RESKILLING

Deliverable D3.1

Professions & jobs related to the entire CCAM services value chain

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List of Acronyms	
Acronym	**Definition**
ADAS	Advanced Driver Assistance Systems
AI	Artificial Intelligence
AM	Additive Manufacturing
AV	Autonomous Vehicle
BIM	Building Information Modeling/Management
CCAM	Connected and Automated Mobility
CEM	Common Evaluation Methodology
CPD	Continuing Professional Development
EC	European Commission
ERTRAC	European Road Transport Research Advisory Council
ESCO	European Skills, Competences, Qualifications and Occupations
EU	European Union
EURES	European Employment Services
EV	Electric Vehicle
GIS	Geographic Information System
HIL/SIL	Hardware-in-the-Loop (HIL) and Software-in-the-Loop (SIL)
HMI	Human-Machine Interface
HMI/UX	Human-Machine Interface/User Experience
HR	Human Resources
ICT	Information and Communications Technology
ILO	International Labour Organization
ILOSTAT	Official labour statistics database of the International Labour Organization
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISO	International Organization for Standardization
ODD	Operational Design Domain
OECD	Organisation for Economic Co-operation and Development
OSH	Occupational Safety and Health
OTA	Over the Air
PDI	Physical/Digital Infrastructure
PIAAC	Programme for the International Assessment of Adult Competencies
SAE	Society of Automotive Engineers
SOTIF	Safety Of The Intended Functionality
SRIA	Strategic Research and Innovation Agenda
TCM	Traffic Message Channel
TMC	Traffic Management Centre
UAV	Unmanned Aerial Vehicle
V2X	Vehicle-to-Everything
VET	Vocational Education and Training
WEF	World Economic Forum
WMS	Input and verify data in warehouse management systems

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Executive Summary

This deliverable provides a comprehensive analysis of how the deployment of Connected, Cooperative and Automated Mobility (CCAM) will transform the transport and mobility workforce across Europe. It examines the evolution of existing roles, the creation of new CCAM-driven professions, the skills and competencies required at different automation levels, and the implications for education, training, and labour market adaptation. It consolidates evidence from previous EU projects, scientific literature, and real-world job advertisements to identify both existing roles undergoing transformation and emerging positions created by automation, connectivity, and digitalization.

The report achieves three main objectives:

1. **Mapping** CCAM-related professions and jobs across the entire value chain, from design and development to operations, advanced manufacturing and digital fabrication rolees, recycling, and training.
2. **Assessing** skill requirements for each profile, aligned with automation maturity and future training needs.
3. **Developing a CCAM-specific taxonomy** of knowledge and skills, cross-referenced with ESCO and SAE levels, to guide reskilling and upskilling strategies.

The analysis confirms that CCAM will significantly reduce traditional driving roles while creating new positions in remote operations, fleet orchestration, and customer-facing services. At the same time, demand for highly qualified profiles will grow, particularly in software development, data analytics, cybersecurity, functional safety, and systems integration. Existing jobs such as mechanics, clerks, and planners will evolve toward digital oversight, incident management, and service personalization, while entirely new roles will emerge, including Autonomous Systems Expert, AI Specialist, AMoD services modelers and programmers, Software Integration Engineers (V2X), Electric Car Battery Support Agent, Warehouse Assistants for Smart Hubs.

Skills and training needs will shift toward advanced technical clusters such as AI and data analytics, cybersecurity and privacy, functional safety standards like ISO 26262 and SOTIF, V2X interoperability, and human factors and user experience design. Transversal skills such as communication, adaptability, and stakeholder engagement will remain essential across all profiles. Training strategies must therefore be modular, stackable, and credentialed through micro-credentials and continuous professional development to ensure workforce readiness. In parallel, harmonized certification frameworks, liability clarity, robust safety cases, and inclusive reskilling strategies will be key to secure societal acceptance and economic viability.

The mapping exercise consolidates 110 job profiles into 33 functional job families, classified according to ISCO-08 codes and skill levels, and aligned with ISCED education levels. This structured approach supports comparability across tasks and facilitates the design of training curricula in subsequent work packages.

CCAM workforce transformation is cross-modal and predominantly linked to highly qualified profiles (ISCO skill levels 3 and 4). While manual labour roles will diminish, new opportunities will arise for professionals equipped with advanced technological and transversal skills. The taxonomy developed in this deliverable provides a solid foundation for designing evidence-based reskilling and upskilling programs, ensuring that Europe’s mobility sector remains competitive, inclusive, and future-ready.

1. Introduction

RESKILLING envisions to implement a strategic approach, which will empower the workforce and businesses of Europe's mobility (of people and goods) sector, to effectively cope with the anticipated changes in the sector from CCAM deployment, but also to actively participate in advancing and refining the sector. For this to be achieved, RESKILLING will propose, implement, apply and validate a comprehensive approach, guided by inclusivity, co-creation, and social innovation principles, which will efficiently and sustainably coordinate a range of novel services and tools, fostering optimal adaptation of the mobility sector (covering both people and goods) to the deployment of CCAM solutions and services. This deliverable will focus on the identification of professions and jobs associated with CCAM for people and goods and to analyse the socio-economic and employment impacts of CCAM across the entire value chain.

1.1. Purpose of the Document

The purpose of this document is to identify the professions and jobs (including future ones) associated with CCAM services for the movement of people and goods, covering the entire value chain.

Within this task, the professions and jobs within the entire CCAM-related value chain had been comprehensively mapped, building upon the stakeholder mapping from T2.1. The primary objectives are twofold:
(a) Assessing the impact on current professions and jobs, considering both positive and negative effects caused by CCAM;
(b) Identifying emerging, new, or expanded professions and jobs demanded by the evolving CCAM landscape.

Our assessment has encompassed a wide spectrum of professions, ranging from the manufacturing of vehicles, parts, and infrastructure elements to their operational use, connected services, and businesses. It has been extended to decommissioning (including recycling) and prolonged or secondary life operations, such as for autonomous vehicle batteries and electronic circuits. Software (S/W), hardware (H/W), various services, and even training and support-related professions have been covered as well. This includes roles for blue-collar, white-collar, and mixed-collar workers across scenarios involving the transportation and mobility of people, goods, and hybrid situations.

To achieve these goals, the following approaches have been used:
(i) Conducting an in-depth analysis and updating/revising insights from relevant ongoing and completed projects and studies
(ii) Performing a comprehensive literature review and desk research, analysing a minimum of 20 recent reports and scientific papers from both EU and international sources. This has encompassed references like the European Skills Agenda, the Future of Jobs Report 2023 and more relevant ones. Additionally, content analysis of relevant job advertisements have be conducted on platforms like LinkedIn and EURES.

To ensure comprehensive insights, we have engaged stakeholders in consultations, including at least 2 representatives from each stakeholder group outlined in T2.1, as well as all members of the RESKILLING Advisory Board. Lastly, we have developed a taxonomy outlining the knowledge and skills relevant to CCAM, drawing upon insights from the Drive2theFuture project and the ESCO classification. This taxonomy is aligned with various levels of automation and the corresponding training requirements.

1.2. Intended Audience

Companies related to CCAM, including battery manufacturers and spare parts of the automotive sector, as well as decommissioning, employers in the sector, and both qualified and unqualified professionals who wish to offer their services in CCAM and need to update their skill to meet the requirements of the specific position.

This deliverable is aimed not only at private companies but also at personnel from public entities in customer service roles, infrastructure management across all modes, and legal professions related to compliance. In addition, workers' organizations are included as key stakeholders to promote a just transition and ensure fair labor practices during CCAM deployment. Public transport authorities are also part of the intended audience, as they will play a central role in the operational deployment of CCAM services for passenger mobility and need to anticipate changing skill requirements, both as operators and in procurement processes.

Last but not least, scientist and trainers are expected to be part of the intended audience, to take the role of teaching how to incorporate and adapt the different skills into the current and future emerging roles of the CCAM.

1.3. Interrelations

This task has built upon the stakeholder mapping from T2.1. These stakeholders have been engaged for different consultations within this task in order to validate the outcomes; specifically two representatives from each stakeholder group of T2.1 were included, as well as all members of the RESKILLING Advisory Board.

Task 3.1 provides input to T3.2 Employment effects of CCAM; that is, this T3.2 will examine the direct and in-direct impact of CCAM deployment on the different professions and job types throughout the entire CCAM value chain, given the analysis provided from the reviewed studies and projects in T3.1.

Moreover, T3.1 will serve as the basis for the training profiles in T4.3: Training modules for updated and enhanced CCAM-specific professional skills.

2. Analysis of previous projects, studies and job advertisments

The deployment of Connected, Cooperative and Automated Mobility (CCAM) represents a transformative shift in the transport and mobility ecosystem, with profound implications for employment, skills, and workforce readiness. Understanding these impacts requires a structured approach that combines evidence from previous research, foresight studies, and real-world job market signals.

This chapter establishes the analytical foundation for Task T3.1 by consolidating insights from three complementary sources:

- Previous projects and studies that provide conceptual frameworks, use cases, and methodologies relevant to CCAM workforce transformation.
- Literature review and desk research, synthesizing findings from European and international reports to identify trends in job evolution, skill requirements, and policy measures.
- Job advertisement analysis, offering a snapshot of current industry demand and validating emerging roles and competencies.

Together, these inputs inform the mapping of CCAM-related professions and jobs across the entire value chain, supporting the development of a comprehensive taxonomy of knowledge and skills aligned with automation levels and training needs. This evidence base will guide subsequent tasks on reskilling strategies and curriculum design, ensuring that CCAM deployment is inclusive, sustainable, and economically viable.

2.1.1. In depth analysis from relevant projects and studies

Although previous initiatives rarely provided direct, job-level evidence specific to the CCAM workforce, they offered valuable conceptual foundations and methodological guidance that informed our mapping of CCAM-impacted job profiles and the associated skills taxonomy. These projects contributed in several key ways:

- Scenario and Contextual Framing: Defined operational contexts and use cases where new or expanded roles emerge, such as piloting models, testing frameworks, and PDI/ODD support.
- Transition and Employability Insights: Delivered evidence on workforce acceptance, reskilling pathways, and the positive and negative impacts on existing professions.
- Terminology and Methodological Alignment: Provided standardized taxonomies, evaluation methods, and data-sharing practices that were adapted for structuring job profiles and the skills matrix.
- Educational Frameworks: Highlighted scalable approaches to digital learning and credentialing, informing the design of training pathways relevant to subsequent work packages.

Table 1 presents the main projects consulted, indicating their status, primary focus, key outputs reviewed, and the specific ways in which they contributed to Task T3.1.

Table 1 Summary of the most relevant previous initiatives to the job mapping

Initiative	Programme / status	Main focus or key outputs we reviewed	How it supported T3.1
SKILLFUL	H2020 – finished	Foresight on future transport skills; curricula	Baseline structure for skills evolution;

Initiative	Programme / status	Main focus or key outputs we reviewed	How it supported T3.1
		concepts; cross-modal scope	competence headings reused for CCAM taxonomy
FAME	Horizon Europe – finished	European framework for CCAM testing: taxonomy, Common Evaluation Methodology (CEM), and test data space	Identified job families around validation, safety assurance, evaluation design, data governance
PAsCAL	H2020 – finished	Public acceptance, driver behaviour; Guide to Autonomy; training needs	Emerging training/support roles and retraining needs for drivers/operators
WeTransform	H2020 – finished	Workforce transition agenda; barriers/needs/skills across transport modes	Evidence on barriers and risks to current professions; language for policy actions
Drive2theFuture	H2020 – finished	User acceptance, training tools, HMI, multi-mode pilots	Specified operator-adjacent roles and training content aligned with automation level
SHOW	H2020 – finished	Europe-wide AV pilots in public transport; societal impact (incl. employability)	Insights into fleet supervision, dispatching, customer care, accessibility roles
Augmented CCAM	Horizon Europe – ongoing	Physical/Digital Infrastructure (PDI) support, ODD extension, multi-site tests	Clarified infrastructure-centric roles and AI/data/standards skillsets
Open Social Innovation (Germany)	National – policy & programmes	Social innovation & multi-stakeholder, challenge-driven approaches	Inspired stakeholder engagement & co-creation method for consultations

Initiative	Programme / status	Main focus or key outputs we reviewed	How it supported T3.1
National Digital Education Space (Germany)	National – ongoing	Federated digital learning & credential infrastructure	Reference architecture for scalable, modular training delivery and portable credentials
Drive Sweden	National programme – ongoing	Cross-sector ecosystem for connected/automated/shared mobility; innovation cloud	Model for ecosystem roles and living-lab operations relevant to urban pilots
UPSKILL	Erasmus+ – finished	VET skills frameworks & curricula design (manufacturing/plastics; digital & green)	Transversal VET methodology adapted for CCAM training blueprints
IN2CCAM	Horizon Europe – finished	Integration of CCAM services with traffic management; Living Labs	Specified operational roles for traffic-CCAM integration and architecture-linked skills
AVENUE	H2020 – finished	Automated shuttle services integrated in PT; on-demand models	Informed service design & customer-facing roles for inclusive deployment
Skill-UP	Erasmus+ – finished	Air Sector Skills Transformation Map; short courses & assessment tools	Structure for future skills mapping and micro-learning assets referenced
MOVE2CCAM	Horizon Europe – finished	Impact assessment framework/tool; co-creation via Satellites; case pilots	Impact KPIs and multi-actor co-creation insights for scenario-specific job outlooks
PAVE Europe (Partners for Automated Vehicle Education – Europe)	Independent network focused on education and public trust in AVs; active and partnering in several Horizon Europe CCAM projects	Public-facing white papers and activities on acceptance, skills, and deployment pathways: Safer, Cleaner, More Equitable: Seizing the Opportunities of Highly Automated Vehicles	Framed user acceptance and trust requirements relevant to workforce roles and training (e.g., engagement, communication,

Initiative	Programme / status	Main focus or key outputs we reviewed	How it supported T3.1
		(Dec 2024), and The Future of Public Transportation: Embracing Autonomous Mobility (June 2025).	transparency). Helped identify emerging service and operational profiles (e.g., MaaS platform management, remote operations support, community engagement) and upskilling needs (public-facing safety communication, inclusive design). Informed our taxonomy with human-centred CCAM perspectives and recommendations for modular training/CPD aligned to deployment maturity.

Previous initiatives primarily concentrated on technological development, pilot demonstrations, user acceptance, and generic skills frameworks. Building on these foundations, together with expert input (partners, stakeholders and advisory board members) Task T3.1 has consolidated 110 distinct CCAM-impacted job profiles across the entire value chain and developed a CCAM-specific knowledge and skills taxonomy aligned with automation levels and training requirements. This taxonomy cross-references ESCO and incorporates relevant elements from projects such as SKILLFUL, Skill-UP, and acceptance-oriented studies (see Sections 3 and 4).

Distinctive features of the RESKILLING approach:

- Functional Value Chain Perspective

Introduces a comprehensive value chain framework that integrates technical, social, regulatory, educational, and commercial dimensions of CCAM deployment.

- Structured Occupational Classification

Provides a systematic categorization of 110 job profiles into 33 job families using ISCO-08 codes and skill levels, ensuring consistency across tasks and alignment with labor market standards.

- Inclusion of Emerging and Transitional Roles

Captures new and evolving roles, reflecting the dynamic nature of CCAM-related employment and enabling proactive workforce planning.

- Skill Shifts and Role Evolution

Highlights how existing roles are transforming through automation and digitalization. Identifying transitional roles supports flexible and inclusive strategies for future workforce adaptation.

2.1.2. Comprehensive literature review and desk research

This review consolidates recent European and international evidence to support Task T3.1 in three ways: (i) identifying workforce impacts across the CCAM value chain, (ii) specifying emerging and evolving roles, and (iii) defining knowledge and skills requirements aligned with automation maturity and training pathways. The synthesis complements insights from prior EU projects and current job advertisement analysis, ensuring that the job mapping and the forthcoming CCAM knowledge & skills taxonomy rest on a robust, multi-source base.
Task leader and consortium partners reviewed 20+ items spanning policy/roadmap documents, technical/socio-economic studies, and skills/education evidence (EU and international). Key anchor documents include the CCAM Strategic Research and Innovation Agenda (SRIA, updated 2023), the ERTRAC CCAM Roadmap, and the CINEA CCAM portfolio brochure, complemented by OECD and WEF skills reports.
Findings were coded under four themes: (1) workforce impacts, (2) role emergence and evolution, (3) skills and training needs, and (4) policy, governance, and assurance.
Findings complemented job ad content and previous EU project outputs to ensure alignment with job families, taxonomy design, and training implications (WP4).

Table 2 shows the 22 documents that were reviewed.

Table 2-Reviewed documents related to CCAM

Title	Document type	Contribution
European Skills Agenda, 2020	Policy Framework / Report	Establishes strategic impetus for large-scale up-/reskilling, modular learning pathways, and stakeholder alliances supporting training design and credentialing logic.
Study on employment and social impacts of connected and automated driving (CAD) (ECORYS), 2021	Report	Scenario-based employment impacts; identifies shifts from driving to supervision/remote operation; informs displacement risk assessment and role evolution in operations.
Study on the Social Dimension of the Transition to Automation and Digitalisation in Transport (ECORYS/CERTH, DG MOVE), 2021	Report	Barriers for worker adaptation, social dialogue needs, targeted measures; underpins recommendations for inclusive reskilling and balanced impact assessment.
T. Geißler and E. Shi, "Taxonomies of Connected, Cooperative and Automated Mobility," 2022 IEEE Intelligent Vehicles Symposium (IV), Aachen, Germany, 2022, pp. 1517-1524, doi: 10.1109/IV51971.2022.9827245	Scientific Paper	Clarifies multi-perspective taxonomies (vehicle/infrastructure/user; SAE J3016/J3216), guiding alignment of roles and skills to automation and cooperation classes.
World Economic Forum – Future of Jobs Report 2023	Report	Macro trends in rising demand for AI/data/sustainability skills and declining routine roles; strengthens rationale for digital literacy and analytical competence across CCAM roles.

Title	Document type	Contribution
World Economic Forum – Future of Jobs Report 2025	Report	Reinforces importance of cognitive/transversal skills (analytical, creativity, resilience, lifelong learning) and growing relevance of cybersecurity/environmental stewardship.
Alonso Raposo, M., Grosso, M., Mourtzouchou, A., Krause, J., Duboz, A. and Ciuffo, B., Economic implications of a connected and automated mobility in Europe, RESEARCH IN TRANSPORTATION ECONOMICS, ISSN 0739-8859, 92, 2022, p. 101072, JRC124917.	Scientific Paper	Explores sectoral effects (automotive, telecoms, logistics, insurance) and labor market competition; supports value-chain framing and identification of expanded roles.
Movilidad conectada, cooperativa y autónoma (CCAM) – APE M2F, 2023	Report (Spanish source)	Summarizes enabling technologies (5G/V2X, AI, data sharing); informs technical skill clusters and infrastructure-readiness roles.
Alonso Raposo, M., Grosso, M., Després, J., Fernandez Macias, E., Galassi, M., Krasenbrink, A., Krause, J., Levati, L., Mourtzouchou, A., Saveyn, B., Thiel, C. and Ciuffo, B., An analysis of possible socio-economic effects of a Cooperative, Connected and Automated Mobility (CCAM) in Europe, doi:10.2760/777 (online)	Technical Report	Policy-oriented lens on CCAM transformation; supports governance, liability, and assurance considerations in role profiles.
Randi A. Fagerholt, Hanne Seter, Petter Arnesen, How can authorities be enablers in the deployment of CCAM? An experienced-based expert study from Norway https://doi.org/10.1016/j.trip.2023.100874.	Scientific/Policy Study	Institutional perspectives on drivers/barriers; informs public-sector roles (policy administration, regulatory liaison) and stakeholder engagement tasks.
Developing a Common Evaluation Methodology for CCAM (Innamaa et al., 2023; FAME/CEM)	Scientific Paper / Methodological Report	Establishes evaluation and data-sharing practices; underpins roles in validation, safety assurance, evaluation design, and test data governance.
The Potential Implications of Autonomous Vehicles in and around the Workplace, 2018	Study / Report	Identifies new job creation in technology deployment, evolving training requirements, and short-term vulnerabilities; informs impact assessment and training priorities.
Alexandros Nikitas, Alexandra-Elena Vitel, Corneliu Cotet, Autonomous vehicles and employment: An urban futures revolution or catastrophe?, https://doi.org/10.1016/j.cities.2021.103203.	Scientific Paper	Empirical insights into automation's workplace effects; supports identification of sector-specific skill bottlenecks and human-centric task resilience.
CCAM SRIA 2023 updated	Strategic roadmap / Partnership	Provides the multiannual R&I agenda (2021–2027) updated in 2023, defining the CCAM vision, objectives, deployment-readiness concept, and the 7 clusters

Title	Document type	Contribution
	policy document	(Large-scale Demonstration; Vehicle Technologies; Validation; Integrating CCAM in the transport system; Key Enabling Technologies; Societal aspects & people needs; Coordination), and guides the identification of Horizon Europe call topics and monitoring of impacts.
European Partnership under Horizon Europe – CCAM (draft proposal)	Draft Proposal / Policy Document	Frames strategic R&I agenda, systemic benefits (safety, environment, inclusiveness), and collaborative mechanisms; guides role demand in pilots/testbeds/standardization.
A Strategist's Guide to Upskilling, 2019	Article / Practice Guide	Actionable upskilling processes (assessment, pathway design, monitoring) adapted for CCAM training architectures and organisational change management.
OECD – Skills Matter (PIAAC), 2016	Report	Evidence on literacy, numeracy, and problem-solving in tech-rich environments; validates inclusion of foundational competencies in CCAM pathways.
OECD – Insights from Skills Strategies in the European Union, 2024	Report	Highlights national skills strategies, cross-sector coordination, and policy lessons; informs governance for scalable reskilling and certification.
OECD – What Skills and Abilities Can Automation Technologies Replicate? New Evidence, 2022	Report	Identifies bottleneck skills (complex decision-making, creativity, interpersonal communication); supports prioritisation of human-in-the-loop competencies.
World Economic Forum – Future of Jobs (2016, Executive Summary)	Report	Early baseline on digital disruption and skill trajectories; provides longitudinal context for acceleration seen in 2023–2025.
WEF – Global Skills Taxonomy Adoption Toolkit (2025)	Toolkit / Report	Guides structuring and adoption of skills taxonomies, performance expectations, and credential frameworks; informs taxonomy architecture and alignment.
Connected, Cooperative, and Autonomous Mobility (Move2Future), 2023	Report	Consolidates CCAM technology enablers and service implications; strengthens mapping of roles in connectivity, AI, and data-sharing ecosystems.

Main findings from this analysis are as follows :

1. **Workforce impacts**
   Convergent evidence anticipates a decline in traditional driving roles and growth in supervision, remote operations, dispatch/fleet orchestration, and customer-facing functions; expansion continues for high-skill profiles in software, data, cybersecurity, functional safety, and systems integration.
2. **Role emergence and evolution**
   New roles appear, e.g., remote AV operator, V2X systems engineer, AI assurance/safety engineer, data governance officer, battery second-life manager. Meanwhile, existing roles (mechanics, clerks, planners, drivers) shift toward digital oversight, incident management, and service personalisation.
3. **Skills and training needs**
   Priority clusters include AI/data analytics, cybersecurity & privacy, functional safety/SOTIF, V2X/interoperability, remote supervision/telematics, and human factors/UX; transversal skills (communication, adaptability, stakeholder engagement) remain critical. Training should be modular, stackable, and credentialed (micro-credentials, CPD), aligned to automation maturity.
4. **Policy, governance, and assurance**

Evidence highlights needs for harmonised certification, liability clarity, safety cases, robust data governance, and public acceptance frameworks supported by common evaluation methodologies (e.g., FAME/CEM) and SRIA cluster logic.

2.1.3. Content analysis of relevant jobs advertisements

To complement the literature review and project analysis, a targeted content analysis of job advertisements was conducted to capture real-time industry demand for CCAM-related roles and skills. This exercise aimed to validate emerging profiles and competencies identified in previous sections.

Between May and December 2025, a total of 60 job advertisements directly or indirectly related to CCAM were analysed. These postings were collected from:

- EURES portal
- Websites of European technology and research centres
- LinkedIn

The analysis revealed a clear **dominance of highly skilled roles**. Most positions required advanced technical expertise in areas such as software and hardware engineering, IoT, cloud architecture, and ADAS systems, combined with strong soft skills like project management and stakeholder engagement. Examples of these roles include IoT Engineer, Cloud Platform Architect, Principal Architect for ADAS and Automated Driving, Senior Business Development & Automotive Manager, Innovation Lead for Zero Emission Vehicles, and System Designer for Autonomous Train Development.

Alongside these high-level positions, there was evidence of **emerging operational and vocational roles**. These profiles reflect early demand for hands-on technical expertise and include Service Technicians for Automated Guided Vehicles and Robots, Mechanical Technicians or Prototype Builders, Service Engineers for Automated Transit Systems, and 3D Printing Technicians. Although these roles indicate a need or gradual shift in content for certain blue-collar and mid-level technical positions, they remain far less common than advanced R&D and business roles. While 3D printing and digital repair technicians are not specific to CCAM and support many industrial domains, their skills are increasingly relevant to CCAM-related prototyping, maintenance, and lightweight component production. This suggests not a CCAM-driven emergence of these roles, but rather an adaptation of existing cross-sector profiles to the needs of automated mobility.

Geographically, the postings were concentrated in **European R&D hubs** such as Belgium, the Netherlands, and Germany. Many positions were linked to **electric mobility and zero-emission** technologies, confirming the overlap between CCAM and the broader energy transition. There was also an **international dimension**, with roles advertised in Japan and India, highlighting the global nature of CCAM deployment.

Employment modalities varied, with a **mix of permanent technical roles and project-based** contracts for pilots and testbeds. Blue-collar vacancies were scarce, and maintenance roles increasingly required **digital literacy**, including skills in telemetry and sensor calibration.

The **skill requirements** observed across all advertisements aligned closely with those identified in the literature and previous EU projects. Technical competencies included algorithmic perception and planning, HIL/SIL testing, functional safety standards such as ISO 26262, SOTIF, V2X stack, edge/cloud integration, and OTA updates. Data and AI-related skills encompassed data engineering, model evaluation, synthetic data generation, and explainable AI. Cybersecurity and privacy skills focused on threat modelling, secure communications, and compliance. Human-centric and operational skills emphasized HMI/UX basics,

exception management, and incident response, while transversal skills such as communication, adaptability, stakeholder engagement, and project governance remained critical.

Despite the emergence of service and maintenance positions, open vacancies for traditional blue-collar workers were minimal. This suggests that industry is currently **prioritising highly qualified professionals** to drive the transition, while reskilling for operational staff may still be in its early stages. Alternatively, this pattern may reflect an industry belief that operational and blue-collar roles can be filled through existing staff who can be upskilled, trained, or reskilled internally, thus reducing the need to advertise such positions externally.

This analysis reinforces the added value of the RESKILLING initiative: **anticipating** future workforce needs and designing training pathways before demand peaks. The competencies observed in current postings validate the taxonomy developed in Task T3.1 and highlight:

- The urgency of upskilling technical professionals in AI, connectivity, and automation.
- The need to prepare vocational profiles for maintenance and operational roles in automated systems.
- The importance of soft skills and cross-functional collaboration for all CCAM-related positions.

3. Mapping of relevant jobs for CCAM

The deployment of CCAM will reshape the transport and mobility workforce across all value chain stages. To anticipate these changes, Task T3.1 consolidates a long list of job profiles impacted by CCAM, including both existing roles undergoing transformation and emerging positions created by automation, connectivity, and digitalization.

This mapping serves three objectives:

1. Provide a structured classification of CCAM-related jobs using internationally recognized standards.
2. Assess skill requirements for each profile, aligned with automation maturity and future training needs.
3. Enable consistency across subsequent tasks, including taxonomy development and reskilling strategies.

