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# D3.2 Brief Ad hoc Innovation radar report (a)

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Hans-Georg Hermann

Vladislav Sidorov

Ragnhild Wahl



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**AUTHORS**

Name	Partner
Hans-Georg Hermann	Swiss Re
Vladislav Sidorov	Rupprecht Consult
Ragnhild Wahl	ITS Norway

**CONTRIBUTORS**

Name	Partner
Daniel Franco	Rupprecht Consult
Consortium partners	

**REVIEWERS**

Name	Partner
Christos Gkartzonikas	MaasLab
Marusa Benkic	CORTE
Lone-Eirin Lervåg	ITS Norway

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## Acronyms and definitions

Acronyms	Definitions
CCAM	Cooperative, Connected, and Automated Mobility
AV	Autonomous Vehicle
L4	Level 4 automation (refers to the SAE's definition)

## Executive summary

The CCAM-ERAS project addresses the societal and labour market impacts of deploying Connected, Cooperative, and Automated Mobility (CCAM) in the transport sector. Specifically, CCAM-ERAS will seek to increase knowledge of the necessary skills required for CCAM deployment.

Key to this project's objective is to gain in-depth knowledge of technology developments and innovations in the CCAM area. To actively monitor such trends, CCAM-ERAS has implemented an Innovation Radar. The radar focuses on identifying high-potential innovations and key innovators concerning CCAM deployment. The Innovation Radar provides an overview of the relative maturity of relevant innovations in CCAM, along with their relevance for the project and the stakeholder community. This is presented by means of "Innovation profiles". These profiles describe the current research status, technological readiness, field of application, potential, etc.

This report outlines the methodology, which includes defining innovation capacity, establishing key performance indicators (KPIs), applying data mining techniques, and scoring innovations to generate innovation profiles. These profiles provide brief descriptions of innovations with insights into their maturity and potential impact.

The report serves as a pilot, testing the radar methodology and its outcomes within a selected scope rather than a full scan.

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# 1 Introduction

## 1.1 Project overview

CCAM-ERAS aims to prepare society for managing labour market impacts that arise from deploying connected, cooperative, and automated mobility (CCAM) services within the transport sector. Key to this project's objective is in-depth knowledge of technology developments and innovations in the CCAM area. Thus, a full CCAM scan, providing understanding and awareness of CCAM implications in the transport sector, is carried out in three steps:

1. In-depth scan of CCAM implications
2. Innovation Radar development and monitoring
3. Development of relevant use cases

The knowledge of CCAM's state of play and future development trends emerging from this work will be used to analyse future skills requirements and related labour aspects, contributing to a broader goal of supporting an inclusive, sustainable, and future-ready mobility ecosystem.

To actively monitor trends related to CCAM deployment, CCAM-ERAS has implemented an Innovation Radar. The radar is a strategic tool for identifying and structuring innovations, which might affect the future labour market and required skills. It focuses on identifying high-potential innovations and key innovators in regard to CCAM deployment. It provides an overview of the relative maturity of innovations in CCAM, along with their relevance for the project and the stakeholder community.

## 1.2 Purpose of the document

This report documents the methodology used to establish the Innovation Radar and the Radar's output in terms of innovation profiles. These profiles give a short description of selected relevant innovations in question, including aspects like current research status, technology readiness, etc. This report represents the first iteration of using the radar and its results. The report is to be considered as a pilot for testing the methodology and assessing results in a selected area. The second iteration of the report, due for September 2026, will apply the methodology introduced to all measurements identified in Chapter 2.

The report is structured as follows: Chapter 2 describes the Innovation capacity, which forms the basis of the Innovation Radar. Chapter 3 outlines the methodology, while Chapter 4 presents the results for selected topics, not representing a full scan. Finally, Chapter 5 offers reflections and concluding remarks based on this first iteration of the Innovation Radar.

## 2 Innovation capacity

The innovation Radar is revealing the *innovation capacity*. In a CCAM-ERAS context, the innovation capacity is defined as the ability to realise the innovation in real-life systems and services, with a potential for affecting the future labour market and required skills.

Innovation capacity depends on the technical (in this context, CCAM) and market potential, as illustrated in Figure 1.

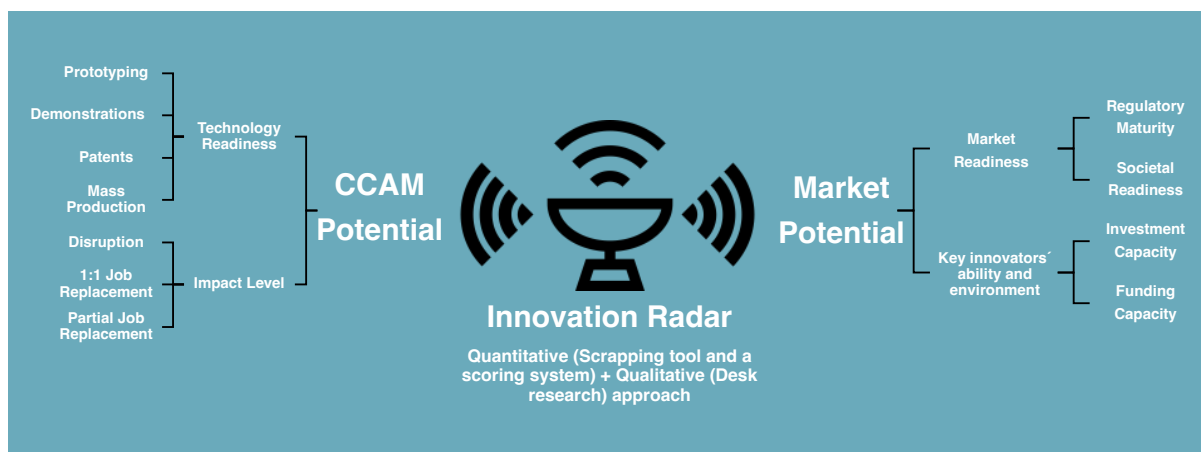


Figure 1: Innovation Radar concept

CCAM potential comprises two dimensions, which are further broken down into low-level KPIs:

- **Technology readiness** indicates the maturity of the technology, measured in terms of identified quantities of relevant prototypes, demonstrations, patents, and mass production. Hence, the technology readiness dimension measures the technical feasibility of realising an innovation.
- The **impact level** indicates whether the innovation in question has the potential to impact the labour market and required skills (relevance). This is measured by disruption of the market, 1:1 job replacement, and partial job replacement. This dimension will also act as a filter regarding which innovations to include in the CCAM-ERAS innovation profiles.

