



# MobiNexus

Collaborating for Innovative Mobility

## D4.1 Assessment of Skill Gaps and Development Needs

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4	Science and Technology Park of the University of Rijeka (STEP RI)	HR
5	International Association of Science Parks and Areas of Innovation (IASP)	ES
6	MOBY X SOFTWARE LIMITED (MOBY X)	CY

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## Abbreviations

AI – Artificial Intelligence  
CA – Consortium Agreement  
CSA – Coordination and Support Action  
CUS – Coventry University Services  
EC – European Commission  
EIT VCM – European Institute of Innovation and Technology Value Creation Model  
EU – European Union  
EV – Electric Vehicle  
GA – Grant Agreement  
HE – Horizon Europe  
IASP – International Association of Science Parks and Areas of Innovation  
ICMF – Innovation Center of the Faculty of Mechanical Engineering of the University of

Belgrade

KPI – Key Performance Indicator

KV – Key Validation

MaaS – Mobility as a Service

ML – Machine Learning

MOBY X – MOBY X Software Limited

NGO – Non-Governmental Organisation

OEM – Original Equipment Manufacturer

STEP RI – Science and Technology Park of the University of Rijeka

STEM – Science, Technology, Engineering and Mathematics

UPC – UPC Future Mobility Research Hub

UX – User Experience

V2G – Vehicle-to-Grid

VCM – Value Creation Model

WP – Work Package

## Executive Summary

This deliverable (D4.1) presents the assessment of skills gaps and development needs carried out within Work Package 4 of the MobiNexus project. The objective of this task is to identify key competence gaps affecting user-centric mobility innovation ecosystems and to define priority areas for future capacity-building activities.

The assessment was implemented through a structured and participatory approach. It combined desk research with outputs from five partner-led co-creation workshops organised across the consortium partner countries. Workshops covered three thematic domains: vehicle electrification, shared mobility and autonomous mobility. Stakeholders from academia, research and industry participated in the workshops. The EIT Value Creation Model (EIT VCM) was used as a common analytical framework to structure discussions and consolidate results.

The findings show that many challenges in mobility innovation are not only technical. While technology development is progressing, ecosystem actors face important competence gaps that slow down deployment and scaling. These gaps often appear at the interfaces between mobility and energy systems, between digital technologies and governance structures, and between different stakeholder groups.

Across the three domains, three main cross-domain patterns were identified:

- Limited governance, coordination and participatory capacity, which leads to fragmented decision-making and slow implementation.
- Insufficient integration of sustainability and lifecycle thinking into operational and business practices.

- Weak commercialisation and business model innovation competences, resulting in difficulties in moving from pilot projects to scalable and financially viable services.

Although these patterns are shared, stakeholder groups emphasise different aspects. Industry actors focus on operational reliability, investment risk and viable revenue models. Research stakeholders stress system integration, standards and regulatory alignment. Education actors highlight curriculum gaps and the need for more practice-oriented learning environments.

Based on the consolidated evidence, three priority areas for competence development were identified:

- (1) Commercialisation and Business Model Innovation Capacity,
- (2) Governance, User Adoption and Deployment Readiness, and
- (3) Sustainability Integration Capacity.

These priority areas are formulated as transversal and long-term competence directions. They provide a structured basis for future training design under the project, particularly within the MobiNexus Entrepreneurship Academy (Task 4.2).

Overall, D4.1 provides an evidence-based foundation for aligning competence-building activities with real ecosystem needs, supporting more effective collaboration across the knowledge triangle and strengthening the capacity of mobility innovation systems to deliver scalable, sustainable and user-centred solutions

## 1. Introduction

### 1.1 Context: MobiNexus and WP4 objectives

The MobiNexus project aims to strengthen mobility innovation ecosystems by enabling more effective interaction and knowledge exchange across academia, research organisations and industry. The project supports a more integrated ecosystem approach, where key actors collaborate to accelerate the uptake, deployment and scaling of user-centric innovations in the transport and mobility sector.

Within this overall context, Work Package 4 (WP4) – Empowering Skills and Entrepreneurial Growth for User-Centric Mobility Innovation, addresses one of the main systemic barriers for innovation: the lack of competences and capacities needed to transform innovative ideas into scalable solutions. WP4 therefore focuses on identifying existing competence gaps and defining development priorities that can support ecosystem actors in responding to current and emerging challenges in mobility.

In particular, Task 4.1 - Assessment of Skills Gaps and Development Needs, aims to conduct a comprehensive assessment of the skills landscape across the involved innovation ecosystems, with a specific focus on skills gaps in digital, green and entrepreneurial domains. The

assessment is conducted through a participatory and evidence-based approach, combining stakeholder engagement and structured analysis.

This deliverable (D4.1) reports on the assessment of skills gaps and development needs carried out through stakeholder engagement activities implemented during the project. In particular, it consolidates outcomes from five co-creation workshops organised with a diverse set of stakeholders/participants, structured using the EIT Value Creation Model (EIT VCM) logic to support a systematic interpretation of what currently works, what produces negative effects, what is missing, and what opportunities are available for improvement.

The results presented in this report constitute an evidence-based input for subsequent competence-building activities under the project, supporting the design of targeted training interventions and ecosystem support measures.

## 1.2 Rationale: The importance of identifying skills gaps for user-centric mobility innovation

Mobility and transport systems are undergoing rapid transformation driven by technological innovation, sustainability requirements and changing user expectations. In this context, the capacity of mobility innovation ecosystems to deliver user-centric solutions increasingly depends on the availability of adequate competences across the knowledge triangle (education–research–business), rather than on technology alone.

While technological solutions for electrification, shared mobility and autonomous vehicles continue to advance, their adoption and scaling are frequently constrained by skills-related barriers. Workshop discussions confirmed that these barriers are not only technical. They also relate to missing competences in using data and digital tools, understanding and implementing sustainability aspects, navigating regulation and governance, and applying entrepreneurial and organisational skills (e.g. business model innovation and multi-stakeholder coordination). Therefore, the identification and prioritisation of skills gaps provides the main evidence base to translate workshop findings into concrete capacity-building implications and development needs for the next project activities. In this way, competence-building actions are better aligned with real stakeholder challenges and future education and training interventions.

The assessment focuses on digital, green and entrepreneurial competences, in line with WP4 scope and the broader policy focus on digitalisation, decarbonisation and entrepreneurship in mobility. Digital competences support data-driven solutions, interoperability and the safe use of digital tools and platforms. Green competences are needed to enable the shift towards low-carbon mobility, including electrification and the integration of sustainability principles into planning and operations. Entrepreneurial competences help stakeholders translate innovative ideas into viable services and business models and support cooperation across different actors of the ecosystem.

### 1.3 The three thematic domains addressed in the workshops

The workshops and the assessment were structured around three thematic domains, as defined in the project methodology and the scope of the D4.1 assessment, reflecting key areas of innovation and transformation in the mobility sector:

Vehicle electrification; Autonomous mobility; Shared mobility.

These domains represent high-impact technology and service areas in which competences are rapidly evolving. They also require strong collaboration across the knowledge triangle (education–research–business) to support effective implementation and scaling of user-centric mobility solutions.

All workshops addressed all three domains to ensure comparable outputs across the five countries. This approach helped identify both common (recurring) skills gaps and differences by domains stakeholder groups and national contexts.