3.1. Definitions

To ensure comparability and methodological rigor, job profiles are classified according to the **International Standard Classification of Occupations** (**ISCO-08**), developed by the **International Labour Organization (ILO)**. ISCO organizes occupations into a hierarchical structure based on tasks performed and required skill level, enabling harmonized labor market analysis across countries.

Codification is made according the following rules:

- Major Groups (1-digit): Broad occupational categories (e.g., 2 professionals).
- Sub-Major Groups (2-digit): More specific clusters (e.g., 21 Science and Engineering Professionals).
- Minor Groups (3-digit) and Unit Groups (4-digit): Detailed job families and roles (e.g., 2144 Mechanical Engineers).

ISCO defines **four skill levels**, primarily determined by the complexity of tasks and the educational attainment typically required:

- **Skill Level 1:** Basic tasks; usually primary education or short on-the-job training (e.g., laborers).
- **Skill Level 2:** Operational roles requiring vocational training or secondary education (e.g., drivers, mechanics).
- **Skill Level 3:** Technicians and associate professionals; typically post-secondary non-tertiary education.
- **Skill Level 4:** Highly specialized professionals and managers; usually tertiary education (bachelor's or higher).

Skill levels correspond broadly to **ISCED (International Standard Classification of Education)** levels, developed by UNESCO:

Table 3 Correspondance between ISCO skill levels and ISCED levels

ISCO Skill Level	Typical ISCED Level	Description
Level 1	ISCED 0–2	Basic education; manual/routine tasks
Level 2	ISCED 3–4	Upper secondary or vocational training
Level 3	ISCED 5	Short-cycle tertiary or advanced vocational
Level 4	ISCED 6–8	Bachelor's, Master's, or Doctoral degrees

This alignment ensures that job mapping can be directly connected to training pathways, supporting the design of training curricula in a later task (T4.3).

3.2. Mapping of jobs

By systematically reviewing outputs from relevant European research projects, job advertisements, and incorporating feedback from expert partners and external stakeholders, a total of **110 distinct job profiles** have been identified as impacted by the implementation of CCAM. These profiles encompass both **existing roles undergoing transformation** and **emerging positions** created by automation, connectivity, and digitalization, and are detailed in ANNEX I Jobs Mapping. Each job is classified according to **ISCO-08 occupational codes** and corresponding **skill levels**, ensuring methodological consistency and alignment with international labour standards. This classification supports comparability across tasks and facilitates the subsequent development of the CCAM knowledge and skills taxonomy.

Although some jobs are specific to a particular transport mode, the majority of CCAM-related roles are **cross-modal**, applicable across different mobility contexts. This cross-modality is evident in emerging profiles such as Remote Vehicle Operations Technicians, Mobility-as-a-Service (MaaS) Platform Managers, and Digital Infrastructure Monitors, which support integrated systems across road, rail, and urban mobility.

Similarly, most roles can serve both **passenger and freight transport**, as technical, maintenance, and safety skills are largely transferable. For example, Predictive Maintenance Analysts, IoT Developers, and Cybersecurity Experts operate in contexts where interoperability between passenger and freight systems is essential. Reskilling and upskilling requirements for these cases will therefore be broadly similar, focusing on digital literacy, data-driven decision-making, and cybersecurity awareness.

Workforce needs in CCAM are predominantly linked to **highly qualified profiles**, corresponding to ISCO skill levels 3 and 4, which dominate ANNEX I Jobs Mapping. These include roles such as AI Specialists, Autonomous Systems Experts, 5G/6G Network Engineers, and Additive Manufacturing Design Engineers, all requiring advanced technical expertise and strong analytical capabilities. However, a limited number of roles at **levels 1 and 2** have also been identified, mainly in operational and support functions. These include Autonomous Delivery Handlers, Warehouse Assistants for Smart Hubs, Travel Attendants, and Charging Station Attendants, which will evolve to incorporate basic digital skills and interaction with automated systems. For these profiles, reskilling will focus on digital literacy, safe interaction with automated technologies, and customer assistance in CCAM-enabled environments.

While the primary focus of this mapping is road transport, some roles that are cross-modal have been included to ensure completeness and interoperability. Emerging positions such as Rail Automation Engineers or Remote Harbour Operators illustrate the growing need for CCAM competencies beyond road transport, reinforcing the importance of harmonized training frameworks across all modes.

Finally, the consolidated table of job profiles includes two additional columns:

- **Value Chain Stage**, indicating the functional area of CCAM deployment to which the job contributes.

- **Job Family**, grouping individual profiles into broader categories for structured analysis.

These elements are explained and developed in detail in the following section.

3.2.1. Jobs classification and categorization

3.2.1.1 Value Chain Perspective

Based on previous studies (Chapter 2) and the description of the task in the Grant Agreemen (GA), we have identified the following **functional stages of the CCAM value chain**. This approach helps clarify how different occupations contribute to the development, deployment, operation, and support of CCAM systems.

The value chain proposed in Figure 1 integrates not only the technological dimensions of CCAM, but also its social, regulatory, educational, and commercial aspects. This holistic perspective ensures that the development and deployment of CCAM systems are inclusive, economically viable, and aligned with societal needs and expectations.

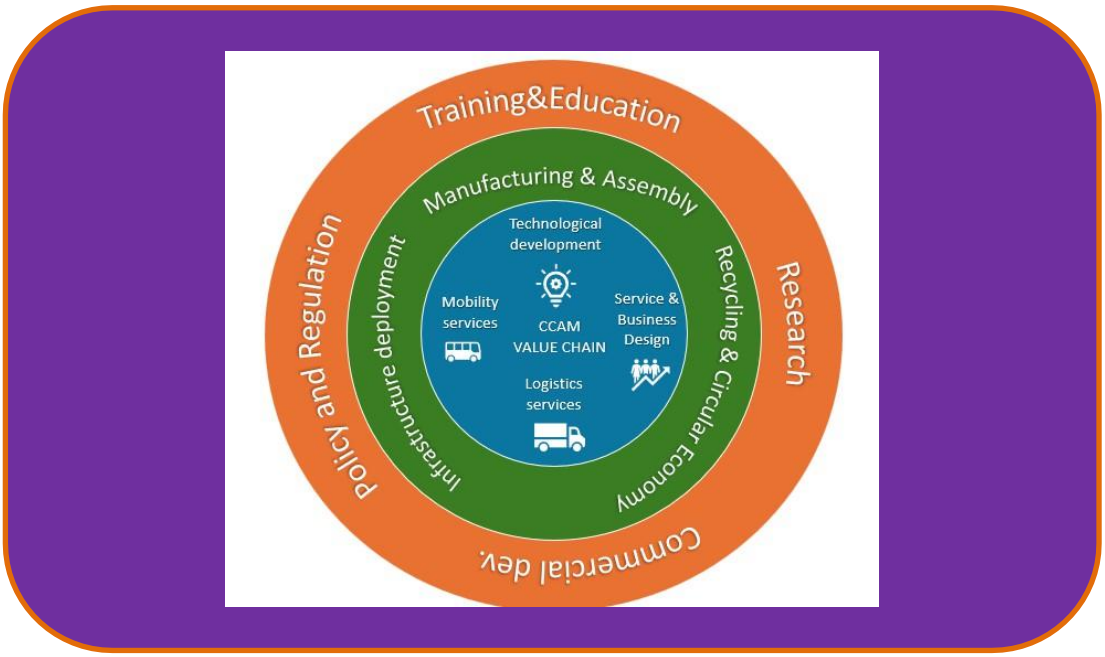

Figure 1 CCAM Value Chain

The diagram illustrates the functional value chain for CCAM, highlighting how activities and roles are structured across three concentric layers that reflect their contribution to CCAM deployment:

- **Core functions**: Technology development, service and business design, and operational delivery (mobility and logistics services).
- **Operational and technical backbone**: This layer represents the physical, digital and technical backbone that supports CCAM deployment and also its sustainability. Includes cross-cutting enabling technologies such as additive manufacturing, AI, and advanced materials.
- **Strategic and societal functions**: These functions provide governance, innovation, skills development, and market uptake, ensuring CCAM is inclusive, economically viable, and aligned with societal needs. This includes policy and regulation, training and education, research, and

market and commercial development, which covers roles that promote, sell, and manage CCAM services and platforms to support adoption and growth.

This layered approach emphasizes that CCAM is not merely a technological advancement but a comprehensive ecosystem integrating technical, operational, and social dimensions.
Based on this framework, we defined nine functional stages, from design and development to training and education, each grouping roles that contribute to CCAM deployment. These stages provide the foundation for the job families and detailed in the next section.

1. Research & Innovation

Researchers are not included in the analysis as research roles are inherently exploratory and future-oriented, focused on emerging technologies, and long-term innovation. These roles are not directly impacted by CCAM deployment, but rather influence its development. Their evolution is not a consequence of CCAM, but a driver of it.

2. Design & Development

- Technological Development: Roles involved in conceptualizing, engineering, and programming CCAM technologies,
- Service & Business Design: Roles focused on service design, user experience, accessibility, and business model innovation, ensuring CCAM solutions are socially inclusive and economically viable

3. Manufacturing & Assembly

Roles involved in producing and assembling vehicles, infrastructure, and components, including customization for service delivery and user accessibility.

4. Recycling & Circular Economy

Roles focused on the reuse, recycling, and sustainable disposal of vehicles, components, and infrastructure.

5. Infrastructure Deployment & Operations

Roles that plan, manage, and deliver mobility services, including freight and passenger transport, customer support, remote operations, and personalized travel assistance.

6. Mobility Services & Logistics

Roles that plan, manage, and deliver mobility services, including freight and passenger transport, customer support, remote operations, and personalized travel assistance.

7. Policy & Regulation

Roles that define legal frameworks, ensure compliance, and manage risk in CCAM operations and systems, including social impact analysts, ethics experts, and community engagement officers.

8. Market & Commercial Development

Roles that promote, sell, and manage CCAM services and platforms to support adoption and growth, including business development, marketing, and public relations professionals who shape public perception and user engagement.

9. Training & Education

Roles involved in training and educating users and professionals in CCAM systems, including simulator instructors, accessibility trainers, and curriculum developers for inclusive mobility education.

3.2.1.2 Functional Job Families

Given the impracticality of working with an extensive list of more than 100 individual job profiles in subsequent project activities, a consolidated set of **33 job families** has been developed. This grouping is based on shared characteristics in terms of ISCO-08 occupational codes and corresponding skill levels, enabling a more structured and manageable framework for analysis and alignment with other project components.

The following job families reflect the multifaceted nature of CCAM deployment, encompassing not only technical roles but also those critical to its social acceptance, regulatory compliance, business viability, and inclusive education. This classification supports a holistic understanding of the workforce transformation driven by CCAM.

Design & Development

1. **Engineers**

- ISCO-08: 214 (Engineering Professionals); ISCO skill level: 4.

Role: Innovating mobility solutions (vehicle technology, digital systems for transportation, AV's); development of algorithms; design vehicle systems and components; design of energy storage systems; test vehicle control software and V2X; develop robotics systems; manage communication protocols and systems; ensure vehicle safety standards; design IoT solutions for vehicle connectivity.

2. **Service & Business Design**

- ISCO-08: 2421 Management and organizational analysts ; ISCO skill level: 4

Role: Shape business models and service concepts for automated mobility. The role focuses on organizational analysis and designing strategies that ensure economic viability, user-centric services, and smooth integration into existing ecosystems.

3. **Software & Systems Development**

- ISCO-08: 2511 (Systems Analysts), 2512 (Software Developers), 2513 (Web and multimedia developers), 2519 (Software and Multimedia Developers and Analysts Not Elsewhere Classified). ISCO Skill level: 4.

Role: Creating and maintaining the digital backbone of automated mobility. These professionals design architectures and develop algorithms for autonomous driving, connectivity, and MaaS platforms, ensuring interoperability and cybersecurity. They enable real-time decision-making, sensor integration, and user-friendly interfaces that support safe and efficient CCAM ecosystems

4. **Cybersecurity & IT Protection**

- Telecommunications & Connectivity engineers

ISCO-08: 2152 (Electronics Engineers), 2153 (Telecommunications engineers); Skill Level: 4

- Cybersecurity & IT Protection Experts

ISCO-08: 2519 (Software and Applications Developers and Analysts Not Elsewhere Classified); Skill Level: 4

- Cybersecurity & IT Protection Technician

ISCO-08: 351 (Information and Communication Technicians); Skill Level: 3

Role: Protects vehicle systems and related infrastructure from cyber threats. Work remotely to protect CCAM systems from cyber threats, ensuring data integrity and system resilience.

5. **Data Science & Analytics experts**

- ISCO-08: 2511 (Systems Analysts); Skill level: 4

Role: Analyzes data to improve vehicle algorithms and performance. Implements artificial intelligence for vehicle decision-making. Design and implement intelligent transportation solutions using autonomous vehicles. They develop algorithms for fleet optimization, ride-sharing efficiency, and real-time traffic adaptation. Analyze real-time traffic, vehicle, and user data to optimize routes, improve safety, and enhance service delivery.

6. **HMI, UX & Human Factors Experts**

- ISCO-08: 2166 (Graphic and Multimedia Designers) and 2634 (Psychologists); Skill Level: 4.

Role: Analizes how people interact with new mobility technologies and designing interventions to improve user experience, safety, and overall system efficiency. Studies driver/passenger interaction with automated systems. Create intuitive interfaces for operators and passengers. Designing accessible user interfaces for CCAM systems. Ensuring digital platforms are usable by people with disabilities. Ensures CCAM services are designed for vulnerable groups. Design physical environments.

Manufacturing & Assembly

7. **Manufacturing & Assembly Technicians**

- ISCO-08: 3114 (Electronics Engineering Technicians), 3115 (Mechanical Engineering Technicians); Skill level 3.

Role: Includes vehicle, UAV, shipbuilding, sensor technicians, and additive manufacturing process technicians. Are responsible for producing and assembling components for connected and automated mobility systems. In CCAM, these roles involve integrating advanced electronics, sensors, and communication modules, applying digital manufacturing techniques like additive manufacturing, and ensuring compliance with safety and quality standards for automated vehicles and infrastructure.

Recycling & Circular Economy

8. **Decommissioning & Recycling technicians**

- ISCO-08: 3119 (Physical and Engineering Science Technicians Not Elsewhere Classified), 2149 (Engineering Professionals Not Elsewhere Classified); ISCO skill level: 3

Role: Plans and oversee the decommissioning process of vehicle components and CCAM-related infrastructure such as sensors, communication networks, and charging stations. Manages the recycling of

materials from decommissioned vehicles and infrastructure. Oversees reuse, recycling, and disposal of EV batteries in compliance with environmental standards.

- ISCO-08: 9612 (Laborers in Transport); ISCO skill level: 2

Role: Performs the physical disassembly of vehicle components and infrastructure

9. Recycling and waste management operators

- ISCO-08: 8131 (Chemical Products Plant and Machine Operator); Skill level 1-2

Role: Responsible for dismantling vehicle components and sorting materials, particularly batteries and electronic parts, to ensure sustainable disposal and reuse.

Infrastructure Deployment & Operations

10. Maintenance & Repair operators

- ISCO-08: 2511 (Systems Analysts), 2144 (Electronics Engineers); ISCO skill level: 4

Role: Uses sensor data and AI to anticipate and prevent failures in AV systems. Charging infra needs constant attention, cleaning, digital upgrading etc.

- ISCO-08: 3114 (Electronics Engineering Technicians), 3119 (Physical and Engineering Science Technicians Not Elsewhere Classified); ISCO skill level: 3

Role: Maintain trackside sensors and communication systems. Perform maintenance on infrastructure.

- ISCO-08: 7231 (Motor Vehicle Mechanics and Repairers); ISCO skill level: 2

Role: Maintains, diagnoses, and repairs connected and automated vehicles, ensuring the proper functioning of advanced systems such as sensors, electric drivetrains, and vehicle-to-everything (V2X) communication components. Help with the upkeep of roadside units, cameras, and V2X communication devices.

11. Construction workers

- ISCO-08: 93 (Drivers and Mobile Plant Operators); ISCO; Skill level 1, 2

Role: Upgrading and maintaining roads and highways, warehouses and hubs

This role will evolve to use of automated machinery, robotic paving systems, and drone-based inspections will reduce manual labour but increase the need for technical oversight. Workers may shift toward machine supervision, remote operation, and system diagnostic. This requires basic digital literacy. Some roles may shift from Skill Level 2 to Level 3, especially where technical troubleshooting is required, workers interact with automated systems and data logging and digital reporting become standard.

12. Emergency & Incident Management

- ISCO 1349 (Professional Services Managers Not Elsewhere Classified); Skill level 3

Role: Integrate CCAM systems with fire, ambulance, and police operations.

13. Urban Planning, including Physical & Digital Infrastructure

- ISCO-08: 2164 Urban and Regional Planners; ISCO skill level: 4

Role: Design and implement spatial development strategies that integrate CCAM solutions into urban and regional environments. They analyze mobility patterns, land use, and infrastructure needs to ensure safe, efficient, and sustainable deployment of automated and connected transport systems, aligning with smart city and regional planning objectives.

- ISCO-08: 2142 Civil Engineer; ISCO skill level: 4

Role: Designs infrastructure and spatial layouts that enable safe and efficient automated mobility. The role ensures integration of connected and cooperative systems into urban environments, considering traffic flow, sustainability, and accessibility.

- ISCO-08: 3114; Building and Civil Engineering Technicians; ISCO skill level: 3

Role: Assist engineers and planners in implementing construction projects, using tools like CAD, BIM, and GIS. They ensure compliance with standards and help integrate physical and digital infrastructure such as sensors and connectivity into roads and urban spaces to support smart mobility and CCAM systems.

Mobility Services & Logistics

14. Remote Mobility Support Roles

- ISCO-08: 4222 contact centre information clerks, 4323 transport clerks; ISCO skill level: 2

Role: Handle remote assistance for drivers and passengers, monitor vehicle systems, issue tickets or tolls, and support electric vehicle operations. In CCAM, these roles evolve to include digital interaction platforms, real-time data monitoring, and coordination with automated systems, ensuring seamless service delivery and safety in highly connected transport ecosystems.

15. On-Site Mobility Assistance Roles

- ISCO-08: 5111 (Travel Attendants and Travel Stewards), 5249 (Vehicle Rental Agent), 4222 (Contact Centre Information Clerks); Skill level 1-2.

Role: Customer engagement and safety issues, Assistance of elderly and disabled during travel, Assistance to passengers pre-, during and post-travel, More focus on the needs of the customer (traveller). Provides personalized travel assistance in multimodal hubs or on-demand services. Facilitates the onboarding and support of customers using connected and automated rental vehicles. Assist with vehicle parking and retrieval in CCAM-enabled environments, potentially coordinating with autonomous vehicle systems.

16. Surveillance Operators

- ISCO-08: 5414 (Security guards); Skill level 2

Role: Surveillance Operators (including transport surveillance staff, parking enforcement officers, and traffic violation officers) are responsible for monitoring public transport systems, enforcing regulations, and ensuring safety. In CCAM contexts, these roles evolve to use digital surveillance tools, automated violation detection systems, and real-time data platforms to manage connected and automated mobility environments efficiently.

17. Mobility and services platform managers

- ISCO-08: 2421 Management and organization analysts; ISCO skill level: 4

Role: Mobility and Services Platform Managers such as MaaS Managers and AV Fleet Managers, oversee the integration and operation of connected mobility services and automated vehicle fleets. They manage digital platforms for MaaS, coordinate data-driven operations, ensure compliance with safety and cybersecurity standards, and optimize service delivery through analytics and automation. In CCAM, these roles are critical for orchestrating real-time multimodal transport systems, fleet connectivity, and user experience in highly automated environments.

18. Remote Operations

- ISCO-08: 4222 contact centre information clerks, 4323 transport clerks; ISCO skill level: 2

Role: Handle remote assistance for drivers and passengers, monitor vehicle systems, issue tickets or tolls, and support electric vehicle operations. In CCAM, these roles evolve to include digital interaction platforms, real-time data monitoring, and coordination with automated systems, ensuring seamless service delivery and safety in highly connected transport ecosystems.

19. Drivers

- Currently ISCO-08: 83 Drivers and Mobile Plant Operators; Skill level 2

Drivers in CCAM transition from traditional vehicle operation to supervising and interacting with automated systems. Their role focuses on monitoring autonomous functions, managing exceptions, and ensuring safety during handover situations. They also provide feedback on system performance and adapt to new mobility services, emphasizing situational awareness and compliance with evolving regulations. This will likely lead to new ISCO codes and higher skill level classifications.

20. Freight, Warehouse & Port workers

- ISCO-08: 9333 (Freight handler working manually or with semi-automated systems); Skill level 1

Role: Supervising, and coordinating automated loading/unloading systems, ensuring safe interaction between autonomous freight vehicles and digital logistics platforms. Assist in loading/unloading goods from automated delivery vehicles or drones. Support automated sorting and dispatch systems in urban logistics centers.

- ISCO-08 4321 (Stock Clerks) or 4323 (Transport Clerks); Skill Level 2

Role: Oversee the final leg of delivery, ensuring packages are received and systems function properly. Monitor automated systems (e.g., AGVs, conveyors). Input and verify data in warehouse management systems (WMS). Coordinate with technical teams for system alerts or errors.

21. Logistics managers

- ISCO-08: 1324 Supply, Distribution and Related Managers; Skill level 4

Role: Responsible for goods mobility management in urban areas; coordination between shippers, logistics service providers and retailers. Coordinates and manage the logistics of automated and connected vehicle shipments, ensuring compliance with international regulations and optimizing the efficiency of transportation networks

- ISCO-08: 4323 Transport Clerks; ISCO skill level: 2

Role: Transport Clerks in CCAM manage digital documentation and real-time data flows for connected and automated transport systems. They coordinate schedules, monitor vehicle status through telematics platforms, and ensure compliance with smart mobility regulations, supporting seamless integration of automated logistics and passenger services.

22. Traffic Control & Signalling

- ISCO-08: 4323 (Transport Clerks); Skill level 3

Role: Traffic Control & Signalling roles such as rail signallers, traffic controllers, and autonomous traffic coordinators, manage the safe and efficient movement of vehicles and trains. In CCAM, these roles evolve to operate digital signalling systems, automated traffic management platforms, and real-time coordination tools to ensure seamless integration of connected and automated vehicles within multimodal transport networks.

23. **Human Resources & Organizational Development**

- ISCO-08 2423 (Personnel and Careers Professionals); Skill level 4

Role: Manages recruitment, onboarding, and well-being of remote operators, including ergonomic and mental health support.

Policy & Regulation

24. Legal & Regulatory professionals

- ISCO-08: 2619 (Legal professionals not elsewhere classified); Skill level 4

Role: Ensures that companies developing and deploying CCAM technologies comply with local, national, and international regulations navigates and comply with regulations. Specializes in the legal aspects of data collection, storage, and sharing for connected vehicles, ensuring compliance with privacy laws and regulations. Focuses on the legal implications of cybersecurity threats to connected and automated vehicles, advising on risk management and compliance. Formulate and stablish suitable regulations and legal framework for the operation of autonomous vehicles and managing issues related to the future vehicles as well as solve liability issues in case of failure or incident occurrence and develop ethical rules for the robots.

25. Policy makers (local, municipal, regional, national, EU levels)

- ISCO-08: 2422 (Policy Administration Professionals); Skill level 4

Role: Designing, evaluating, and implementing public policies (CCAM related). Facilitate dialogue with citizens during CCAM testing and deployment phases. Advocate for fair labor practices in environments managed by algorithms, ensuring certified staff are protected and systemic failures are properly investigated.

26. Insurance & Risk Assessment professionals

- ISCO-08: 2412 (Financial and Investment Advisers) 2413 (Financial Analyst), 2619 (legal professionals not elsewhere classified), 2421 (Lawyers); Skill level 4

Role: enabling the safe and sustainable deployment of Connected, Cooperative and Automated Mobility. They assess financial, legal, and operational risks associated with automated vehicles, connected infrastructure, and emerging mobility services. Their responsibilities include developing new insurance

models for shared and autonomous fleets, evaluating liability frameworks, ensuring regulatory compliance, and advising on investment strategies to mitigate uncertainties. By integrating data-driven risk analysis and legal expertise, they help build trust and resilience in CCAM ecosystems.

- ISCO-08: 2412 Financial and Investment Advisers; ISCO skill level: 3

Role: Adapts traditional insurance practices to the CCAM landscape

27. Ethics & Philosophy experts

- ISCO-08: 2633 (Philosophers), 2632 (Sociologists); Skill level 4

Role: Ensure that the development and deployment of connected and automated mobility systems adhere to ethical principles, addressing societal, environmental, and regulatory challenges

28. Socioeconomic & Impact Analyst

- ISCO-08: 2631 Transport Economist, 2635 Social Impact Analysts ; ISCO skill level: 4

Role: Assess the economic, social, and environmental implications of CCAM technologies and services. They conduct cost-benefit analyses, evaluate equity and accessibility impacts, and provide insights for policy and investment decisions. They also assess societal readiness for CCAM, examining public acceptance, trust in automation, behavioural responses, and the institutional and community conditions required for successful adoption. These roles ensure that CCAM solutions are financially viable, socially inclusive, and aligned with sustainability goals, supporting strategic planning and regulatory compliance.

29. Health, Safety & Ergonomics

- ISCO-08 2263 Environmental and Occupational Health and Hygiene Professionals; Skill level 4

Ensure that new mobility technologies are implemented safely for workers and users. They assess risks, develop safety protocols, and support compliance in evolving transport environments.

Market & Commercial Development

30. Sales workers:

- ISCO-08: 5249 Sales Workers Not Elsewhere Classified; ISCO skill level: 2

Role: Sales workers (including vehicle sales representatives, charging station attendants, and car rental agents) play an important role in customer interaction and service delivery in CCAM ecosystems. Their responsibilities extend beyond traditional sales to include explaining advanced vehicle technologies, managing digital handover processes, and supporting connected services. They ensure customers understand automated features, charging infrastructure, and digital platforms, contributing to a smooth transition toward smart mobility solutions.

31. Sales & Marketing specialists

- ISCO-08: 2431 (advertising and marketing professionals), 2432 (Public relations professionals); Skill level 4

Role: Includes vehicle sales professionals, marketing experts, business development managers, and service designers. Are responsible for promoting and designing mobility services in CCAM ecosystems. They develop strategies for automated and connected vehicle markets, manage digital campaigns, and design user-centric services. These roles ensure market adoption, customer engagement, and business

growth by leveraging data analytics, digital platforms, and innovative service models tailored to smart mobility.

Training & Education

32. Trainers

- ISCO-08: 5165 driving instructors ; ISCO skill level: 2

Role: Driving Instructors are evolving from traditional driver training to CCAM-focused roles, including simulator-based instruction, AV safety protocols, and connected mobility operations. They ensure drivers and operators understand automation levels, teleoperation procedures, and digital tools, supporting safe integration of automated vehicles into transport systems.

- ISCO-08: 4323 transport clerks ; ISCO skill level: 2-3

Role: Transport Clerks in training roles focus on educating staff on operational processes and digital tools used in CCAM environments. They deliver courses on traffic coordination, automated signalling systems, and safety protocols for connected mobility. These roles ensure that personnel can effectively manage digital platforms, respond to incidents, and comply with data protection and cybersecurity standards in highly automated transport systems.

33. Educational Program Developers

- ISCO-08: Group 23 (Education Specialists), Skill level 4

Role: Curriculum Developers (all levels of education), Simulation-Based Learning Developers

The consolidated set of 33 job families demonstrates the **multidimensional** nature of CCAM deployment, encompassing technical, operational, regulatory, and societal domains. Nearly half of these families are concentrated in design and development activities, which include engineers, software and systems developers, cybersecurity experts, data science and analytics specialists, and HMI/UX professionals. These profiles form the technological core of CCAM and are essential for enabling automation, connectivity, and interoperability. They require advanced expertise in areas such as artificial intelligence, IoT, V2X communication, functional safety standards like ISO 26262 and SOTIF, and cybersecurity, placing them firmly at ISCO skill level 4.