Market potential comprises two dimensions, broken down into low-level KPIs:

- **Market readiness** indicates the maturity of the market and comprises both regulatory maturity and societal readiness. This dimension, therefore, measures whether the innovation can be introduced from a legal perspective and whether the market is ready to adopt.
- **Key innovator´s ability and environment** indicate whether the innovation can be realised financially. This dimension is measured by the investment capacity and the funding capacity.

The first iteration of this report will focus on introducing the methodology to develop the Innovation Radar with application on the following measurements:

- Technology Readiness: Prototyping
- Impact Level: Disruption and Job Replacement
- Market Readiness: Regulatory Maturity

The second iteration of the report will cover the full scope of the Innovation Radar as depicted in Figure 1: Innovation Radar concept by covering additionally the following measurements:

- Technology Readiness: Demonstrations, Patents, Mass Production
- Market Readiness: Social Readiness
- Key Innovators' ability and environment: Investment Capacity, Funding Capacity

## 3 Methodology

The Innovation Radar is developed with a 5-step approach, as presented in Figure 2.

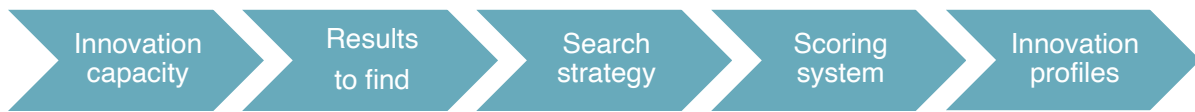


Figure 2: Innovation Radar methodology

**Step 1:** The innovation capacity is defined and broken down into sub-groups representing CCAM and market potential, as described in Chapter 2.

**Step 2:** The results to be received from the data mining procedures are identified. For the quantitative results, keywords are selected to create KPIs like the number of xx, the ratio of x/y, etc. A set of guiding questions is defined for searching for qualitative results.

**Step 3:** The search strategy for data mining of both quantitative and qualitative results is defined. Section 3.1 will further explain this.

**Step 4:** A flexible scoring system is defined and applied. The scoring system filters which data to consider for further analysis to create innovation profiles. See section 3.1.2 for a more thorough introduction.

**Step 5:** The remaining data is analysed and transformed into a set of innovation profiles, as described in Chapter 4.

### 3.1 Quantitative

#### 3.1.1 Search strategy

To collect an overview of the relative maturity of innovations in CCAM and identify high potential innovations and key innovators it was decided to use an already established on the market online tool – **browse.ai**, which has the data- and text-mining functionalities.

Browse.ai – is a subscription based web automation tool that allows users to extract and monitor data from websites. It enables users to train bots to scrape data, track changes, and simulate human interactions with web pages.

Main functionalities include:

1. Web Data Extraction (Scraping)
  - Users can extract structured data (text, images, links, etc.) from websites and download it as a CSV, Google Sheets, or API feed.
  - AI-powered training enables automation with minimal setup.
2. Website Change Monitoring
  - Track changes on webpages (new news items, etc.) and receive notifications when updates occur.

### 3. Automated Web Browsing

- Simulate human interactions such as clicking, scrolling, filling out forms, and navigating between pages.

### 4. Prebuilt Automation Templates

- Offers ready-made bots for common use cases (e.g., scraping patents databases, google scholar, etc.).

### 5. Integration with Other Tools

- Connects with Google Sheets, Zapier, etc., and APIs for workflow automation.

To enable automated content collection through Browse.ai, multiple strategic sites and platforms (Annex – 6.1) were identified based on expert recognition for leading thematic resources (e.g. CCAM.eu, Zenzic.io) and through a series of brainstorming sessions with consortium partners as first qualification criteria followed by URL selection through keyword search benchmarking as final qualification criteria. Keyword search benchmarking was conducted by searching the URL's with keywords of interest and comparing the quantity of search results. URL's with low number of search results did not qualify to be used going forward as sources for the Innovation Radar. These sites were selected to ensure the long-term comprehensiveness, relevance, and sustainability of the Innovation Radar tool. The identified URLs were then organised into the corresponding thematic sections of the Innovation Radar (Figure 1).

To collect the relevant text data (such as news items) from each of these websites, a two-robot deep scraping method was employed. Deep scraping is a method used to extract data from multiple interconnected pages on a website. It involves systematically following the links provided on a main page and gathering data from the linked detailed pages.

