informs programme development, educator capacity building, curriculum updates, and workforce transition measures.
3. **Scale what works**, moving from pilots to mainstream delivery through shared tools and content, mutual recognition approaches, and coordinated access to funding—so that solutions can be reused across Member States and regions, including by SMEs.

Finally, governance must act as the **bridge between innovation policy and skills implementation**. As the EU accelerates initiatives on software-defined vehicles, connectivity, artificial intelligence, electrification, batteries, and circularity, skills pipelines and educator capacity must be developed **in parallel with technology deployment**, not retrospectively. Strengthened sectoral governance is therefore essential to ensure that innovation, investment, and skills evolve together—supporting competitiveness, resilience, and high-quality employment across the automotive-mobility ecosystem.

E1 MULTI-LEVEL EUROPEAN SECTORAL AND CROSS-SECTORAL SKILLS COLLABORATION
E1 Multi-level European Sectoral and Cross-sectoral Skills Collaboration

Goal The goal is to **reinforce existing skills collaboration partnership via the Automotive Skills Alliance with a coherent multi-level collaboration model** for automotive-mobility skills that aligns EU, national and regional authorities with industry, education and training providers and social partners, with national or regional **coordination points** and **implementation follow-through across Member States and regions, while building on and enforcing established connections to e.g. Automotive Regions Alliance**. The collaboration brings the sector-specific solutions, while assuring the representation and collaboration withing the sector and bridging and linking to cross-sectoral collaborations, platforms and solutions.

This should be in line with reinforcement of the Pact for Skills, as it is stated in the in the [Union of Skills](#) to provide pragmatic solution to fragmentation of initiatives, to strengthen skills governance, cooperation structures and improved portability across the single market,⁷⁷ the [Industrial Action Plan for the European automotive sector](#) emphasis on skills as a strategic pillar and large-scale partnership implementation,⁷⁸ and the [Transition Pathway for the EU mobility industrial ecosystem](#) focus on coordinated ecosystem implementation and alignment of initiatives.⁷⁹ The model should further have shared priorities, agree common monitoring and reporting (KPIs), and support adoption of shared tools and standards, enabling **mainstreaming of proven solutions** and **interoperability for skills portability and mobility**.

Rationale Automotive skills challenges cut across education and training systems (with around **40% of existing skill sets expected to be obsolete by 2030**),⁸⁰ labour markets, industrial policy, regional development and innovation ecosystems, and **fragmented governance predictably results in duplicated pilots, inconsistent curricula, uneven quality and slow scaling across Member states and value-chain segments**. The [Union of Skills](#) frames this governance and coordination problem as a constraint on effective skills investment and delivery and links improved portability and mobility in the single market for skills to stronger stakeholder structures, **coordinated approaches** and more consistent use of EU transparency and labour-market tools.⁸¹ In the automotive ecosystem, the [Industrial Action Plan](#) positions skills as a strategic pillar and points to **reinforced large-scale implementation** through [Pact](#)

⁷⁷ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 4–5, 12–13.

⁷⁸ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

⁷⁹ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

⁸⁰ [Skills, Job Roles, Education & Training: Grasping the Scale of Transformation. Key Facts and Insights from the TRIEME Report \(Sectoral Skills Intelligence Release 1 \(D2.2\)\)](#)

⁸¹ European Commission. (2025). [The Union of Skills](#) [Communication], pp. 4–5, 12–13.