### 1.4 Structure of the deliverable

The remainder of this deliverable is structured as follows. Section 2 presents the methodological approach used for the assessment. It explains the desk research process, the shortlisting of skills gaps, the organisation of the co-creation workshops, and the application of the EIT Value Creation Model as the analytical framework.

Section 3 presents the consolidated workshop results. It includes findings by thematic domain (vehicle electrification, shared mobility and autonomous mobility), followed by a cross-domain synthesis of competence gaps and stakeholder perspectives.

Section 4 translates the identified competence gaps into priority areas for competence development. It outlines the main training implications derived from the assessment and formulates strategic directions for future capacity-building activities under the project.

Finally, Section 5 provides the overall conclusions of the assessment and summarises the main findings and their relevance for subsequent project tasks, in particular for the development of structured training activities within the MobiNexus framework.

## 2. Methodological approach for the assessment of skills gaps and development needs

This section presents the methodological approach used for the assessment of skills gaps and development needs reported in Deliverable D4.1. The assessment was carried out through five partner-led co-creation workshops, following a common structure across countries and thematic domains. The workshop process was supported by templates to ensure consistent

collection and reporting of stakeholder inputs. The EIT Value Creation Model (EIT VCM) was used as an analytical framework to structure and interpret the workshop results.

## 2.1 Overview of the assessment approach

The assessment was implemented through a two-step approach. First, an initial mapping of relevant competence areas was developed based on desk research and literature review. Second, stakeholder inputs were collected and analysed through five partner-led co-creation workshops. The workshops provided the main evidence base for identifying competence gaps and deriving development needs, using a common structure and the EIT Value Creation Model (EIT VCM).

## 2.2 Desk Research and Synthesis of Skills Gaps as Pre-Workshop Input

To support the preparation of the co-creation workshops, partners conducted a structured desk research and literature review aimed at identifying competence gaps related to the three thematic domains addressed in the workshops: vehicle electrification, shared mobility and autonomous mobility. The review provided an initial evidence base and an indicative list of skills gaps to inform workshop discussions and template development.

The desk research was organised by thematic responsibility, with two partners assigned to each domain in order to ensure broader source coverage and consistency. Partners screened relevant academic, industry and policy sources and recorded identified skills gaps in a shared Excel template, including a short description and supporting references. Skills gaps were mapped across three competence categories: digital competences, green competences and entrepreneurial competences. This distributed review process resulted in a consolidated dataset of over 150 extracted skills gap statements across the three thematic domains.

The consolidated dataset was subsequently harmonised through removal of duplicates, standardisation of terminology and merging of semantically similar formulations across domains and competence categories. This step ensured that the skills gap statements were phrased in a consistent way and could be more easily compared and discussed during the workshop preparation.

In order to reduce the long list to a manageable number of discussion inputs, a structured synthesis process was applied, coordinated by ICMF. This process combined expert review with computer-assisted semantic grouping of related statements, allowing conceptually close skills gaps to be clustered and reformulated into broader, non-overlapping themes. The purpose was to prepare a balanced and representative set of discussion themes suitable for facilitated workshop work.

Considering the workshop format and limited time available for EIT Value Creation Model mapping, the team defined a shortlist of nine priority skills gap themes, with three themes per thematic domain (electrification, shared mobility and autonomous vehicles). The selection was guided by overall relevance and suitability for structured discussion, rather than predefined

quotas across competence categories. Within each domain, themes were formulated to minimise conceptual overlap and ensure actionability for multi-stakeholder dialogue and subsequent translation into training implications.

The shortlisting process was conducted iteratively through internal WP4.1 review meetings, where proposed clusters were discussed and refined. The final set of themes was confirmed through internal partner consultation within the WP4.1 team and subsequently used as the basis for EIT Value Creation Model mapping during the co-creation workshops

The final shortlist of nine skill gap themes used for workshop mapping is presented in Table 1.

Thematic Domain	Code	Shortlisted Skill Gap Theme
Vehicle Electrification	E1	Limited skills in battery circularity and lifecycle management
Vehicle Electrification	E2	Lack of innovation capabilities for electrification-focused business models
Vehicle Electrification	E3	Insufficient expertise in renewable energy integration with EV charging (incl. V2G)
Autonomous Mobility	A1	Insufficient skills in advanced AI/ML integration and real-time decision-making
Autonomous Mobility	A2	Limited expertise in sustainability integration and lifecycle analysis for AV systems
Autonomous Mobility	A3	Weak business model innovation and strategic foresight for AV commercialisation
Shared Mobility	S1	Limited capacities for multi-stakeholder coordination and participatory planning
Shared Mobility	S2	Low digital literacy and barriers to user adoption of smart mobility tools
Shared Mobility	S3	Insufficient technical expertise in AI, data analytics and cybersecurity for mobility

Table 1. Shortlisted Skill Gap Themes Used for Workshop Mapping

### 2.3 Co-creation workshops: implementation and common design

To ensure comparability of results across countries, all workshops followed the same common design and facilitation approach, as agreed within Task 4.1.

#### 2.3.1 Workshop format, thematic scope and facilitation process

The workshops were organised as partner-led sessions conducted at country level. All five workshops were implemented as online events, with a duration of approximately 90–120 minutes.

Each workshop involved participation from stakeholders representing the knowledge triangle (education/academia, research organisations and business/industry), with the aim of ensuring balanced perspectives and active contribution during the value mapping exercise.

All workshops covered the same three thematic domains addressed in the D4.1 assessment: vehicle electrification, shared mobility and autonomous mobility.

The EIT Value Creation Model was applied to a common consolidated list of literature-based skills gaps, enabling consistent analysis across countries and allowing comparison of results.

The workshops followed a common structure consisting of two main sessions: (i) an introductory session presenting the purpose of the workshop, the thematic domains and the skills gaps used for the analysis; and (ii) a working session focused on value creation analysis, where participants assessed each skills gap across five EIT Value Creation Model dimensions (captured, destroyed, missed/surplus, absence and opportunities).

Moderators facilitated stakeholder discussion, ensured balanced contributions across stakeholder groups, and captured workshop outputs in a structured manner to support post-workshop consolidation and reporting.

### 2.3.2 Data collection tools and templates

To support consistent facilitation and reporting, partners used a common set of tools and templates, including:

- Moderator Guide, providing practical facilitation instructions and roles.
- Introductory slides template, used for consistent context setting and workshop instructions.
- EIT VCM value mapping table, used during the workshop to capture stakeholder inputs in real time for each skills gap.
- Workshop summary report template (Word), completed after each workshop to document key findings and contextual information.
- Excel consolidation file, used to merge workshop outputs across countries and support synthesis at deliverable level.

### 2.4 Stakeholder engagement approach

Stakeholder engagement was conducted through partner networks in each participating country. Partners invited stakeholders relevant for mobility innovation, aiming to ensure representation across the knowledge triangle (academia/education, research organisations and industry/business). Stakeholders were invited based on their professional involvement, implementation experience and relevance to at least one of the three thematic domains.

The invitation process clearly communicated the purpose of the workshops and their role in identifying competence gaps to inform future competence-building activities. Workshops were designed as guided interactive sessions conducted online, requiring no special preparation, to encourage participation and open discussion.