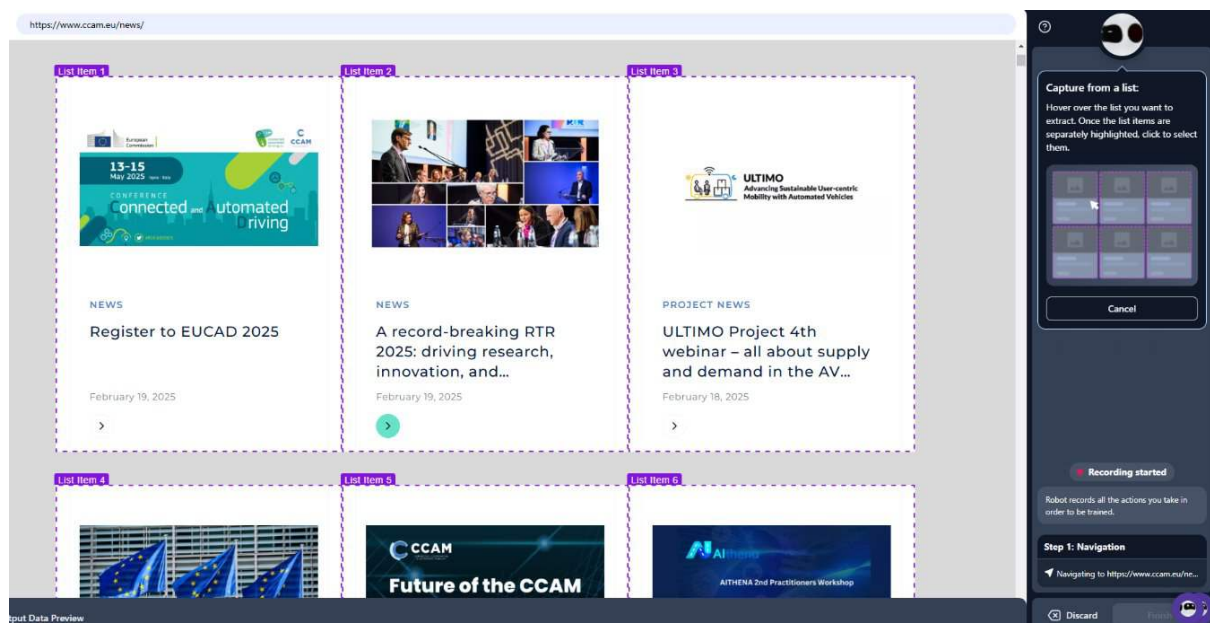


Figure 3: A text capturing process from CCAM.EU by using browse.ai

Table 1: An example of created dataset from CCAM.EU by the primary robot

	Origin URL	CCAM_EU_NEWS Limit	Extract Date	Category	Title	Date
1	https://www.ccam.eu/news/	500	2025-02-17 09:...	PRESS RELEASE	CCAM Associat...	February 14, 20...
2	https://www.ccam.eu/news/	500	2025-02-17 09:...	NEWS	Discover latest ...	February 7, 2025
3	https://www.ccam.eu/news/	500	2025-02-17 09:...	NEWS	Lina Becella, ne...	February 4, 2025
4	https://www.ccam.eu/news/	500	2025-02-17 09:...	PROJECT NEWS	Upcoming SINF...	January 31, 2025
5	https://www.ccam.eu/news/	500	2025-02-17 09:...	NEWS	Open Public Co...	January 31, 2025
6	https://www.ccam.eu/news/	500	2025-02-17 09:...	NEWS	RAPTOR 2025 ...	January 23, 2025

The process functions as follows:

### 1. Primary Robot (Main Page Scraper)

- Once the designated URL is inserted into the system and the relevant text information is selected from the list (Figure 3), the primary robot scans the list or category page. It extracts high-level information, such as titles, descriptions, and URLs from the main listing or index page. The robot then creates the dataset and saves it as a CSV file (Table 1).

### 2. Secondary Robot (Detail Page Scraper)

- The next step involves creating a secondary robot designed to scrape a single detail page for each news item from the same URL (Figure 3). After selecting the specific data points, the secondary robot extracts detailed information, such as full news item descriptions and images, and saves it in the CSV file.

### 3. "Workflow"

- The "Workflow" function is used to automate the connection between the primary and secondary robots. The secondary robot visits each individual link generated by the primary robot, extracts all the necessary information (full news item descriptions), and updates the dataset (Table 2).
- An additional benefit of the "Workflow" function is the ability to schedule automatic monitoring of the target URL at a preferred frequency. Whenever new news items are posted on the target URL, the primary robot monitors and downloads them, updating the dataset. The secondary robot then updates its dataset, accordingly, including the newly added news items.

# Ford Otosan and AVL take next AV step



By **TARA CRAIG** — November 8, 2019 ⌚ 2 Mins Read



### Visible Text, HTML

Ford Trucks' new F-MAX tractors with Ford Otosan and AVL platooning technology have successfully completed initial test drives.

Ford Otosan assistant general manager Burak Gökçelik and AVL executive vice president Rolf Dreisbach attended the launch event of the platooning technology at the Ford Otosan Eskişehir Plant in Turkey.

"This is an important milestone on the road to autonomous driving in heavy commercial transportation," Gökçelik said. "This R&D project will enable us to advance smart mobility, reduce carbon emissions and fuel consumption, and improve road safety.

"In the next phases of the project and long term we aim to develop SAE Level 4 autonomous driving

Figure 4: An example of "deep scraping" the detailed news item information from ADAS & Autonomous Vehicles International by using the secondary robot

Table 2: An example of the final dataset of the detailed news items from ADAS & Autonomous Vehicles International of the secondary robot by using the workflow function

	A	B	C	D	E
1	Task Link	Origin URL	Title	Date	Description
2	<a href="https://da">https://da</a>	<a href="https://www">https://www</a>	Tier IV launches autonomous test vehicle development kit	June 13, 2025	Tier IV has launched a starter kit for developing autonomous technologies and
3	<a href="https://da">https://da</a>	<a href="https://www">https://www</a>	Magna and Innoviz to supply BMW Group with solid-state lidar	April 27, 2018	Manufacturing giant Magna and lidar specialist Innoviz Technologies have signed a
4	<a href="https://da">https://da</a>	<a href="https://www">https://www</a>	Plans for Europe's first Smart City Mobility Center revealed	November 16, 2018	Plans to build Europe's first Smart City Mobility Center in the UK, to test and develop
5	<a href="https://da">https://da</a>	<a href="https://www">https://www</a>	Time to get real: Discover how to make AVs a reality at the event	May 7, 2019	Leading speakers from the three symposiums at this year's Autonomous Vehicle
6	<a href="https://da">https://da</a>	<a href="https://www">https://www</a>	Renault-Nissan Alliance opens mobility innovation lab in Tel Aviv	June 13, 2025	The Alliance (Renault-Nissan-Mitsubishi) has officially inaugurated a new joint
7	<a href="https://da">https://da</a>	<a href="https://www">https://www</a>	Delta Motorsport unveils flexible AV chassis and control system	September 4, 2019	Silverstone-based Delta Motorsport has launched its generic autonomous EV platform
8	<a href="https://da">https://da</a>	<a href="https://www">https://www</a>	Ford Otosan and AVL take next AV step	June 13, 2025	Ford Trucks' new F-MAX tractors with Ford Otosan and AVL platooning technology

In addition to the two-robot (deep scraping) approach, several prebuilt robots provided by Browse.ai (such as the United States Patent and Trademark Office public search and Canadian Patents Database Basic Search) were also used to collect meaningful information.

Once the data was mined, all the text databases were downloaded as CSV files, saved on the project's SharePoint, and then passed to the scoring system for subsequent analysis.

### 3.1.2 Scoring system

The scoring system was developed to serve as a calibratable filter to selectively reduce the high quantities of URL web results generated by the Browse.ai tool. For instance, if Browse.ai searches a predefined URL according to specific search terms, the quantity of search results can be in the range of several hundred sub-URLs – further referred to as online text. To allow for a meaningful selection of web-search results that possess the highest innovation potential for the Innovation Radar, the scoring system was developed in Microsoft Excel and deployed in the project.

The mechanism of the scoring system can be described in four steps:



Figure 5: Conceptual description of the scoring system mechanism

1. **Web Results:** Search results are generated by Browse.ai robots and saved in a CSV file. The CSV file gets manually imported into the scoring system.
2. **Scoring Criteria:** To calibrate the scoring system to filter for the most valuable search results, the scoring criteria were defined as per the following. There are three scoring criteria implemented in the scoring system:
  - a. **Keyword density:** searches the text of the online text for pre-defined keywords and adds a keyword total score, e.g. 50% if the online text includes the keywords. The strategy to identify keywords can vary based on the desired goal, i.e. when searching for all prototype projects, "prototype" is the most important keyword. If the focus is on prototype projects in Europe only, the keyword "europe" should be considered as well. The keyword total score can vary per query to filter for the most important online texts. Up to 10 keywords can be used and each keyword can carry an individual weight within the keyword total score with a total weight for all keywords at 100% (refer to Table 3).
  - b. **Publication date:** searches the date of publication and assigns a date total score of e.g. 30% if the publication is within the last 365 days. The date total score can vary per query to filter for the most important online texts.
  - c. **Mention of actors:** searches the text of the online text for pre-defined actor names and adds an actor total score, e.g. 20% if the online text includes the actors. The actor total score can vary per query to filter for the most important online texts. Up to 10 actors can be used and each actor can carry a score (refer to Table 4). Note, the actor scores are not in the same way cumulative as keyword weights. For the actor score, the maximum score of 20% can be reached already with 1 actor. The reason for a different methodology compared to the one for keywords is, that an online text with only 1 actor mentioned has a high probability to be considered interesting for the Innovation Radar, whereas an online text with only 1 keyword has a lower probability to be interesting.