[for Skills](#) partnerships,⁸² implying a need for governance arrangements that can set priorities, coordinate actors and translate commitments into delivery at scale, including under restructuring and demographic pressure.⁸³ The [Transition Pathway for the EU mobility industrial ecosystem](#) similarly stresses the **need to map and connect existing initiatives, reinforce coordination** across ongoing skills actions and improve transparency and mutual acceptance of competences, which **requires structured multi-level mechanisms** to align EU-level direction with national and regional implementation.⁸⁴ Sectoral evidence also shows why governance is operationally necessary: [TRIEME research](#) identifies fragmentation risks from diverse actors and initiatives and highlights the need for partnerships, common standards and **structured collaboration to avoid siloed approaches** as digitalisation and AI accelerate competence change.⁸⁵ A [workforce analysis](#) reinforces the same point, highlighting limited consolidation and visibility on who is supported, at what scale and with what impact, and insufficient capacity to coordinate and monitor a growing number of projects, which **slows replication and disadvantages smaller actors** such as SMEs.⁸⁶ A boots of an existing collaboration model is therefore required to convert intelligence and priorities into coordinated work programmes and **implementation follow-through**, ensure **shared tools and standards are adopted consistently** across Member States and regions, and **provide sustainable governance** for delivery platforms such as the Future Mobility Academy.

Impact

A multi-level governance model that sustains collaboration around shared priorities, tools and standards across the automotive-mobility ecosystem, embeds skills objectives into sector-relevant industrial and innovation roadmaps, and provides consistent data governance and interoperability for portability, monitoring and accountability. Clear roles, responsibilities and decision rights that stabilise coordination across EU, national and regional levels and provide predictable operating conditions for delivery platforms, notably the Future Mobility Academy and ecosystem gateways. Faster alignment and scaling of proven solutions through structured priority-setting, common KPIs and implementation follow-through, enabling rapid coordination and re-prioritisation of skills actions in response to market shocks, technological disruption or geopolitical developments. Making the well-defined priorities, goals and work of the Automotive Skills Alliance and this sectoral skills strategy live faster with wider positive impact, as the sector needs it to support innovation and competitiveness.

⁸² European Commission. (n.d.). [Pact for Skills](https://pact-for-skills.ec.europa.eu/index_en). https://pact-for-skills.ec.europa.eu/index_en.

⁸³ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16

⁸⁴ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

⁸⁵ TRIEME Project. [Desk Research on Trends in Automotive-Mobility Sector \(Deliverable D2.1\)](#), pp. 7–8, 30.

⁸⁶ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 76–77.

Items

1. Support and boost a structured multi-level collaboration system for automotive-mobility skills collaboration connecting EU, national, regional and ecosystem stakeholders (including industry, education and training providers, social partners, public authorities, research, relevant international, national and regional clusters), with clear roles, priority-setting and implementation follow-through, while facilitating, boosting, following and building on existing in the Automotive Skills Alliance, which has been proven as the well running sectoral skills alliance.
 - 1.1. Support and boost multi-level coordination points and structured mechanisms that connect regional implementation, members states with EU-level and sector-level priorities, enabling consistent deployment and continuous feedback.
 - 1.2. Support and boost existing and bring new working group/task forces structures within the topic committees to discuss and work towards shared goals of the stakeholders on re-/up-skilling topics and boost motivation of the participating stakeholders.
 - 1.3. Facilitate and support the establishment of systemic collaboration among Automotive Skills Alliance and the R&I community, following the [Joint Research & Innovation EU framework](#) to support Forward-looking insights and to support assessment of societal impact, to provide fast and agile reaction to industry-oriented skills needs.
 - 1.4. Support establishment of a special skills governance track supporting SMEs and Start-ups in accessing the partnerships to benefit from training, funds, and recognition (including reducing administrative burden and targeted support).
 - 1.5. Regularly coordinate with the European Commission to align the automotive skills agenda with EU skills priorities (including the Union of Skills and Pact for Skills direction), and ensure coherent linkages with industrial, transition policies, and direct demands of industry and other sectoral players and stakeholders.
 - 1.6. Align the structured multi-level model with reinforced the Pact for Skills collaboration on sectoral, but also cross-sectoral collaboration. To allow critical, fast and pragmatic exchange across stakeholders on sectoral solutions, as well as across all stakeholders on cross-sectoral topics, such as skills intelligence gathering methodology, description, ontology, recognition and other topics.
 - 1.7. Support and boost EU-wide collaboration and exchange of good practices between EU, national and regional stakeholders, including industry, education and training providers, and social partners, and to support mainstreaming of proven practices. Leverage ASA's established platform.
 - 1.8. Support the collaboration among clusters and public and regional authorities to deploy desired ecosystem solutions.