Alongside this technological foundation, new families are emerging that reflect the growing importance of **digital and data-driven operations**. Roles such as mobility and services platform managers, remote operations specialists, and predictive maintenance analysts illustrate the shift toward real-time analytics, tele-supervision, and integrated service platforms. These positions demand hybrid skill sets that combine technical proficiency with operational oversight, reinforcing the need for interdisciplinary training.

The **operational backbone** of CCAM represented by manufacturing and assembly, maintenance and repair, and infrastructure deployment remains vital but is undergoing significant transformation. Traditional mechanical tasks are increasingly complemented by digital diagnostics, sensor calibration, and predictive maintenance. This evolution **elevates skill requirements** from basic manual competencies to digital literacy and system interaction, particularly for ISCO levels 2 and 3.

Beyond technology, CCAM introduces **strategic and societal dimensions** that are equally key. Job families such as policy makers, legal and regulatory professionals, insurance and risk assessment experts, and socioeconomic analysts ensure governance, liability management, ethical compliance, and societal

acceptance. These roles require advanced analytical and legal expertise, highlighting the importance of **cross-disciplinary knowledge**.

Market uptake and user-centric design also play an essential role in CCAM's success. The inclusion of sales and marketing specialists, service and business designers, and accessibility and inclusion experts underscores the need to bridge technology with end-user experience. These roles demand strong communication skills, behavioral analysis capabilities, and a commitment to universal design principles.

In terms of **skill-level distribution**, ISCO levels 3 and 4 dominate, accounting for more than 70 percent of the job families and confirming CCAM's reliance on highly qualified professionals in engineering, IT, and data science. Levels 1 and 2 persist in support and customer-facing roles such as travel attendants, charging station attendants, and warehouse assistants, but these profiles will require reskilling in digital tools, safety protocols, and interaction with automated systems to remain relevant. Training strategies must therefore combine advanced technical modules for high-skill roles with digital literacy and human-machine interaction basics for operational staff.

The **taxonomy of job families** provides a clear roadmap for targeted reskilling and upskilling initiatives. It emphasizes the urgency of developing modular, stackable training programs aligned with SAE automation levels, integrating cybersecurity, data governance, and AI competencies into technical curricula, and embedding soft skills and inclusivity principles across all profiles to ensure societal acceptance and user trust.

4. Taxonomy of skills

The mapping of jobs within the definition of existing and new profiles for the CCAM, are the starting point to develop a taxonomy. This taxonomy outlines the knowledge and skills relevant to CCAM and it has been developed drawing upon insights from the Drive2theFuture (https://www.drive2thefuture.eu/) project and the ESCO classification (https://esco.ec.europa.eu/es). The taxonomy is aligned with various levels of automation and the corresponding training requirements, offering valuable contributions to Tasks 4.2 and 4.3 in WP4.

A taxonomy is a hierarchical classification that organizes and groups elements systematically according to their principles and shared characteristics. In this deliverable, taxonomy is understood as a tool to classify professional skills that apply to each of the job families, with the aim of facilitating the understanding, study, and identification of each of them in their application to CCAM according to each of the SAE levels of automation, applied to the road domain.

Thus, taxonomy is established as a reference tool to determine the skills required in each of the profiles (or job families) depending on the degree of automation of the processes or the degree of penetration of CCAM in the professional field. Knowledge of each of the skills foreseen in each phase will allow for a better focus on the training needs of each profile, enabling work on those competencies that require reskilling or upskilling, thereby anticipating the market and placing people at the center.

4.1. Drive2theFuture and ESCO classification

The Drive2theFuture project aimed to prepare “drivers”, travellers and vehicle operators of the future to accept and use connected, cooperative and automated transport modes and the industry of these technologies to understand and meet their needs and wants. Drive2theFuture has developed a taxonomy of skills and knowledge for AV operations. Specifically, the relevant skills and knowledge have been identified for each transport mode and automation level. The operation task was therefore decomposed into the cognitive domain and key related factors were extracted, revealing the anticipated skills of the operator as well as training needs.

One of the outcomes of the Drive2TheFuture project was identifying and investigating the skills and knowledge required for an efficient and proper operation of any autonomous vehicle. In Drive2TheFuture, skills are defined as the expertise and the ability to efficiently perform a simple or more complex task and have been categorized in technical skills, social skills (like team working or communication), soft skills (like IT skills) or labour skills. Knowledge is the information, awareness or familiarity someone should have in order to get expertise and be able to perform a task.
To do this, the Drive2theFuture project reviewed websites, articles, scientific papers and deliverables for identifying the requirements for all workers and drivers ; additionally the project considered professional and private operators as well as all transportation sectors and vehicle types to reveal the new needs arisen from automation. Furthermore, all automation levels were taken into consideration as each one has different requirements while the autonomous vehicle operation will be decomposed into the cognitive domain. Finally, the skills and knowledge were evaluated for their importance and prioritized accordingly.
According to the SAE International, there are six levels of driving automation, from Level 0 (no driving automation) to level 5 (full driving automation) in the context of motor vehicles and their operations in roadways :

- Level 0: No Driving Automation
- Level 1: Driver Assistance
- Level 2: Partial Driving Automation
- Level 3: Conditional Driving Automation
- Level 4: High Driving Automation
- Level 5: Full Driving Automation

The levels apply to the driving automation feature(s) that are engaged in any given instance of on-road operation of an equipped vehicle. SAE also refers to three primary actors in driving: the (human) user, the driving automation system, and other vehicle systems and components.

These SAE levels underpin CCAM role evolution in both, vehicle operation and manufacturing and digitalisation domains.

A description of each of the SAE levels is shown in the following figure:

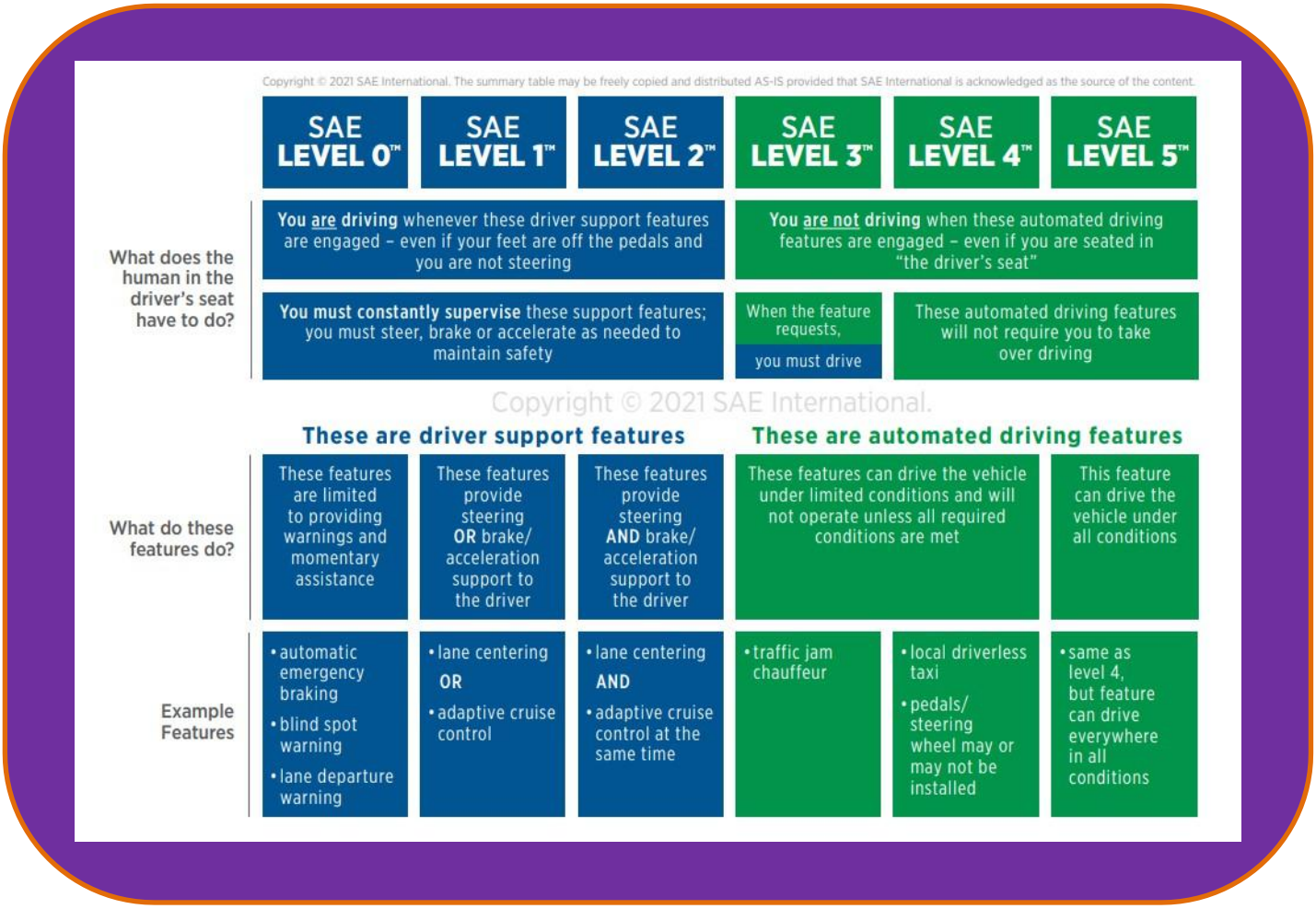

Figure 2 SAE International levels, 2021.

In case of autonomous vehicles of levels 2 and 3 the driver should continuously cooperate and collaborate with the vehicle on the driving task. The driver should be able to monitor the systems not only in terms of supervising their status but also their performance and their appropriate operation. The intensity of monitoring or "vigilant attention" as it is called, is higher in levels 2 and 3 and decreases in level 4 and 5 and requires driver concentration maintenance and supervision skills (Alonso Raposo et al., 2018). Knowledge of the location of these systems and sensors should also be gained so that they are not blocked resulting in inaccurate or no information.

Additionally, it is necessary for the driver of levels of automation 3 and 4 to be able to take over the vehicle control when necessary either due to system limitations or failure. The control take over could be either from automated function to manual or between different levels of automation. This transition of control should be performed in a safe way and within a specific time period (short notice) and therefore it is necessary that the driver keeps high levels of situational awareness and concentration even if he is engaged in secondary tasks.

The autonomous operation of the vehicles of all automation levels is exclusively based on the various sensors, systems and the algorithms developed making them work properly as well as the efficient communication with the other vehicles and the infrastructure. ICT skills are necessary for vehicle manufacturing and people with programming skills and experts in machine learning and artificial intelligence are needed for the algorithms and software development so that the autonomous vehicles can understand the surroundings, detect any (physical) object around (vehicle, motorcycle, bicycle, pedestrian, lane crossing, lane marking, etc) and (re)act in a safe and efficient way.

The road sector is considered to be very complex as the vehicle coexists with other autonomous vehicles, conventional ones, motorcycles, cyclists and pedestrians and therefore the safe and appropriate interaction and communication between all road users is of major importance. The sensors installed in the vehicle serving the communication, detection and reaction should be able to scan the surroundings of the vehicle and transmit the correct information and messages to the driver or the “driver” so that he understands the information and reacts appropriately. In automation levels 3 and 4 the vehicle communicates with the infrastructure and its various units (lane marking, traffic lights, etc) and as a result both the vehicle and infrastructure units should exchange information in order to keep the vehicle into track or adapt its speed according to the traffic light signalization. For this reason, infrastructure characteristics should be appropriately designed for supporting communication and information exchange and the road surface should be of good quality to support it (Fiedler et al., 2019). The interaction and communication skills of the autonomous vehicle with the surroundings is the basis for its safe operation and coexistence with the other users of the road network. People working in the TMC should have the knowledge of recognizing the data received and the skills to pro-cess and analyse it.

Considering the SAE classification, Drive2theFuture project summarizes in the table below all the skills and knowledge necessary for AV operations in the road sector. That projectcategorized the skills into social, programming and computer skills, engineering/technical skills, driver skills & knowlege, remote operations, communication skills, traffic management center and legal knowledge. RESKILLING has included these skills into the new taxonomy, but taking into account that the concept of this project is broader, in the sense that it includes not only the driving aspect, but also dismantling, decommissioning, recycling, passenger assistance, insurance, compliance, and legal matters, among others, which surround the concept of CCAM.

Skills	Description
Social Skills	Communication, Team working, organization, problem-solving
Programming and Computer Skills	Artificial Intelligence, Algorithms, software development, backend/frontend skills, machine learning, higher-order skills in big data analytics Cybersecurity and encryption protection, security systems for protecting external communication for AVs, data protection
Engineering/ Technical Skills	Sensors and systems development, hardware development, Robotics, electrical engineering, automotive engineering, digital road map database access, firmware, Smart Traffic Light controller system, smart signs, advisory road marking, etc Testing and Simulation Skills
Driver Skills and Knowledge	Cooperation and collaboration with the vehicle, Efficiently monitoring and supervising the system, Concentration maintenance, Familiarity with all electronic devices and sensors on and inside the vehicle, limitations and capabilities, Understanding of the information and warnings from the systems based on the surroundings, Knowledge of differences among different levels of automation, Situational awareness and transition of control skills, Capability of recognizing errors and malfunctions and act properly
Remote operation	Skills and knowledge for efficient remote monitoring of the PT and freight and logistics transport operations in confined areas
Communication skills	V2I and V2V communication model, Wireless communication, ad hoc network, DSRC Multi-Channel Test Tool
Traffic management center	Collection and processing skills from the data transmitted from the infrastructure and the vehicles
Legal knowledge	Legal framework and standards for the autonomous vehicle operation Social legislation and its adaptation to autonomous vehicle operations (driving and rest time rules) Liability issues in case of incident occurrence Data generated by V2X infrastructures to be compliant with national or international law

Figure 3 Drive2theFuture taxonomy.

To complement the list of skills needed in the CCAM, the RESKILLING project is based also in the ESCO (European Skills, Competences, Qualifications and Occupations) classification. ESCO is the European multilingual classification of Skills, Competences and Occupations.

ESCO works as a dictionary, describing, identifying and classifying professional occupations and skills relevant for the EU labour market and education and training. Those concepts and the relationships between them can be understood by electronic systems, which allows different online platforms to use ESCO for services like matching jobseekers to jobs on the basis of their skills, suggesting trainings to people who want to reskill or upskill, etc. The aim of ESCO is to support job mobility across Europe and therefore a more integrated and efficient labour market, by offering a “common language” on occupations and skills that can be used by different stakeholders on employment and education and training topics.

The ESCO skills pillar distinguishes between i) skill/competence concepts and ii) knowledge concepts by indicating the skill type. There is however no distinction between skills and competences. Every concept also includes an explanation in the form of description.

4.2. Methodology

As described in Section 3.1, the methodology for developing a taxonomy in the RESKILLING project will be based primarily on the Drive2theFuture project and the European ESCO classification. Drive2theFuture mainly provides the skills required for automated mobility, considering primarily the driving perspective and aligning each of them with the levels of automation defined by SAE. The classification of skills and knowledge carried out by ESCO offers a generic view of the needs of current professional profiles, including those categories or job families considered in RESKILLING, such as legal aspects, unskilled work, construction, assembly and disassembly, or programming.

The contribution of RESKILLING lies in bringing together all identified job families into a single taxonomy and in developing a complete list of skills and knowledge for each of them, drawing on information from both Drive2theFuture and ESCO, and aligning them with SAE levels. RESKILLING therefore provides a broader perspective on professional profiles than that carried out exclusively for driving in Drive2theFuture, while also incorporating a more diverse and updated set of skills adapted to future needs than that provided by ESCO. The taxonomy for classifying CCAM skills has been developed exclusively for the road transport mode.

Specifically, the steps for developing the taxonomy in RESKILLING are:

1. Obtain the classification of each job family. These job families may include several professional profiles depending on an ISCO-08 and an ISCO skill level.
2. Build a matrix for each job family. This matrix consists of a header with the name of the job family, its ISCO-08, its ISCO skill level, and its description. In one column, the list of skills obtained mainly from ESCO is included, as well as from the research team's work based on information gathered from other areas of the literature and from the Drive2theFuture project applied to CCAM.
3. Next to each skill, the definition of each skill or knowledge is provided.
4. In different columns, the SAE levels for road transport are inserted. The need for each skill at each level will be represented using a color code. Green indicates that the skill is necessary for that level; orange indicates that the skill is partially required; red indicates the absence of need for that skill at the specific automation level.
5. The matrix includes a field for specific comments and considerations. These comments allow emphasis on aspects of the skill or its description, or on its application to each level of automation, since the line separating the skill and the level of automation is, in some cases, very thin.

JOB FAMILY#1 (ISCO-08: XX; ISCO skill level: X).

SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)					
		JOB FAMILY DESCRIPTION	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automat
1	SKILL 1	Description skill 1						
2	SKILL 2	Description skill 2						
3	SKILL 3	Description skill 3						
4	SKILL 4	Description skill 4						

The skill is needed for the SAE level
The skill is needed partially for the SAE level
The skill is not needed for the SAE level

Figure 4 Methodology for the taxonomy of skills in CCAM

This taxonomy has been validated by the WP3 partners team and aims to achieve several objectives:

1. Serve as an updated scientific reference when identifying the needs and competencies required to address work related to CCAM.
2. Enable a focus on people, through the design of training programs tailored to those competencies and adapted to each phase of implementation or each SAE level.
3. More specifically, allow the determination of which existing professional profiles will disappear, which will remain, and which will emerge. In this way, educational needs can be adapted through reskilling or upskilling of certain skills in the CCAM labor field.
4. Within the RESKILLING project, this taxonomy represents an added-value input for WP4; based on this taxonomy, different training programs will be developed for certain profiles to help improve the competencies needed to address CCAM.

The full taxonomy for the CCAM can be explored in the ANNEX II Taxonomy.

4.3. Taxonomy's outcomes

The taxonomy of skills and knowledge for each of the job families provides different perspectives and results to be taken into account, related to:

- Differences between levels of automation
- The nature of professional profiles: qualified vs. non-qualified workers
- Professions with a more technological focus
- Emerging and disappearing professions

4.3.1. Levels of automation connotations

An important aspect to consider is the existence of slight differences in certain cases when assigning the relevance of a specific skill in CCAM to the corresponding SAE level. These differences include:

- SAE levels 1 and 2 – Driver Assistance and Partial Automation. Our criterion assumes that since some human intervention may still be required at SAE Level 2 (Partial Automation), the relevant skills identified for SAE level 1 also remain applicable at the following level.
- SAE levels 3 and 4 – Conditional Automation and High Automation. We have applied the same reasoning here. As automation progressively increases, we consider that the relevant skills at SAE level 3 largely continue to apply at SAE level 4.

In addition, the tasks have been carried out by ZLC and reviewed by the consortium partners participating in WP3, who have validated both the taxonomy and the allocation of skills to each SAE level across all job families.

4.3.2. Qualified vs. non-qualified workers

The taxonomy reflects substantial differences between skilled jobs corresponding to ISCO skill level 4 and unskilled jobs ISCO skill level 1 or 2. In the course of the evolution toward automated operations, manual labor tends to disappear. A clear example is shown in the figure below for freight and warehouse operators: A large part of the skills required for the performance of daily work will no longer be necessary as automation levels advance. Monitoring, manual work on shelves, observation of operations, loading and unloading, and many other activities will gradually be automated from level 1 to level 5 (full automation). Many of these professional profiles will disappear, while new ones will emerge, requiring higher qualifications, since the necessary skills will be linked to training abilities related to new technologies rather than to the transversal or universal skills typical of unskilled professions.

FREIGHT AND WAREHOUSE (ISCO-08: 93; ISCO skill level: 1).							
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)				
		Supervising, and coordinating automated loading/unloading systems, ensuring safe interaction between autonomous freight vehicles and digital logistics platforms. Assist in loading/unloading goods from automated delivery vehicles or drones. Support automated sorting and dispatch systems in urban logistics centers.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation
1	Communicate verbal instructions	Communicate transparent instructions. Ensure that messages are understood and followed correctly.					
2	Analyse work-related written reports	Read and comprehend job-related reports, analyse the content of reports and apply findings to daily work operations.					
3	Give instructions to staff	Give instructions to subordinates by employing various communication techniques. Adjust communication style to the target audience in order to convey instructions as intended.					
4	Have computer literacy	Utilise computers, IT equipment and modern day technology in an efficient way.					
5	Keep task records	Organise and classify records of prepared reports and correspondence related to the performed work and progress records of tasks.					
6	Manage assignment of routes	Supervise the work of others and effectively coordinate the completion of regularly assigned routes via various check-in systems.					
7	Match vehicles with routes	Match types of vehicles to transport routes, taking into consideration service frequency, peak transport times, service area covered, and road conditions.					
8	Monitor condition of local roads	Know local streets and their condition in order to provide efficient and timely transportation services.					
9	Monitor drivers	Ensure that drivers meet the legal requirements to operate, arrive at work at required times, present no signs of alcohol or drug abuse, and follow the commissioned itineraries of the day. Monitor drivers to ensure quality work performance and efficiency. Ensure maintenance of record of time expended and distances covered.					
10	Plan schedule	Develop the schedule including procedures, appointments and working hours					
11	Prepare transportation routes	Prepare routes through the addition or subtraction of routes, making changes to route frequency, and changing the service span of routes. Adjusts routes through providing additional running time to routes, adding additional capacity during periods of overcrowding (or reducing capacity during periods of low passenger numbers), and adjusting departure times in response to changes in circumstances along a given route, thereby ensuring efficient use of resources and achievement of customer relations goals.;					
12	Schedule and dispatch drivers	Schedule and dispatch drivers, working equipment and service vehicles to desired locations as requested by customers; use telephone or radio communication.					
13	Road transport legislation	The regulations at regional, national, and European level on safety and environmental requirements for road transport operations.					
14	Supervise and coordinate automated systems	Supervising, and coordinating automated loading/unloading systems, ensuring safe interaction between autonomous freight vehicles and digital logistics platforms					
15	Assist un/loading operations with automated systems	Assist in loading/unloading goods from automated delivery vehicles or drones.					
16	Support automated sorting and dispatch systems	Support automated sorting and dispatch systems in urban logistics centers.					

Figure 5 Freight and warehouse workers (ISCO-08 93) taxonomy

The opposite case would be that of professionals with ISCO skill level 4, that is, qualified professionals. An example of this would be the job family “Engineers”. In this case, the current skills at automation level 0 according to SAE would remain, with adjustments, at automation level 5. In other words, this would not be a scenario of job disappearance, but rather an upskilling of the competencies required for the

performance of the profession in CCAM in the medium and long term, as progress is made through the different SAE levels.

ENGINEERS (ISCO-08: 2149, 2144, 2152, 2153; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Innovating mobility solutions (vehicle technology, digital systems for transportation, AV's); development of algorithms; design vehicle systems and components; design of energy storage systems; test vehicle control software and V2X; develop robotics systems; manage communication protocols and systems; ensure vehicle safety standards; design IoT solutions for vehicle connectivity.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automati
1	Automotive engineering	The discipline of engineering that combines mechanical, electrical, electronic, software and safety engineering to design motor vehicles such as trucks, vans and automobiles.						
2	Manufacturing processes	The steps required through which a material is transformed into a product, its development and full-scale manufacturing.						
3	Design electromechanical systems	Draft sketches and design electromechanical systems, products, and components using Computer Aided Design (CAD) software and equipment.						
4	Vehicle electrical systems	Know vehicle electrical systems, including components such as the battery, starter, and alternator.						
5	Design automotion components	Design engineering parts, assemblies, products, or systems that contribute to the automation of industrial machines.						
6	Robotics components	The components that can be found in robotic systems, such as microprocessors, electronics, sensors, circuit boards, encoders, servomotors, controllers, pneumatics or hydraulics.						
7	Create software design	Transpose a series of requirements into a clear and organised software design.						
8	Keep up with industrial transformation of industrial processes	Keep up to date with digital innovations applicable to industrial processes. Integrate these transformations in the company's processes aiming for competitive and profitable business models.						
9	Computer engineering	Engineering discipline that combines computer science with electrical engineering to develop computer hardware and software. Computer engineering occupies itself with electronics, software design, and the integration of hardware and software.						
10	Design hardware	Design and develop new computer hardware systems and components. Draft blueprints and assembly drawings specifying how the computer equipment should be build.						
11	Electronics	The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications. Apply this knowledge to ensure electronic equipment runs smoothly.						
12	Sensors	Sensors are transducers that can detect or sense characteristics in their environment. They detect changes in the apparatus or environment and provide a corresponding optical or electrical signal. Sensors are commonly divided in six classes: mechanical, electronic, thermal, magnetic, electrochemical, and optical sensors.						
13	ICT communication protocols	The system of rules which allow the exchange of information between computers or other devices via computer networks.						
14	Coordinate technological activities	Give instructions to colleagues and other cooperating parties in order to reach the desired outcome of a technological project or achieve set goals within an organisation dealing with technology.						
15	Analyse business requirements	Study clients' needs and expectations for a product or service in order to identify and resolve inconsistencies and possible disagreements of involved stakeholders.						
16	Provide ICT system training	Plan and conduct training of staff on system and network issues. Utilise training material, evaluate and report on the learning progress of trainees.						

Figure 6 Engineers taxonomy (ISCO-08 :2149, 2144, 2152 and 2153)

In conclusion, training efforts should be directed in two ways:

1. Ensuring that unskilled professionals can reorient their professional performance toward the new needs of CCAM, often having to acquire new skills (“reskilling”) and being inmersed in new educational programs, in order to remain in the market.
2. Providing sufficient training to skilled professionals so that the upskilling of their abilities is aligned with the needs of each moment, according to the level of automation in which they find themselves.

4.3.3. Technological focus skills

A direct consequence of the penetration of CCAM across each and every evolutionary level will be the need to incorporate new technologies into all processes. In this regard, the work of professionals responsible for programming, algorithm design, data management, data analytics, etc., will be crucial. In any case, not only will professions with technological skills be revalued, but they will also have to accompany this process through learning and evolution that will require an upskilling of their abilities. An example of this can be seen in the job family “Data Science & Analytics” where the ”comments” column places special emphasis on the critical importance of training in areas such as AI, data management, or advanced analytics for the proper performance of professions related to CCAM.

DATA SCIENCE & ANALYTICS EXPERTS (ISCO-08: 2511; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Analyzes data to improve vehicle algorithms and performance. Implements artificial intelligence for vehicle decision-making. Design and implement intelligent transportation solutions using autonomous vehicles. They develop algorithms for fleet optimization, ride-sharing efficiency, and real-time traffic adaptation. Analyze real-time traffic, vehicle, and user data to optimize routes, improve safety, and enhance service delivery.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Analyse big data	Collect and evaluate numerical data in large quantities, especially for the purpose of identifying patterns between the data.						
2	Establish data processes	Use ICT tools to apply mathematical, algorithmic or other data manipulation processes in order to create information.						
3	Manage data	Administer all types of data resources through their lifecycle by performing data profiling, parsing, standardisation, identity resolution, cleansing, enhancement and auditing. Ensure the data is fit for purpose, using specialised ICT tools to fulfil the data quality criteria.						
4	Use data processing techniques	Gather, process and analyse relevant data and information, properly store and update data and represent figures and data using charts and statistical diagrams.						
5	Apply statistical analysis techniques	Use models (descriptive or inferential statistics) and techniques (data mining or machine learning) for statistical analysis and ICT tools to analyse data, uncover correlations and forecast trends.						
6	Execute analytical mathematical calculations	Apply mathematical methods and make use of calculation technologies in order to perform analyses and devise solutions to specific problems.						
7	Perform data mining	Explore large datasets to reveal patterns using statistics, database systems or artificial intelligence and present the information in a comprehensible way.						
8	Business analytics	The disciplines and technologies for solving business problems through employing quantitative methods such as data analysis and statistical models.						
9	Perform data cleansing	Detect and correct corrupt records from data sets, ensure that the data become and remain structured according to guidelines.						
10	Data ethics	The subfield of ethics that assess whether data practices are considerable ethical. It assesses processes such as collecting, analysing and disseminating structured and unstructured data that might negatively impact the society.						
11	Statistics	The study of statistical theory, methods and practices such as collection, organisation, analysis, interpretation and presentation of data. It deals with all aspects of data including the planning of data collection in terms of the design of surveys and experiments in order to forecast and plan work-related activities.						
12	Query languages	The field of standardised computer languages for retrieval of information from a database and of documents containing the needed information.						
13	Information structure	The type of infrastructure which defines the format of data: semi-structured, unstructured and structured.						
14	Resource description framework query language	The query languages such as SPARQL which are used to retrieve and manipulate data stored in Resource Description Framework format (RDF).						
15	Information confidentiality	The mechanisms and regulations which allow for selective access control and guarantee that only authorised parties (people, processes, systems and devices) have access to data, the way to comply with confidential information and the risks of non-compliance.						
16	Collect ICT data	Gather data by designing and applying search and sampling methods.						
17	Interpret current data	Analyse data gathered from sources such as market data, scientific papers, customer requirements and questionnaires which are current and up-to-date in order to assess development and innovation in areas of expertise.						
18	Report analysis results	Produce research documents or give presentations to report the results of a conducted research and analysis project, indicating the analysis procedures and methods which led to the results, as well as potential interpretations of the results.						
19	Data science	The field of study that deals with big amount of data using AI techniques such as machine learning algorithms to predict patterns and obtain useful information to make business decisions						
20	Deliver visual presentation of data	Create visual representations of data such as charts or diagrams for easier understanding.						