Table 3: Example of 10 selected keywords and their individual weights totalling to 100%. If the online article would include all keywords, the full score of 50% would be applied for that online article.

	Keyw ords:	Weight
1	autonomous	15%
2	prototype	5%
3	testing	5%
4	ccam	15%
5	automated	15%
6	driving	5%
7	driverless	10%
8	vehicle	5%
9	launch	15%
10	l4	10%
		100%

Table 4: Example of 10 selected actors and their score. A maximum of 20% score can be achieved already with 1 actor mentioned. Accumulation of scores is limited to 20%.

	Actors:	Score
1	waymo	20%
2	baidu	20%
3	weride	20%
4	zoox	15%
5	aurora	15%
6	pony	15%
7	mobileye	15%
8	moia	10%
9	oxa	10%
10	motional	10%

3. **Scoring Mechanism:** This part covers the process to analyse the text from the online text, identify matches with the defined criteria, and assign the defined total scores in case of a match. To avoid introducing commercial tools or custom software code, Microsoft Excel was chosen due to its wide availability and user competence. The import of the search results into the scoring system was completed in step 1. As next step, a manual adjustment of existing formulas is needed to assign input columns to the corresponding scoring mechanism. Keyword search as well as actor search mechanisms should be assigned to the column with the text column of the online text. Publication date search mechanism should be assigned to the column with date information. In the following, the mechanism will be explained for keyword, date, and actor scoring:

a. Keyword scoring:

- i. read the cell content from the assigned column (text of the online text)
- ii. convert the text into small letters (to avoid capital vs. small letter mismatch)
- iii. convert the small letter text into XML blocks
- iv. convert the search criteria (in small letters) into XML blocks
- v. analyse through XML block matching, if the text contains the criteria
- vi. assign the defined score in case of a criteria match

b. Date scoring:

- i. read the cell content from the assigned column (date information)
- ii. calculate if the publication date difference is smaller than 365 days from the day of the analysis
- iii. assign the defined score in case of a criteria match

c. Actor scoring: same technical process as keyword score

4. **Results & Ranking:** In the final part of scoring system, the scores from all criteria matches are aggregated for the specific online text. Once each online text has its aggregated total score, a ranking function is applied to sort all online texts from highest ranking to lowest ranking. Only the highest-ranking online texts will be considered for publication in the Innovation Radar report.

## 3.2 Qualitative

### 3.2.1 Desk study

In addition to the quantitative approach outlined in chapters 3.1 and 3.2 the methodology also includes a desk study focusing on the qualitative manual assessment of ongoing trends and innovations related to CCAM development. The qualitative desk study leverages capabilities of Artificial Intelligence Large Language Models (i.e. ChatGPT 4o) to develop insights for defined measurements.

AI has been leveraged in two ways:

- Extracting valuable information from defined online sources
- Generating narratives to strategically developed prompts to explore cross-domain impacts (e.g. CCAM job disruptions and future education requirements)

#### **Extracting valuable information from defined online sources:**

The developed approach was to identify key online sources, drawing from structured brainstorming sessions and subsequent independent research to determine a list of relevant websites and platforms. These sources are then categorised according to the thematic sections of the Innovation Radar (Figure 1).

The process involves collecting relevant reports, publications, white papers, surveys, and other related materials for each thematic area.

The next step involves using an AI language model (e.g., ChatGPT) to extract the most valuable insights from the source materials. To achieve this, a series of chats are created in alignment with the thematic areas of the Innovation Radar. Uploading only the corresponding thematic reports to each chat enhances the quality of the outcomes.

Defining tailored prompts to guide the AI in generating concise summaries of the most critical information is essential. In a project context – such as CCAM-ERAS - involving the users ensures that the output generated are applicable and can be used across all relevant work packages.

#### **Generating narratives to strategically developed prompts to explore cross-domain impacts:**

For problem statements which require building forward looking narratives based on cross-domain insights, the methodology developed leverages AI based on strategically designed prompts. The inputs for prompt development were gathered in an interactive activity across the project consortium and in the next step designed to build narratives over multiple steps of queries to generate deeper insights through a controlled and sequential process.

## 3.3 Defining Innovation profiles

A team of experts and researchers assesses the results from the previous steps. The technology in question is analysed based on its perceived impact on the market and the estimated time for when it will impact the labour market. Following this assessment, the Innovation profiles are identified and shared amongst the stakeholder community.

## 4 Results

This report represents a first iteration of the innovation radar, focusing on a specific part of the CCAM potential, namely “prototypes”.

The innovation Radar aims to identify the innovation capacity in the CCAM ecosystem as illustrated in Figure 1 (Innovation Radar concept).

Derived from the Innovation Radar concept, various measurements have been defined and grouped into quantitative KPI or qualitative desktop research information.

Table 5 provides an overview of the measurements and their definition.

Table 5: Innovation Radar measurements and their definitions

Measurement	Quantitative KPI	Qualitative Desk Research
<b>Prototyping</b>	Count of projects	
<b>Demonstrations (Pilots, Trials)</b>	Count of projects	
<b>Patents</b>	Count of patents	
<b>Mass Production</b>	Number of vehicles, number of cities or countries to be operated in	
<b>Disruption</b>		CCAM Job Requirements, CCAM Certification Programs, CCAM Degree Programs
<b>1:1 Job Replacement</b>		1:1 Job Replacement
<b>Partial Job Replacement</b>		Partial Job Replacement
<b>Regulatory Maturity</b>		L4 regulations around the world
<b>Social Readiness</b>		Trade unions' and worker representatives' view on CCAM, Public Acceptance, Consumer Preference
<b>Investment Capacity</b>	Number and combined market capitalization of companies covering CCAM prototyping and mass production	
<b>Funding Capacity</b>		Type of CCAM companies and estimation of their funding budget

### 4.1 Quantitative data (KPIs)

This section covers the CCAM measurements described with quantitative KPI and lists the most promising impacts in the CCAM ecosystem. All quantitative results in this chapter have been generated with the methodology explained in Chapters 3.1 and 3.1.2.