- 1.9. Systematically map and connect existing initiatives; identify overlaps and gaps; and create transparent alignment pathways to sector competence needs to bring benefits to the stakeholders

Status & Best EU Level Status**Practices**

At EU level, the strategic direction for automotive skills governance is defined through the Union of Skills, the Pact for Skills and the Industrial Action Plan for the European automotive sector, all of which emphasise stronger stakeholder coordination, skills portability, alignment with industrial transition and large-scale implementation through ecosystem partnerships.

However, across Europe, implementation remains uneven and fragmented. Governance is often project-based, coordination between EU, national and regional levels is inconsistent, and mechanisms for priority-setting, feedback, monitoring and scaling of proven solutions are not systematically embedded. While strong initiatives and platforms exist, they are not yet integrated into a coherent, multi-level collaboration system capable of translating skills intelligence and policy priorities into sustained, coordinated delivery across Member States and regions.

TRIEME and ASA Practice

The Automotive Skills Alliance (ASA) demonstrates a mature, multi-level governance model for automotive skills development as a Pact for Skills Large-Scale Partnership, with a formal structure comprising the partnership, topic committees and the ASA Office, providing stable ecosystem-level coordination and decision support. ASA acts as a sector-wide coordination anchor, enabling national and regional initiatives to align with EU-level automotive skills priorities, while serving as a recognised interlocutor for the European Commission through direct and continuous dialogue on skills policy and implementation. The alliance aligns its skills agenda with EU industrial and skills priorities while integrating direct industry demand through its thematic and technology-focused committees. ASA enables EU-wide collaboration and exchange of good practices by connecting industry, education and training providers, social partners and public actors across Member States, with the Skills Hub structuring and mapping initiatives around shared job roles and skills needs to improve transparency, identify gaps and support alignment pathways. Through shared reference structures for skills, job roles and training categorisation, ASA applies a practical, interoperable sector-level skills architecture and embeds academy-type processes that support continuity and scaling beyond individual projects, anticipating the Future Mobility Academy model. Skills priorities are linked to industrial strategies and transition roadmaps, including specific attention to SMEs and start-ups through a one-stop-shop approach that lowers access barriers to training and tools. ASA also operates thematic working groups, task forces and topic committees that support joint problem-solving and shared ownership of outcomes and has established quantified objectives and progress indicators as a basis for

sector-wide monitoring and reporting, although further harmonisation of KPIs across sectors remains needed.

All this creates a well defined and established foundation, which is supported and ready to be further reinforced by implementation and connection to systemic solutions. Automotive Skills Alliance, as the Pact for Skills Large-scale Partnership, goal is coordination and explicitly connect key European initiatives — European Universities alliances, Centres of Vocational Excellence (CoVEs), EU Skills Academies, Blueprint and other Erasmus+ projects, regional innovation ecosystems, and national training programmes—so they operate as parts of one coherent skills architecture rather than parallel efforts – to tackle fragmentation by creating a shared reference point and common processes, the collaboration ensures that outputs from these initiatives become interoperable, scalable and reusable across Europe and directly connected to the strategic sector as the automotive-mobility is.

Strengthening and scaling up already existing Strategic Skills Collaboration of the Automotive Skills Alliance will help European automotive-mobility sector to maintain industrial competitiveness, accelerate innovation uptake and support high-quality jobs in all regions. The automotive–mobility sector drives transformation in many other ecosystems, the improving skills coordination here will generate a positive multiplier effect across the wider European economy. This is not about creating new parallel structures, but about continuing, expanding and supporting what already works – turning a proven collaborative foundation into a long-term European mechanism that ensures people have the skills needed to succeed in the green and digital transition.