Figure 7 Data science and analytics expert taxonomy (ISCO-08 :2511)

4.3.4. Dissapearing and emerging professions: New skills

A section that deserves special attention is that of emerging professions, resulting from new skills projected across the different SAE levels and arising from the needs generated by the penetration of CCAM. Identifying these needs will enable several short-term actions:

- Provide a framework for defining the skills associated with these new professions : e.g., Additive Manufacturing Process Engineer, Simulation-based AM developer, and recycled filament technician.
- Supply trainers with the necessary information to design training programs, so that the preparation of new professionals can be carried out in a timely and appropriate manner according to each CCAM level.
- Raise awareness in society, with sufficient anticipation, of the emerging needs and opportunities in the labor market, and provide the information tools and channels through which the corresponding training can be delivered.

An example of this is the job family “Insurance and Risk Assessment Professionals.” While professions related to risk evaluation and insurance management are not new, a new branch of knowledge is opening in connection with CCAM, which will need to be addressed almost from scratch. In the following image, the specialized new skills that will need to be acquired can be observed, having attention to the corresponding comments column.

INSURANCE & RISK ASSESSMENT PROFESSIONALS (ISCO-08: 2619; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Specializes in assessing legal responsibility in incidents involving autonomous systems.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Tort Law Expertise	Deep understanding of civil liability principles, including negligence, strict liability, and product liability.						
2	Technology Law Literacy	Familiarity with legal frameworks governing AI, robotics, and autonomous systems.						
3	Regulatory Analysis	Ability to interpret and apply national and international regulations related to autonomous mobility.						
4	Incident Reconstruction	Skill in analyzing data and evidence to reconstruct events involving autonomous systems.						
5	Data Forensics	Understanding of digital evidence, including sensor logs, telematics, and algorithmic decision trails.						
6	Contractual Risk Assessment	Evaluating liability clauses in contracts between manufacturers, operators, and users of autonomous systems.						
7	Ethical Reasoning	Applying ethical frameworks to assess responsibility in complex, multi-agent scenarios.						
8	AI Decision-Making Interpretation	Ability to interpret and critique algorithmic behavior and its legal implications.						
9	Cross-disciplinary Communication	Collaborating effectively with engineers, insurers, and policymakers to build legal arguments.						
10	Case Law Research	Staying updated on precedents and evolving jurisprudence related to autonomous technologies.						
11	Expert Witness Coordination	Working with technical experts to support legal claims or defenses in litigation.						
12	Risk Mitigation Strategy	Advising stakeholders on how to reduce legal exposure in autonomous deployments.						
13	Privacy & Consent Analysis	Evaluating how data collection and usage affect liability in incidents.						
14	International Law Awareness	Understanding cross-border legal issues in global autonomous system operations.						
15	Litigation & Dispute Resolution	Managing legal processes, from pre-trial investigation to courtroom strategy and settlement.						
16	Advise on legal decisions	Advise judges, or other officials in legal decision-making positions, on which decision would be right, compliant with the law and with moral considerations, or most advantageous for the adviser's client, in a specific case.						
17	Observe confidentiality	Observe the set of rules establishing the nondisclosure of information except to another authorised person.						

Figure 8 Insurance and risk assessment professionals taxonomy (ISCO-08 : 2619)

Another similar example corresponds to the job family “Mobility and Service Platform Managers”, since it is entirely linked to CCAM-related professional profiles, such as MaaS Managers and AV Fleet Managers, in operations aimed at overseeing the integration and operation of connected mobility services and automated vehicle fleets. Among their competencies and tasks are the coordination of data-driven operations, ensuring compliance with safety and cybersecurity standards, and optimizing service delivery through analytics and automation. Within CCAM, these roles are critical for orchestrating real-time multimodal transport systems, fleet connectivity, and user experience in highly automated environments.

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As it can be observed in the figure below, some of the needed skills doesn't apply for the SAE level 0, as this level has no automation and are progressing substantially as long as the SAE levels increase.

Mobility and services platform managers (ISCO-08: 2421 Management and organization analysts; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Mobility and Services Platform Managers such as MaaS Managers and AV Fleet Managers, oversee the integration and operation of connected mobility services and automated vehicle fleets. They manage digital platforms for MaaS, coordinate data-driven operations, ensure compliance with safety and cybersecurity standards, and optimize service delivery through analytics and automation. In CCAM, these roles are critical for orchestrating real-time multimodal transport systems, fleet connectivity, and user experience in highly automated environments.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Develop organizational strategies	Design and implement strategies for MaaS and AV fleet operations.						
2	Manage digital platforms	Oversee MaaS platforms and ensure seamless integration of services.						
3	Apply data analytics for decision-making	Use big data to optimize fleet and mobility services.						
4	Ensure compliance with regulatory standards	Apply legal frameworks for automated mobility and data protection.						
5	Manage automated vehicle fleets	Coordinate operations and maintenance of AV fleets.						
6	Apply cybersecurity principles	Ensure secure handling of data and protection of digital platforms.						
7	Use project management methodologies	Apply Agile or PRINCE2 for managing CCAM projects.						
8	Coordinate multimodal transport services	Integrate public transport, AVs, and shared mobility solutions.						
9	Monitor service performance	Track KPIs and operational metrics for mobility platforms.						
10	Manage stakeholder relationships	Engage with authorities, partners, and customers for CCAM services.						
11	Apply problem-solving techniques	Resolve operational and technical issues in mobility services.						
12	Use simulation tools for service planning	Model demand and fleet allocation scenarios for MaaS.						
13	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive data.						
14	Manage incident response protoc	Develop and implement plans for service disruptions and emergencies.						
15	Communicate effectively with stak	Provide clear updates and reports to decision-makers and partners.						

Figure 9 Mobility and services platform managers taxonomy (ISCO-08 : 2421)

Although the previous subsection addressed professions at risk of disappearing, for some job families this should not be seen as a threat as such, since other emerging opportunities arise within CCAM. What is true, however, is that certain conventional professions will see a reduction in the skills required at each CCAM level, as can be observed below for “Construction Workers”. This will force them to complement or redirect their daily work toward other approaches or toward specific tasks that continue to require their skills.

CONSTRUCTION WORKERS (ISCO-08: 93; ISCO skill level: 1).									
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Upgrading and maintaining roads and highways, warehouses and hubs	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Follow written instructions	Follow written directions in order to perform a task or carry out a step-by-step procedure						
2	Maintain material handling equipment	Identify and report malfunctions and damage to material handling equipment. Manage battery connections.						
3	Follow health and safety procedures in construction	Apply the relevant health and safety procedures in construction in order to prevent accidents, pollution and other risks.						
4	Guide operation of heavy construction equipment	Guide a colleague in operating a piece of heavy construction equipment. Follow the operation closely and understand when feedback is called for.						
5	Inspect asphalt	Inspect the placement of asphalt concrete ensuring that the specifications are met and no flows are present.						
6	Inspect construction supplies	Check construction supplies for damage, moisture, loss or other problems before using the material.						
7	Inspect road signs	Inspect road signs for signs of corrosion, outdated information, nicks and dents, legibility and reflectance. Decide on the course of action when problems are found.						
8	Pave asphalt layers	Use different grades of asphalt to lay the asphalt layers of a road						
9	Perform traffic sign maintenance	Install and secure road signs, and replace them if needed. Maintain traffic lights by resolving issues, replacing light bulbs and cleaning the glass covering. Control telematic systems for proper functioning.						
10	Remove road surface	Remove an existing road surface. Use the appropriate machinery or coordinate with machine operators to assist in the excavation of asphalt or concrete road coverings						
11	Transport construction supplies	Bring construction materials, tools and equipment to the construction site and store them properly taking various aspects into account such as the workers' safety and protection from deterioration						
12	Use safety equipment in construction	Use elements of protective clothing such as steel-tipped shoes, and gear such as protective goggles, in order to minimise risk of accidents in construction and to mitigate any injury if an accident does occur.						
13	Work ergonomically	Apply ergonomy principles in the organisation of the workplace while manually handling equipment and materials.						
14	Work safely with hot materials	Take care when handling hot materials. Wear the right protective clothing and take care not to burn yourself or others, damage equipment, or create fire hazards						
15	Asphalt mixes	The properties, advantages and disadvantages of asphalt mixes such as Marshall and Superpave mixes and the way they are best applied						
16	Mechanical tools	Various type of machines and tools, including their designs, uses, repair, and maintenance						
17	Types of asphalt covering	Different types of asphalt covering, based on their bitumen content and composition. The strengths, weaknesses, and price points of each type. Special properties such as porosity, resistance to skidding and noise characteristics.						

Figure 10 Construction workers taxonomy

5. Conclusions

The analysis presented in Sections 2 and 3 provides a detailed understanding of how CCAM deployment will transform the transport and mobility workforce. Insights from previous European projects, literature review, and job advertisement analysis were combined to establish a robust evidence base for identifying both existing roles undergoing transformation and emerging positions created by automation, connectivity, and digitalization.

It was confirmed that CCAM will significantly reduce traditional driving roles while creating new positions in remote operations, fleet orchestration, and customer-facing services. Existing roles such as mechanics, clerks, and planners are expected to evolve toward digital oversight, incident management, and service personalization. At the same time, entirely new profiles are emerging, including Autonomous Systems Expert, AI Specialist, AMoD services modelers and programmers, Software Integration Engineers (V2X), Electric Car Battery Support Agent, Warehouse Assistants for Smart Hubs.

The review of literature and job advertisements highlighted critical skill clusters that will underpin future workforce readiness. These include AI and data analytics, cybersecurity and privacy, functional safety and SOTIF, V2X interoperability, remote supervision, and human factors/UX. Additive manufacturing is also one of the enablers of new technical employment segments, linked to CCAM sustainability and circular supply chains. Transversal skills such as communication, adaptability, and stakeholder engagement remain essential. Training strategies must therefore be modular, stackable, and credentialed through micro-credentials and continuous professional development, aligned with automation maturity.

Job advertisement analysis reinforced these findings by showing strong demand for high-skill technical roles, with early signs of operational and vocational positions. However, blue-collar CCAM roles remain scarce, underscoring the urgency of anticipatory reskilling for maintenance and service profiles. Positions are concentrated in European R&D hubs and increasingly linked to electrification and digital services, confirming the convergence of CCAM with broader technological transitions.

The mapping exercise consolidated 110 job profiles into 33 functional job families, classified according to ISCO-08 codes and skill levels. The majority of roles correspond to ISCO skill levels 3 and 4, reflecting the predominance of highly qualified profiles in CCAM. Only a limited number of profiles were identified at skill levels 1 and 2, mainly in operational support, maintenance, and customer assistance functions. ISCO skill levels were aligned with ISCED education levels, enabling direct connection to training pathways. The mapping adopts a functional value chain perspective, covering nine stages from design and development to training and education, and includes columns for value chain stage and job family to support structured analysis and taxonomy development.

In summary, CCAM workforce transformation is cross-modal, with most roles applicable to both passenger and freight transport. While the primary focus is road transport, cross-modal roles have been included to ensure interoperability. This mapping provides a solid foundation for the taxonomy and for the design of reskilling and upskilling strategies in WP4, ensuring that future training programs are evidence-based and aligned with the evolving needs of the CCAM ecosystem.

The conclusions derived from the taxonomy are summarized below:

1. Serve as an updated scientific reference when identifying the needs and competencies required to address work related to CCAM.
2. Enable a focus on people, allowing the determination of which existing professional profiles will disappear, which will remain, and which will emerge to create and/or adapt educational needs through reskilling or upskillng of certain skills in the CCAM.

3. A direct consequence of the penetration of CCAM across each and every evolutionary level will be the need to incorporate new technologies into all processes.
4. Manual labor skills tend to disappear in some cases, whereas qualified professions remains, although upskilling of competencies will be required in CCAM in the medium and long term. Other non-qualified professions will maintain only specific tasks than can't be automated or will have to adopt new skills via educational programs.
3. According to the taxonomy, training efforts should focus on:
    - Ensuring that unskilled professionals can reorient their professional performance toward the new needs of CCAM, often having to acquire new skills ("reskilling") and being inmersed in new educational programs, in order to remain in the market.
    - Providing sufficient training to skilled professionals so that the upskilling of their abilities is aligned with the needs of each moment, according to the level of automation in which they find themselves.

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ANNEX I Jobs Mapping

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
Mobility Behavioral scientist	Analizes how people interact with new mobility technologies and designing interventions to improve user experience, safety, and overall system efficiency	Cross-modal	passengers &freight	2634	4	HMI, UX & Human Factors Experts	Design & Development
Ethics expert/Transport philosophers	Ensure that the development and deployment of connected and automated mobility systems adhere to ethical principles, addressing societal, environmental, and regulatory challenges	Cross-modal	passengers &freight	2633	4	Ethics & Philosophy Experts	Policy & Regulation
Data Scientist	Analyzes data to improve vehicle algorithms and performance.	Cross-modal	passengers &freight	2511	4	Data Science & Analytics experts	Design & Development
Mobility Innovation expert	Focuses on innovating mobility solutions, enhancing vehicle technology, and advancing digital systems for transportation, addressing autonomous vehicle research and smart infrastructure and sustainable transport strategies.	Cross-modal	passengers &freight	2149	4	Engineers	Design & Development
Autonomous Systems expert	Develops algorithms for perception, decision-making, and control in self-driving vehicles.	Cross-modal	passengers &freight	2149	4	Engineers	Design & Development
Human Factors & HMI Researcher	Studies driver/passenger interaction with automated systems.	Cross-modal	passengers	2634	4	HMI, UX & Human Factors Experts	Design & Development
Automotive Engineer	Designs and develops vehicle systems and components.	Road	passengers &freight	2144	4	Engineers	Design & Development
Automated Vehicle Assembly Technicians	Assemble vehicles with integrated sensors, AI systems, and connectivity modules.	Road	passengers &freight	3114	3	Manufacturing & Assembly Technicians	Manufacturing & Assembly
Battery and Powertrain Engineers	Design and manufacture electric drivetrains and energy storage systems.	Road	passengers &freight	2144	4	Engineers	Design & Development
Sensor and LiDAR Technicians	Install and calibrate perception systems for autonomous driving	Road	passengers &freight	3114	3	Manufacturing & Assembly Technicians	Manufacturing & Assembly
Software Integration Engineers	Embed and test vehicle control software and V2X (vehicle-to-everything) communication systems. They integrate software components like sensors, cloud platforms, and embedded systems.	Road	passengers &freight	2144	4	Engineers	Design & Development
Rail Automation Engineers	Develop and implement autonomous train control systems.	Rail	passengers &freight	2144	4	Engineers	Design & Development
Smart Infrastructure Technicians	Manufacture and maintain trackside sensors and communication systems.	Rail	passengers &freight	3114	3	Manufacturing & Assembly Technicians	Manufacturing & Assembly

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
Rail Vehicle Design engineer	Design train units with CCAM-compatible features like predictive maintenance and real-time data exchange.	Rail	passengers &freight	2144	4	Engineers	Design & Development
UAV Assembly Technicians	Build and test autonomous drones and air taxis.	Air	passengers &freight	3114	3	Manufacturing & Assembly Technicians	Manufacturing & Assembly
Remote Operations Specialists	Monitors, manages, and optimizes remote operations to ensure efficient and effective performance of CCAM systems.	Maritime	passengers &freight	2152	4	Remote Operations	Mobility Services & Logistics
Human-Machine Interface (HMI) Designers	Create intuitive interfaces for operators and passengers. Designing accessible user interfaces for CCAM systems Ensuring digital platforms are usable by people with disabilities	Cross-modal	passengers &freight	2166	4	HMI, UX & Human Factors Experts	Design & Development
Software engineers	Create and maintain software for vehicle automation.	Cross-modal	passengers &freight	2512	4	Software & Systems Development	Design & Development
Backend software engineer	Data storage services, design of APIs for proper communication between the sensors, between the vehicle and the infrastructure or between the sensors and the server/platform/cloud	Cross-modal	passengers &freight	2512	4	Software & Systems Development	Design & Development
Robotics and automation Engineer	Develops robotic systems for automated vehicles.	Cross-modal	passengers &freight	2152	4	Engineers	Design & Development
AI Specialist	Implements artificial intelligence for vehicle decision-making	Cross-modal	passengers &freight	2511	4	Data Science & Analytics experts	Design & Development
5G/6G Network Engineer	Designs, deploys, and optimizes ultra-reliable, low-latency mobile networks to enable seamless V2X communication for connected and automated vehicles. Ensures network performance supports real-time data exchange, edge computing, and safety-critical applications in dynamic mobility ecosystems	Cross-modal	passengers &freight	2152	4	Engineers	Design & Development
Telecommunication Systems and Protocols Manager	Manages communication protocols and systems.	Cross-modal	passengers &freight	2153	4	Engineers	Design & Development
Urban Planner	Designs infrastructure to support automated mobility.	Cross-modal	passengers &freight	2164	4	Urban Planning & Digital Infrastructure	Infrastructure Deployment & Operations
IoT developers (engineer)	Develops Internet of Things solutions for vehicle connectivity	Cross-modal	passengers &freight	2152	4	Engineers	Design & Development
Traffic Managers	coordinating real-time mobility flows, integrating connected vehicle data, and ensuring safe, efficient, and interoperable	Cross-modal	passengers &freight	4323	2	Traffic Control & Signalling	Mobility Services & Logistics

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
	transport systems in increasingly automated environments.						
Smart Infrastructure Technicians	Maintain trackside sensors and communication systems.	Cross-modal	passengers &freight	3114	2	Maintenance & Repair Operators	Infrastructure Deployment & Operations
App developer	Designs, builds, and maintains mobile or web applications that enable seamless communication, data exchange, and user interaction between connected vehicles, infrastructure, and mobility services.	Cross-modal	passengers &freight	2519	4	Software & Systems Development	Design & Development
Construction workers	Upgrading and maintaining roads and highways, warehouses and hubs	Cross-modal	passengers &freight	9313	1	Construction workers	Infrastructure Deployment & Operations
Safety Engineer	Ensures vehicles meet safety standards.	Cross-modal	passengers &freight	2144	4	Engineers	Design & Development
Regulatory Compliance Specialist	Ensures that companies developing and deploying CCAM technologies comply with local, national, and international regulations Navigates and comply with regulations.	Cross-modal	passengers &freight	2619	4	Legal & Regulatory professionals	Policy & Regulation
Cybersecurity Experts	Protects vehicle systems and related infrastructure from cyber threats.	Cross-modal	passengers &freight	2519	4	Cybersecurity & IT Protection Technician	Design & Development
Cybersecurity Analysts	Work remotely to protect CCAM systems from cyber threats, ensuring data integrity and system resilience.	Cross-modal	passengers &freight	351	4	Cybersecurity & IT Protection Technician	Design & Development
Insurance specialist	Adapts traditional insurance practices to the CCAM landscape	Cross-modal	passengers &freight	2412	3	Insurance & Risk Assessment Professionals	Policy & Regulation
Data Privacy Lawyer	Specializes in the legal aspects of data collection, storage, and sharing for connected vehicles, ensuring compliance with privacy laws and regulations	Cross-modal	passengers &freight	2619	4	Legal & Regulatory professionals	Policy & Regulation
Cybersecurity Legal Advisor	Focuses on the legal implications of cybersecurity threats to connected and automated vehicles, advising on risk management and compliance	Cross-modal	passengers &freight	2619	4	Legal & Regulatory professionals	Policy & Regulation
Law specialists	Formulate and stablish suitable regulations and legal framework for the operation of autonomous vehicles and	Cross-modal	passengers &freight	2619	4	Legal & Regulatory	Policy & Regulation

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
	managing issues related to the future vehicles as well as solve liability issues in case of failure or incident occurrence and develop ethical rules for the robots					professionals	
Liability Risk Assessor	Specializes in assessing legal responsibility in incidents involving autonomous systems.	Cross-modal	passengers &freight	2619	4	Insurance & Risk Assessment Professionals	Policy & Regulation
Policy Administration Professional	designing, evaluating, and implementing public policies (CCAM related)	Cross-modal	passengers &freight	2422	4	Policy Makers	Policy & Regulation
Remote Vehicle Operations Technician	Technical operation and remote control of autonomous vehicles within the CCAM ecosystem. The technician ensures safe and efficient vehicle behavior in complex or unexpected scenarios by using advanced control systems and diagnostics tools.	Cross-modal	passengers &freight	3154	3	Remote Operations	Mobility Services & Logistics
Logistics Coordinators	Manage the logistics of automated mobility services (supervision)	Cross-modal	freight	1324	4	Logistics Managers	Mobility Services & Logistics
Urban Logistics Manager	Responsible for goods mobility management in urban areas; coordination between shippers, logistics service providers and retailers.	Cross-modal	freight	1324	4	Logistics Managers	Mobility Services & Logistics
Global freight forwarder/manager	Coordinates and manage the logistics of automated and connected vehicle shipments, ensuring compliance with international regulations and optimizing the efficiency of transportation networks	Cross-modal	freight	1324	4	Logistics Managers	Mobility Services & Logistics
Remote harbour operators	Managing and overseeing the operations of automated and connected vehicles within ports and harbours. This includes tasks such as remote monitoring, assistance, and control of these vehicles to ensure efficient and safe operations	Maritime	passengers &freight	3154	3	Remote Operations	Mobility Services & Logistics
Dockworkers and logistics platforms workers	Supervising, and coordinating automated loading/unloading systems, ensuring safe interaction between autonomous freight vehicles, smart port infrastructure, and digital logistics platforms	Cross-modal	freight	9333	1	Freight, Warehouse & Port Workers	Mobility Services & Logistics
Autonomous Mobility on Demand (AMoD) services modelers and programmers	Design and implement intelligent transportation solutions using autonomous vehicles. They develop algorithms for fleet optimization, ride-sharing efficiency, and real-time traffic adaptation.	Cross-modal	passengers &freight	2511	4	Data Science & Analytics experts	Design & Development
Web and Multimedia Developers	Develop real-time traffic visualization and user interfaces	Cross-modal	passengers &freight	2513	4	Software & Systems Development	Design & Development
Drivers (truck, bus, taxi). Role will evolve with automation levels	Drivers (truck, bus, taxi). Role will evolve with automation levels	Road	passengers &freight	83	2	Drivers	Mobility Services & Logistics

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
Drivers (rail, metro). Role will evolve with automation levels	Drivers (rail, metro). Role will evolve with automation levels	Rail	passengers &freight	83	2	Drivers	Mobility Services & Logistics
Signallers	Operates signals and points manually or semi-automatically. Low of mixed automation. Similar to rail traffic controller but less automated	Rail	passengers &freight	4323	2	Traffic Control & Signalling	Mobility Services & Logistics
Mobility-as-a-Service (MaaS) Platform Manager	Oversees integration of various transport services into a unified digital platform.	Cross-modal	passengers	1323	4	Mobility & Services Platform Managers	Mobility Services & Logistics
Rail Traffic Controller	Control of automated movements of engines and train, Operations along rail lines. Through centralized digital control systems. More automated	Rail	passengers &freight	4323	2	Traffic Control & Signalling	Mobility Services & Logistics
Last Mile Delivery coordinators	Ensure the efficient operation of automated delivery systems, manage delivery schedules, track progress, and address any issues that arise during the final stage of delivery	Cross-modal	freight	4323	2	Traffic Control & Signalling	Mobility Services & Logistics
Mobility Data Analysts	Analyze real-time traffic, vehicle, and user data to optimize routes, improve safety, and enhance service delivery.	Road	passengers &freight	2511	4	Data Science & Analytics experts	Design & Development
Mobility Consultant	Advises public and private stakeholders on the planning, implementation, and optimization of connected, cooperative, and automated mobility solutions to ensure efficiency, accessibility, and sustainability.They ensure seamless integration of connected and automated mobility services to improve efficiency, user experience, and environmental impact.	Cross-modal	passengers &freight	2421	4	Urban Planning & Digital Infrastructure	Mobility Services & Logistics
Autonomous Delivery Handlers	Assist in loading/unloading goods from automated delivery vehicles or drones.	Cross-modal	freight	9333	1	Freight, Warehouse & Port Workers	Mobility Services & Logistics
Last-Mile Delivery supervisor	Oversee the final leg of delivery, ensuring packages are received and systems function properly.	Road	freight	4321	2	Freight, Warehouse & Port Workers	Mobility Services & Logistics
Warehouse Assistants for Smart Hubs	Support automated sorting and dispatch systems in urban logistics centers.	Cross-modal	freight	9333	1	Freight, Warehouse & Port Workers	Mobility Services & Logistics
Vehicle sales representatives	Responsible for selling vehicles to individual customers or fleet buyers (B2C/B2B)	Cross-modal	passengers &freight	5249	2	Sales Workers	Market & Commercial Development
Electric Car Battery Support Agent	Support services for electric car batteries, helping customers and dealers with questions, contracts, and billing. It works closely with a major car brand but focuses on managing battery use rather than manufacturing them.	Road	passengers &freight	4321	2	Remote Mobility Support	Mobility Services & Logistics

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
Business Development Manager	Responsible for identifying growth opportunities, building strategic partnerships, and driving revenue within the CCAM industry.	Cross-modal	passengers &freight	2421	4	Sales & Marketing specialists	Market & Commercial Development
Marketing Specialist	Develops marketing strategies for automated mobility.	Cross-modal	passengers &freight	2431	4	Sales & Marketing Specialists	Market & Commercial Development
Driving instructors	Teach drivers how to interact with automated systems, including when and how to take control from the system.	Cross-modal	passengers &freight	5165	2	Trainers	Training & Education
Simulator Instructor for AVs	Trains drivers and operators using high-fidelity simulators for AV systems	Cross-modal	passengers &freight	5165	2	Trainers	Training & Education
Educational Program Developers	Create curricula for automated mobility education.	Cross-modal	passengers &freight	2351	4	Educational Program Developers	Training & Education
Public Relations Specialist	Educate the public about automated mobility benefits.	Cross-modal	passengers &freight	2432	4	Sales & Marketing Specialists	Market & Commercial Development
Infrastructure Maintenance Technician	Performs maintenance on infrastructure.	Cross-modal	passengers &freight	3119	3	Maintenance & Repair Operators	Infrastructure Deployment & Operations
Predictive Maintenance Analyst	Uses sensor data and AI to anticipate and prevent failures in AV systems.	Cross-modal	passengers &freight	2511	4	Maintenance & Repair Operators	Infrastructure Deployment & Operations
Mechanic	Maintains, diagnoses, and repairs connected and automated vehicles, ensuring the proper functioning of advanced systems such as sensors, electric drivetrains, and vehicle-to-everything (V2X) communication components.	Cross-modal	passengers &freight	7231	2	Maintenance & Repair Operators	Infrastructure Deployment & Operations
e-charge maitenance	Charging infra needs constant attention, cleaning, digital upgrading etc.	Cross-modal	passengers &freight	2514	4	Maintenance & Repair Operators	Infrastructure Deployment & Operations
Digital Infrastructure Monitor	This function is clearly emerging as a necessary part of CCAM ecosystems, especially in roles related to real-time data monitoring, infrastructure diagnostics, and system coordination	Cross-modal	passengers &freight	2142	4	Urban Planning & Digital Infrastructure	Infrastructure Deployment & Operations
Remote Customer Support Agents	Assist users of automated mobility services via chat, video, or voice, helping with onboarding, troubleshooting, and emergencies.	Cross-modal	passengers &freight	4222	2	Remote Mobility Support	Mobility Services & Logistics