The scoring system was calibrated with a focus on the specific KPI relevant keyword, i.e. "prototype", to filter for the most suitable web results. Each of the following quantitative results sections lists the scoring criteria in a table. A sensitivity analysis has been conducted with various keywords and weights to filter for the most promising activities. The authors have made the judgment of which activities are more promising than others based on their understanding of the CCAM subject matter.

#### 4.1.1 Prototyping

The results in the section CCAM prototyping are described with the KPI "number of innovative CCAM prototyping activities". The KPI reflects the number of projects identified through the web-research process.

**KPI – number of innovative CCAM prototyping activities: 42**

The KPI is a combined number from 8 different URL and represents the number of CCAM prototyping projects with high innovation potential. The following projects were identified as the most promising CCAM prototypes:

From URL: <https://www.autonomousvehicleinternational.com>

<a href="#">UK government brings forward self-driving pilots to spring 2026</a>
<a href="#">Aurora Innovations autonomous Toyota Sienna test fleet hits the road</a>
<a href="#">Oxa launches autonomous Ford E-Transit van and minibus</a>
<a href="#">Tier IV launches autonomous test vehicle development kit</a>
<a href="#">Renault-Nissan Alliance opens mobility innovation lab in Tel Aviv</a>
<a href="#">Wejo reveals DLIVEREE autonomous vehicle prototype</a>
<a href="#">MobileDrive adopts Siemens digital twin technology to test autonomous drive system</a>
<a href="#">Nissan demonstrates autonomous Leaf prototype on public roads in Japan</a>

From URL: <https://www.assemblymag.com>

<a href="#">Autonomous Tandem Drift Sequence Improves Vehicle Safety</a>
<a href="#">John Deere Acquires Autonomous Tractor Startup</a>
<a href="#">Autonomous Last-Mile Delivery Robots</a>
<a href="#">Ultrasound Helps Improve Autonomous Vehicle Safety</a>

From URL: <https://www.ccam.eu/>

<a href="#">Move2CCAM ´s series of online workshops on Co-creating CCAM prototype business models</a>
<a href="#">Discover latest Althena project developments @ their 2nd Practitioners Online Workshop</a>
<a href="#">CCAM Association – Strategic partner to the 2024 CLEPA Innovation Awards!</a>
<a href="#">Participate to the FRODDO project questionnaire on Cooperation Requirements and Needs for CCAM Actors</a>

From URL: <https://www.connectedautomateddriving.eu>

<a href="#">EC Action Plan for automotive industry aims to get autonomous vehicles on Europe’s roads faster</a>
<a href="#">Several Autonomous Vehicle Trials and Experimentations taking Place in Europe</a>
<a href="#">Building confidence in AI-based AV ecosystem</a>
<a href="#">How Switzerland is preparing for the automation megatrend</a>

From URL: <https://futuretransport-news.com>

<a href="#">WeRide and Uber to Roll Out Autonomous Vehicles in the UAE</a>
<a href="#">Level 4 Autonomous Cars Begin Passenger Operations in Germany</a>
<a href="#">Vay to Increase Las Vegas Operations to 100 Autonomous Vehicles</a>
<a href="#">Oxa to Provide Autonomous Vehicle Platform for Sunderland Bus Project</a>
<a href="#">Aurora Informational Report: Preparing for Driverless Operations</a>
<a href="#">Bringing Roadside Warning Devices into the 21st Century</a>

From URL: <https://www.sae.org/>

<a href="#">The ‘Buzz’ in driverless shuttling</a>
<a href="#">Horiba to expand virtual AV vetting with physical-body testing</a>
<a href="#">The AV industry searches for a near-term business case</a>
<a href="#">Underwriters Labs publishes first AV safety standard</a>
<a href="#">Ultrasonics to keep lidar clean</a>
<a href="#">Opsys Tech demos cost-effective solid-state lidar-module prototypes</a>
<a href="#">Sensing enters a new era</a>

From URL: <https://www.traffictechnologytoday.com>

<a href="#">UK’s Driven project shows AVs can operate safely on London streets</a>
<a href="#">Europe’s first full-sized autonomous bus demonstrated at CAV Scotland event</a>
<a href="#">USDOT seeks AV innovators for Inclusive Design Challenge</a>
<a href="#">StreetWise trial finds consumer confidence in AVs riding high</a>
<a href="#">Wejo unveils prototype to support development of autonomous vehicles for the future</a>

From URL: <https://zenzic.io/>

<a href="#">Second round of additional CAM Scale-Up UK commercial funding</a>
<a href="#">£2 million available for UK CAM organisations</a>
<a href="#">SAIF Autonomy Raises \$1.2M with Fusion Fund to Accelerate Trustworthy Embodied AI at Scale</a>
<a href="#">Guest Blog: The future of insurance in connected and automated mobility</a>

The scoring criteria weights have been selected based on a sensitivity analysis and applied as per following table:

Table 6: Scoring criteria and weights to identify prototyping projects

Scoring Criteria			Keywords:	Weight	Actors:	Score
Criteria	Weight	How to extract	1 <a href="#">autonomous</a>	0%	1 <a href="#">waymo</a>	10%
Keyword density	70%	Count of keywords	2 <a href="#">prototype</a>	100%	2 <a href="#">baidu</a>	10%
Date	20%	Publication date (newer = better)	3 <a href="#">testing</a>	0%	3 <a href="#">weride</a>	10%
Mentions of Actor	10%	Named companies/research institutions	4 <a href="#">europe</a>	0%	4 <a href="#">zoox</a>	10%
			5 <a href="#">automated</a>	0%	5 <a href="#">aurora</a>	10%
			6 <a href="#">driving</a>	0%	6 <a href="#">pony</a>	10%
			7 <a href="#">driverless</a>	0%	7 <a href="#">mobileye</a>	10%
			8 <a href="#">vehicle</a>	0%	8 <a href="#">moia</a>	10%
			9 <a href="#">launch</a>	0%	9 <a href="#">oxa</a>	10%
			10 <a href="#">i4</a>	0%	10 <a href="#">motional</a>	10%
				100%		

Consequently, and to create the final selection of web results, a manual selection of the top ranked articles has been made by the authors to select for CCAM prototypes with the most innovation potential. Lastly, a final manual check has been conducted to avoid duplicated references.

## 4.2 Qualitative data

This section covers the qualitative desk research to generate insights to the innovation dimensions as outlined in Table 5.