Stakeholder	Key role	 Sectoral Skills Collaboration (ASA)
		 European Commission
	Supporting role	 Education & Training
		 Industry
		 National & Regional Authorities
		 Social Partners
Timeframe	Long-term	
Recurrence	Continuous	

E2 FINANCIAL MECHANISMS TO SUPPORT THE IMPLEMENTATION
E2 Financial Mechanisms to Support the Implementation

Goal To **guide and influence the design and alignment of EU, national, and regional funding mechanisms**, together with private investment, so that skills investment in the automotive-mobility ecosystem enables **scaled, sustained, and high-impact delivery** of upskilling and reskilling. The objective is to promote funding approaches that are **impact-driven, coherent, and reusable**, reducing fragmentation and duplication while strengthening delivery capacity and continuity for shared sector platforms and partnerships.

This action calls for funding frameworks and programmes to explicitly support **measurable outcomes** and ensure that funded initiatives are aligned with agreed **sectoral and cross-sectoral skills priorities**—including digitalisation and AI-related competences—rather than operating as isolated or stand-alone projects from different funding programmes.

This orientation reflects the [Union of Skills](#) emphasis on impact, coordination, and accountability; the [Industrial Action Plan for the European automotive sector](#) focus on mobilising instruments such as ESF+ and Erasmus+ for large-scale sector delivery;⁸⁷ and the [Transition Pathway for the EU mobility industrial ecosystem](#) call to reinforce implementation capacity and connect initiatives across the ecosystem.⁸⁸

Rationale The automotive-mobility transition is generating **large, time-bound skills needs** driven by electrification, digitalisation, automation, and AI, while existing funding approaches and delivery conditions remain fragmented across instruments and governance levels. Skills intelligence consistently shows that competence requirements evolve faster than traditional funding and project cycles, increasing the risk that investment lags behind industrial change and **delivers limited structural impact**.

Despite the availability of significant EU-level instruments (including ESF+, Erasmus+, JTF, EGF and InvestEU), skills funding is often **project-driven rather than system-oriented**. This leads to repeated redevelopment of similar curricula and tools, limited reuse of existing assets, uneven coverage across regions, and insufficient continuity once projects end. Smaller actors—particularly SMEs and training providers—are disproportionately affected by administrative complexity and the lack of clear entry points into funding ecosystems.

Evidence from [TRIEME](#) and wider labour-market research underlines that **impact at scale requires changes in how funding is structured and used**, not only higher volumes of funding. This includes supporting modular and recognition-ready provision, enabling long-term maintenance of shared tools and platforms, and encouraging initiatives to **build on**

⁸⁷ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

⁸⁸ European Commission. (2024). [The Transition Pathway for the EU Mobility Industrial Ecosystem](#), p. 30.

existing sectoral infrastructure—such as skills intelligence, common competence frameworks, academies, and delivery gateways—rather than starting from scratch.

[The Industrial Action Plan for the European automotive sector](#) points to EU-level funding levers (including ESF+ and EGF) and highlights the need to strengthen uptake and **steer support towards delivery capacity**, including **targeted support for Large-Scale Skills Partnerships** under the [Pact for Skills](#) (including via Erasmus+) to move from initiatives to **scaled implementation in strategic sectors such as automotive**.⁸⁹ [TRIEME's skills intelligence](#) also highlights that modular approaches and recognition-ready provision (including micro-credentials and quality-assured learning outcomes) are necessary to support adult upskilling at scale, which implies **financing mechanisms that can sustain stackable provision rather than one-off pilots**.⁹⁰ [Labour-market research](#) recommendations reinforce that financing must shift from fragmented project cycles to sustained operational capability: limited consolidation and visibility on what is funded and delivered, alongside insufficient capacity to coordinate and monitor a growing number of projects, slows replication, increases duplication and disadvantages smaller actors such as SMEs.⁹¹

In this context, **simplifying access, aligning investment with skills intelligence and agreed priorities**, and **providing continuity funding for shared sector platforms and partnerships** become practical requirements for scaling; stronger outcome measurement and systematic reuse of existing assets (modules, curricula, tools) are necessary to reduce reinvention and ensure that investment translates into deployed training, mobility outcomes and improved workforce resilience.