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
Charging Station Attendants	Responsible for cleaning, inspecting, and reporting issues at EV charging stations.	Cross-modal	passengers &freight	5249	2	Sales Workers	Market & Commercial Development
Sensor Maintenance Assistants	Help with the upkeep of roadside units, cameras, and V2X communication devices.	Cross-modal	passengers &freight	7231	2	Maintenance & Repair Operators	Infrastructure Deployment & Operations
Public Transport Surveillance Operator	Staff taking care of security in public transport spaces/ Watcher of video streams. Additionally detection of abnormal system operation	Cross-modal	passengers	5414	2	Surveillance Operators	Mobility Services & Logistics
Recycling Specialist	Manages the recycling of materials from decommissioned vehicles and infrastructure	Cross-modal	passengers &freight	3119	4	Decommissioning & Recycling Technicians	Recycling & Circular Economy
Disassembly Technician	Performs the physical disassembly of vehicle components and infrastructure	Cross-modal	passengers &freight	9612	2	Decommissioning & Recycling Technicians	Recycling & Circular Economy
Battery Lifecycle Manager	Oversees reuse, recycling, and disposal of EV batteries in compliance with environmental standards.	Cross-modal	passengers &freight	2149	4	Decommissioning & Recycling Technicians	Recycling & Circular Economy
Battery Sorting Workers	Support the recycling process of EV batteries under supervision.	Cross-modal	passengers &freight	8183	2	Recycling & Waste Management Operators	Recycling & Circular Economy
Travel attendants/ assistants, Global travel assistant, Passenger service (“comfortable”) managers	Customer engagement and safety issues, Assistance of elderly and disabled during travel, Assistance to passengers pre-, during and post-travel, More focus on the needs of the customer (traveller).	Cross-modal	passengers	5111	1	On-Site Mobility Assistance Roles	Mobility Services & Logistics
Customer Support Agent	Assists customers with inquiries and issues related to autonomous vehicle services.	Cross-modal	passengers &freight	4111	2	Remote Mobility Support	Mobility Services & Logistics
Accessibility and Inclusion Specialist	Ensures CCAM services are designed for vulnerable groups. Design physical environments (e.g., transport hubs, vehicle interiors, public spaces) Ensure universal design principles are applied Integrate accessibility features like ramps, tactile paths, boarding aids, and space for mobility devices Collaborate with engineers and urban planners to make infrastructure inclusive	Cross-modal	passengers	2166	4	HMI, UX & Human Factors Experts	Design & Development
Smart mobility assistant	Provides personalized travel assistance in multimodal hubs or on-demand services.	Cross-modal	passengers &freight	4222	2	On-Site Mobility Assistance Roles	Mobility Services & Logistics

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
Car rental agent	Facilitates the onboarding and support of customers using connected and automated rental vehicles	Road	passengers &freight	5249	2	On-Site Mobility Assistance Roles	Mobility Services & Logistics
CCAM Operations Trainer	Trains personnel to operate, monitor, and interact with connected and automated mobility systems, including remote support platforms, logistics automation tools, and teleoperation interfaces.	Cross-modal	passengers &freight	4323	2	Trainers	Training and education
Emergency Response Coordinator	Integrate CCAM systems with fire, ambulance, and police operations.	Cross-modal	passengers &freight	1349	3	Emergency & Incident Management	Infrastructure Deployment & Operations
Community Engagement Officer	Facilitate dialogue with citizens during CCAM testing and deployment phases.	Cross-modal	passengers &freight	2432	4	Policy Makers	Policy & Regulation
Transport Economist / Cost-Benefit Analyst	Assess socio-economic impacts of CCAM for policymaking and infrastructure investment.	Cross-modal	passengers &freight	2631	4	Socioeconomic & Impact Analysts	Policy & Regulation
CCAM Social Impact Analysts	Analyse social impacts of CCAM (accessibility, gender, equity, inclusion, employment).	Cross-modal	passengers &freight	2635	4	Socioeconomic & Impact Analysts	Policy & Regulation
Occupational Safety and Health (OSH) expert	Ensure that new mobility technologies are implemented safely for workers and users. They assess risks, develop safety protocols, and support compliance in evolving transport environments.	Cross-modal	passengers &freight	2263	4	Health, Safety & Ergonomics	Policy & Regulation
Union Representative	Advocate for fair labor practices in environments managed by algorithms, ensuring certified staff are protected and systemic failures are properly investigated	Cross-modal	passengers &freight	2422	4	Policy Makers	Policy & Regulation
Remote HR Specialist	Manages recruitment, onboarding, and well-being of remote operators, including ergonomic and mental health support.	Cross-modal	passengers &freight	2423	4	Human Resources & Organizational Development	Mobility Services & Logistics
Traffic Law/Traffic Violation Officers	Monitor and enforce compliance with traffic regulations in increasingly automated and digitally managed mobility environments.	road	passengers &freight	5412	3	Surveillance Operators	Policy & Regulation
Parking enforcement officer	Oversee parking compliance using smart surveillance and digital ticketing systems integrated with CCAM infrastructure.	road	passengers &freight	5414	2	Surveillance Operators	Policy & Regulation
Valet operator	Assist with vehicle parking and retrieval in CCAM-enabled environments, potentially coordinating with autonomous vehicle systems.	Road	Passengers	5249	1	On-Site Mobility Assistance Roles	Mobility Services & Logistics
Ticket issuer	Manage digital and physical ticketing processes for transport access, transitioning toward automated and app-based systems.	Road	Passengers	4221	2	Remote Mobility Support	Mobility Services & Logistics
Toll collectors	Operate and supervise toll systems that are increasingly automated and integrated with CCAM platforms for seamless mobility payments.	Road	passengers &freight	4211	2	Remote Mobility Support	Mobility Services & Logistics

Job	Role	Mode	Type of mobility	ISCO-08	Skill level	Job Family	Value Chain stage
Additive Manufacturing Design Engineer	Designs CCAM components specifically for 3D printing, including sensor mounts, brackets, housing, etc.	Cross-modal	passengers &freight	2144	4	Engineers	Design & Development
Additive Manufacturing Process Technician	Operates and calibrates 3D printers for metal/polymer components in CCAM hardware	Cross-modal	passengers &freight	3115	3	Manufacturing & Assembly Technicians	Manufacturing & Assembly
AM-Enabled Maintenance Technician	Produces spare parts on-demand via AM for predictive maintenance in CCAM vehicles or hubs	Cross-modal	passengers &freight	7231	3	Maintenance & Repair Operators	Infrastructure Deployment
Simulation-based AM Developer	Integrates AM with simulation workflows to optimize CCAM components	Cross-modal	passengers &freight	2511	4	Software & Systems Development	Design & Development
Recycled Material Filament Technician	Develops and handles 3D printing feedstock from recycled EV/AV materials (e.g., plastics, batteries)	Cross-modal	passengers &freight	3119	3	Decommissioning & Recycling Technicians	Recycling & Circular Economy
AM Training Specialist (Mobility Sector)	Provides vocational training on AM machines and digital fabrication specific to CCAM supply chains	Cross-modal	passengers &freight	5165	3	Trainers	Training & Education
Mobility Service Designer	Conceptualizes user-centric mobility services.	Cross-modal	passengers	2421	4	Service & Business Design	Design & Development
Remote Mobility Support Specialist	Provides personalized remote assistance for multimodal journeys and coordination across transport modes.	Cross-modal	passengers	4222 / 4323	2	Remote Mobility Support Roles	Mobility Services & Logistics
Door-to-Door Mobility Assistant	Assists vulnerable users (e.g., elderly, disabled) from home to vehicle and to destination reception.	Cross-modal	passengers	5111 / 5249	1	On-Site Mobility Assistance Roles	Mobility Services & Logistics
Business Developer / Service Designer	Creates business models, plans mobility hubs, and designs integrated mobility services.	Cross-modal	passengers &freight	2431 / 2432	2	Sales & Marketing Specialists	Market & Commercial Development
Mobility Finance Specialist	Designs financial products for CCAM fleets, subscription models, and MaaS platforms.	Cross-modal	passengers &freight	2413	4	Insurance & Risk Assessment Professionals	Policy & Regulation
Digital Mobility Payment Manager	Oversees secure payment systems for connected mobility services, integrating banking APIs and V2X.	Cross-modal	passengers &freight	1330	4	Sales & Marketing Specialists	Market & Commercial Development

ANNEX II Taxonomy

Color code:

The skill is needed for the SAE level
The skill is needed partially for the SAE level
The skill is not needed for the SAE level

DRIVERS (ISCO-08: 83; ISCO skill level: 2). Drivers (truck, bus, taxi)										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Trucks, bus and taxi (passengers and freight)	0-No automatio	1-Driver assistanc	2-Partial automatic	3-Conditional automatic	4-High automatic	5-Full automatic	COMMENTS
1	Assist passengers	Provide help to people getting in and out of their car or any other transportation vehicle, by opening doors, provide physical support or hold belongings. Keep safety measures and procedures in mind.							Physical assistance declines with automation and self-service features.
2	Adhere to transportation work schedule	Adhere to assigned work schedule as prepared by the transportation company							General skill remains relevant across all levels.
3	Assist disabled passengers	Use appropriate safety procedures to operate lifts and secure wheelchairs and other assistive devices while assisting physically disabled travellers							Physical assistance declines with automation and self-service features.
4	Drive in urban and non urban areas	Being able to drive the truck, bus or taxi in urban or non-urban areas							Manual driving becomes obsolete at higher SAE levels as automation takes over.
5	Communicate with passengers and supervisors	Communication abilities to provide simple pieces of information to passengers (bus, taxi drivers) including cash payment, rules and route information). Willing to communicate to supervisors (bus, taxi, trucks) regarding incidents and unexpected events.							Communication and cash handling decline as digital systems automate these tasks.
6	Ensure vehicle operability	Basic knowledge that ensure the vehicle (bus, taxi or truck) operates in good conditions							Automated diagnostics and predictive maintenance reduce manual checks.
7	Interpret traffic signals	Being able to understand the circulation coding (international level also for truck drivers working abroad)							Manual driving becomes obsolete at higher SAE levels as automation takes over.
8	Supervise un/loading of cargo	Truck drivers must supervise un/loading cargo							Physical assistance declines with automation and self-service features.
9	Read maps	Being able to read maps from banners or electronic devices							General skill remains relevant across all levels.
10	Stay alert and concentration	Concentration during driving hours to prevent accidents							Manual driving becomes obsolete at higher SAE levels as automation takes over.
11	Use communication devices	Being able to use different communication devices to interact with passengers, supervisors and customers (mobile phone, microphone, etc.)							General skill remains relevant across all levels.
12	Tolerate sitting for long periods	Being able to work sitting for long periods							General skill remains relevant across all levels.
13	Mechanical components of vehicles	Basic knowledge of the main mechanical components of the vehicle							Automated diagnostics and predictive maintenance reduce manual checks.
14	Health and safety measures in transportation	Knowledge on healthy and safety measures in case of an event such as an accident or to prevent them							Regulatory and safety knowledge remains important for compliance oversight.
15	Passengers/freight transport regulations	Knowledge on basic regulations applying to passengers and freight							Regulatory and safety knowledge remains important for compliance oversight.
16	Execute vehicle maintenance	Basic maintenance of the vehicle							Automated diagnostics and predictive maintenance reduce manual checks.
17	Handle petty cash	Handle petty cash for minor expenses and transactions required for the daily running of a business.							Communication and cash handling decline as digital systems automate these tasks.
18	Monitor operation of vehicle	Being able to monitor the automated vehicle and react							Monitoring and reacting to automated systems becomes critical at higher SAE levels.
19	Problem solving	Being able to solve simple problems during the driving hours							Driving-related problem solving declines; oversight remains partially relevant.
20	Traffic monitoring	Being able to understand and monitor the status of traffic around the vehicle							Navigation and traffic awareness shift to AI, reducing manual involvement.
21	Autonomous car driver	Being able to react in case of an event with the autonomous vehicle							Monitoring and reacting to automated systems becomes critical at higher SAE levels.
22	Familiarity with all electronic devices and sensors on and inside the vehicle	Being familiar with the automated vehicle and properly react when needed							Monitoring and reacting to automated systems becomes critical at higher SAE levels.
23	Understand information of warnings	Being able to understand the automated warnings and react							Monitoring and reacting to automated systems becomes critical at higher SAE levels.
24	Capability of recognizing errors and prompt reaction	Being able to quickly react with the automated vehicle under the recognition of an error							Monitoring and reacting to automated systems becomes critical at higher SAE levels.
25	Collection and processing data from the infrastructure and the vehicles	Being able to collect data in an automated system							Monitoring and reacting to automated systems becomes critical at higher SAE levels.
27	Operate GPS Systems	Use GPS systems							Navigation and traffic awareness shift to AI, reducing manual involvement.
28	Road transport legislation	Knowledge on road transport legislation							Regulatory and safety knowledge remains important for compliance oversight.
29	Types of cargo	Knowledge on different types of cargo e.g. bulk cargo, liquid bulk cargo and heavy materials.							Regulatory and safety knowledge remains important for compliance oversight.
30	Manoeuvre heavy trucks	Drive, manoeuvre and park tractors, trailers and lorries on roads, around tight corners, and in parking spaces.							Manual driving becomes obsolete at higher SAE levels as automation takes over.
31	Control de performance of the vehicle	Understand and anticipate the performance and behaviour of a vehicle. Comprehen concepts such as lateral stability, acceleration, and braking distance							Driving-related problem solving declines; oversight remains partially relevant.
32	Transport topography	Knowledge of the local transport topography, including roads, traffic hotspots, and alternative routes to reach a destination							Regulatory and safety knowledge remains important for compliance oversight.
33	Anticipate foreseeable problems on the road	Anticipate problems on the road such as punctures, pursuit driving, understeering or, oversteering.							Driving-related problem solving declines; oversight remains partially relevant.

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CONSTRUCTION WORKERS (ISCO-08: 93; ISCO skill level: 1).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Upgrading and maintaining roads and highways, warehouses and hubs	0-No automation	1-Driver assistance	2-Partial automation	3- Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Follow written instructions	Follow written directions in order to perform a task or carry out a step-by-step procedure							Manual inspection and paving decline as automation and robotics handle these tasks.
2	Maintain material handling equipment	Identify and report malfunctions and damage to material handling equipment. Manage battery connections.							Predictive maintenance and automated diagnostics reduce manual intervention.
3	Follow health and safety procedures in construction	Apply the relevant health and safety procedures in construction in order to prevent accidents, pollution and other risks.							Safety remains critical but automation reduces direct exposure to hazards.
4	Guide operation of heavy construction equipment	Guide a colleague in operating a piece of heavy construction equipment. Follow the operation closely and understand when feedback is called for.							Automation reduces need for guiding operators as machines become autonomous.
5	Inspect asphalt	Inspect the placement of asphalt concrete ensuring that the specifications are met and no flows are present.							Manual inspection and paving decline as automation and robotics handle these tasks.
6	Inspect construction supplies	Check construction supplies for damage, moisture, loss or other problems before using the material.							Manual inspection and paving decline as automation and robotics handle these tasks.
7	Inspect road signs	Inspect road signs for signs of corrosion, outdated information, nicks and dents, legilibility and reflectance. Decide on the course of action when problems are found.							Manual inspection and paving decline as automation and robotics handle these tasks.
8	Pave asphalt layers	Use different grades of asphalt to lay the asphalt layers of a road							Manual inspection and paving decline as automation and robotics handle these tasks.
9	Perform traffic sign maintenance	Install and secure road signs, and replace them if needed. Maintain traffic lights by resolving issues, replacing light bulbs and cleaning the glass covering. Control telematic systems for proper functioning.							Telematics and automated systems reduce manual maintenance tasks.
10	Remove road surface	Remove an existing road surface. Use the appropriate machinery or coordinate with machine operators to assist in the excavation of asphalt or concrete road coverings							Manual inspection and paving decline as automation and robotics handle these tasks.
11	Transport construction supplies	Bring construction materials, tools and equipment to the construction site and store them properly taking various aspects into account such as the workers' safety and protection from deterioration							Manual inspection and paving decline as automation and robotics handle these tasks.
12	Use safety equipment in construction	Use elements of protective clothing such as steel-tipped shoes, and gear such as protective goggles, in order to minimise risk of accidents in construction and to mitigate any injury if an accident does occur.							Safety remains critical but automation reduces direct exposure to hazards.
13	Work ergonomically	Apply ergonomy principles in the organisation of the workplace while manually handling equipment and materials.							Safety remains critical but automation reduces direct exposure to hazards.
14	Work safely with hot materials	Take care when handling hot materials. Wear the right protective clothing and take care not to burn yourself or others, damage equipment, or create fire hazards							Safety remains critical but automation reduces direct exposure to hazards.
15	Asphalt mixes	The properties, advantages and disadvantages of asphalt mixes such as Marshall and Superpave mixes and the way they are best applied							Knowledge remains relevant for planning and oversight even as laying becomes automated.
16	Mechanical tools	Various type of machines and tools, including their designs, uses, repair, and maintenance							Predictive maintenance and automated diagnostics reduce manual intervention.
17	Types of asphalt covering	Different types of asphalt covering, based on their bitumen content and composition. The strengths, weaknesses, and price points of each type. Special properties such as porosity, resistance to skidding and noise characteristics.							Knowledge remains relevant for planning and oversight even as laying becomes automated.

FREIGHT AND WAREHOUSE (ISCO-08: 93; ISCO skill level: 1).								
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)					
		Supervising, and coordinating automated loading/unloading systems, ensuring safe interaction between autonomous freight vehicles and digital logistics platforms. Assist in loading/unloading goods from automated delivery vehicles or drones. Support automated sorting and dispatch systems in urban logistics centers.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Communicate verbal instructions	Communicate transparent instructions. Ensure that messages are understood and followed correctly.						
2	Analyse work-related written reports	Read and comprehend job-related reports, analyse the content of reports and apply findings to daily work operations.						
3	Give instructions to staff	Give instructions to subordinates by employing various communication techniques. Adjust communication style to the target audience in order to convey instructions as intended.						
4	Have computer literacy	Utilise computers, IT equipment and modern day technology in an efficient way.						
5	Keep task records	Organise and classify records of prepared reports and correspondence related to the performed work and progress records of tasks.						
6	Manage assignment of routes	Supervise the work of others and effectively coordinate the completion of regularly assigned routes via various check-in systems.						
7	Match vehicles with routes	Match types of vehicles to transport routes, taking into consideration service frequency, peak transport times, service area covered, and road conditions.						
8	Monitor condition of local roads	Know local streets and their condition in order to provide efficient and timely transportation services.						
9	Monitor drivers	Ensure that drivers meet the legal requirements to operate, arrive at work at required times, present no signs of alcohol or drug abuse, and follow the commissioned itineraries of the day. Monitor drivers to ensure quality work performance and efficiency. Ensure maintenance of record of time expended and distances covered.						
10	Plan schedule	Develop the schedule including procedures, appointments and working hours						
11	Prepare transportation routes	Prepare routes through the addition or subtraction of routes, making changes to route frequency, and changing the service span of routes. Adjusts routes through providing additional running time to routes, adding additional capacity during periods of overcrowding (or reducing capacity during periods of low passenger numbers), and adjusting departure times in response to changes in circumstances along a given route, thereby ensuring efficient use of resources and achievement of customer relations goals.;						
12	Schedule and dispatch drivers	Schedule and dispatch drivers, working equipment and service vehicles to desired locations as requested by customers; use telephone or radio communication.						
13	Road transport legislation	The regulations at regional, national, and European level on safety and environmental requirements for road transport operations.						
14	Supervise and coordinate automated systems	Supervising, and coordinating automated loading/unloading systems, ensuring safe interaction between autonomous freight vehicles and digital logistics platforms						
15	Assist un/loading operations with automated systems	Assist in loading/unloading goods from automated delivery vehicles or drones.						
16	Support automated sorting and dispatch systems	Support automated sorting and dispatch systems in urban logistics centers.						

FREIGHT AND WAREHOUSE (ISCO-08: 43; ISCO skill level: 2).								
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)					
		Oversee the final leg of delivery, ensuring packages are received and systems function properly.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Work in a logistics team	Ability to work confidently within a logistics team, with each member of the team fulfilling a role designed to increase the efficiency of the whole						
2	Pallets loading	Ability to load and unload pallets on vehicles in a safe way.						
3	Use barcode scanning requirement	Track the inventory by operating barcode scanning devices						
4	Pack goods	Pack different kinds of goods such as finished manufactured products or goods in use. Pack goods by hand in boxes, bags and other types of containers.						
5	Ensure correct goods labelling	Ensure that goods are labeled with all necessary labeling information (e.g. legal, technological, hazardous and others) regarding the product. Ensure that labels respects the legal requirements and adhere to regulations.						
6	Use packaging equipment	Use fastening and packaging tools such as plastic strapping, applicators and adhesives, marking and labelling equipment, and tape.						
7	Communicate verbal instructions	Communicate transparent instructions. Ensure that messages are understood and followed correctly.						
8	Monitor vehicle fleet operations	Monitor the operations of the vehicle fleet; track delays and identify repair needs; analyse fleet information to develop and implement improvement actions.						
9	Keep task records	Organise and classify records of prepared reports and correspondence related to the performed work and progress records of tasks.						
10	Prepare transportation routes	Prepare routes through the addition or subtraction of routes, making changes to route frequency, and changing the service span of routes. Adjusts routes through providing additional running time to routes, adding additional capacity during periods of overcrowding and adjusting times						
11	Apply transportation management concepts	Apply transport industry management concepts in order to improve transportation processes, reduce waste, increase efficiency, and improve schedule preparation.						

CYBERSECURITY & IT PROTECTION TECHNICIAL (ISCO-08: 2519, 351; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Protects vehicle systems and related infrastructure from cyber threats. Work remotely to protect CCAM systems from cyber threats, ensuring data integrity and system resilience.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS	
1	Address problems critically	Identify the strengths and weaknesses of various abstract, rational concepts, such as issues, opinions, and approaches related to a specific problematic situation in order to formulate solutions and alternative methods of tackling the situation.							Strategic and ethical oversight remains important but some manual reporting tasks decline with automation.	
2	Establish data processes	Use ICT tools to apply mathematical, algorithmic or other data manipulation processes in order to create information.							Data management and processing remain essential for CCAM systems at all automation levels.	
3	Manage data	Administer all types of data resources through their lifecycle by performing data profiling, parsing, standardisation, identity resolution, cleansing, enhancement and auditing. Ensure the data is fit for purpose, using specialised ICT tools to fulfil the data quality criteria.							Data management and processing remain essential for CCAM systems at all automation levels.	
4	Use data processing techniques	Gather, process and analyse relevant data and information, properly store and update data and represent figures and data using charts and statistical diagrams.							Data management and processing remain essential for CCAM systems at all automation levels.	
5	Manage database	Apply database design schemes and models, define data dependencies, use query languages and database management systems (DBMS) to develop and manage databases.							Data management and processing remain essential for CCAM systems at all automation levels.	
6	Process data	Enter information into a data storage and data retrieval system via processes such as scanning, manual keying or electronic data transfer in order to process large amounts of data.							Manual data entry declines as automated data pipelines and IoT integration take over.	
7	Report analysis results	Produce research documents or give presentations to report the results of a conducted research and analysis project, indicating the analysis procedures and methods which led to the results, as well as potential interpretations of the results							Strategic and ethical oversight remains important but some manual reporting tasks decline with automation.	
8	Define data quality criteria	Specify the criteria by which data quality is measured for business purposes, such as inconsistencies, incompleteness, usability for purpose and accuracy.							Data management and processing remain essential for CCAM systems at all automation levels.	
9	Perform data cleansing	Detect and correct corrupt records from data sets, ensure that the data become and remain structured according to guidelines.							Data management and processing remain essential for CCAM systems at all automation levels.	
10	Data ethics	The subfield of ethics that assess whether data practices are considerable ethical. It assesses processes such as collecting, analysing and disseminating structured and unstructured data that might negatively impact the society.							Strategic and ethical oversight remains important but some manual reporting tasks decline with automation.	
11	Database	The classification of databases, that includes their purpose, characteristics, terminology, models and use such as XML databases, document-oriented databases and full text databases.							Data management and processing remain essential for CCAM systems at all automation levels.	
12	Query languages	The field of standardised computer languages for retrieval of information from a database and of documents containing the needed information.							Data management and processing remain essential for CCAM systems at all automation levels.	
13	Information structure	The type of infrastructure which defines the format of data: semi-structured, unstructured and structured.							Data management and processing remain essential for CCAM systems at all automation levels.	
14	Resource description framework query language	The query languages such as SPARQL which are used to retrieve and manipulate data stored in Resource Description Framework format (RDF).							Data management and processing remain essential for CCAM systems at all automation levels.	
15	Develop information security strategy	Create company strategy related to the safety and security of information in order to maximise information integrity, availability and data privacy.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	
16	Maintain plan for continuity of operations	Update methodology which contains steps to ensure that facilities of an organisation (vehicles) are able to continue operating, in case of broad range of unforeseen events.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	
17	Manage disasters recovery plans	Prepare, test and execute, when necessary, a plan of action to retrieve or compensate lost information system data.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	
18	Organizational resilience	The strategies, methods and techniques that increase the organisation's capacity to protect and sustain the services and operations that fulfil the organisational mission and create lasting values by effectively addressing the combined issues of security, preparedness, risk and disaster recovery.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	
19	Cyber security	The methods and best practices that protect ICT systems, networks, computers, devices, services, processes and people against unauthorised access, modification and/or denial of service of assets.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	
20	Web application security threats	The attacks, vectors, emergent threats on websites, web applications and web services, the rankings of their severity identified by dedicated communities such as OWASP.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	
21	Cyber attack counter measures	Methods, technologies and techniques used to defend (detect, monitor and recover) against cyber attacks. These cyber attacks include several attack vectors such as malware, denial of service (DoS) attacks and phishing.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	
22	Identify ICT security risks	Apply methods and techniques to identify potential security threats, security breaches and risk factors using ICT tools for surveying ICT systems, analysing risks, vulnerabilities and threats and evaluating contingency plans.							Cybersecurity and resilience remain critical across all SAE levels due to increasing digitalization and automation risks.	