Given the high interdependence of Job Replacement, Job Requirements and Education Programs, the following hierarchical prompts were developed to cover all three measurements:

- Prompt 1 with focus on 1:1 Job Replacement and Partial Job Replacement:
  - Conduct an analysis of how a large deployment of Level 4 autonomous vehicles in Europe will impact future job requirements. Break the analysis down into industries and job groups which are impacted by autonomous vehicles. In the next step, create 3 groups and analyse (1) if the job is getting obsolete, (2) if further training is required to do the job with autonomous vehicles, (3) if there is a new job required to make the use case work. As last step, summarize the job requirements which are needed with a large deployment of Level 4 autonomous vehicles in Europe.
- Prompt 2 with focus on Job Requirements:
  - The education system offers certification programs that allow for specialization in defined areas. Most certification programs are aimed for higher education as a post-degree specialization. Based on the previous analysis results, group the job requirements according to the European Qualifications Framework (EQF) into lower education (below 2), mid (3, 4, 5) and higher (above 6) and make suggestions if job requirements can be added to existing European certification programs or require new certification programs.
- Prompt 3 with focus on Education Programs:
  - Based on the previous analysis, which of the future job requirements with focus on higher education are a too large scope for a certification program and should rather be developed in a degree program? Alternatively, which future job requirements could be combined into one or several degree programs?

### 4.2.1 Job Replacement

Prompt 1 with focus on Job Replacement:

Conduct an analysis of how a large deployment of Level 4 autonomous vehicles in Europe will impact future job requirements. Break the analysis down into industries and job groups which are impacted by AVs. In the next step, create 3 groups and analyse (1) if the job is getting obsolete, (2) if further training is required to do the job with autonomous vehicles, (3) if there is a new job required to make the use case work. As last step, summarize the job requirements which are needed with a large deployment of Level 4 autonomous vehicles in Europe.

The following responses were generated with ChatGPT 4o and consequently reviewed and optimized by the authors:

- **Industry & Job Group Impact Analysis**
  - Transportation & Logistics
    - Jobs impacted: Truck drivers, delivery drivers, taxi drivers, bus operators, fleet dispatchers
    - Impact: Core disruption due to automation of driving tasks.
  - Automotive Industry
    - Jobs impacted: Vehicle manufacturers, system integrators, software developers, maintenance technicians
    - Impact: Shift toward electric and AV-related production and maintenance; increased demand for high-tech skills.
  - Insurance
    - Jobs impacted: Claims assessors, underwriters, actuaries, customer service agents
    - Impact: Fewer claims expected; risk shifts from driver to manufacturer or software provider.
  - Urban Mobility & Public Sector
    - Jobs impacted: City planners, public transport coordinators, infrastructure engineers
    - Impact: Need for new traffic management systems, AV-friendly urban design, and policy updates.
  - IT & Cybersecurity
    - Jobs impacted: Data scientists, cybersecurity analysts, AI developers
    - Impact: Strong demand for digital talent to secure, monitor, and improve AV systems.
  
- **Categorization of Job Evolution into the 3 Groups (Obsolete, Retraining, Emerging)**
  - Group 1: Jobs Becoming Obsolete

<b>Job Role</b>	<b>Industry</b>	<b>Justification</b>
Taxi and ride-hailing drivers	Transportation	Level 4 AVs remove the need for human drivers in geofenced areas.
Long-haul truck drivers (some lanes)	Logistics	Automated freight corridors can handle major routes without human input.
Driving instructors (for AV zones)	Transportation	Human driving instruction not needed where AVs dominate.

- Group 2: Jobs Requiring Retraining or Upskilling

<b>Job Role</b>	<b>Industry</b>	<b>New Requirements</b>
Fleet managers	Transportation	Must learn to manage AV fleets, teleoperations, and routing algorithms.
Vehicle mechanics	Automotive	Need to understand AV electronics, sensors, and software diagnostics.
Insurance underwriters	Insurance	Shift to data-based risk models and manufacturer liability understanding.
Public transport planners	Public Sector	Must integrate AVs into multi-modal transport systems.

- Group 3: Emerging Jobs

<b>New Role</b>	<b>Industry</b>	<b>Description</b>
AV safety operators / remote monitors	Transportation	Monitor AVs remotely, intervene when needed.
Mobility data analysts	Public Sector / Tech	Analyze AV usage data for optimization and policy.
AV systems engineers	Automotive / Tech	Develop, test, and refine AV systems.
AV cybersecurity specialists	IT / Cybersecurity	Ensure the security of vehicle software and infrastructure.
Simulation and AI training engineers	Automotive	Run virtual training scenarios to improve AV learning.

**Assessment from the authors:**

The above generated responses by ChatGPT are reasonable and provide a scenario with high probability.

## 4.2.2 Job Requirements

Prompt 2 with focus on Job Requirements:

The education system offers certification programs that allow for specialization in defined areas. Most certification programs are aimed for higher education as a post-degree specialization. Based on the previous analysis results, group the job requirements according to the European Qualifications Framework (EQF) into lower education (below 2), mid (3, 4, 5) and higher (above 6) and make suggestions if job requirements can be added to existing European certification programs or require new certification programs.

The following responses were generated with ChatGPT 4o and consequently reviewed and optimized by the authors:

Building on the previous analysis of how Level 4 autonomous vehicle (AV) deployment impacts jobs in Europe, we now categorize job requirements into those suitable for lower education (vocational or secondary) and higher education (post-secondary/degree-level). Then we align them with existing European certification programs where possible or propose new certifications.

- Categorization of Job Requirements by Education Level
  - **Lower Education (Vocational/Secondary Level):** These roles are operational or technical in nature, suited to vocational training or apprenticeship programs.

Job Role	Skills Required	Suitable for Vocational Programs
Remote AV Monitor / Safety Operator	Basic systems monitoring, teleoperation	Low EQF Level (1–2)
AV Fleet Maintenance Technician	AV sensor calibration, diagnostics, electronics	Mid EQF Level (3–5)
Smart Infrastructure Installer	Sensor setup, V2X communication systems	Mid EQF Level (3–5)
Charging Station Technician	High-voltage systems, electric grid interfacing	Mid EQF Level (3–5)

- **Higher Education (Post-secondary/Degree Level):** These roles involve advanced analytics, systems thinking, or engineering expertise.