Impact

Clear expectations and reference principles for funding design that help **increase impact per euro invested**, reduce fragmentation, and accelerate the translation of skills investment into deployed training, job-to-job transitions, and workforce resilience. Stronger alignment between EU, national, and regional funding approaches improves efficiency, transparency, and accessibility—particularly for SMEs—while sustained support for shared sector infrastructure improves continuity beyond project lifecycles. Systematic outcome tracking and reuse of existing assets strengthen accountability, comparability, and evidence-based reprioritisation of investment.

A funding environment that enables reforms and delivery at national and regional level, **strategically leverages EU programmes and instruments**, and makes investment feasible for industry participation, particularly SMEs and start-ups. Better targeting of reskilling and upskilling resources to the **most critical sectoral and regional transition needs**, with

⁸⁹ European Commission. (2025). [Industrial Action Plan for the European automotive sector](#), pp. 15–16.

⁹⁰ TRIEME Project. [Sectoral Skills Intelligence – Release I \(Deliverable D2.2\)](#), pp. 37–38.

⁹¹ ACEA, Adecco Group (2025). [The race to reskill: Speeding up the European automotive workforce transition](#), pp. 76–78.

reduced overlap and duplication across instruments and stronger alignment between EU, national and regional funding and automotive transition priorities, **improving efficiency, transparency and accessibility** of support while **lowering administrative burden** for smaller actors. Sustained operation and scaling of shared sector infrastructure beyond project lifecycles, increasing reuse of existing tools, curricula and platforms and improving continuity after funding ends. Standard KPIs, outcome tracking and longer-term impact evaluation, strengthening value-for-money, accountability and stakeholder trust and enabling data-driven reprioritisation and continuous improvement across funded actions.

Items

1. **Promote alignment of skills investment with sectoral and cross-sectoral skills intelligence**, so that funding priorities reflect material transition needs and agreed sectoral and cross-sectoral objectives.
2. **Encourage impact and alignment requirements in funding programmes**, including expectations that funded initiatives demonstrate contribution to agreed sectoral priorities and reuse of existing assets where available, avoiding duplication and reinvention.
3. **Support coordination across EU, national, and regional funding frameworks**, improving consistency with Automotive Transition Pathways and reducing overlap between instruments.
4. **Enable direct support for sustainable facilitation of shared sector backbones**, including skills intelligence layers, collaboration and governance models, academies, and common delivery platforms, enabling projects to plug into and reinforce these structures – following the actions in this sectoral skills strategy.
5. **Aim to facilitate simplified access to funding**, particularly for SMEs, start-ups and smaller organizations, by encouraging streamlined administrative requirements and structured support for navigating funding instruments.
6. **Promote outcome-oriented funding approaches**, including common KPIs, outcome tracking (e.g. skills deployment, job transitions, career progression), and longer-term evaluation of funded actions.
7. Promote outcome-oriented monitoring, moving beyond training participation metrics towards workforce transition indicators such as redeployment, job-to-job transitions and retention after reskilling.
8. Encourage funding approaches that recognise and mitigate training trade-offs for employers, including production downtime, wage costs and SME replacement capacity.
9. Support alignment of training investments with industrial transition cycles to increase feasibility and impact.

Status & Best EU Level Status
Practices

At EU level, the strategic importance of more coordinated, outcome-oriented skills investment is widely recognised through the Union of Skills, the Pact for Skills, and sectoral transition policies. In practice, however, funding approaches remain fragmented, impact requirements are uneven, and incentives for reuse of existing assets are limited. Long-term support for shared sector infrastructure and harmonised impact evaluation remain structural gaps, constraining scalability and value-for-money.

TRIREME and ASA Practice

The **Automotive Skills Alliance (ASA)** illustrates how skills investment can be aligned around **shared sectoral backbones**. Through industry-led skills intelligence, common competence references, collaboration models, and the Skills Hub as a delivery gateway, ASA enables initiatives and projects to build on existing structures rather than duplicate effort. As a Pact for Skills large-scale partnership, ASA supports alignment of EU, national, and regional funding approaches with sector transition needs and increasingly promotes outcome-oriented objectives and shared indicators—demonstrating how coordinated funding design can **reduce fragmentation, increase reuse, and significantly raise impact** for the sector, regions, companies, and workers.