## 2.5 Analytical framework and application: the EIT Value Creation Model (EIT VCM)

The EIT Value Creation Model (EIT VCM) is a framework developed by the European Institute of Innovation and Technology (EIT) to support the assessment of value creation and impact generated through innovation activities and collaboration across the knowledge triangle (education–research–business). In the context of the D4.1 assessment, it was used as the main analytical framework to structure workshop discussions and enable consistent interpretation of stakeholder inputs.

The EIT VCM was applied as a practical structuring tool for collecting and documenting workshop results across countries and thematic domains. During the workshops, stakeholders provided structured inputs using an online collaborative tool (digital whiteboard), documenting each identified skills gap across five EIT VCM categories: (i) what currently works well / produces value, (ii) what does not work or produces negative effects, (iii) missed value / underutilised potential, (iv) value absence (missing elements and capacities), and (v) opportunities for improvement.

Using this framework enabled systematic documentation of stakeholder input and supported consolidation and comparison of outputs across all five workshops. The list of skills gaps was embedded in the Excel value mapping table used for the EIT VCM analysis during workshops.

## 2.6 Reporting, validation and consolidation process

Each partner was requested to prepare and submit a standardised Workshop Summary Report package consisting of two elements: (i) a Word summary report and (ii) one consolidated Excel value mapping file.

After the workshops, moderators consolidated the collected stakeholder inputs to ensure that data were clear, concise and usable for further synthesis. This consolidation focused on Sheet 1 – Value Mapping Table and included removing duplicate or overlapping comments, merging similar ideas and rewriting statements into short, clear inputs while retaining the original meaning.

Following this technical consolidation, moderators prepared Sheet 2 – Summary per Skill Gap, which provides a short analytical synthesis of the consolidated inputs from Sheet 1. For each skill gap, the summary captures key patterns across the five EIT VCM dimensions, highlights the most critical issues and opportunities, and notes any relevant differences in perspectives across stakeholder groups (academia, research, business/industry).

All workshop reporting outputs served as the core evidence base for the synthesis and comparative analysis presented in Deliverable D4.1, and as input for the design of subsequent competence-building actions planned under later project tasks.

### 3. Consolidated workshop results

#### 3.1 Introduction to results section

This section presents the consolidated results from the co-creation workshops implemented under Task 4.1. An overview of the workshops across partner countries is provided in Table 2.

Country	Organiser	Date	Duration	No. participants
<b>Croatia</b>	STEP RI	11. Dec 2025	1.5 hours	22
<b>United Kingdom</b>	CUS	16. Dec 2025	1.5 hours	17*
<b>Serbia</b>	ICMF	24. Dec 2025	2 hours	22
<b>Spain</b>	UPC & IASP	23. Jan 2026	2 hours	22
<b>Cyprus</b>	MOBY X	06. Feb 2026	2 hours	17

*Table 2. Overview of Task 4.1 co-creation workshops*

*\*plus 5 additional semi-structured stakeholder interviews conducted after the workshop*

The results presented below reflect stakeholder inputs collected through the EIT Value Creation Model (EIT VCM) value mapping exercise and documented in the common reporting templates. Workshop documentation (short workshop summary reports) is provided in the Annex of this document.

Results are presented as (i) domain-specific results for the three thematic areas addressed in the assessment: vehicle electrification, shared mobility and autonomous mobility and (ii) cross-domain findings across workshops.

#### 3.2 Dataset and evidence base

The consolidated analysis builds on the partners’ value mapping table outputs, including (i) the technically consolidated inputs captured in the EIT VCM value mapping table (Sheet 1), and (ii) the thematic synthesis provided per identified skills gap (Sheet 2).

While Sheet 1 captures structured inputs across EIT VCM value dimensions, Sheet 2 provides an interpretative synthesis highlighting recurring patterns and priority issues. The present analysis primarily relies on this thematic synthesis, as it enables the identification of cross-domain trends and the most relevant findings across the value dimensions (captured, destroyed, missed/surplus, absence and opportunities).

The results are interpreted with attention to both converging and diverging views across stakeholder groups, ensuring that the assessment reflects the complexity of the mobility innovation ecosystem.

### 3.3 Results by thematic domain

This subsection summarises the consolidated findings for the three thematic domains used in the workshops. For each thematic domain, results are presented for the predefined skills gap themes, highlighting main findings, identified opportunities and differences in perspectives across stakeholder groups.

#### 3.3.1 Vehicle electrification

Within the vehicle electrification domain, three key skills gaps emerge as critical barriers to the development of sustainable and scalable electrified mobility. These include limited expertise in battery circularity and lifecycle management; insufficient innovation capacities for developing viable electrification-focused business models; and weak competences in integrating EV charging with renewable energy systems, including smart charging, V2G, and energy management.

#### **E1 Limited skills in Circular economy for batteries, including recycling and second-life battery management**

##### **Main findings**

Basic EV charging infrastructure and some technical know-how on battery maintenance already exist. However, skills related to battery recycling, second-life applications, and overall battery circularity remain limited. Knowledge in this area is highly specialised and mainly concentrated in academia and industry, with weak transfer to other stakeholder groups.

Although expertise in battery lifecycle assessment, recycling, and reuse exists, it is not sufficiently embedded in business models or operational decision-making. There is also a lack of accessible, reliable information and practical use-cases, as well as limited commercial and organisational capacities to operationalise second-life battery applications.

As a result, second-life solutions and circular value chains remain underdeveloped, leading to missed opportunities for sustainability gains, cost reduction, and local value creation.

##### **Opportunities for improvement**

Key improvement areas include enhanced training and certification in battery lifecycle management and circular economy principles, with stronger emphasis on integrating lifecycle assessment and second-life strategies into business models and operational decision-making.

Competences for integrating renewable energy, smart charging, and V2G into viable and scalable business models should be further developed. Improved maintenance and monitoring practices, clearer standards for second-life batteries, and better access to validated information and practical use-cases would support implementation.

Targeted training on circular battery value chains and mobility–energy integration platforms enabling reuse, grid services, and local value creation is particularly needed, alongside collaborative platforms for interdisciplinary knowledge exchange.

### **Stakeholder perspectives**

Industry actors emphasised infrastructure performance, operational reliability, and the need for commercially viable second-life business cases, highlighting uncertainty regarding market uptake despite existing technical capacity for battery maintenance and refurbishment.

Education stakeholders pointed to major knowledge and training gaps, especially in battery recycling, second-life applications, lifecycle-based decision-making, and V2G, stressing the need for more practice-oriented and flexible training formats that connect technical expertise with business implementation.

Research and academic actors focused on lifecycle assessment methods, recycling processes, regulatory alignment, and the need to better embed circular economy principles into standards, policy, procurement frameworks, and formal training pathways.

**E2 Lack of Innovation capabilities for electrification-focused business models (charging, V2G, battery-as-a-service)**

### **Main findings**

Several pilots in smart charging, V2G, and service-based electrification have generated valuable technical learning; however, they have not evolved into scalable business models. Weak business-model innovation capacities, high investment costs, and fragmented market structures reduce investor confidence and slow market uptake. Insufficient entrepreneurial competences further constrain revenue generation and long-term investment.