Job Role	Skills Required	Suitable for Higher Education
AV Remote Operator	Remote driving tech, regulations, intervention logic	EQF 5–6 (depending on scope)
Insurance Data Underwriter	Risk modelling, algorithmic pricing	EQF 6-7
Mobility Data Analyst	Big data, urban mobility modelling	EQF 7
Urban Mobility Planner	Policy, multimodal system design	EQF 7
AV Systems Engineer	Robotics, AI, control systems	EQF 7–8
Cybersecurity Analyst (Automotive)	Threat modelling, AV system hardening	EQF 7–8

- **Mapping to Existing European Certification Programs**

- **Lower Education Programs (Existing & Adaptable)**

Role	Existing Program	Comment
AV Maintenance Technician	EUREKA Automotive Technician Certification	Can be expanded to include AV-specific modules (LiDAR, telematics)
Remote Monitor	<i>Remote AV Monitor Certificate</i>	Based on German remote operation regulation
Charging Station Technician	Electro Mobility Technician Certificate	Suitable to integrate AV charging systems and diagnostics
Smart Infrastructure Installer	Smart Systems Installer (EQF Level 4)	Could be extended to include V2X communications and ITS components

- **Higher Education Programs** (Existing & Adaptable)

Role	Existing Program	Comment
AV Systems Engineer	MSc in Autonomous Systems	Highly relevant, already includes robotics and AI for AVs
Cybersecurity Analyst	MSc Cybersecurity	Programs can incorporate modules on AV-specific threats and ADAS security
Mobility Data Analyst	MSc in Transport and Smart Cities	Add focus on AV-generated big data, route prediction models
Urban Mobility Planner	Master in Urban Planning and Mobility	Must evolve to include AV route integration and zoning policies
Insurance Data Underwriter	MSc in Actuarial Science	Needs AI/AV exposure: data-driven risk models, manufacturer liability, etc.
Remote Operator (Advanced)	BSc/MSc AV Operation & Supervision	Expand to include system understanding and regulatory depth

- **Proposed New Certification Programs.** Where significant gaps exist, new certifications are recommended:

- **For Vocational Education**

Proposed Program	Justification
Autonomous Vehicle Safety Teleoperator Certificate	Ideal for defining pan-EU safety frameworks, can draw from existing standards training
Sensor Diagnostics & AV System Maintenance (EQF Level 4)	Leverage existing automotive maintenance infrastructure, update with AV modules

- **For Higher Education**

Proposed Program	Justification
MSc in Autonomous Mobility Ecosystems	Interdisciplinary focus: policy, tech, mobility economics
MSc in AI & Robotics for Transportation	Engineering-driven; could host AV testbeds and simulations
LLM in AV Law and Insurance	Specialized legal and regulatory knowledge for evolving AV landscapes

- **Summary of Future Job Requirements in the AV Era**
  - Core Skill Shifts
    - From manual driving to digital operations: Proficiency with vehicle telematics, monitoring systems, and cloud platforms.
    - From hardware maintenance to software diagnostics: Deep understanding of AV-specific tech (LiDAR, AI perception).
    - From rule-based decision-making to probabilistic modelling: Especially in insurance, logistics, and planning roles.
  - Emerging Competency Domains
    - Data literacy: Ability to work with large sets of mobility and sensor data.
    - Cybersecurity awareness: Baseline knowledge across all AV-touching jobs.
    - Human-machine interaction: Skills for supervising, collaborating with, or enhancing AV systems.
  - Training and Education Recommendations
    - Technical retraining: Short-term certification programs for technicians and operators.
    - Lifelong learning: Institutions must integrate AV-focused curricula in engineering, urban planning, and policy programs.
  - Cross-sector collaboration: Public-private partnerships for re-skilling displaced workers, especially in transport.

- **Recommendations**

Aspect	Key Recommendations
Existing programs	Adapt existing VET and MSc programs across Europe by adding AV-specific content (e.g., sensors, remote ops, data management)
New programs needed	Create certification programs for safety teleoperators, sensor technicians, and interdisciplinary AV mobility planners

**Assessment from the authors:**

The above generated responses by ChatGPT are reasonable and provide a scenario with high probability.

### 4.2.3 Education Programs

Prompt 3 with focus on Education Programs:

Based on the previous analysis, which of the future job requirements with focus on higher education are a too large scope for a certification program and should rather be developed in a degree program? Alternatively, which future job requirements could be combined into one or several degree programs?

The following responses were generated with ChatGPT 4o and consequently reviewed and optimized by the authors:

Based on the previous analysis, we can now evaluate which future job requirements at the higher education level are:

- Too broad in scope for a certification program and should instead be part of full degree programs.
- Can be logically combined into new or interdisciplinary degree offerings, especially in the context of the large-scale deployment of Level 4 autonomous vehicles (AVs) in Europe.

#### Job Requirements Too Broad for Certification Programs

Certification programs are ideal for narrow, technical specializations or supplementary training. However, the following job requirements demand deep interdisciplinary expertise, foundational theoretical grounding, and research capabilities—best delivered through full degree programs (Bachelor’s or Master’s):

Role	Why Not a Certification?	Recommended Degree
AV Systems Engineer	Systems-level integration, robotics, AI	MSc Autonomous Mobility Systems
Mobility Data Analyst	Cross-disciplinary: analytics + planning	MSc Transport Informatics
Cybersecurity Analyst	AV-specific threat models, encryption	MSc Cybersecurity for Mobility
Urban Mobility Planner	Multimodal planning, AV zoning	MSc Urban Planning & Smart Cities
Insurance Underwriter	Liability, data modeling, insurance theory	MSc Automated Risk & Insurance Analytics
AV Remote Operator (Advanced)	Legal framework, tech system understanding	BSc/MSc Remote Vehicle Operations (Germany-compliant)

### Combinations into Interdisciplinary Degree Programs

To optimize educational pathways and reduce fragmentation, related job requirements can be bundled into coherent, multi-track degrees:

<b>Program</b>	<b>Combines Roles</b>
MSc Autonomous Mobility Systems	Systems Engineer + Data Analyst + Teleoperator
MSc Urban Mobility & AV Policy	Planner + Infrastructure Strategist
MSc Risk & Law for AVs	Underwriter + Legal Advisor
MSc Cybersecurity & Resilience in Mobility	Cyber Analyst + Safety Architect
BSc/MSc AV Operations & Supervision	AV Remote Operator + Monitoring Expert

### Summary: Program Design Recommendations

<b>Category</b>	<b>Recommendation</b>
Too large for certifications	AV Systems Engineer, Urban Planner, Mobility Data Analyst, Cybersecurity Analyst, Insurance Risk Analyst
Ideal for full degrees	Combine roles into 4–5 interdisciplinary MSc programs targeting AV systems, urban design, data analytics, cybersecurity, and insurance

### Assessment from the authors:

The above generated responses by ChatGPT are reasonable and provide a scenario with high probability.

#### 4.2.4 Regulatory Maturity

The following desk research has been done via manual web research to cover the status of existing regulations allowing the test or even deployment of L4 automated vehicles on public roads. The scope was intentionally expanded to global research to allow for regulatory comparison within the European Union and worldwide.