Stakeholders
Key role

European Commission

National & Regional Authorities
Supporting role

Sectoral Skills Collaboration (ASA)

Industry

Education & Training

Social Partners
Timeframe

Short-term

Recurrence

Continuous

2 AUTOMOTIVE SKILLS AGENDA OUTLOOK & FUTURE SCENARIOS

Structural Drivers Shaping the Future of the Automotive Sector and Their Implications for Skills

From future scenarios to structural realities

The future of the automotive sector is no longer defined by a set of hypothetical scenarios or alternative development paths. Over the past decade, and especially since the launch of the European Green Deal, the direction of travel has become increasingly clear. The sector is undergoing a profound and multi-layered transformation driven by binding regulatory targets, accelerated technological change, global competition, and geopolitical developments. What remains uncertain is not *whether* change will occur, but *how fast, how unevenly, and with what capacity* the workforce and education systems can adapt.

Traditional future scenarios—often framed as optimistic, pessimistic, or business-as-usual—have limited value in this context. They tend to abstract from the concrete policy, investment, and technological commitments already shaping the sector, and they rarely translate into actionable guidance for skills development, curriculum design, or training delivery. For a sectoral skills strategy, the more relevant question is not “which future will materialise?”, but rather:

Which structural forces are already reshaping the automotive ecosystem, and what do they imply for people, skills, and education systems?

This approach reflects the reality faced by companies, workers, regions, and education providers. It also aligns with recent European policy frameworks, which increasingly integrate industrial policy, innovation policy, and skills policy into a single strategic narrative. In this context, skills are no longer a downstream issue, but a core enabler of competitiveness, resilience, and social cohesion.

Regulatory and policy drivers: skills shaped by binding commitments

Regulation remains one of the strongest drivers of change, because long-term objectives are embedded in EU policy frameworks and influence investment decisions across the value chain. At the same time, the **implementation architecture is evolving**, and recent developments show that regulatory pathways can be **adjusted, sequenced, or supplemented with flexibilities** as market conditions, infrastructure readiness, and competitiveness pressures evolve.

This is visible in the Commission’s recent automotive policy approach, where the transition is reinforced but also managed through **packages, amendments, and accelerated reviews**—in part to maintain investment capacity and industrial deployment. For skills planning, this means the workforce must be prepared not only for “one fixed pathway” but for **multiple compliance and technology routes**, with changing timelines and requirements that may shift faster than qualification cycles

At the same time, regulation is becoming more complex and more interconnected. Automotive professionals are required to understand not only technical requirements, but also how regulation interacts with traceability of the supply chain, sustainability reporting, digital compliance, cybersecurity rules, data governance, and product liability. This is particularly visible in areas such as batteries, software-defined vehicles, autonomous systems, and data access.

From a skills perspective, this has several implications:

- Growing demand for **hybrid profiles** that combine technical expertise with regulatory and sustainability literacy.
- Increased need for **continuous upskilling**, as regulatory frameworks evolve faster than traditional qualification cycles.
- Stronger pressure on **SMEs and suppliers**, which often lack internal regulatory expertise and rely on external training and shared resources.
- Rising importance of **transversal competences**, such as systems thinking, risk assessment, and compliance management.

Regulatory drivers therefore act not only as constraints, but as powerful catalysts for reshaping skill profiles across the entire automotive value chain.

Technological drivers: accelerating cycles and converging disciplines

Technological change remains a central force shaping the future of the automotive sector, but its nature has shifted significantly. The transformation is no longer driven by isolated technological breakthroughs, but by the convergence of multiple technologies that affect both products and processes simultaneously.

Electrification, battery systems, power electronics, and charging infrastructure are now deeply intertwined with digital technologies such as software engineering, artificial intelligence, data analytics, and cybersecurity. The emergence of software-defined vehicles connected and automated mobility, and digital mobility services is blurring traditional boundaries between mechanical engineering, electrical engineering, ICT, and data science.