Although certain technical capacities and initial practical exposure already exist, innovation support remains largely confined to business incubators and specialised hubs, with restricted accessibility and few demonstrable examples of successful electrification business models.

In addition, weak integration between renewable energy systems and EV infrastructure, limited real-world deployment of V2G solutions, and the absence of mature recycling and second-life systems continue to constrain the development of viable, service-oriented electrification models.

### **Opportunities for improvement**

Opportunities focus on strengthening business model innovation skills alongside the existing technical base in electrification, including start-up, lean, and financial modelling for scalable services.

Training programmes to build structured start-up innovation competences, lean business modelling, and financial modelling for scalable electrification services, including clearer pathways from pilots to market, are particularly needed.

Standardised training modules (e.g. battery swapping and service contracts), combined with innovation labs, sprint challenges, and exchange programmes, could better connect mobility and energy entrepreneurs in co-creating new solutions.

Further value lies in expanding practical implementation of V2G, integrating renewable energy with EV systems, and developing second-life, recycling, and battery swapping applications through real-life testing. Scalable training formats and stronger use of industry case studies would additionally support wider uptake and market relevance.

### **Stakeholder perspectives**

From an industry perspective, the lack of viable revenue models, low investor confidence, and unclear paths from pilot projects to the market, strongly emphasising difficulties in moving from pilots to scalable services. Start-ups shared these concerns and also pointed to limited access to testing and experimentation spaces. Public authorities focused more on regulatory clarity and risk reduction.

Research stakeholders emphasised better system integration between energy and mobility systems and the role of public frameworks in enabling new electrification markets, noting a gap between research results and user needs.

Education and academic representatives stressed the lack of structured innovation training and experimentation spaces linking technical knowledge to business model development, alongside skills gaps in battery lifecycle management, renewable energy integration with EVs, and V2G, and the need for more practical training and stronger entrepreneurial culture among students.

## **E3 Insufficient expertise in integrating renewable energy with EV charging, including V2G, grid balancing and energy management**

### **Main findings**

Persistent system-level weaknesses are evident in the integration of EV charging and renewable energy systems. Poor integration between EV charging infrastructure and renewable energy systems results in inefficiencies, higher operating costs, and increased stress on electricity networks.

Skills gaps in energy management, grid balancing, and V2G limit the development of flexibility services and new revenue streams, constraining both environmental and economic performance.

Although promising pilots and strong renewable capacity exist, regulatory uncertainty, fragmented responsibilities, and weak coordination between cities, operators, OEMs, and energy actors continue to hinder effective EV–grid integration. Renewable energy remains underutilised in EV charging, and available data are not sufficiently used for system optimisation and informed decision-making.

Education and regulatory frameworks do not yet fully incorporate best practices in renewable-based charging, V2G, smart grids, and battery lifecycle management, while knowledge is still concentrated in specialised organisations and open data and public–private cooperation remain limited.

### **Opportunities for improvement**

Improvement efforts should focus on strengthening skills and system integration at the mobility–energy interface.

Development of training programmes on renewable energy integration, smart charging, and V2G, supported by integrated mobility–energy platforms for grid balancing and flexibility services, is particularly needed.

Further progress can be supported through AI/ML tools for demand response and forecasting of renewable generation and EV demand, together with clearer policy recommendations, standards for grid integration, and appropriate incentive schemes. Promoting concepts such as EV-based virtual power plants and coordinated planning between mobility and energy sectors would enable more efficient system operation.

Better regulatory alignment, improved data use, and targeted interdisciplinary education and training — especially those encouraging student entrepreneurship and risk-taking — are also important for supporting these complex solutions.

### **Stakeholder perspectives**

Research and policy actors emphasised grid stability, system efficiency, and alignment with broader energy transition objectives.

Industry focused on operational complexity, high costs, and uncertainty around monetising flexibility services such as V2G, highlighting the lack of clear business cases and technical guidance.

Academia pointed to gaps between theoretical knowledge and practical application of renewable integration in real-world charging operations, alongside analytical and regulatory barriers affecting implementation.

City planners stressed coordination and planning gaps, while business representatives noted the fast growth of the EV market but low use of renewable energy in charging, limited data use, and the need for clearer regulations and national training programmes.

Education stakeholders underlined fragmented cooperation between energy and transport sectors and the need to better integrate best practices, smart energy management, and battery lifecycle topics into curricula and certification. Industry also called for greater data sharing from public and utility actors to support innovation.

### 3.3.2 Autonomous mobility

The analysis of the autonomous mobility domain identified three major competence gaps that limit the safe, sustainable, and commercially viable deployment of AV systems. These include insufficient practical skills in advanced AI/ML integration, sensor fusion, and real-time decision-making; limited expertise in sustainability integration, lifecycle analysis, and energy-efficient AV operation; and weak business model innovation capacities combined with insufficient strategic foresight for large-scale AV commercialisation.

#### **A1** Insufficient Skills in Advanced AI/ML Integration, Sensor Fusion and Real-Time Decision-Making for Autonomous Mobility Systems

##### **Main findings**

Despite rapid progress in AI and sensor technologies, there is a lack of practical skills for integrating these solutions into safe, real-time autonomous mobility systems.

Competences in validation, verification, embedded optimisation, safety assurance, and explainable AI remain limited, and training programmes are not well aligned with industry and regulatory needs.

Training provision is often misaligned with industry and regulatory requirements, particularly regarding safety assurance and explainable AI, limiting readiness for large-scale deployment.

AI solutions are rarely tested in real-world conditions due to limited testing infrastructure, high costs, weak cross-sector cooperation, and insufficient data sharing. Regulatory frameworks and education systems are not fully adapted to the practical requirements of autonomous mobility, while most applied expertise remains concentrated in industry.

##### **Opportunities for improvement**

Improvement efforts should focus on strengthening practical AI competences and enabling real-world deployment.

Industry-aligned training on AI/ML integration, sensor fusion, and real-time decision-making, supported by applied learning environments such as living labs, digital twins, and operational testbeds, is particularly needed.

Establishing open testing zones and real-life testing environments (e.g. a National AV test centre), together with shared data platforms and common evaluation standards, would support validation and benchmarking. Clear regulatory guidance and dedicated training on ethical, trustworthy, and safety-critical AI are also necessary.

Further progress requires stronger cooperation between IT, transport, and urban planning sectors, integration of practical AI applications into education, and the development of specialised study programmes for autonomous vehicles. Short, practice-oriented formats such as AI bootcamps, co-delivered by academia and industry, as well as training in human-centred design and innovation use-cases, would additionally strengthen implementation capacity.

## Stakeholder perspectives

Academia focused on curriculum depth and the challenge of keeping AI-related training up to date, pointing to gaps in advanced AI competences.

Industry highlighted deployment readiness, explainable AI, and the gap between existing training and operational needs, particularly regarding safe integration into real-time systems.

Research actors emphasised safety assurance, regulatory compliance, accountability, dataset quality, benchmarking, and ethical standards in real-time decision systems.

All groups recognised strong theoretical foundations and a developed IT sector, but agreed that AI solutions are rarely tested in real-world conditions due to limited testing environments and high costs. Research representatives additionally underlined the need for national AV test centres, applied testing environments, and clearer regulatory and liability frameworks.