DATA SCIENCE & ANALYTICS EXPERTS (ISCO-08: 2511; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Analyzes data to improve vehicle algorithms and performance. Implements artificial intelligence for vehicle decision-making. Design and implement intelligent transportation solutions using autonomous vehicles. They develop algorithms for fleet optimization, ride-sharing efficiency, and real-time traffic adaptation. Analyze real-time traffic, vehicle, and user data to optimize routes, improve safety, and enhance service delivery.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Analyse big data	Collect and evaluate numerical data in large quantities, especially for the purpose of identifying patterns between the data.							Advanced analytics and AI remain critical for CCAM systems at all automation levels.
2	Establish data processes	Use ICT tools to apply mathematical, algorithmic or other data manipulation processes in order to create information.							Data management and processing are essential for connected and automated mobility ecosystems.
3	Manage data	Administer all types of data resources through their lifecycle by performing data profiling, parsing, standardisation, identity resolution, cleansing, enhancement and auditing. Ensure the data is fit for purpose, using specialised ICT tools to fulfil the data quality criteria.							Data management and processing are essential for connected and automated mobility ecosystems.
4	Use data processing techniques	Gather, process and analyse relevant data and information, properly store and update data and represent figures and data using charts and statistical diagrams.							Data management and processing are essential for connected and automated mobility ecosystems.
5	Apply statistical analysis techniques	Use models (descriptive or inferential statistics) and techniques (data mining or machine learning) for statistical analysis and ICT tools to analyse data, uncover correlations and forecast trends.							Advanced analytics and AI remain critical for CCAM systems at all automation levels.
6	Execute analytical mathematical calculations	Apply mathematical methods and make use of calculation technologies in order to perform analyses and devise solutions to specific problems.							Advanced analytics and AI remain critical for CCAM systems at all automation levels.
7	Perform data mining	Explore large datasets to reveal patterns using statistics, database systems or artificial intelligence and present the information in a comprehensible way.							Advanced analytics and AI remain critical for CCAM systems at all automation levels.
8	Business analytics	The disciplines and technologies for solving business problems through employing quantitative methods such as data analysis and statistical models.							Advanced analytics and AI remain critical for CCAM systems at all automation levels.
9	Perform data cleansing	Detect and correct corrupt records from data sets, ensure that the data become and remain structured according to guidelines.							Data management and processing are essential for connected and automated mobility ecosystems.
10	Data ethics	The subfield of ethics that assess whether data practices are considerable ethical. It assesses processes such as collecting, analysing and disseminating structured and unstructured data that might negatively impact the society.							Ethical oversight remains important but some manual checks decline with automation.
11	Statistics	The study of statistical theory, methods and practices such as collection, organisation, analysis, interpretation and presentation of data. It deals with all aspects of data including the planning of data collection in terms of the design of surveys and experiments in order to forecast and plan work-related activities.							Data management and processing are essential for connected and automated mobility ecosystems.
12	Query languages	The field of standardised computer languages for retrieval of information from a database and of documents containing the needed information.							Data management and processing are essential for connected and automated mobility ecosystems.
13	Information structure	The type of infrastructure which defines the format of data: semi-structured, unstructured and structured.							Data management and processing are essential for connected and automated mobility ecosystems.
14	Resource description framework query language	The query languages such as SPARQL which are used to retrieve and manipulate data stored in Resource Description Framework format (RDF).							Data management and processing are essential for connected and automated mobility ecosystems.
15	Information confidentiality	The mechanisms and regulations which allow for selective access control and guarantee that only authorised parties (people, processes, systems and devices) have access to data, the way to comply with confidential information and the risks of non-compliance.							Data privacy and confidentiality remain critical across all SAE levels.
16	Collect ICT data	Gather data by designing and applying search and sampling methods.							Manual reporting and interpretation decline as automated dashboards and AI-driven insights take over.
17	Interpret current data	Analyse data gathered from sources such as market data, scientific papers, customer requirements and questionnaires which are current and up-to-date in order to assess development and innovation in areas of expertise.							Manual reporting and interpretation decline as automated dashboards and AI-driven insights take over.
18	Report analysis results	Produce research documents or give presentations to report the results of a conducted research and analysis project, indicating the analysis procedures and methods which led to the results, as well as potential interpretations of the results.							Manual reporting and interpretation decline as automated dashboards and AI-driven insights take over.
19	Data science	The field of study that deals with big amount of data using AI techniques such as machine learning algorithms to predict patterns and obtain useful information to make business decisions							Advanced analytics and AI remain critical for CCAM systems at all automation levels.
20	Deliver visual presentation of data	Create visual representations of data such as charts or diagrams for easier understanding.							Manual reporting and interpretation decline as automated dashboards and AI-driven insights take over.

DECOMMISSIONING AND RECYCLING TECHNICIANS (ISCO-08: 2144, 3119, 2149; ISCO skill level: 3).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Plans and oversee the decommissioning process of vehicle components and CCAM-related infrastructure such as sensors, communication networks, and charging stations. Manages the recycling of materials from decommissioned vehicles and infrastructure. Oversees reuse, recycling, and disposal of EV batteries in compliance with environmental standards.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Automotive engineering	The discipline of engineering that combines mechanical, electrical, electronic, software and safety engineering to design motor vehicles such as trucks, vans and automobiles.							Knowledge of vehicle systems and sustainable technologies remains critical for dismantling and recycling across all automation levels.
2	Green automotive technologies	Technologies that allow the development of sustainable practices within the automotive industry. They are focused on lowering the negative effects of this industry on the environment such as air pollution or the use of non-renewable sources, and on using green methods in the design and manufacture of automotive products.							Knowledge of vehicle systems and sustainable technologies remains critical for dismantling and recycling across all automation levels.
3	Hybrid vehicle architecture	Hybrid vehicle nomenclature, classification and architectures including efficiency considerations. Pros and cons of series, parallel and power split solutions. It excludes the architecture and R&D in non plug-in hybrid vehicles.							Knowledge of vehicle systems and sustainable technologies remains critical for dismantling and recycling across all automation levels.
4	Apply reverse engineering	Use techniques to extract information or disassemble an ICT component, software or system in order to analyse, correct and reassemble or reproduce it.							Reverse engineering is essential for component recovery and recycling regardless of automation level.
5	Disassemble equipment	Disassembles equipment using hand tools in order to clean equipments and to perform regular operational maintenance.							Manual disassembly declines as robotic and automated dismantling systems become prevalent.
6	European vehicle type-approval legislation	The EU framework for the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles.							Compliance with EU legislation remains mandatory across all SAE levels.
7	Reverse engineering	The process of extracting knowledge or design information from anything man-made and reproducing it or anything else based on the extracted information. The process often involves disassembling something and analysing its components and workings in detail.							Reverse engineering is essential for component recovery and recycling regardless of automation level.
8	Draw blue prints	Draw layout specifications for machinery, equipment and building structures. Specify which materials should be used and the size of the components. Show different angles and views of the product.							Blueprint creation becomes less frequent as digital models and automated design tools dominate.
9	Sensors	Sensors are transducers that can detect or sense characteristics in their environment. They detect changes in the apparatus or environment and provide a corresponding optical or electrical signal. Sensors are commonly divided in six classes: mechanical, electronic, thermal, magnetic, electrochemical, and optical sensors.							Sensor knowledge is vital for handling advanced vehicle systems and recycling electronic components.
10	New vehicles on the market	Latest developments and trends related to the new types of vehicles and vehicle brands on the market.							Awareness of new vehicle technologies is essential for adapting recycling processes to evolving designs.

DECOMMISSIONING AND RECYCLING TECHNICIANS (ISCO-08: 9612; ISCO skill level: 2).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Performs the physical disassembly of vehicle components and infrastructure	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Dismantle broken appliances	Dismantle equipment and appliances which are broken and ineligible for repair so that their separate components can be sorted, recycled, and disposed of in a manner which is compliant with waste and recycling legislation.							Manual dismantling declines as robotic and automated systems handle disassembly tasks.
2	Operate recycling processing equipment	Operate recycling processing equipment such as granulators, crushers and balers; process and sort materials to be recycled.							Automation in recycling plants reduces manual operation but oversight remains partially relevant.
3	Assess waste type	Identify waste materials during collection and sorting operations in order to assess whether they need to be recycled, disposed of, or otherwise be treated.							AI-based sorting systems reduce manual assessment but human supervision remains important.
4	Ensure compliance with waste legislative regulations	Implement and monitor company procedures for the collection, transport and disposal of waste, in compliance with all regulations and legal requirements.							Compliance with regulations remains critical across all automation levels.
5	Dispose of hazardous waste	Dispose of dangerous materials such as chemical or radioactive substances according to environmental and to health and safety regulations.							Handling hazardous waste requires strict oversight and cannot be fully automated for safety reasons.
6	Dispose of non hazardous waste	Dispose of waste materials which pose no risk to health and safety in a manner which complies with recycling and waste management procedures except for waste incineration.							Automation reduces manual disposal tasks but oversight remains partially relevant.
7	Educate on recycling regulations	Educate organisations and individuals on the correct procedures and legislation concerning the recycling of different types of waste in different types of containers, waste collection procedures, and on the sanctions following non-compliance to legislation.							Education remains important but digital platforms and automated compliance tools reduce manual training needs.

EDUCATIONAL PROGRAMS DEVELOPERS (ISCO-08: 2351; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Create curricula for automated mobility education.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS	
1	Develop curriculum	Develop and plan the learning goals and outcomes for education institutions, as well as the required teaching methods and potential education resources.							Curriculum development and integration of virtual learning remain essential across all automation levels.	
2	Identify education needs	Identify the needs of students, organisations and companies in terms of provision of education in order to aid in the development of curricula and education policies.							Human collaboration remains important but partially automated analytics reduce manual needs at higher levels.	
3	Cooperate with education professionals	Communicate with teachers or other professionals working in education in order to identify needs and areas of improvement in education systems, and to establish a collaborative relationship.							Human collaboration remains important but partially automated analytics reduce manual needs at higher levels.	
4	Monitor curriculum implementations	Monitor the steps taken in educational institutions to implement the approved learning curriculum for said institution to ensure adherence and the use of proper teaching methods and resources.							Monitoring shifts to automated dashboards and AI-driven insights, reducing manual oversight.	
5	Monitor educational developments	Monitor the changes in educational policies, methodologies and research by reviewing relevant literature and liaising with education officials and institutions.							Monitoring shifts to automated dashboards and AI-driven insights, reducing manual oversight.	
6	Ensure compliance with policies	Ensure compliance with legislation and company procedures in respect of health and safety in the workplace and public areas. Ensure awareness and compliance with all company policies in relation to health and safety and equal opportunities in the workplace.							Compliance remains critical across all SAE levels regardless of automation.	
7	Perform scientific research	Gain, correct or improve knowledge about phenomena by using scientific methods and techniques, based on empirical or measurable observations.							Research remains important but manual paper writing declines as automated reporting tools emerge.	
8	Write scientific papers	Present the hypothesis, findings, and conclusions of your scientific research in your field of expertise in a professional publication.							Research remains important but manual paper writing declines as automated reporting tools emerge.	
9	Apply knowledge of human behaviour	Practice principles related to group behaviour, trends in society, and influence of societal dynamics.							Human behaviour knowledge remains relevant but some aspects are supported by AI-driven analytics.	
10	Work with virtual learning environments	Incorporate the use of online learning environments and platforms into the process of instruction.							Curriculum development and integration of virtual learning remain essential across all automation levels.	

EMERGENCY & INCIDENT MANAGER (ISCO-08: 1349; ISCO skill level: 3).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Integrate CCAM systems with fire, ambulance, and police operations.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS	
1	Public health	The principles of health and sickness affecting the population, including the means for health promotion and prevention and community and primary care.							Public health and safety oversight remain critical regardless of automation.	
2	Organisational policies	The policies to achieve set of goals and targets regarding the development and maintenance of an organisation.							Strategic and policy planning remain essential across all automation levels.	
3	Strategic planning	The elements defining the foundation and core of an organisation such as its mission, vision, values, and objectives.							Strategic and policy planning remain essential across all automation levels.	
4	Ensure public safety and security	Implement the relevant procedures, strategies and use the proper equipment to promote local or national security activities for the protection of data, people, institutions, and property.							Public health and safety oversight remain critical regardless of automation.	
5	Manage emergency care situations	Manage situations in which decision making under time pressure is essential to save lives.							Automation supports emergency response, but human decision-making remains partially relevant at higher levels.	
6	Use geographic information systems	Work with computer data systems such as Geographic Information Systems (GIS).							GIS remains vital for planning and coordination across all SAE levels.	
7	Fire safety regulations	The legal rules to be applied for fire safety and fire prevention in a facility.							Compliance and safety planning remain mandatory regardless of automation.	
8	Coordinate rescue missions	Coordinate rescue missions during the event of a disaster or during an accident, ensure that all possible methods are being used to ensure the safety of the people being rescued, and that the search is as efficient and thorough as possible.							Automation reduces manual coordination, but oversight and strategic decisions remain partially relevant.	
9	Coordinate with other emergency services	Coordinate the firefighters' work with the activities of the emergency medical services and of the police.							Automation reduces manual coordination, but oversight and strategic decisions remain partially relevant.	
10	Maintain operational communications	Maintain communications between different departments of an organisation, between the staff, or during specific operations or missions, to ensure that the operation or mission is successful, or that the organisation functions smoothly.							Automation reduces manual coordination, but oversight and strategic decisions remain partially relevant.	
11	Manage security equipment	Oversee and conduct inventory of security tools and equipment.							Automation reduces manual supervision, but compliance and safety checks remain partially relevant.	
12	Plan health and safety procedures	Set up procedures for maintaining and improving health and safety in the workplace.							Compliance and safety planning remain mandatory regardless of automation.	
13	Supervise worker safety	Ensure safety of site personnel; supervise correct use of protective equipment and clothing; understand and implement safety procedures.							Automation reduces manual supervision, but compliance and safety checks remain partially relevant.	

ENGINEERS (ISCO-08: 2149, 2144, 2152, 2153; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Innovating mobility solutions (vehicle technology, digital systems for transportation, AV's); development of algorithms; design vehicle systems and components; design of energy storage systems; test vehicle control software and V2X; develop robotics systems; manage communication protocols and systems; ensure vehicle safety standards; design IoT solutions for vehicle connectivity.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Automotive engineering	The discipline of engineering that combines mechanical, electrical, electronic, software and safety engineering to design motor vehicles such as trucks, vans and automobiles.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
2	Manufacturing processes	The steps required through which a material is transformed into a product, its development and full-scale manufacturing.							Manual oversight of manufacturing declines as automated production systems dominate, but process knowledge remains relevant.
3	Design electromechanical systems	Draft sketches and design electromechanical systems, products, and components using Computer Aided Design (CAD) software and equipment.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
4	Vehicle electrical systems	Know vehicle electrical systems, including components such as the battery, starter, and alternator.							General skill remains relevant across all levels.
5	Design automotion components	Design engineering parts, assemblies, products, or systems that contribute to the automation of industrial machines.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
6	Robotics components	The components that can be found in robotic systems, such as microprocessors, electronics, sensors, circuit boards, encoders, servomotors, controllers, pneumatics or hydraulics.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
7	Create software design	Transpose a series of requirements into a clear and organised software design.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
8	Keep up with industrial transformation of industrial processes	Keep up to date with digital innovations applicable to industrial processes. Integrate these transformations in the company's processes aiming for competitive and profitable business models.							Continuous adaptation to digital transformation is essential at all automation levels.
9	Computer engineering	Engineering discipline that combines computer science with electrical engineering to develop computer hardware and software. Computer engineering occupies itself with electronics, software design, and the integration of hardware and software.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
10	Design hardware	Design and develop new computer hardware systems and components. Draft blueprints and assembly drawings specifying how the computer equipment should be build.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
11	Electronics	The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications. Apply this knowledge to ensure electronic equipment runs smoothly.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
12	Sensors	Sensors are transducers that can detect or sense characteristics in their environment. They detect changes in the apparatus or environment and provide a corresponding optical or electrical signal. Sensors are commonly divided in six classes: mechanical, electronic, thermal, magnetic, electrochemical, and optical sensors.							Core engineering and design skills remain critical for CCAM development and maintenance across all automation levels.
13	ICT communication protocols	The system of rules which allow the exchange of information between computers or other devices via computer networks.							Communication protocols are fundamental for connected and automated systems at all SAE levels.
14	Coordinate technological activities	Give instructions to colleagues and other cooperating parties in order to reach the desired outcome of a technological project or achieve set goals within an organisation dealing with technology.							Human coordination and training reduce as automation increases, but remain partially relevant for oversight and integration.
15	Analyse business requirements	Study clients' needs and expectations for a product or service in order to identify and resolve inconsistencies and possible disagreements of involved stakeholders.							Human coordination and training reduce as automation increases, but remain partially relevant for oversight and integration.
16	Provide ICT system training	Plan and conduct training of staff on system and network issues. Utilise training material, evaluate and report on the learning progress of trainees.							Human coordination and training reduce as automation increases, but remain partially relevant for oversight and integration.

ETHICS & PHILOSOPHY EXPERTS (ISCO-08: 2633; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Ensure that the development and deployment of connected and automated mobility systems adhere to ethical principles, addressing societal, environmental, and regulatory challenges	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Use logical reasoning	Use cognitive abilities to make decisions and to move logically from one idea to another.							Core ethical and logical reasoning skills remain critical for governance and decision-making across all automation levels.
2	Ethics	The philosophical study that deals with solving questions of human morality; it defines and systemises concepts such as right, wrong, and crime.							Core ethical and logical reasoning skills remain critical for governance and decision-making across all automation levels.
3	Morality	The principles and beliefs derived from a code of conduct, accepted by a large group of people, that make the distinction between what is right and wrong behaviour.							Core ethical and logical reasoning skills remain critical for governance and decision-making across all automation levels.
4	Logic	The study and use of accurate reasoning, where the legitimacy of arguments is measured by their logical form and not by content.							Core ethical and logical reasoning skills remain critical for governance and decision-making across all automation levels.
5	Sociology	The group behaviour and dynamics, societal trends and influences, human migrations, ethnicity, cultures and their history and origins.							Core ethical and logical reasoning skills remain critical for governance and decision-making across all automation levels.
6	Government policy implementation	The procedures related to the application of government policies at all levels of public administration.							Policy implementation oversight remains essential regardless of automation.
7	Maintain relations with government agencies	Establish and maintain cordial working relationships with peers in different governmental agencies.							Human interaction and advocacy remain important but some tasks are supported by digital platforms and automated compliance tools at higher levels.
8	Apply person-centered care	Treat individuals as partners in planning, developing and assessing care, to make sure it is appropriate for their needs. Put them and their caregivers at the heart of all decisions.							Human interaction and advocacy remain important but some tasks are supported by digital platforms and automated compliance tools at higher levels.
9	Make legistlation transparent for users of social services	Inform and explain the legislation for users of social services, in order to help them understand the implications it has on them and how to use it for their interest.							Human interaction and advocacy remain important but some tasks are supported by digital platforms and automated compliance tools at higher levels.
10	Promote inclusion	Promote inclusion in health care and social services and respect diversity of beliefs, culture, values and preferences, keeping in mind the importance of equality and diversity issues.							Human interaction and advocacy remain important but some tasks are supported by digital platforms and automated compliance tools at higher levels.

HEALTH, SAFETY & ERGONOMICS (ISCO-08: 2263; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Ensure that new mobility technologies are implemented safely for workers and users. They assess risks, develop safety protocols, and support compliance in evolving transport environments.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Advise on risk management	Provide advice on risk management policies and prevention strategies and their implementation, being aware of different kinds of risks to a specific organisation.							Compliance and risk management remain critical across all automation levels.
2	Advise on safety improvements	Provide relevant recommendations following the conclusion of an investigation; ensure that recommendations are duly considered and where appropriate acted upon.							Compliance and risk management remain critical across all automation levels.
3	Educate on emergency management	Educate communities, organisations, or individuals on risk management and emergency response, such as how to develop and implement prevention and reaction strategies, and educate on emergency policies specific to the risks applicable to that area or organisation.							Automation reduces manual emergency handling, but oversight and education remain partially relevant.
4	Manage emergency procedures	React quickly in case of emergency and set planned emergency procedures in motion.							Automation reduces manual emergency handling, but oversight and education remain partially relevant.
5	Perform risks analysis	Identify and assess factors that may jeopardise the success of a project or threaten the organisation's functioning. Implement procedures to avoid or minimise their impact.							Compliance and risk management remain critical across all automation levels.
6	Test safety strategies	Test policies and strategies related to risk and safety management and procedures, such as testing evacuation plans, safety equipment, and carrying out drills.							Automation reduces manual emergency handling, but oversight and education remain partially relevant.
7	Think analytically	Produce thoughts using logic and reasoning in order to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.							Analytical thinking remains essential for interpreting data and improving safety strategies.
8	Ensure compliance with policies	Ensure compliance with legislation and company procedures in respect of health and safety in the workplace and public areas. Ensure awareness and compliance with all company policies in relation to health and safety and equal opportunities in the workplace.							Compliance and risk management remain critical across all automation levels.
9	Ensure compliance with environmental legislation	Monitor activities and perform tasks ensuring compliance with standards involving environmental protection and sustainability, and amend activities in the case of changes in environmental legislation. Ensure that the processes are compliant with environment regulations and best practices.							Compliance and risk management remain critical across all automation levels.
10	Health, safety and hygiene legislation	The set of health, safety and hygiene standards and items of legislation applicable in a specific sector.							Compliance and risk management remain critical across all automation levels.
11	Analyse ergonomics in different workplaces	Analyse how people interact with machinery, equipment, and work spaces from an ergonomic point of view.							Automation reduces manual ergonomic assessments, but design oversight remains partially relevant.
12	Identify customer's needs	Use appropriate questions and active listening in order to identify customer expectations, desires and requirements according to product and services.							Human feedback gathering declines as digital tools and analytics support these tasks.
13	Gather feedback from employees	Communicate in an open and positive manner in order to assess levels of satisfaction with employees, their outlook on the work environment, and in order to identify problems and devise solutions.							Human feedback gathering declines as digital tools and analytics support these tasks.
14	Ergonomics	The science of designing systems, processes and products that complement the strengths of people so that they can use them easily and safely.							Automation reduces manual ergonomic assessments, but design oversight remains partially relevant.
15	Assess ergonomics of the workplace	Assess ergonomics of the workplace in relation to the human resources.							Automation reduces manual ergonomic assessments, but design oversight remains partially relevant.

SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Analizes how people interact with new mobility technologies and designing interventions to improve user experience, safety, and overall system efficiency. Studies driver/passenger interaction with automated systems. Create intuitive interfaces for operators and passengers. Designing accessible user interfaces for CCAM systems. Ensuring digital platforms are usable by people with disabilities. Ensures CCAM services are designed for vulnerable groups. Design physical environments	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	User Experience (UX) Research	Investigates how users interact with mobility technologies to uncover needs, frustrations, and opportunities							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
2	Human-Machine Interaction (HMI)	Designs intuitive and responsive interfaces that foster trust and ease of use between humans and automated systems.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
3	Accessibility Design	Ensures digital platforms and physical environments are usable by people with disabilities, following universal design principles and accessibility standards.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
4	Inclusive Design	Creates solutions that accommodate diverse user groups, including older adults, children, and people with cognitive or physical impairments.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
5	Interface Prototyping	Develops and tests interactive mockups of user interfaces for vehicles and mobility services.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
6	Behavioral Analysis	Studies driver and passenger behavior to improve safety, comfort, and system efficiency.							Behavioral analysis shifts to automated data-driven insights, reducing manual observation but still needed for interpretation.
7	Usability Testing	Evaluates how easily and effectively users—including those with disabilities—can interact with mobility systems.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
8	Digital Platform Design	Builds accessible and user-friendly digital services for CCAM systems, such as mobile apps and web portals.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
9	Data Analysis	Interprets user interaction data to guide design decisions and system improvements.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
10	System Thinking	Understands how different components of mobility ecosystems interact and affect user experience.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
11	Simulation and Modeling	Uses virtual environments to test and refine user interactions with automated systems.							Core UX, HMI, and design skills remain critical for CCAM systems across all automation levels.
12	Stakeholder Engagement	Collaborates with engineers, policymakers, and community groups to ensure inclusive design outcomes.							Collaboration and change management reduce as automation increases, but remain partially relevant for governance and adoption.
13	Interdisciplinary Collaboration	Works across fields like psychology, engineering, and urban planning to create holistic mobility solutions.							Collaboration and change management reduce as automation increases, but remain partially relevant for governance and adoption.
14	Empathy	Prioritizes the emotional and practical needs of users, especially those from vulnerable or underserved populations.							Empathy remains important for inclusive design but some aspects are supported by AI-driven personalization.
15	Change Management	Facilitates the adoption of new mobility technologies through user education, accessibility training, and adaptive design.							Collaboration and change management reduce as automation increases, but remain partially relevant for governance and adoption.

HUMAN RESOURCES & ORGANIZATIONAL DEVELOPMENT (ISCO-08: 2423; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Manages recruitment, onboarding, and well-being of remote operators, including ergonomic and mental health support.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Facilitates job market access	Improve the chances of individuals to find a job, by teaching the required qualifications and interpersonal skills, through training and development programs, workshops or employment projects.							Manual recruitment and interviewing decline as automation and AI-driven hiring tools increase, but oversight remains partially relevant.
2	Interview people	Interview people in a range of different circumstances.							Manual recruitment and interviewing decline as automation and AI-driven hiring tools increase, but oversight remains partially relevant.
3	Negotiate employement agreements	Find agreements between employers and potential employees on salary, working conditions and non-statutory benefits.							Manual recruitment and interviewing decline as automation and AI-driven hiring tools increase, but oversight remains partially relevant.
4	Observe confidentiality	Observe the set of rules establishing the nondisclosure of information except to another authorised person.							Confidentiality and compliance with labour laws remain essential regardless of automation.
5	Recruit employees	Hire new employees by scoping the job role, advertising, performing interviews and selecting staff in line with company policy and legislation.							Manual recruitment and interviewing decline as automation and AI-driven hiring tools increase, but oversight remains partially relevant.
6	Labour legislation	Legislation, on a national or international level, that governs labour conditions in various fields between labour parties such as the government, employees, employers, and trade unions.							Confidentiality and compliance with labour laws remain essential regardless of automation.
7	Apply knowledge of human behaviour	Practice principles related to group behaviour, trends in society, and influence of societal dynamics.							Human-centric health and ergonomics oversight reduce as digital monitoring tools emerge, but remain partially relevant.
8	Assist employee health programs	Support and provide assistance to health and safety engineer and medical staff in implementing employee health programmes.							Human-centric health and ergonomics oversight reduce as digital monitoring tools emerge, but remain partially relevant.
9	Gather feedback from employees	Communicate in an open and positive manner in order to assess levels of satisfaction with employees, their outlook on the work environment, and in order to identify problems and devise solutions.							Feedback collection shifts to automated surveys and analytics, reducing manual involvement but still needed for interpretation.
10	Recruitment strategy	Develops targeted hiring practices to attract qualified remote mobility operators.							Core HR strategies for onboarding and inclusivity remain critical across all automation levels.
11	Onboarding process design	Creates structured onboarding programs that familiarize new operators with CCAM systems and protocols							Core HR strategies for onboarding and inclusivity remain critical across all automation levels.
12	Ergonomic risk assessment	Evaluates remote work setups to minimize physical strain and promote long-term operator health.							Human-centric health and ergonomics oversight reduce as digital monitoring tools emerge, but remain partially relevant.
13	Mental health awareness	Recognizes signs of stress or burnout and implements support systems to maintain operator well-being.							Human-centric health and ergonomics oversight reduce as digital monitoring tools emerge, but remain partially relevant.
14	Training program development	Designs and delivers training tailored to remote operators, including safety, system updates, and user interaction protocols.							Core HR strategies for onboarding and inclusivity remain critical across all automation levels.
15	Inclusive Work Environment Design	Ensures remote work policies and tools are accessible to operators with disabilities or other specific needs.							Core HR strategies for onboarding and inclusivity remain critical across all automation levels.

INSURANCE & RISK ASSESSMENT PROFESSIONALS (ISCO-08: 2412; ISCO skill level: 3).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Adapts traditional insurance practices to the CCAM landscape	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Mobility Ecosystem Knowledge	Understanding of CCAM technologies, stakeholders, and operational models including autonomous vehicles and smart infrastructure.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
2	Risk Assessment in CCAM	Ability to evaluate emerging risks related to connected and automated mobility systems.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
3	Telematics & Sensor Data Analysis	Proficiency in interpreting vehicle-generated data to inform underwriting and claims.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
4	Cybersecurity Awareness	Knowledge of digital threats and protection strategies relevant to connected mobility systems.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
5	Regulatory Compliance	Familiarity with evolving legal frameworks governing CCAM and insurance obligations.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
6	Product Innovation	Skill in designing new insurance products tailored to CCAM use cases (e.g., usage-based insurance).							Innovation and sustainability strategies are essential for adapting insurance models to CCAM ecosystems.
7	Data Privacy & Ethics	Understanding of data governance, consent, and ethical use of mobility data.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
8	Digital Claims Management	Ability to implement and manage automated, data-driven claims processes.							Manual claims handling declines as automation and AI-driven processes dominate, but oversight remains partially relevant.
9	Cross-sector Collaboration	Experience working with automotive, tech, and infrastructure partners to co-develop insurance solutions.							Collaboration and organizational change reduce as systems mature, but remain partially relevant for governance and integration.
10	AI & Machine Learning Literacy	Basic grasp of AI models used in autonomous systems and their implications for insurance.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
11	Scenario Modeling & Simulation	Capability to model future mobility scenarios and assess insurance impacts.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.
12	Customer-Centric Design	Designing insurance experiences that align with user expectations in digital mobility environments.							Innovation and sustainability strategies are essential for adapting insurance models to CCAM ecosystems.
13	Change Management	Leading organizational transformation from legacy insurance models to CCAM-ready frameworks.							Collaboration and organizational change reduce as systems mature, but remain partially relevant for governance and integration.
14	Sustainability & ESG Integration	Aligning insurance offerings with environmental and social governance goals in mobility.							Innovation and sustainability strategies are essential for adapting insurance models to CCAM ecosystems.
15	Strategic Foresight	Anticipating long-term trends in mobility and positioning insurance strategies accordingly.							Core technical and regulatory skills remain critical for CCAM risk management across all automation levels.