This convergence has two critical consequences for skills:

First, **the half-life of technical skills is shortening**. Technologies evolve faster than curricula, and innovation cycles increasingly outpace formal education and training systems. Skills acquired at the beginning of a career may become partially obsolete within a few years, requiring continuous updating through modular and flexible learning pathways.

Second, **disciplinary silos are no longer sufficient**. While deep expertise remains essential, it must be complemented by the ability to collaborate across domains. Engineers, technicians, and managers

alike need a broader understanding of how systems interact, how software and hardware co-evolve, and how digital solutions affect safety, sustainability, and user experience.

Key technological trends influencing skills demand include:

- The shift from hardware-centric to **software-centric vehicle architectures**
- Integration of **AI and data-driven decision-making** in design, production, and operations
- Increased importance of **cybersecurity and functional safety**
- Advanced manufacturing technologies, automation, and robotics
- Lifecycle-based approaches to product design, maintenance, and recycling

These trends reinforce the need for education and training systems that are agile, interdisciplinary, and closely connected to industrial practice.

Economic and geopolitical drivers: resilience, supply chains, and talent competition

Beyond regulation and technology, the automotive sector is increasingly shaped by economic and geopolitical dynamics. Recent crises—ranging from the COVID-19 pandemic to supply chain disruptions and geopolitical tensions—have exposed structural vulnerabilities in global value chains and accelerated a reassessment of industrial dependencies.

European automotive companies are under growing pressure to strengthen supply chain resilience, diversify sourcing, and localise critical activities such as battery production, raw material processing, and advanced manufacturing. This has significant implications for regional development, employment structures, and skills demand.

At the same time, the sector is operating in an increasingly competitive global environment. Competition is no longer limited to traditional automotive players, but includes technology companies, new entrants, and global actors supported by assertive industrial strategies. Talent has become a strategic resource, and Europe faces intense competition for highly skilled workers in areas such as software engineering, AI, cybersecurity, and advanced manufacturing.

Demographic trends further exacerbate these challenges. An ageing workforce, combined with persistent skills shortages and declining interest in certain technical professions, risks creating bottlenecks that constrain innovation and growth.

From a skills perspective, these economic and geopolitical drivers highlight:

- The need to **reskill and redeploy existing workers**, rather than relying solely on new entrants.
- The importance of **regional skills strategies**, as the impact of transformation varies significantly across regions and value-chain positions.

- The growing relevance of **lifelong learning systems** that support job-to-job transitions.
- The necessity to make the automotive sector more **attractive to young people**, including through stronger links to STEM education and visible career pathways.

In this context, skills development becomes a central component of economic security and industrial resilience.

Workforce implications: from job forecasts to capability building

The combined effect of regulatory, technological, and economic drivers is transforming not only individual jobs, but the overall structure of work in the automotive sector. While new roles are emerging and others are declining, the most significant change lies in the evolution of competence profiles rather than in job titles.

Across the value chain, there is a clear shift towards:

- **Hybrid roles** that combine technical, digital, and transversal competences
- Greater emphasis on **problem-solving, adaptability, and learning ability**
- Increased demand for **collaborative skills**, as work becomes more interdisciplinary
- Higher expectations regarding **sustainability awareness and responsibility**

At the same time, the transformation creates risks of polarisation. Highly skilled digital profiles are in strong demand, while workers in certain traditional roles may face displacement if reskilling pathways are not accessible and timely. Particularly SMEs and suppliers may struggle to invest in training without coordinated support.

These dynamics underline the limitations of traditional workforce planning approaches based solely on job forecasts. Instead, a **capability-based approach** is needed—one that focuses on building transferable competences and enabling continuous transitions across roles, companies, and regions.

Artificial intelligence as a cross-cutting accelerator and source of structural uncertainty

Artificial intelligence (AI) represents one of the most powerful and disruptive forces shaping the future of the automotive-mobility ecosystem. Its impact cuts across products, processes, business models, and organisational structures, influencing engineering, manufacturing, supply chains, mobility services, and decision-making at all levels. Unlike previous technological waves, AI does not affect a single domain or occupation but acts as a horizontal accelerator that amplifies the speed, scope, and complexity of ongoing transformation.