## A2 Limited Expertise in Sustainability Integration, Lifecycle Analysis and Energy-Efficient Operation of Autonomous Vehicles

### Main findings

Sustainability considerations are not systematically integrated into autonomous vehicle design, deployment, and operation.

Lifecycle impacts, energy efficiency, and embedded emissions are insufficiently assessed due to missing analytical frameworks and skills, resulting in weak alignment with climate and resource-efficiency objectives.

Although sustainability knowledge exists in the automotive sector, practical integration remains limited. Risks such as rebound effects, low uptake of shared AV fleet concepts, and the absence of standardised assessment frameworks were highlighted. Education and workforce development in sustainability, lifecycle analysis, and energy-efficient operation remain limited and not sufficiently multidisciplinary. Sustainability in business is still often perceived mainly as a cost rather than a strategic value driver.

### Opportunities for improvement

Greater integration of sustainability principles into autonomous mobility systems is required across design, deployment, and operation phases.

Development of sustainability analytics and lifecycle-based operational frameworks embedded in autonomous vehicle deployment, optimisation, and evaluation is particularly needed.

An open-source LCA tool tailored to AV services, together with AI-based simulation of multimodal scenarios, would support better impact assessment and decision-making. Clear sustainability standards and criteria for AV procurement and regulation are also necessary.

Progress depends on stronger multidisciplinary education (AI, transport, law), urban testing environments, and specialised programmes linking AI, mobility, forecasting, and business model development. Closer cooperation between sustainability experts and industry, including practical training on applying sustainability principles in business, would further support implementation.

### **Stakeholder perspectives**

Academia and research actors highlighted missing lifecycle frameworks, sustainability analytics, and the need for clearer standards aligned with climate goals. Environmental integrity, rebound risks, and performance assessment were identified as areas that require stronger methodological support.

Education stakeholders stressed curriculum development, multidisciplinary competences (AI, transport, law), and the integration of international best practices into new study programmes.

Industry acknowledged the relevance of sustainability but emphasised the need for practical tools, measurable KPIs, and solutions that can be integrated into design and operational processes. It was noted that sustainability is often balanced against safety, cost, and deployment constraints.

Stakeholders also suggested that companies already applying sustainable practices should more actively share their experiences to support wider learning and market adoption.

### **A3 Lack of Business Model Innovation Capabilities and Strategic Foresight for the Commercialisation of Autonomous Vehicles**

#### **Main findings**

Autonomous vehicle development remains largely pilot-driven, with limited progress towards sustainable commercial services. Weak business model innovation skills and insufficient strategic foresight hinder market formation, investment confidence, and large-scale deployment.

Uncertainty regarding demand, liability, and value capture further constrains large-scale commercialisation. Although pilots and foresight studies provide initial insights, there is no coherent vision for sustainable AV business models.

Regulatory uncertainty, conservative planning approaches, and limited foresight competences lead to cautious investment and missed opportunities, particularly in lower-risk segments such as logistics and controlled environments.

Commercialisation is also limited by unclear legal liability frameworks, insufficient use of simulation tools, lack of standardised test zones, and underdeveloped safety and ethical protocols. While knowledge on business model innovation is available through training and innovation hubs, its practical adoption remains slow, and more visible pilot cases demonstrating viable AV business models are needed.

### **Opportunities for improvement**

Stronger support for business model innovation and strategic foresight is needed to enable AV commercialisation.

This includes training programmes on start-up innovation, business modelling, servitization, digitalisation, **regulatory intelligence**, and scenario-based planning to support scalable autonomous vehicle services.

Public–private partnerships for AV-ready infrastructure, together with clear frameworks for regulatory risk assessment and predictable pathways from pilot to scale-up, would improve investment confidence. Expanding the use of simulation tools and establishing standardised test zones would further support validation and market readiness.

Additional progress depends on modern learning models in education and stronger ethical, safety, and legal frameworks that enable viable and scalable AV business models.

### **Stakeholder perspectives**

Industry strongly highlighted demand uncertainty, the absence of viable markets beyond pilot projects, and challenges in generating predictable revenue streams. Start-ups showed greater interest in niche and controlled use cases as lower-risk entry points.

Research and public authorities emphasised governance uncertainty, legal liability, and unclear long-term deployment pathways.

Academia focused on foresight methods, scenario building, and anticipating future skills and market needs, stressing the need for stronger integration of strategic thinking into curricula.

Both education and research stakeholders underlined the importance of standardised test zones, stronger ethical and safety protocols, and clearer regulatory frameworks to support commercial readiness. It was noted that skills gaps are more pronounced within education and research sectors, suggesting the need for targeted capacity building to strengthen technology transfer and commercialisation.

#### 3.3.3 Shared Mobility

Shared mobility systems face three critical competence gaps that affect coordination, digital uptake, and technical implementation. The first concerns limited capacities for multi-stakeholder coordination and participatory planning among city authorities, operators, and business partners. The second relates to low digital literacy and barriers that hinder effective user adoption of smart mobility tools and MaaS platforms. The third gap lies in insufficient technical expertise among mobility staff in AI, data analytics, cybersecurity, and smart mobility system management.

**S1** Limited skills for multi-stakeholder coordination and participatory planning among city authorities, operators, and business partners

## **Main findings**

Despite general willingness to collaborate, coordination and facilitation skills among city authorities, operators, and business partners remain limited.

Participatory approaches are not consistently embedded in planning, decision-making processes and standard procedures, leading to fragmented governance, slow implementation, and reduced trust among stakeholders.

Shared mobility services are expanding and supported by user demand and basic digital infrastructure. However, governance structures remain fragmented, with multiple decision-makers, traditional procurement models, weak data use, and poor integration with public transport limiting service optimisation and scaling.

Underuse of mobility data and insufficient digital literacy further constrain data-driven planning. Although some collaboration frameworks exist through EU projects and public transport operators, conflicting interests, unstable business models, and limited joint decision-making capacity hinder effective multi-stakeholder cooperation and long-term system development.

## **Opportunities for improvement**

Stronger coordination mechanisms are needed to support participatory and multi-stakeholder planning in shared mobility.

**Sector-wide collaboration platforms supported by adult education services to strengthen coordination, facilitation, and participatory planning capacity are particularly needed.**

Urban living labs and co-design processes involving authorities, operators, and citizens should be expanded, together with updated tendering and governance frameworks better suited to iterative, technology-driven projects.

Cross-administration regulatory alignment, supported by shared data and decision-support tools, would improve coherence. Further progress depends on a coherent national shared mobility strategy aligned with local authorities and public enterprises.

Improved data-driven mobility planning, harmonised pick-up and drop-off zones, enhanced digital literacy, and stronger data-sharing platforms would support the development, testing, and scaling of pilot mobility solutions.

## **Stakeholder perspectives**

Research participants emphasised governance complexity, institutional fragmentation, and coordination challenges across institutions.

Industry focused on misaligned incentives, unclear roles, lack of shared planning tools, and practical barriers to collaboration.

Public authorities pointed to legal and institutional constraints.

Academia highlighted gaps in participatory methods and facilitation skills, as well as the lack of institutionalisation of co-creation practices. NGOs stressed the need to better embed citizen perspectives.

Business stakeholders underlined weak coordination, limited institutional support, and insufficient integration with public transport. Education and research actors focused more on data use, digital literacy, user education, and the need for stronger pilot cooperation with cities and a coherent national strategy.