INSURANCE & RISK ASSESSMENT PROFESSIONALS (ISCO-08: 2619; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Specializes in assessing legal responsibility in incidents involving autonomous systems.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Tort Law Expertise	Deep understanding of civil liability principles, including negligence, strict liability, and product liability.							Legal and regulatory expertise remains critical across all automation levels for compliance and liability management.
2	Technology Law Literacy	Familiarity with legal frameworks governing AI, robotics, and autonomous systems.							Legal and regulatory expertise remains critical across all automation levels for compliance and liability management.
3	Regulatory Analysis	Ability to interpret and apply national and international regulations related to autonomous mobility.							Legal and regulatory expertise remains critical across all automation levels for compliance and liability management.
4	Incident Reconstruction	Skill in analyzing data and evidence to reconstruct events involving autonomous systems.							Technical and forensic skills are essential for investigating incidents and interpreting AI decisions at all SAE levels.
5	Data Forensics	Understanding of digital evidence, including sensor logs, telematics, and algorithmic decision trails.							Technical and forensic skills are essential for investigating incidents and interpreting AI decisions at all SAE levels.
6	Contractual Risk Assessment	Evaluating liability clauses in contracts between manufacturers, operators, and users of autonomous systems.							Legal and regulatory expertise remains critical across all automation levels for compliance and liability management.
7	Ethical Reasoning	Applying ethical frameworks to assess responsibility in complex, multi-agent scenarios.							Ethical reasoning remains vital for addressing complex liability and fairness issues in automated systems.
8	AI Decision-Making Interpretation	Ability to interpret and critique algorithmic behavior and its legal implications.							Technical and forensic skills are essential for investigating incidents and interpreting AI decisions at all SAE levels.
9	Cross-disciplinary Communication	Collaborating effectively with engineers, insurers, and policymakers to build legal arguments.							Collaboration and litigation support reduce as automation and standardized protocols mature, but remain partially relevant for governance and disputes.
10	Case Law Research	Staying updated on precedents and evolving jurisprudence related to autonomous technologies.							Collaboration and litigation support reduce as automation and standardized protocols mature, but remain partially relevant for governance and disputes.
11	Expert Witness Coordination	Working with technical experts to support legal claims or defenses in litigation.							Collaboration and litigation support reduce as automation and standardized protocols mature, but remain partially relevant for governance and disputes.
12	Risk Mitigation Strategy	Advising stakeholders on how to reduce legal exposure in autonomous deployments.							Collaboration and litigation support reduce as automation and standardized protocols mature, but remain partially relevant for governance and disputes.
13	Privacy & Consent Analysis	Evaluating how data collection and usage affect liability in incidents.							Legal and regulatory expertise remains critical across all automation levels for compliance and liability management.
14	International Law Awareness	Understanding cross-border legal issues in global autonomous system operations.							Legal and regulatory expertise remains critical across all automation levels for compliance and liability management.
15	Litigation & Dispute Resolution	Managing legal processes, from pre-trial investigation to courtroom strategy and settlement.							Manual litigation tasks decline with digital evidence and automated compliance tools, but oversight remains partially relevant.
16	Advise on legal decisions	Advise judges, or other officials in legal decision-making positions, on which decision would be right, compliant with the law and with moral considerations, or most advantageous for the adviser's client, in a specific case.							Manual litigation tasks decline with digital evidence and automated compliance tools, but oversight remains partially relevant.
17	Observe confidentiality	Observe the set of rules establishing the nondisclosure of information except to another authorised person.							Confidentiality remains mandatory across all SAE levels regardless of automation.

LEGAL & REGULATORY PROFESSIONALS (ISCO-08: 2619; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Ensures that companies developing and deploying CCAM technologies comply with local, national, and international regulations navigates and comply with regulations. Specializes in the legal aspects of data collection, storage, and sharing for connected vehicles, ensuring compliance with privacy laws and regulations. Focuses on the legal implications of cybersecurity threats to connected and automated vehicles, advising on risk management and compliance. Formulate and stablish suitable regulations and legal framework for the operation of autonomous vehicles and managing issues related to the future vehicles as well as solve liability issues in case of failure or incident occurrence and develop ethical rules for the robots.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Observe confidentiality	Observe the set of rules establishing the nondisclosure of information except to another authorised person.							Confidentiality remains mandatory across all SAE levels regardless of automation.
2	Regulatory Compliance Strategy	Ability to interpret and apply local, national, and international laws to CCAM technologies.							Core legal and compliance skills remain critical across all automation levels for governance and risk management.
3	Data Protection & Privacy Law	Expertise in GDPR and other privacy frameworks governing vehicle data collection, storage, and sharing.							Core legal and compliance skills remain critical across all automation levels for governance and risk management.
4	Cybersecurity Legal Risk Analysis	Assessing legal implications of cyber threats and advising on compliance and mitigation strategies.							Core legal and compliance skills remain critical across all automation levels for governance and risk management.
5	Autonomous Vehicle Legislation	Deep understanding of laws and policies specific to self-driving and connected vehicles.							Core legal and compliance skills remain critical across all automation levels for governance and risk management.
6	Policy Formulation & Advocacy	Crafting and promoting legal frameworks that support safe and ethical CCAM deployment.							Policy and coordination tasks reduce as frameworks mature, but remain partially relevant for oversight and updates.
7	Liability & Insurance Law	Navigating complex liability issues in incidents involving autonomous systems and advising on coverage.							Core legal and compliance skills remain critical across all automation levels for governance and risk management.
8	Ethics in Robotics & AI	Developing ethical guidelines for autonomous decision-making and robotic behavior.							Ethical oversight remains vital for ensuring fairness and accountability in automated decision-making.
9	Cross-border Legal Coordination	Managing legal challenges in international CCAM operations and harmonizing regulatory approaches.							Policy and coordination tasks reduce as frameworks mature, but remain partially relevant for oversight and updates.
10	Contract Law & Technology Agreements	Drafting and reviewing contracts between OEMs, tech providers, and mobility operators.							Policy and coordination tasks reduce as frameworks mature, but remain partially relevant for oversight and updates.
11	Legal Risk Management	Identifying and mitigating legal risks in CCAM development and deployment.							Policy and coordination tasks reduce as frameworks mature, but remain partially relevant for oversight and updates.
12	Public Policy Engagement	Collaborating with government bodies to shape mobility legislation and standards.							Policy and coordination tasks reduce as frameworks mature, but remain partially relevant for oversight and updates.
13	Legal Tech Literacy	Familiarity with legal technologies and platforms used for compliance tracking and case management.							Legal tech literacy remains essential for managing compliance and digital case workflows at all SAE levels.
14	Stakeholder Negotiation	Leading legal discussions among diverse stakeholders including regulators, engineers, and insurers.							Manual negotiation and incident handling decline with automation and standardized protocols, but oversight remains partially relevant.
15	AI Governance & Accountability	Ensuring transparency and accountability in algorithmic decision-making within mobility systems.							Core legal and compliance skills remain critical across all automation levels for governance and risk management.
16	Incident Investigation & Legal Response	Coordinating legal response and documentation in case of system failures or accidents.							Manual negotiation and incident handling decline with automation and standardized protocols, but oversight remains partially relevant.

LOGISTICS MANAGERS (ISCO-08: 4323; ISCO skill level: 2).									
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Manage the logistics of automated mobility services	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Ensure public safety and security	Implement the relevant procedures, strategies and use the proper equipment to promote local or national security activities for the protection of data, people, institutions, and property.							Safety oversight remains important but manual enforcement declines as automation and monitoring systems mature.
2	Macht vehicles with routes	Match types of vehicles to transport routes, taking into consideration service frequency, peak transport times, service area covered, and road conditions.							Manual route planning and fleet allocation reduce as AI-driven optimization tools dominate at higher automation levels.
3	Follow work procedures	Adhere to procedures at work in a structured and systematic manner.							Standardized procedures become embedded in automated systems, reducing manual adherence but still requiring oversight.
4	Manage fleet capacity	Manage the existing fleet, its availability and carrying capacity in order to schedule itineraries.							Manual route planning and fleet allocation reduce as AI-driven optimization tools dominate at higher automation levels.
5	Manage truck drivers	Manage the operational performance of truck drivers.							Driver management becomes obsolete as vehicles re
6	Monitor vehicle fleet operations	Monitor the operations of the vehicle fleet; track delays and identify repair needs; analyse fleet information to develop and implement improvement actions.							Monitoring shifts to automated dashboards and pred
7	Handle intermodal equipment	Handle intermodal equipment e.g. cranes, sideloaders, forklifts and hostler trucks.							Manual handling of intermodal equipment declines a
8	Prepare transportation routes	Prepare routes by chosing the best possible way and foresee adjustments in case of need, by providing additional running time or adapting capacity and timing in response to changes in circumstances, thereby ensuring an efficient use of resources and achievement of customer relations goals.							Manual route planning and fleet allocation reduce as
11	Autonomous Mobility Technologies	Understand basic systems like sensors, V2X, and MaaS platforms							Digital and cybersecurity skills remain critical for man
12	Incident and Disruption Management	Respond to service interruptions and technical failures							Incident response becomes partially automated but h
13	Fleet Management Software (FMS)	Use digital tools to track vehicle status and performance							Digital and cybersecurity skills remain critical for man
14	Communication and Coordination	Liaise with technical teams, operators, and customers							Human coordination reduces as systems automate w
15	Safety and Cybersecurity Awareness	Apply safety protocols and digital security measures							Digital and cybersecurity skills remain critical for man
16	Data Interpretation and Reporting	Analyze operational data and generate reports							Digital and cybersecurity skills remain critical for man
17	Resource and Staff Supervision	Oversee support personnel like technicians and coordinators							Human coordination reduces as systems automate w
18	Adaptability to Technological Change	Learn new tools and adapt to evolving mobility technologies							Digital and cybersecurity skills remain critical for man

LOGISTICS MANAGERS (ISCO-08: 1324; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Responsible for goods mobility management in urban areas; coordination between shippers, logistics service providers and retailers. Coordinates and manage the logistics of automated and connected vehicle shipments, ensuring compliance with international regulations and optimizing the efficiency of transportation networks	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS	
1	Analyse transport costs	Identify and analyse transportation costs, service levels and availability of equipment. Make recommendations and take preventive/corrective measures.							Efficiency planning shifts to AI-driven optimization, reducing manual involvement but oversight remains partially relevant.	
2	Coordinate road haulage operations	Plan and coordinate road haulage and distribution; ensure that goods reach their destinations in a safe and timely manner.							Manual coordination declines as automated fleet management systems dominate at higher SAE levels.	
3	Coordinate transport fleet	Coordinate and supervise transport fleet in all of its traffic functions; maintain service levels while keeping costs at a minimum.							Manual coordination declines as automated fleet management systems dominate at higher SAE levels.	
4	Develop efficiency plans for logistics operations	Elaborate and implement plans in order to increase efficiency and reduce waste during logistics operations.							Efficiency planning shifts to AI-driven optimization, reducing manual involvement but oversight remains partially relevant.	
5	Implement efficiency plans for logistics operations	Implement efficiency plans developed by managers in facilities. Use techniques, resources, and training in order to improve workplace efficiency.							Efficiency planning shifts to AI-driven optimization, reducing manual involvement but oversight remains partially relevant.	
6	Liaise with transportation companies	Establish relationships with transportation companies in order to negotiate advantageous agreements for the transport of goods and livestock.							Human communication reduces as digital platforms handle most interactions, but remains partially relevant for exceptions.	
7	Make independent operating decisions	Make immediate operating decisions as necessary without reference to others, taking into account the circumstances and any relevant procedures and legislation. Determine alone which option is the best for a particular situation.							Decision-making becomes increasingly automated, but human oversight remains partially relevant for complex scenarios.	
8	Promote the use of sustainable transport	Promote the use of sustainable transport to reduce the carbon footprint and noise and increase safety and efficiency of transport systems. Determine performance regarding the use of sustainable transport, set objectives for promoting the use of sustainable transport and propose environmentally friendly alternatives of transport.							Sustainability goals remain essential across all automation levels.	
9	Set transport targets	Set transport targets and ensure that employees and operations meet their targets.							Target setting and tracking shift to automated dashboards, reducing manual tasks but requiring oversight.	
10	Road traffic laws	The rule governing the circulation of vehicles, such as national traffic codes and the rules of the road.							Legal compliance remains mandatory regardless of automation level.	
11	Road transport legislation	The regulations at regional, national, and European level on safety and environmental requirements for road transport operations.							Legal compliance remains mandatory regardless of automation level.	
12	Develop compliance with legal requirements	Guarantee compliance with established and applicable standards and legal requirements such as specifications, policies, standards or law for the goal that organisations aspire to achieve in their efforts.							Legal compliance remains mandatory regardless of automation level.	
13	Communicate with customers	Respond to and communicate with customers in the most efficient and appropriate manner to enable them to access the desired products or services, or any other help they may require.							Human communication reduces as digital platforms handle most interactions, but remains partially relevant for exceptions.	
14	Track shipments	Track and trace all shipment movements on a daily basis by utilising information from tracking systems and proactively notifying customers about the location of their shipments.							Target setting and tracking shift to automated dashboards, reducing manual tasks but requiring oversight.	
15	Logistics Management	Efficient planning and supervision of routes, timing, and resources for shipments.							Digital logistics, connected vehicle knowledge, and compliance remain critical across all automation levels.	
16	Connected Vehicle Knowledge	Understanding of technologies like IoT, sensors, and networks applied to transport.							Digital logistics, connected vehicle knowledge, and compliance remain critical across all automation levels.	
17	Fleet Coordination	Ability to organize and optimize the use of multiple automated vehicles.							Digital logistics, connected vehicle knowledge, and compliance remain critical across all automation levels.	
18	Data Analysis	Use of real-time data to improve logistical and operational decisions.							Digital logistics, connected vehicle knowledge, and compliance remain critical across all automation levels.	
19	Effective Communication	Clear interaction with suppliers, clients, and technical teams.							Human communication reduces as digital platforms handle most interactions, but remains partially relevant for exceptions.	
20	Problem Solving	Quick identification and resolution of issues in the supply chain.							Decision-making becomes increasingly automated, but human oversight remains partially relevant for complex scenarios.	
21	Logistics Software Proficiency	Skilled in digital platforms for tracking, planning, and controlling shipments.							Digital logistics, connected vehicle knowledge, and compliance remain critical across all automation levels.	
22	Regulatory Awareness	Familiarity with transport, safety, and vehicle technology regulations.							Digital logistics, connected vehicle knowledge, and compliance remain critical across all automation levels.	

MAINTENANCE & REPAIR OPERATORS (ISCO-08: 7231; ISCO skill level: 2).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Maintains, diagnoses, and repairs connected and automated vehicles, ensuring the proper functioning of advanced systems such as sensors, electric drivetrains, and vehicle-to-everything (V2X) communication components. Help with the upkeep of roadside units, cameras, and V2X communication devices.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Adapt to new technology used in cars	Adapt to new technology integrated in cars; understand systems operation and provide troubleshooting.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
2	Diagnose problems with vehicles	Diagnose issues with vehicles and assess the efforts and costs required to resolve them.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
3	Carry out repair of vehicles	Provide repair for vehicles and routine level checks, such as engine tune-ups, oil changes, tire rotation and changes, wheel balancing, replacing filters, repair engine failures; repair mechanical and electrical systems malfunctions; replace parts and components; repair body damage.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
4	Maintain motor vehicle steering system	Maintain the system that allows motor vehicles to be directed towards a desired route through steering wheel linkages by using hand and power tools. Make repairs if necessary.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
5	Maintain electrical engines	Understanding of electrical circuits and being able to repair. Test and replace electrical components and wiring, using test meters, soldering equipment, and hand tools.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
6	Vehicle Diagnostics	Ability to identify and troubleshoot issues in connected and automated vehicles.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
7	Sensor Calibration	Expertise in adjusting and validating sensors for accurate data collection.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
8	Electric Drivetrain Maintenance	Knowledge of servicing electric motors, batteries, and power electronics.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
9	V2X Communication Systems	Understanding of vehicle-to-everything protocols and device integration.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
10	Roadside Unit Installation	Skill in setting up and maintaining roadside communication infrastructure.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
11	Camera System Configuration	Ability to install, align, and test vehicle and roadside camera systems.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
12	CAN Bus Analysis	Proficiency in interpreting data from vehicle communication networks.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
13	Software Updates & Integration	Capability to manage firmware updates and integrate new vehicle technologies.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.
14	Safety & Compliance Standards	Familiarity with automotive safety regulations and technical standards.							As automation rises, traditional mechanical tasks decline while advanced diagnostics, software, and sensor-related skills become critical.

MAINTENANCE & REPAIR OPERATORS (ISCO-08: 3114, 3119; ISCO skill level: 3).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Maintain trackside sensors and communication systems. Performs maintenance on infrastructure.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Adjust engineering designs	Adjust designs of products or parts of products so that they meet requirements.							Design adjustments and digital transformation remain critical for adapting to automation and CCAM systems.
2	Assemble sensors	Mount chips on a sensor substrate and attach them using soldering or wafer bumping techniques.							Manual sensor assembly declines as automated manufacturing and robotics take over these tasks.
3	Test sensors	Test sensors using appropriate equipment. Gather and analyse data. Monitor and evaluate system performance and take action if needed.							Testing and diagnostics remain essential for ensuring system reliability across all automation levels.
4	Electronic test procedures	Testing protocols that enable a variety of analyses of electronic systems, products, and components. These tests include the testing of electrical properties, such as voltage, current, resistance, capacitance, and inductance as well as the testing of specific electronic components, such as the electron tubes, semiconductors, integrated circuits, and batteries. These tests include visual inspection, performance tests, environment tests, and safety tests.							Testing and diagnostics remain essential for ensuring system reliability across all automation levels.
5	Maintain sensor equipment	Diagnose and detect malfunctions in sensor components, systems, and products using sensors and remove, replace, or repair these components when necessary. Execute preventative equipment maintenance tasks, such as storing the components in clean, dust-free, and non-humid spaces.							Manual maintenance reduces as predictive and automated diagnostics dominate, but oversight remains partially relevant.
6	Resolve equipment malfunctions	Identify, report and repair equipment damage and malfunctions; communicate with field representatives and manufacturers to obtain repair and replacement components.							Manual maintenance reduces as predictive and automated diagnostics dominate, but oversight remains partially relevant.
7	Keep up with digital transformation of industrial processes	Keep up to date with digital innovations applicable to industrial processes. Integrate these transformations in the company's processes aiming for competitive and profitable business models.							Design adjustments and digital transformation remain critical for adapting to automation and CCAM systems.
8	Communicate with customers	Respond to and communicate with customers in the most efficient and appropriate manner to enable them to access the desired products or services, or any other help they may require.							Customer communication shifts to digital platforms, reducing manual involvement but still needed for complex cases.

MAINTENANCE & REPAIR OPERATORS (ISCO-08: 2511, 2514; ISCO skill level: 4).										
SKILL # (ESCO)	SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Uses sensor data and AI to anticipate and prevent failures in AV systems. Charging infra needs constant attention, cleaning, digital upgrading etc.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Analyse big data	Collect and evaluate numerical data in large quantities, especially for the purpose of identifying patterns between the data.							Advanced analytics, predictive maintenance, and IoT integration remain critical for AV reliability across all automation levels.
2	Collect ICT data	Gather data by designing and applying search and sampling methods.							Manual data collection and interpretation decline as automated data pipelines and AI-driven insights dominate, but oversight remains partially relevant.
3	Interpret current data	Analyse data gathered from sources such as market data, scientific papers, customer requirements and questionnaires which are current and up-to-date in order to assess development and innovation in areas of expertise.							Manual data collection and interpretation decline as automated data pipelines and AI-driven insights dominate, but oversight remains partially relevant.
4	Perform data mining	Explore large datasets to reveal patterns using statistics, database systems or artificial intelligence and present the information in a comprehensible way.							Advanced analytics, predictive maintenance, and IoT integration remain critical for AV reliability across all automation levels.
5	Analyse software specifications	Assess the specifications of a software product or system to be developed by identifying functional and non-functional requirements, constraints and possible sets of use cases which illustrate interactions between the software and its users.							Software specification analysis remains essential for system updates and integration at all SAE levels.
6	Sensor Data Analysis	Ability to interpret and process data from various AV sensors to detect anomalies.							Advanced analytics, predictive maintenance, and IoT integration remain critical for AV reliability across all automation levels.
7	Predictive Maintenance	Uses AI models to forecast system failures and schedule proactive interventions.							Advanced analytics, predictive maintenance, and IoT integration remain critical for AV reliability across all automation levels.
8	Machine Learning	Develops and trains algorithms to improve AV system reliability and performance.							Advanced analytics, predictive maintenance, and IoT integration remain critical for AV reliability across all automation levels.
9	Systems Diagnostics	Identifies root causes of AV malfunctions using automated diagnostic tools.							Advanced analytics, predictive maintenance, and IoT integration remain critical for AV reliability across all automation levels.
10	Charging Infrastructure Management	Monitors and maintains EV charging stations, ensuring uptime and safety.							Maintenance of charging infrastructure and digital updates remain critical for operational continuity across all automation levels.
11	Digital Upgrading	Implements software and firmware updates across AV and charging systems.							Maintenance of charging infrastructure and digital updates remain critical for operational continuity across all automation levels.
12	Cleaning & Sanitation Protocols	Designs and enforces cleaning routines for AVs and charging stations to ensure hygiene and functionality.							Manual cleaning tasks reduce as automation and robotics take over, but hygiene oversight remains partially relevant.
13	IoT Integration	Connects AV systems and infrastructure to smart networks for real-time monitoring and control.							Advanced analytics, predictive maintenance, and IoT integration remain critical for AV reliability across all automation levels.

ON-SITE MOBILITY ASSISTANCE ROLES (ISCO-08: 5111, 4222, 5249; ISCO skill level: 2).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Customer engagement and safety issues, Assistance of elderly and disabled during travel, Assistance to passengers pre-, during and post-travel, More focus on the needs of the customer (traveller). Provides personalized travel assistance in multimodal hubs or on-demand services. Facilitates the onboarding and support of customers using connected and automated rental vehicles. Assist with vehicle parking and retrieval in CCAM-enabled environments, potentially coordinating with autonomous vehicle systems.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS
1	Communicate verbal instructions	Communicate transparent instructions. Ensure that messages are understood and followed correctly.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
2	Deliver outstanding service	Provide outstanding customer service by exceeding customer expectations; establish reputation as an exceptional service provider.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
3	Follow verbal instructions	Have the ability to follow spoken instructions received from colleagues. Strive to understand and clarify what is being requested.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
4	Provide first aid	Administer cardiopulmonary resuscitation or first aid in order to provide help to a sick or injured person until they receive more complete medical treatment.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
5	Assist passengers	Provide help to people getting in and out of their car or any other transportation vehicle, by opening doors, provide physical support or hold belongings. Keep safety measures and procedures in mind.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
6	Health and safety measures in transportation	The body of rules, procedures and regulations related to health and safety measures intended to prevent accidents or incidents in transportation.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
7	Assist clients with special needs	Aid clients with special needs following relevant guidelines and special standards. Recognise their needs and accurately respond to them if needed.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
8	Identify customer's needs	Use appropriate questions and active listening in order to identify customer expectations, desires and requirements according to product and services.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
9	Show intercultural awareness	Show sensibility towards cultural differences by taking actions which facilitate positive interaction between international organisations, between groups or individuals of different cultures, and to promote integration in a community.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
10	Create solutions to problems	Solve problems which arise in planning, prioritising, organising, directing/facilitating action and evaluating performance. Use systematic processes of collecting, analysing, and synthesising information to evaluate current practice and generate new understandings about practice.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
11	Guarantee customer satisfaction	Handle customer expectations in a professional manner, anticipating and addressing their needs and desires. Provide flexible customer service to ensure customer satisfaction and loyalty.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
12	Work with e-services available to citizens	Use, manage and work with public and private online services							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
13	Use internet chat	Chat online using dedicated chat websites, messenger applications or social media websites.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
14	Clear and Empathetic Communication	Ability to simplify technical concepts and guide customers through onboarding with patience and clarity.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
15	Technical problem solving	Diagnosing and resolving issues related to connectivity, app functionality, or digital systems using diagnostic tools and digital dashboards.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
16	Proficiency with Digital Management Platforms	Skilled in using CRM, fleet management software, and mobile apps to handle reservations, contracts, and vehicle tracking efficiently.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
17	Technical Knowledge of Connected Vehicles	Understanding telematics, GPS, remote access, and automation systems to explain and support vehicle features like tracking and remote unlocking.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
18	Familiarity with Autonomous Vehicle Systems	Understanding how autonomous vehicles operate, including sensors, navigation protocols, and handover procedures between manual and automated control.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
19	Coordination in CCAM Environments	Ability to interact with Cooperative, Connected, and Automated Mobility (CCAM) infrastructure, such as smart parking systems and vehicle-to-infrastructure (V2I) communication.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
20	Spatial Awareness and Safety Monitoring	Skill in monitoring vehicle movements, ensuring safe navigation in dynamic environments, and intervening when necessary to prevent collisions or errors.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.
21	Use of Digital Parking Interfaces	Proficiency in using digital platforms, mobile apps, and automated parking systems to manage vehicle entry, retrieval, and customer notifications.							As automation increases, physical and basic communication tasks decline while technical and digital skills become essential.

POLICY MAKERS (ISCO-08: 2422, 2432; ISCO skill level: 4).										
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)							
		Designing, evaluating, and implementing public policies (CCAM related). Facilitate dialogue with citizens during CCAM testing and deployment phases. Advocate for fair labor practices in environments managed by algorithms, ensuring certified staff are protected and systemic failures are properly investigated.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	COMMENTS	
1	Policy design and evaluation	Ability to create, assess, and revise public policies related to CCAM, ensuring alignment with societal needs, legal frameworks, and technological trends.							Skills don't belong to ESCO; adapted to CCAM	
2	Citizen engagement and dialogue	Skill in facilitating inclusive conversations with diverse communities during CCAM testing and deployment, promoting transparency and trust.								
3	Labor rights advocacy	Capacity to defend fair working conditions in algorithm-managed environments, ensuring compliance with labor laws and ethical standards.								
4	Regulatory and legal literacy	Understanding of legal frameworks governing mobility, automation, data protection, and labor to ensure lawful and equitable policy implementation.								
5	Stakeholder coordination	Ability to align interests and actions among government bodies, tech developers, labor unions, and citizens for coherent CCAM deployment.								
6	Impact assessment and risk analysis	Skill in evaluating the social, economic, and ethical impacts of CCAM technologies, including risks of job displacement or algorithmic bias.								
7	Negotiation and conflict resolution	Expertise in mediating disputes between workers, employers, and institutions, especially in contexts involving automation and digital oversight.								
8	Data interpretation and algorithmic oversight	Ability to understand how algorithms affect labor and mobility systems, and to advocate for transparency and accountability in automated decision-making.								
9	Equity and inclusion strategy	Competence in designing policies and engagement strategies that prioritize marginalized groups and ensure equitable access to CCAM benefits.								
10	Public communication and education	Skill in translating complex CCAM concepts into accessible language for public outreach, training, and awareness campaigns.								