In the short term, AI is already being deployed to augment existing roles rather than fully replace them. Applications such as AI-assisted design and simulation, predictive maintenance, quality control,

software development support, logistics optimisation, data analysis, and administrative automation are changing how work is performed across the value chain. These developments can improve productivity and reduce repetitive tasks, but they also alter skill requirements rapidly—often faster than formal job classifications or curricula can adapt.

In the medium to longer term, the potential impact of AI becomes more profound but also more uncertain. As AI systems mature and integrate more deeply into software-defined vehicles, autonomous functions, smart factories, and digital mobility services, they may significantly reshape task distributions, reduce demand for certain routine functions, and increase demand for higher-level competences related to system oversight, validation, ethics, safety, and integration. The precise timing, scale, and distribution of these effects remain uncertain and will depend on regulatory frameworks, societal acceptance, technological breakthroughs, and organisational choices.

From a skills perspective, three structural implications are already clear:

- AI will change most jobs, not eliminate all jobs. The dominant impact is likely to be task transformation within roles rather than wholesale job disappearance, especially in the short to medium term.
- Skill obsolescence cycles will shorten further. AI accelerates the pace at which tools, methods, and required competences evolve, increasing the importance of continuous upskilling and reskilling.
- New hybrid skill profiles will emerge. Demand will grow for profiles that combine domain expertise (engineering, manufacturing, logistics, sustainability) with AI literacy, data understanding, and the ability to work effectively with intelligent systems.

Crucially, AI also introduces a new layer of strategic uncertainty for workforce planning. Traditional approaches based on stable job forecasts become even less reliable when core tasks within occupations can change rapidly. This reinforces the need for a skills strategy that focuses on capabilities, adaptability, and learning capacity rather than narrow role definitions.

For education and training systems, this means that AI cannot be treated as a standalone technical topic. AI literacy, critical understanding of automated decision-making, data awareness, human–AI interaction, and ethical and safety considerations must be progressively embedded across curricula and training pathways—tailored to different roles and qualification levels. At the same time, education and training providers themselves must increasingly adopt AI-enabled tools to personalise learning, accelerate content updates, and scale delivery, while maintaining human-centred pedagogical approaches. As it is mentioned in the Actions B of this strategy.

The rise of AI makes such a sectoral skills strategy more necessary. It underscores the importance of continuous skills intelligence, modular learning pathways, strong links between industry and education, and governance mechanisms that can adapt as technologies evolve. AI should therefore be

understood not as a one-off disruption with a fixed endpoint, but as a persistent transformation force that must be monitored, anticipated, and addressed over time through coordinated European action.

Why a skills-focused, implementation-oriented approach is essential

Given the scale and speed of transformation, the central challenge is not the lack of vision, but the gap between strategic ambition and practical implementation. Education and training systems, while undergoing reform, cannot adapt at the same pace as industrial change without stronger coordination, shared intelligence, and targeted support.

This is why sector-specific, European-level collaboration is indispensable. A fragmented landscape of initiatives, projects, and training offers risks duplication, inefficiency, and uneven impact. What is needed instead is a coherent framework that connects skills intelligence, education providers, industry, social partners, regions, and policy instruments.

Such an approach should be built on a few core principles:

- **Continuous skills intelligence**, grounded in real industrial needs
- **Modular and flexible learning pathways**, including micro-credentials
- **Support for trainers and educators**, enabling them to keep pace with technological change
- **Recognition and portability of skills**, across borders and sectors
- **Strong regional engagement**, aligned with European coordination

The automotive sector, given its scale, complexity, and strategic importance, is uniquely positioned to act as a pilot and frontrunner for this model. By addressing skills as a strategic asset rather than a supporting measure, the sector can not only manage its own transformation but also provide lessons and structures applicable across Europe’s industrial ecosystem.