Differences in priorities remain, with public actors emphasising coordination and policy frameworks, and private actors focusing primarily on profitability and market viability.

## **S2 Low digital literacy and limited ability of users to adopt and effectively use smart mobility tools and apps**

### **Main findings**

A broad range of digital mobility tools and platforms are available; however, low digital literacy and fragmented app ecosystems significantly limit user adoption and trust. Digitally vulnerable groups are particularly affected, leading to exclusion and reduced uptake.

Although digitalisation is progressing, many platforms lack robust accessibility features, multi-language support, and consistent application of universal design principles. Integrated digital literacy support and structured user training are largely absent.

User feedback is not sufficiently integrated into service design, and behavioural data are underused in improving usability and accessibility.

Adoption is further constrained by distrust in new mobility models, resistance to behavioural change, limited interoperability between platforms, and insufficient public awareness of shared mobility concepts. As a result, MaaS deployment remains limited, particularly among certain user groups.

### **Opportunities for improvement**

Strengthening digital inclusion and user support mechanisms is essential for wider adoption of smart mobility solutions.

Creation of community ambassadors and citizen-science-based training to support onboarding, digital literacy, and trust in smart mobility services is particularly needed.

Inclusive and universally accessible app design, together with scaled-up tools and frameworks from European projects addressing digital exclusion, should be integrated into mobility programme roll-out. Digital skills support needs to become a structured component of mobility services rather than an add-on.

Broader public education initiatives, seminars, and workshops can further improve digital literacy and user confidence. Additional progress depends on interoperable MaaS platforms supported by common data standards, simpler user interfaces with clearer onboarding processes, and targeted guidance for vulnerable user groups through city and tourism services.

## Stakeholder perspectives

Industry highlighted usability problems, app fragmentation, interoperability gaps, and low uptake affecting service viability. Operators focused on UX standardisation and cost efficiency.

Public authorities pointed to challenges in embedding digital inclusion requirements into contracts and policy frameworks. Research emphasised digital exclusion and equity concerns, especially for vulnerable groups.

Academia focused on behavioural aspects, user-centred design, and understanding adoption barriers, stressing the importance of literacy support and trust-building measures.

All groups recognised the importance of integrated MaaS platforms and common data standards, although priorities differ between technical interoperability and social inclusion dimensions.

**S3** Insufficient technical expertise among mobility staff in AI, data analytics, cybersecurity, and smart mobility systems

## Main findings

Strong technical expertise in AI, data analytics, and cybersecurity exists within research institutions and specialised organisations, but it is not sufficiently transferred to operational mobility staff.

As a result, mobility services rely heavily on external providers, which increases operational and safety risks and limits data-driven optimisation and resilient service management.

While the sector benefits from a solid engineering base and emerging digital competences, many organisations lack skills in data governance, privacy, interoperability, and applied cybersecurity. Upskilling initiatives remain limited, and smart mobility topics are not yet systematically integrated into educational curricula.

Although STEM programmes and IT training provide foundational knowledge, there is a shortage of experienced experts, limited practical exposure, and ongoing brain drain. These factors constrain the development of in-house digital capacity within mobility organisations.

## Opportunities for improvement

Strengthening in-house technical capacity is essential for the effective deployment of digital and automated mobility systems.

Specialised training on data analytics, cybersecurity, system resilience, and operational governance for digital and automated mobility services is particularly needed.

Clear sector-specific standards for cybersecurity and data protection, combined with structured upskilling and reskilling programmes in AI, data analytics, interoperability, and smart system management, would reduce reliance on external providers and improve service robustness.

Integrating smart mobility systems into formal education and continuous professional training, aligned with long-term urban mobility strategies, is also necessary. Further progress depends on practice-oriented learning environments, including simulation tools, applied laboratories, and test centres, as well as targeted digital training for public sector staff and interdisciplinary programmes linking transport, IT, and cybersecurity domains.

### **Stakeholder perspectives**

Industry highlighted operational risks, cybersecurity vulnerabilities, and reliance on external providers due to internal skills shortages, stressing the need for clearer technical standards and governance frameworks.

Research focused on governance, system resilience, and compliance with emerging regulations.

Academia emphasised gaps in the transfer of advanced knowledge from research to operational practice, particularly in applied analytics and cybersecurity.

Education stakeholders stressed curriculum integration, long-term urban mobility strategies, and stronger public–private partnerships.

It was noted that academic institutions provide strong theoretical foundations, but public authorities and industry require more practical and applied competences, especially in regions with limited access to specialised experts.

## 3.4 Synthesis of competence gaps

### 3.4.1 Cross-domain patterns

Across the three thematic domains, the consolidated workshop results indicate that the most significant barriers are not purely technological. Instead, competence gaps repeatedly emerge at systemic interfaces — between mobility and energy systems, between digital technologies and governance structures, and across stakeholder groups within the knowledge triangle.

Three structural patterns can be identified.

#### **Pattern 1 – Weak transition from pilots to scalable services.**

Across domains, initiatives often remain at demonstration stage. Limited commercialisation competences, unclear demand signals, regulatory uncertainty and weak strategic foresight reduce investment confidence and slow market formation.

#### **Pattern 2 – Governance and coordination weaknesses.**

Across electrification, autonomous mobility and shared mobility, stakeholders referred to fragmented responsibilities, limited coordination mechanisms and insufficient participatory capacity. Even where cooperation exists, structured collaboration models and evidence-based decision processes remain weak. Limited data use and gaps in digital literacy further constrain effective governance and service optimisation.

### **Pattern 3 – Limited sustainability operationalisation.**

While sustainability knowledge is present across ecosystems, its practical integration into operational decisions and business strategies remains insufficient. Lifecycle assessment, circular value chains, renewable integration and sustainability analytics are not systematically embedded in deployment processes.

Together, these patterns indicate that mobility innovation is constrained by systemic capacity gaps in governance, sustainability integration and commercial scaling.

#### 3.4.2 Stakeholder perspective synthesis

While stakeholders broadly acknowledge similar challenges, their perspectives differ in terms of priorities and implementation focus.

Industry actors prioritise operational feasibility, economic viability and risk reduction. Their concerns focus on revenue models, scaling pathways and regulatory clarity.

Research stakeholders emphasise methodological robustness, system integration and alignment with regulatory and climate frameworks.

Education and academia stress curriculum adaptation, applied learning environments and the need to bridge theoretical knowledge with operational and entrepreneurial practice.

These differentiated emphases suggest that future competence-building efforts must combine transversal foundations with stakeholder-specific applications in order to ensure relevance across the knowledge triangle.

#### 3.4.3 Implications for capacity-building direction and Key Messages

The synthesis of workshop findings does not point to isolated technical deficiencies, but to broader structural capability needs within mobility innovation ecosystems. The assessment suggests that the primary constraint is not the absence of technological knowledge, but rather limitations in the ecosystem's ability to coordinate, integrate and operationalise existing expertise.

Instead of defining narrowly technology-specific training interventions, the findings underline the importance of strengthening long-term, transferable competences that can support evolving mobility systems. Recurring weaknesses relate to commercialisation capacity, governance and deployment readiness, and the integration of sustainability principles into operational and business practice. These capability areas are interconnected and collectively influence the effectiveness and scalability of innovation efforts.