Software & Systems developent (ISCO-08: 2511, 2512, 2513, 2519; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
			0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation	
1	apply programming languages	Apply languages like Python, C++, or Java to develop algorithms for autonomous driving, connectivity, and simulation environments.							
2	develop software applications	Build applications for vehicle control systems, cooperative traffic management, and mobility-as-a-service platforms.							
3	design system architecture	Design architectures for integrated CCAM ecosystems, ensuring interoperability between vehicles, infrastructure, and cloud services.							
4	use software design patterns	Implement patterns that support modularity and scalability in autonomous systems and V2X communication platforms.							
5	debug software	Debug safety-critical systems for automated driving and connectivity to ensure reliability and compliance with standards.							
6	develop algorithms	Develop algorithms for route optimization, sensor fusion, and real-time decision-making in automated mobility.							
7	use integrated development environment (IDE) software	Utilize IDEs for rapid prototyping and testing of CCAM applications, including simulation-based development.							
8	implement front-end website design	Design intuitive dashboards for mobility platforms and fleet management systems.							
9	use markup languages	Use markup languages for CCAM-related web services and data visualization tools.							
10	provide technical documentation	Document CCAM software architectures, safety protocols, and interoperability standards.							
11	analyse software specifications	Interpret specifications for CCAM systems to ensure compliance with safety, interoperability, and cybersecurity standards.							
12	use database management system	Manage large-scale mobility datasets for predictive analytics and traffic simulation.							
13	test software performance	Conduct performance tests for CCAM applications under real-world traffic scenarios and edge cases.							
14	apply software developme	Apply agile methods to accelerate development of CCAM solutions and ensure iterative testing.							
15	adapt to change in the wor	Stay updated on emerging CCAM technologies such as AI-driven mobility, edge computing, and 5G/6G connectivity.							

Urban Planner (ISCO-08: 2164 Urban and Regional Planners; ISCO skill level: 4).								
SKILL #	(ESCO) SKILLS/KNOWLEDG	DESCRIPTION	LEVELS OF AUTOMATION (SAE)					
			0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Use geographic information systems (GIS)	Operate GIS software to analyze spatial data and create maps for planning and infrastructure projects.						
2	Apply sustainable urban design principles	Integrate sustainability into urban planning and infrastructure development.						
3	Analyse transportation systems	Evaluate mobility patterns and transport infrastructure to improve connectivity.						
4	Develop smart city strategies	Plan and implement digital solutions for urban environments, including IoT and connectivity.						
5	Assess environmental impact	Conduct studies to determine how projects affect ecosystems and climate resilience.						
6	Plan digital infrastructure	Design and coordinate broadband, sensors, and communication networks for connected mobility.						
7	Manage urban development projects	Coordinate stakeholders and resources for large-scale projects.						
8	Apply data analytics for urban planning	Use big data and predictive models for mobility and infrastructure design.						
9	Ensure compliance with regulatory standards	Apply legal frameworks and urban planning regulations.						
10	Communicate effectively with stakeholders	Engage with authorities, partners, and citizens to align goals.						
11	Facilitate participatory planning	Organize workshops and consultations for community input.						
12	Integrate multimodal transport solutions	Combine public transport, cycling, walking, and automated vehicles.						
13	Evaluate smart mobility tec	Assess autonomous vehicles, connected traffic systems, and MaaS platforms.						
14	Use simulation tools for ur	Model traffic, land use, and infrastructure scenarios.						

Urban Planner (ISCO-08: 2142 Civil Engineer; ISCO skill level: 4).								
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)					
		designs infrastructure and spatial layouts that enable safe and efficient automated mobility. The role ensures integration of connected and cooperative systems into urban environments, considering traffic flow, sustainability, and accessibility.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Design civil infrastructure	Create plans for roads, bridges, and tunnels considering CCAM requirements.						
2	Apply building information modelling (BIM)	Use BIM software for integrated design and digital infrastructure planning.						
3	Use geographic information systems (GIS)	Operate GIS tools to analyze spatial data for infrastructure projects.						
4	Plan digital infrastructure	Design and coordinate sensors, IoT, and connectivity for smart roads.						
5	Analyse transportation systems	Evaluate traffic flow and multimodal transport for CCAM integration.						
6	Apply sustainable construction practices	Ensure environmental sustainability in infrastructure projects.						
7	Use simulation tools for infrastructure planning	Model traffic and structural scenarios for CCAM readiness.						
8	Evaluate smart mobility technologies	Assess autonomous and connected vehicle requirements in infrastructure design.						
9	Ensure compliance with safety standards	Apply legal and technical standards for road safety and automation.						
10	Manage civil engineering projects	Coordinate resources and timelines for infrastructure development.						
11	Apply data analytics for infrastructure	Use big data to optimize traffic and infrastructure performance.						
12	Integrate multimodal transport solutions	Combine roads with cycling, walking, and automated vehicle systems.						
13	Communicate effectively with stakeholders	Engage with authorities and partners for CCAM infrastructure projects.						
14	Apply project management princip	Use methodologies to manage complex civil and digital infrastructure projects.						
15	Assess environmental impact	Evaluate ecological effects of infrastructure projects.						

Urban Planner (ISCO-08: 3114; Building and Civil Engineering Technicians; ISCO skill level: 3).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Assist engineers and planners in implementing construction projects, using tools like CAD, BIM, and GIS. They ensure compliance with standards and help integrate physical and digital infrastructure such as sensors and connectivity into roads and urban spaces to support smart mobility and CCAM systems	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Prepare technical drawings	Create detailed plans using CAD software for infrastructure projects.						
2	Apply building information modelling (BIM)	Use BIM tools for integrated design and digital infrastructure planning.						
3	Use geographic information systems (GIS)	Operate GIS tools to support spatial analysis for CCAM projects.						
4	Assist in planning digital infrastructure	Support deployment of sensors, IoT, and connectivity for smart roads.						
5	Monitor construction activities	Ensure compliance with design and safety standards during implementation.						
6	Apply sustainable construction practices	Support environmentally friendly methods in infrastructure projects.						
7	Use simulation tools for infrastructure	Assist in modeling traffic and structural scenarios for CCAM readiness.						
8	Evaluate smart mobility technologies	Support integration of autonomous and connected vehicle systems.						
9	Ensure compliance with safety standards	Apply technical standards for road safety and automation readiness.						
10	Assist in project management	Help coordinate resources and timelines for infrastructure development.						
11	Apply data analytics for infrastructure	Support data-driven decisions to optimize traffic and infrastructure.						
12	Integrate multimodal transport solutions	Assist in combining roads with cycling, walking, and automated systems.						
13	Communicate effectively with stakeholders	Provide technical updates and collaborate with engineers and planners.						
14	Apply quality control procedures	Ensure materials and processes meet required standards.						
15	Assist in environmental impact ass	Support evaluation of ecological effects of infrastructure projects.						

Remote mobility support roles (ISCO-08: 4222 contact centre information clerks, 4323 transport clerks; ISCO skill level: 2).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Handle remote assistance for drivers and passengers, monitor vehicle systems, issue tickets or tolls, and support electric vehicle operations. In CCAM, these roles evolve to include digital interaction platforms, real-time data monitoring, and coordination with automated systems, ensuring seamless service delivery and safety in highly connected transport ecosystems.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Provide customer support	Assist customers remotely via digital platforms for mobility services.						
2	Use customer relationship management software	Operate CRM tools to manage inquiries and service requests.						
3	Monitor transport operations	Track vehicle and transport system status using digital dashboards.						
4	Handle electronic ticketing systems	Manage ticket issuance and toll collection through automated systems.						
5	Provide remote assistance for automated vehicles	Support drivers and passengers in resolving issues with connected vehicles.						
6	Apply cybersecurity principles	Ensure secure handling of customer and vehicle data in digital systems.						
7	Use real-time communication tools	Operate chat, voice, and video platforms for remote mobility support.						
8	Manage incident reporting systems	Log and escalate technical or operational issues in CCAM environments.						
9	Interpret telematics data	Analyze vehicle data to assist in troubleshooting and performance monitoring.						
10	Coordinate with technical teams	Collaborate with engineers and service providers to resolve mobility issues.						
11	Apply problem-solving techniques	Resolve customer and operational issues efficiently and effectively.						
12	Use digital payment systems	Process tolls and service payments through secure online platforms.						
13	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive information.						
14	Operate remote diagnostic tools	Assist in identifying and resolving technical issues in connected vehicles.						
15	Communicate effectively with cust	Provide clear and empathetic support to enhance user experience.						

Surveillance operators (ISCO-08: 5414 security guards; ISCO skill level: 2).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Surveillance Operators (including transport surveillance staff, parking enforcement officers, and traffic violation officers) are responsible for monitoring public transport systems, enforcing regulations, and ensuring safety. In CCAM contexts, these roles evolve to use digital surveillance tools, automated violation detection systems, and real-time data platforms to manage connected and automated mobility environments efficiently.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Monitor surveillance systems	Operate CCTV and digital monitoring tools for transport and traffic environments.						
2	Use incident reporting software	Log and escalate security or operational issues using digital platforms.						
3	Apply cybersecurity principles	Ensure secure handling of surveillance data and prevent unauthorized access.						
4	Operate automated violation detection systems	Use AI-based tools to identify traffic violations and enforce compliance.						
5	Interpret real-time transport data	Analyze live feeds and sensor data to detect anomalies and safety risks.						
6	Coordinate with enforcement teams	Communicate findings and alerts to field officers and technical teams.						
7	Apply problem-solving techniques	Resolve operational issues and respond to incidents effectively.						
8	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive surveillance data.						
9	Use digital communication tools	Operate chat and alert systems for real-time coordination.						
10	Operate access control systems	Manage digital systems for controlling entry and exit points.						
11	Manage automated parking enforcement tools	Use digital systems to monitor and enforce parking compliance.						
12	Apply basic IT troubleshooting	Resolve minor technical issues in surveillance and enforcement systems.						
13	Communicate effectively with stakeholders	Provide clear reports and updates to supervisors and authorities.						
14	Use mobile enforcement applicati	Operate handheld or mobile apps for traffic and parking enforcement.						
15	Respond to emergency situations	Act quickly and appropriately in case of incidents or system alerts.						

Mobility and services platform managers (ISCO-08: 2421 Management and organization analysts; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Mobility and Services Platform Managers such as MaaS Managers and AV Fleet Managers, oversee the integration and operation of connected mobility services and automated vehicle fleets. They manage digital platforms for MaaS, coordinate data-driven operations, ensure compliance with safety and cybersecurity standards, and optimize service delivery through analytics and automation. In CCAM, these roles are critical for orchestrating real-time multimodal transport systems, fleet connectivity, and user experience in highly automated environments.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Develop organizational strategies	Design and implement strategies for MaaS and AV fleet operations.						
2	Manage digital platforms	Oversee MaaS platforms and ensure seamless integration of services.						
3	Apply data analytics for decision-making	Use big data to optimize fleet and mobility services.						
4	Ensure compliance with regulatory standards	Apply legal frameworks for automated mobility and data protection.						
5	Manage automated vehicle fleets	Coordinate operations and maintenance of AV fleets.						
6	Apply cybersecurity principles	Ensure secure handling of data and protection of digital platforms.						
7	Use project management methodologies	Apply Agile or PRINCE2 for managing CCAM projects.						
8	Coordinate multimodal transport services	Integrate public transport, AVs, and shared mobility solutions.						
9	Monitor service performance	Track KPIs and operational metrics for mobility platforms.						
10	Manage stakeholder relationships	Engage with authorities, partners, and customers for CCAM services.						
11	Apply problem-solving techniques	Resolve operational and technical issues in mobility services.						
12	Use simulation tools for service planning	Model demand and fleet allocation scenarios for MaaS.						
13	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive data.						
14	Manage incident response protoc	Develop and implement plans for service disruptions and emergencies.						
15	Communicate effectively with stak	Provide clear updates and reports to decision-makers and partners.						

Remote operations (ISCO-08: 3154 Electronics Engineering Technicians; ISCO skill level: 3).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Responsible for monitoring and controlling connected and automated vehicles from a distance. They use advanced teleoperation systems, diagnostics tools, and real-time communication platforms to ensure safe and efficient operation of vehicles in complex environments. In CCAM, these roles are essential for intervening when automated systems encounter limitations, managing remote driving tasks, and maintaining connectivity and cybersecurity standards.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Operate teleoperation systems	Control connected and automated vehicles remotely using specialized platforms.						
2	Monitor vehicle diagnostics	Track and analyze real-time vehicle health and performance data.						
3	Apply cybersecurity principles	Ensure secure remote operations and prevent unauthorized access.						
4	Use real-time communication tools	Operate voice and video systems for coordination during remote driving.						
5	Interpret telematics data	Analyze sensor and connectivity data to support remote interventions.						
6	Apply troubleshooting techniques	Diagnose and resolve technical issues in remote operation systems.						
7	Operate simulation tools	Use simulators to train and test remote operation scenarios.						
8	Ensure compliance with safety standards	Follow protocols for safe remote driving and emergency handling.						
9	Manage incident reporting systems	Log and escalate technical or operational issues during remote operations.						
10	Apply data analytics for performance optimization	Use data insights to improve remote operation efficiency.						
11	Coordinate with technical teams	Collaborate with engineers and IT specialists to maintain systems.						
12	Operate remote diagnostic tools	Assist in identifying and resolving technical issues in connected vehicles.						
13	Apply problem-solving techniques	Resolve operational and technical challenges effectively.						
14	Ensure compliance with data prot	Follow GDPR and other standards for handling sensitive data.						
15	Communicate effectively with stak	Provide clear updates and reports to supervisors and partners.						

Traffic Control & Signalling (ISCO-08: 4323 Transport Clerks; ISCO skill level: 3).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Traffic Control & Signalling roles such as rail signallers, traffic controllers, and autonomous traffic coordinators, manage the safe and efficient movement of vehicles and trains. In CCAM, these roles evolve to operate digital signalling systems, automated traffic management platforms, and real-time coordination tools to ensure seamless integration of connected and automated vehicles within multimodal transport networks.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Operate traffic control systems	Manage digital platforms for traffic and rail signalling operations.						
2	Monitor transport operations	Track vehicle and train movements using real-time dashboards.						
3	Use automated signalling tools	Operate AI-based signalling systems for rail and road traffic.						
4	Interpret real-time traffic data	Analyze sensor and connectivity data to optimize traffic flow.						
5	Apply cybersecurity principles	Ensure secure handling of traffic control systems and data.						
6	Coordinate with transport operators	Communicate with drivers and operators to manage traffic incidents.						
7	Manage incident reporting systems	Log and escalate operational issues in traffic control environments.						
8	Operate remote diagnostic tools	Assist in identifying and resolving technical issues in signalling systems.						
9	Apply problem-solving techniques	Resolve operational and technical challenges effectively.						
10	Ensure compliance with safety standards	Follow protocols for safe traffic and signalling operations.						
11	Use simulation tools for traffic planning	Model traffic scenarios to improve flow and safety.						
12	Communicate effectively with stakeholders	Provide clear updates and reports to supervisors and partners.						
13	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive data.						
14	Operate automated traffic coordin	Manage systems that control autonomous vehicle flows.						
15	Apply basic IT troubleshooting	Resolve minor technical issues in traffic control systems.						

Socioeconomic & Impact Analysis (ISCO-08: 2631 Transport Economist, 2635 Social Impact Analysts ; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Assess the economic, social, and environmental implications of CCAM technologies and services. They conduct cost-benefit analyses, evaluate equity and accessibility impacts, and provide insights for policy and investment decisions. These roles ensure that CCAM solutions are financially viable, socially inclusive, and aligned with sustainability goals, supporting strategic planning and regulatory compliance.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Conduct cost-benefit analysis	Evaluate economic feasibility of CCAM projects and investments.						
2	Analyse transport economics	Assess pricing, demand, and financial models for mobility services.						
3	Evaluate social impact	Analyse equity, accessibility, and inclusion effects of CCAM deployment.						
4	Apply data analytics for policy decisions	Use big data to inform transport and social policy frameworks.						
5	Conduct environmental impact assessments	Evaluate ecological implications of automated mobility systems.						
6	Develop socioeconomic models	Create models to predict CCAM adoption and societal outcomes.						
7	Ensure compliance with regulatory standards	Apply legal frameworks for economic and social impact studies.						
8	Use simulation tools for scenario planning	Model future transport and social impact scenarios.						
9	Prepare technical reports	Document findings and recommendations for CCAM projects.						
10	Communicate effectively with stakeholders	Provide clear insights to policymakers, operators, and communities.						
11	Apply problem-solving techniques	Resolve analytical challenges and propose actionable solutions.						
12	Interpret statistical data	Analyse quantitative data to support socioeconomic evaluations.						
13	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive data.						
14	Develop policy recommendations	Provide evidence-based guidance for CCAM implementation.						
15	Use geographic information syste	Analyse spatial data for transport and social impact studies.						

Sales workers (ISCO-08: 5249 ; ISCO skill level: 2).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Sales workers (including vehicle sales representatives, charging station attendants, and car rental agents) play an important role in customer interaction and service delivery in CCAM ecosystems. Their responsibilities extend beyond traditional sales to include explaining advanced vehicle technologies, managing digital handover processes, and supporting connected services. They ensure customers understand automated features, charging infrastructure, and digital platforms, contributing to a smooth transition toward smart mobility solutions.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Provide customer support	Assist customers with vehicle features, charging, and rental services.						
2	Explain automated vehicle features	Educate customers on ADAS and automation levels.						
3	Use digital sales platforms	Operate online tools for reservations, sales, and handovers.						
4	Manage charging station operations	Assist customers with EV charging and payment systems.						
5	Apply cybersecurity principles	Ensure secure handling of customer and payment data.						
6	Use CRM software	Manage customer relationships and service records digitally.						
7	Handle digital payment systems	Process payments securely through online platforms.						
8	Provide remote assistance	Support customers via chat or video for vehicle handover and troubleshooting.						
9	Apply problem-solving techniques	Resolve customer issues related to automated features or charging.						
10	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive data.						
11	Communicate effectively with customers	Provide clear and empathetic support to enhance user experience.						
12	Operate vehicle diagnostic apps	Assist customers in using apps for vehicle health checks.						
13	Manage reservations and scheduling	Coordinate bookings for rentals and charging slots.						
14	Use digital handover tools	Perform vehicle handovers using connected systems and apps.						
15	Apply basic IT troubleshooting	Resolve minor technical issues in digital sales or charging systems.						

Sales and marketing specialists (ISCO-08: 2431, 2432 ; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Includes vehicle sales professionals, marketing experts, business development managers, and service designers. Are responsible for promoting and designing mobility services in CCAM ecosystems. They develop strategies for automated and connected vehicle markets, manage digital campaigns, and design user-centric services. These roles ensure market adoption, customer engagement, and business growth by leveraging data analytics, digital platforms, and innovative service models tailored to smart mobility.	0-No automation	1-Driver assistance	2-Partial automation	3-Conditional automation	4-High automation	5-Full automation
1	Develop marketing strategies	Create campaigns to promote CCAM services and automated vehicles.						
2	Design service concepts	Develop user-centric mobility services for MaaS and CCAM ecosystems.						
3	Apply data analytics for marketing	Use big data to optimize campaigns and customer engagement.						
4	Manage digital platforms	Oversee online tools for marketing and customer interaction.						
5	Ensure compliance with data protection regulations	Follow GDPR and other standards for handling sensitive data.						
6	Develop business development strategies	Identify opportunities for CCAM services and partnerships.						
7	Use CRM software	Manage customer relationships and service records digitally.						
8	Communicate effectively with stakeholders	Provide clear updates and reports to decision-makers and partners.						
9	Apply problem-solving techniques	Resolve marketing and service design challenges effectively.						
10	Manage social media campaigns	Operate digital channels to engage customers and promote CCAM.						
11	Develop policy recommendations for marketing	Provide evidence-based guidance for CCAM adoption strategies.						
12	Use simulation tools for market forecasting	Model adoption scenarios for automated mobility services.						
13	Prepare technical and marketing reports	Document findings and recommendations for CCAM projects.						
14	Apply cybersecurity principles	Ensure secure handling of customer and marketing data.						
15	Coordinate with technical teams	Collaborate with engineers and IT specialists for service design.						

Trainers (ISCO-08: 5165 driving instructors ; ISCO skill level: 2).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Driving Instructors are evolving from traditional driver training to CCAM-focused roles, including simulator-based instruction, AV safety protocols, and connected mobility operations. They ensure drivers and operators understand automation levels, teleoperation procedures, and digital tools, supporting safe integration of automated vehicles into transport systems.	1-No automation	2-Driver assistance	3-Partial automation	4-Conditional automation	5-High automation	6-Full automation
1	Deliver driver training	Provide instruction on vehicle operation and safety protocols.						
2	Use driving simulators	Operate simulators for training on automated and connected vehicles.						
3	Explain automation levels	Educate trainees on SAE levels and their implications for driving.						
4	Apply safety protocols for AVs	Teach procedures for interacting with automated vehicles.						
5	Operate teleoperation systems	Demonstrate remote control of vehicles in training scenarios.						
6	Use digital training platforms	Manage e-learning tools for CCAM-related courses.						
7	Apply problem-solving techniques	Guide trainees in resolving operational challenges.						
8	Ensure compliance with safety standards	Teach adherence to legal and technical safety requirements.						
9	Communicate effectively with trainees	Provide clear instructions and feedback during training.						
10	Use data analytics for training evaluation	Assess trainee performance using digital tools.						
11	Prepare training materials	Develop content for CCAM-focused driver education.						
12	Apply cybersecurity principles	Teach secure practices for connected vehicle systems.						
13	Operate remote diagnostic tools	Demonstrate troubleshooting for connected vehicles.						
14	Manage incident response protoc	Train drivers on emergency procedures for AVs.						
15	Ensure compliance with data prot	Teach GDPR and privacy standards for mobility data.						

Trainers (ISCO-08: 4323 transport clerks ; ISCO skill level: 2).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Transport Clerks in training roles focus on educating staff on operational processes and digital tools used in CCAM environments. They deliver courses on traffic coordination, automated signalling systems, and safety protocols for connected mobility. These roles ensure that personnel can effectively manage digital platforms, respond to incidents, and comply with data protection and cybersecurity standards in highly automated transport systems.	1-No automation	2-Driver assistance	3-Partial automation	4-Conditional automation	5-High automation	6-Full automation
1	Deliver operational training	Provide instruction on transport coordination and CCAM workflows.						
2	Use digital training platforms	Manage e-learning tools for CCAM-related operational courses.						
3	Explain automation levels	Educate trainees on SAE levels and their impact on traffic control.						
4	Apply safety protocols for AVs	Teach procedures for interacting with automated traffic systems.						
5	Operate traffic control simulators	Demonstrate digital tools for traffic and signalling training.						
6	Use real-time communication tools	Train staff on chat and alert systems for CCAM coordination.						
7	Apply problem-solving techniques	Guide trainees in resolving operational challenges.						
8	Ensure compliance with safety standards	Teach adherence to legal and technical safety requirements.						
9	Communicate effectively with trainees	Provide clear instructions and feedback during training.						
10	Use data analytics for training evaluation	Assess trainee performance using digital tools.						
11	Prepare training materials	Develop content for CCAM-focused operational education.						
12	Apply cybersecurity principles	Teach secure practices for connected traffic systems.						
13	Operate remote diagnostic tools	Demonstrate troubleshooting for traffic control systems.						
14	Manage incident response protoc	Train staff on emergency procedures for CCAM operations.						
15	Ensure compliance with data prot	Teach GDPR and privacy standards for mobility data.						

Manufacturing & Assembly Technicians (ISCO-08: 3114 (Electronics Engineering Technicians), 3115 (Mechanical Engineering Technicians) ; ISCO skill level: 3).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		Includes vehicle, UAV, shipbuilding, sensor technicians, and additive manufacturing process technicians. Are responsible for producing and assembling components for connected and automated mobility systems. In CCAM, these roles involve integrating advanced electronics, sensors, and communication modules, applying digital manufacturing techniques like additive manufacturing, and ensuring compliance with safety and quality standards for automated vehicles and infrastructure.	1-No automation	2-Driver assistance	3-Partial automation	4-Conditional automation	5-High automation	6-Full automation
1	Assemble mechanical components	Build and fit parts for vehicles and automated systems.						
2	Install electronic systems	Integrate sensors, communication modules, and control units.						
3	Apply additive manufacturing techniques	Use 3D printing for producing CCAM components.						
4	Use computer-aided design (CAD)	Interpret and apply CAD models for assembly processes.						
5	Operate CNC machines	Program and run CNC equipment for precision manufacturing.						
6	Apply quality control procedures	Ensure compliance with technical and safety standards.						
7	Use digital manufacturing platforms	Manage automated production systems and IoT-enabled tools.						
8	Apply cybersecurity principles	Protect connected manufacturing systems from cyber threats.						
9	Interpret technical drawings	Read and understand engineering schematics and blueprints.						
10	Operate robotic assembly systems	Control robots for automated assembly tasks.						
11	Apply problem-solving techniques	Resolve technical issues during assembly and production.						
12	Ensure compliance with environmental standards	Follow sustainability practices in manufacturing.						
13	Use simulation tools for process optimization	Model manufacturing workflows for efficiency.						
14	Communicate effectively with tea	Coordinate tasks and share technical information clearly.						
15	Ensure compliance with data prot	Handle sensitive production data securely.						

Service and Business Design (ISCO-08: 2421 Management and organizational analysts ; ISCO skill level: 4).									
SKILL #	(ESCO) SKILLS/KNOWLEDGE	DESCRIPTION	LEVELS OF AUTOMATION (SAE)						
		shape business models and service concepts for automated mobility. The role focuses on organizational analysis and designing strategies that ensure economic viability, user-centric services, and smooth integration into existing ecosystems.	1-No automation	2-Driver assistance	3-Partial automation	4-Conditional automation	5-High automation	6-Full automation	COMMENTS
1	Analyse business processes	Examine workflows and processes to identify inefficiencies and opportunities for improvement.							At full automation, processes are largely standardized and embedded in digital platforms. Continuous manual analysis is less critical because AI-driven optimization handles most workflow improvements.
2	Develop business plans	Create structured plans outlining objectives, strategies, and resources for business development.							Strategic planning remains important, but operational business planning becomes less frequent as automated systems provide predictive analytics and scenario modeling, reducing manual intervention.
3	Apply project management	Use methodologies and tools to plan, execute, and monitor projects effectively.							
4	Advise on organisational improvements	Recommend changes to enhance efficiency, productivity, and adaptability.							Organizational structures stabilize around automated systems and digital governance. Incremental improvements are handled by integrated software updates rather than human-led restructuring.
5	Perform risk analysis	Identify and evaluate potential risks and propose mitigation strategies.							
6	Use data analysis techniques	Apply statistical and analytical methods to interpret data and support decision-making.							
7	Communicate effectively in business	Convey information clearly and persuasively to stakeholders.							
8	Apply systems thinking	Understand interdependencies within complex systems to improve decision-making.							
9	Manage stakeholder relationships	Build and maintain positive relationships with internal and external stakeholders.							At higher automation, operational coordination between stakeholders decreases because platforms and standards govern interactions. Relationship management becomes strategic rather than operational, reducing day-to-day engagement.
10	Apply ICT tools	Use digital tools and platforms to support business analysis and operations.							
11	Develop innovation strategies	Design approaches to foster innovation and adapt to technological changes.							
12	Apply change management	Implement strategies to manage organisational change effectively.							
13	Evaluate performance indicators	Assess KPIs to monitor and improve organisational performance.							
14	Apply quality management	Ensure processes meet quality standards and continuous improvement goals.							Quality assurance shifts from manual checks to automated monitoring and self-correcting systems. Human involvement is limited to oversight and compliance audits.
15	Work in a team	Collaborate effectively with colleagues to achieve common objectives.							