The assessment highlights several key messages:

- Innovation challenges persist not because technologies are unavailable, but because ecosystems struggle to align governance structures, sustainability objectives and market logics into coherent deployment pathways.
- The recurring “pilot-to-scale” gap reflects insufficient integration between technical development, regulatory readiness and commercial strategy, rather than technological immaturity.
- Fragmented responsibilities and uneven competence distribution across stakeholder groups reduce collective capacity to act, even where individual expertise exists.
- Sustainability ambitions are strategically acknowledged but remain insufficiently embedded in operational practice, revealing a disconnect between policy objectives and implementation mechanisms.
- Differences in stakeholder perspectives indicate that competence development should strengthen shared systemic understanding across the knowledge triangle, rather than focusing exclusively on sector-specific upskilling.

Taken together, these findings point toward the need for reinforced systemic capabilities that enable coordination, scaling and long-term sustainability across mobility domains. They provide the conceptual bridge for defining structured competence development priorities in the following section.

The progression from the identification of skill gaps to the formulation of competence development needs is conceptually illustrated in Figure 1.



Figure 1. Conceptual progression from identified skill gaps to competence development needs

## 4. Priority Areas for Competence Development and Training Implications

The consolidated workshop results demonstrate that competence gaps identified across electrification, autonomous mobility and shared mobility are not limited to isolated technical shortcomings. Rather, they reflect structural weaknesses in ecosystem capacity, particularly at the interfaces between governance, sustainability integration, and commercialisation.

In response to these structural ecosystem challenges, three interrelated priority areas for competence development are derived from the assessment, as illustrated in Figure 2.



*Figure 2. Structured priority areas derived from cross-domain synthesis*

While domain-specific differences exist, recurring patterns indicate that mobility innovation is frequently constrained by systemic rather than purely technological factors. Therefore, the training implications derived from this assessment are framed around transversal capability areas. These areas are intentionally technology-neutral and focus on long-term, transferable competences that remain relevant across evolving mobility contexts.

The priority areas presented below should be understood as strategic directions for competence development under subsequent project tasks. They do not represent predefined curricula, but rather thematic foundations to guide the design of structured training activities within the MobiNexus framework.

#### 4.1 Translating Identified Gaps into Training Priorities

The synthesis of workshop results highlights three interconnected weaknesses that consistently appear across domains and stakeholder groups:

- limited commercialisation and business model innovation capacity,
- governance complexity and deployment constraints linked to user adoption and coordination,
- insufficient integration of sustainability and lifecycle thinking into operational practice.

These weaknesses reduce ecosystem readiness to move from experimentation to large-scale, user-centric mobility deployment. At the same time, stakeholder perspectives show differentiated needs. Industry actors emphasise commercial viability and operational reliability. Research stakeholders focus on system integration, standards and methodological robustness. Education actors underline curriculum gaps and insufficient applied learning environments.

For this reason, the proposed priority areas combine transversal foundations with flexibility for stakeholder-specific applications.

#### 4.2 Priority Area 1: Commercialisation and Business Model Innovation Capacity

Across all thematic domains, stakeholders repeatedly highlighted difficulties in transitioning from pilot projects to scalable and financially viable services. Limited competences in business model innovation, financial planning, market design and strategic foresight constrain investment confidence and slow down deployment.

The assessment revealed that technical feasibility is often not the primary barrier. Instead, gaps in commercial design capacity, regulatory awareness and scaling strategy frequently prevent long-term implementation. This pattern is particularly visible in electrification services and autonomous vehicle deployment, but is also relevant for shared mobility systems where profitability and market stability remain fragile.

Future training initiatives should therefore strengthen some of the competences related to:

- business model innovation and service design,
- scaling strategies and financial modelling,
- strategic foresight and regulatory literacy,
- transition pathways from pilots to sustainable markets.

Strengthening these capacities supports ecosystem resilience, reduces investor uncertainty and enables innovation to move beyond demonstration projects.

#### 4.3 Priority Area 2: Governance, User Adoption and Deployment Readiness

A second recurring theme concerns governance fragmentation, limited coordination capacity and barriers related to user adoption and digital literacy.

Stakeholder views confirmed that the availability of technology does not automatically ensure societal uptake or operational stability. Weak participatory planning mechanisms, limited digital literacy and regulatory uncertainty undermine trust and slow implementation.

This priority area responds to the understanding that implementation success depends equally on institutional readiness and social legitimacy. Strengthening governance literacy and participatory competences is therefore a structural precondition for effective mobility transition.

Capacity-building efforts should strengthen the ability of ecosystem actors to effectively plan, design, deploy and adapt mobility solutions in real-world contexts. In particular, efforts should focus on developing competences related to:

- planning and collaboration with different stakeholders, including public authorities, industry and user groups, to support joint and timely decision-making;
- understanding rules, institutions and regulatory processes relevant to the deployment of mobility solutions;

- managing operational risks and strengthening system resilience, in order to ensure reliable implementation, adaptation and scaling of mobility solutions;
- user-centred and inclusive design practices, ensuring that mobility solutions are understandable, accessible and adopted by diverse user groups.

Developing these competences supports coordinated decision-making, increases transparency and strengthens public trust in emerging mobility systems.

#### 4.4 Priority Area 3: Sustainability Integration Capacity

The third cross-domain priority relates to insufficient integration of sustainability principles into mobility system design, operations and business logic.

Although sustainability is widely recognised as a strategic objective, the workshops revealed that lifecycle thinking, circular economy approaches and sustainability analytics are not systematically embedded in operational decision-making. Environmental objectives are often treated as external constraints rather than integrated performance criteria.

This priority aims to bridge the gap between strategic climate ambitions and everyday implementation practices. Strengthening sustainability competences enhances regulatory alignment, improves long-term economic resilience and supports resource-efficient innovation.

Training directions should reinforce the ability of ecosystem actors to integrate sustainability principles into the design, operation and scaling of mobility solutions. In particular, training should focus on strengthening competences related to:

- understanding and applying lifecycle thinking and circular economy principles, to assess environmental impacts across the full lifecycle of mobility solutions and identify opportunities for resource efficiency;
- evaluating sustainability impacts, including environmental and climate-related effects, in order to support informed decision-making;
- integrating environmental performance into business and operational decisions, so that sustainability criteria are considered alongside technical and economic factors;
- collaboration across technical, environmental and economic disciplines, enabling more coherent and balanced approaches to sustainable mobility solutions.

Embedding sustainability as a structural capability, rather than as a stand-alone topic, supports both environmental integrity and market viability.

The translation of the three priority areas into indicative training directions is summarised in Table 3.

Priority Area	Indicative Training Directions
Commercialisation & Business Model Innovation	Business model and service design Scaling and financial strategy Regulatory and market intelligence
Governance & Deployment	Participatory planning and stakeholder coordination Institutional and regulatory literacy Operational risk management and implementation resilience User-centred and inclusive design
Sustainability Integration	Lifecycle and circular economy competences Sustainability impact analytics Environmental performance integration

Table 3. Translation of Priority Areas into Indicative Training Directions

#### 4.5 Concluding Remarks on Training Operationalisation

The three priority areas identified above provide an evidence-based framework for guiding future competence-building activities within the MobiNexus project.

Importantly, these areas do not replace domain-specific expertise. Instead, they strengthen transversal ecosystem capacities that enable electrification, autonomous mobility and shared mobility solutions to become scalable, socially legitimate and environmentally aligned.

The detailed operationalisation of these priorities, including format, duration and pedagogical design, will be further developed under subsequent project tasks, particularly within the MobiNexus Entrepreneurship Academy (Task 4.2). In this way, the assessment results of D4.1 are directly translated into structured and targeted training directions aligned with identified ecosystem needs.

## 5. Conclusions

This deliverable presented the consolidated assessment of skills gaps and development needs identified through the Task 4.1 co-creation workshops. Using a common workshop design and the EIT Value Creation Model (EIT VCM) as a structuring framework, the assessment captured stakeholder input across the knowledge triangle (education, research and business) in relation to three thematic domains: vehicle electrification, shared mobility and autonomous mobility.

Overall, the results confirm that competence barriers to user-centric mobility innovation are not limited to technology development. Instead, stakeholders consistently highlighted that implementation and scaling are constrained by systemic capacity gaps that appear at the interfaces between domains, organisations and stakeholder roles. Even where technical know-how exists, practical deployment is slowed by weak cross-sector coordination, limited applied

learning environments, insufficient data sharing and limited ability to translate pilots into sustainable services.

Across the three domains, three cross-domain patterns emerged as the most persistent. First, fragmented governance structures and limited participatory capacity reduce the ability of cities, operators, industry and users to jointly plan, implement and optimise mobility solutions. Second, sustainability and lifecycle thinking are not systematically operationalised in design, deployment and business decision-making, despite high awareness of climate and resource-efficiency objectives. Third, many initiatives remain pilot-driven due to weak commercialisation competences, limited strategic foresight and ongoing uncertainty related to regulation, demand and value capture.

The assessment also showed that stakeholder groups share core concerns but emphasise different dimensions. Industry actors prioritise operational reliability, risk reduction and commercial viability. Research stakeholders focus on system integration, standards, benchmarking and alignment with regulatory and climate frameworks. Education stakeholders underline curriculum gaps and the need for stronger applied learning environments that connect technical knowledge to operational and entrepreneurial practice. These differences suggest that future competence-building actions should combine transversal foundations with stakeholder-specific application pathways, in order to ensure relevance for different ecosystem roles.

Based on the evidence consolidated in this report, three priority areas for competence development were defined as key directions for capacity building: (i) commercialisation and business model innovation capacity, (ii) governance, user adoption and deployment readiness, and (iii) sustainability integration and systemic innovation capability. These areas reflect transferable competences rather than narrow technology-specific skills, and they provide a stable basis for training development across evolving mobility contexts.

The findings of D4.1 therefore provide a structured input for subsequent MobiNexus activities. In particular, they establish an evidence-based foundation for the design of targeted training interventions and competence-building formats under later project tasks, including the MobiNexus Entrepreneurship Academy (Task 4.2). By linking stakeholder-validated gaps with clearly defined development priorities, the deliverable supports alignment between ecosystem needs and the practical operationalisation of training and support measures within the project.

## ANNEX – Workshop Summary Reports (Short versions)

### A.1 Workshop Summary Report – Croatia (STEP RI)

The Croatian co-creation workshop was organised by STEP RI as an online session, gathering 22 participants from academia, research organisations and industry, with interactive inputs collected using the Conceptboard collaboration platform.

The workshop was structured in two parts. The first part consisted of expert presentations addressing European funding opportunities and international cooperation in the field of innovative mobility. The second part was organised as a facilitated working session focused on assessing predefined skills gaps in vehicle electrification, shared mobility and autonomous mobility using the EIT Value Creation Model (EIT VCM).

The interactive session was moderated by Mario Vukelić, who introduced the EIT VCM framework and guided participants through the structured assessment. Participants contributed individually by adding inputs to the shared Conceptboard workspace, where contributions were organised according to EIT VCM value dimensions and stakeholder sectors.

### A.2 Workshop Summary Report – Serbia (ICMF)

In Serbia, the co-creation workshop was led by ICMF and conducted online, gathering 22 participants from academia, research organisations and industry. The event opened with an introductory presentation of the MobiNexus project and the objectives of Task 4.1, followed by a presentation of the identified skills gaps and the EIT Value Creation Model (EIT VCM), and a structured interactive working session using the MIRO collaboration platform.

The working session focused on assessing predefined skills gaps in vehicle electrification, shared mobility and autonomous mobility using the EIT Value Creation Model (EIT VCM). Moderation was led by Nataša Bojković, with Slobodan Mitrović providing co-moderation and technical support. Participant inputs were collected and structured directly on the shared MIRO board according to the EIT VCM value dimensions and stakeholder group affiliation.

### A.3 Workshop Summary Report – United Kingdom (CUS)

Coventry University (CUS) hosted the UK co-creation workshop as an online session. The workshop gathered 17 participants from academia, industry and research and policy organisations, and was complemented by five additional semi-structured stakeholder interviews. The workshop began with a presentation introducing the MobiNexus project objectives and methodology, followed by a structured working session supported by the MIRO collaboration platform.

The session focused on identifying and prioritising skills gaps in future mobility. Facilitation was led by Peta Murphy, with Eleni Anoyrkati providing project presentation and moderation support. Participant inputs were captured in real time through the MIRO board and structured in line with the CUS value-mapping framework.

Insights from the complementary stakeholder interviews were consolidated with workshop inputs to enrich and validate the value-mapping results.

#### A.4 Workshop Summary Report – Spain (CARNET-UPC)

The workshop in Spain was coordinated by UPC Future Mobility Research Hub (CARNET-UPC) with the support of International Association of Science Parks and Areas of Innovation (IASP). The workshop was held online via the Google Meet platform, and gathered 22 participants from the local Catalan and Spanish ecosystems. It was structured in two parts. The first part consisted of presentations introducing the MobiNexus project, the objectives of Task 4.1, and the methodology for the co-creation process.

The interactive session was moderated by Dr. Laia Pagés, who introduced the EIT VCM framework and guided participants through the structured assessment, while Bartosz Wybraniec and Albert Vergés provided co-moderation and technical support. Participants contributed collaboratively by adding inputs to a shared MIRO workspace, where contributions were organised according to EIT VCM value dimensions and stakeholder sectors, enabling comparison of perspectives across different stakeholder groups.

#### A.5 Workshop Summary Report – Cyprus (MOBY X)

The Cypriot co-creation workshop was organised by MOBY X as an online session, gathering 17 participants from academia, research organisations and industry.

The workshop followed a clearly structured flow. After a brief introduction outlining the objectives of Task 4.1 and the analytical logic of the EIT Value Creation Model, the session was organised into three thematic blocks. At the beginning of each block, the moderator provided short contextual guidance, after which participants mapped their observations across the five value dimensions using an online collaborative whiteboard tool.

Moderation was led by Ioannis Tsouros, with Athena Tsimpa providing facilitation support. The moderators focused on ensuring balanced participation across stakeholder groups, encouraging concise and experience-based inputs, and maintaining a steady pace of discussion. Contributions were captured systematically for post-workshop consolidation and analysis.