In case a country has existing laws for L4 testing or deployment or grants individual government approvals with active L4 testing projects in place, the specific country and the reference to the law or project is mentioned in this section.

For an easy-to-read reference, the status has been summarised in a dynamic world map highlighting the countries that allow for L4 deployment (dark blue) and L4 testing (green).

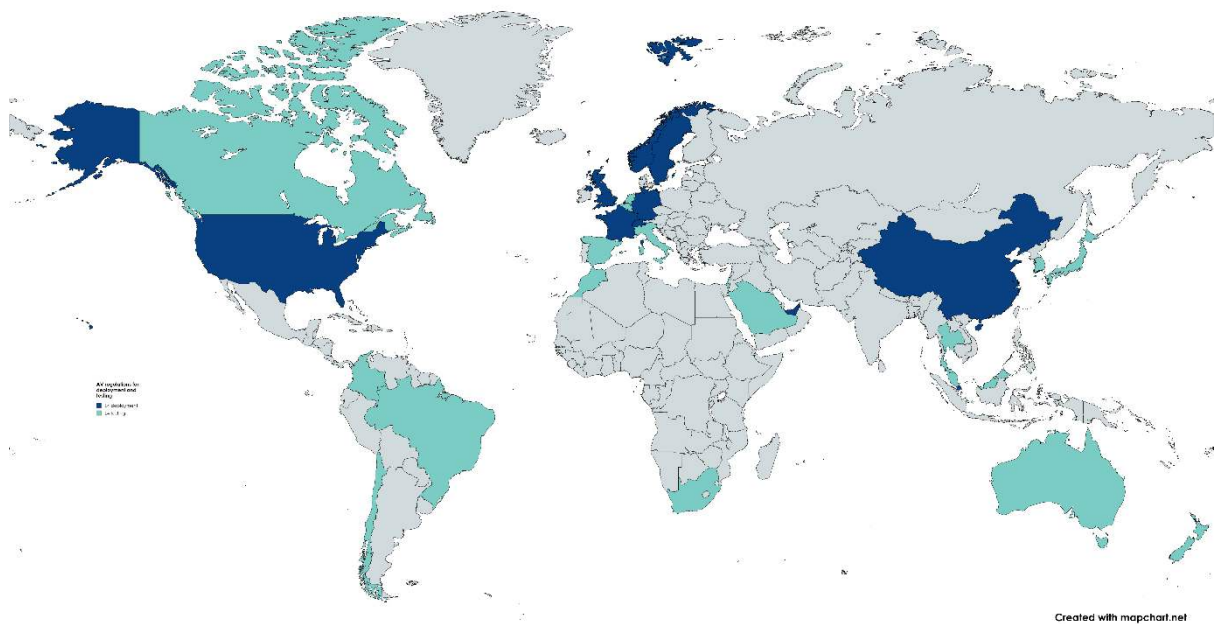


Figure 6: AV regulations for deployment and testing

At the time of this research, 9 countries have laws in place that support the commercial deployment of L4 automated vehicles. In addition, 19 countries support testing of L4 automated vehicles either through laws or local permits. Going forward, countries like Canada and Japan, which are currently supporting L4 testing, are expected to pass laws for L4 deployment in the foreseeable future and it is also expected that countries which are not covered by this research will support L4 testing.

A more detailed overview is provided in the following table listing each of the countries:

<b>Country</b>	<b>L4 Deployment</b>	<b>L4 Testing</b>	<b>Comment</b>	<b>References</b>
USA	Y	Y	Coexistence of federal guidance and state regulations	<a href="#">Link</a>
Canada	N	Y	Temporary trials of AV	<a href="#">Link</a>
Brazil	N	Y	No federal AV law yet, but testing is allowed under local permits	<a href="#">Link</a>
Chile	N	Y	No federal AV law yet, but testing is allowed under local permits	<a href="#">Link</a>
Colombia	N	Y	No federal AV law yet, but testing is allowed under local permits	<a href="#">Link</a>
UK	Y	Y	Regulates the use of automated vehicles on roads and public places	<a href="#">Link</a>
Germany	Y	Y	National type-approval for L4	<a href="#">Link</a>
France	Y	Y	AV to operate in France provided they are supervised by a remote operator and operated on predefined lanes or areas	<a href="#">Link</a>
Netherlands	N	Y	Defines AV testing on open roads	<a href="#">Link</a>
Spain	N	Y	Legalizes testing with safety-drivers	<a href="#">Link</a>
Sweden	Y	Y	Allows AVs in controlled areas	<a href="#">Link</a>
Norway	N	Y	L4 testing allowed	<a href="#">Link</a>
Italy	N	Y	Permits L4 AV testing	<a href="#">Link</a>
Belgium	N	Y	Allows AV testing under strict conditions	<a href="#">Link</a>
Switzerland	Y	Y	Legalizes L4 vehicles	<a href="#">Link</a>
South Africa	N	Y	No AV regulation but testing is allowed under existing road laws	<a href="#">Link</a>
Morocco	N	Y	No federal AV law yet, but testing is allowed under local permits.	<a href="#">Link</a>
UAE	Y	Y	Legalized L4 in 2023	<a href="#">Link</a>
KSA	N	Y	No federal AV law yet, but testing is allowed under local permits	
Israel	N	Y	Testing with safety drivers allowed	<a href="#">Link</a>
China	Y	Y	National Guideline for L4	<a href="#">Link</a>
Singapore	Y	Y	L4 approved with and without safety driver in dedicated areas	<a href="#">Link</a>
South Korea	N	Y	L4 testing allowed	<a href="#">Link</a>
Japan	N	Y	L3 is allowed, L4 only for testing	<a href="#">Link</a>
Thailand	N	Y	L4 testing in limited zones allowed	<a href="#">Link</a>
Malaysia	N	Y	L4 testing in limited zones with safety driver allowed	<a href="#">Link</a>
Australia	N	Y	No federal AV law yet, but testing is allowed under local permits	<a href="#">Link</a>
New Zealand	N	Y	No federal AV law yet, but testing is allowed under local permits	<a href="#">Link</a>

## 5 Conclusions and reflections

The implementation of the Innovation Radar within the CCAM-ERAS project represents a first step toward continuously identifying and assessing technological developments in the rapidly evolving CCAM domain. While this pilot phase confirms the methodology's foundational value, it also contains the limitations and areas where refinement is necessary at the later stage.

### 5.1 Reflection on the methodology

The methodology used in the first iteration of the Innovation Radar has been effective and well-structured. It provides a clear framework for identifying key innovations in the CCAM field, using both quantitative data (prototypes) and qualitative insights (such as job impacts and regulatory readiness). This approach has proven to be a strong starting point for understanding the state of CCAM technologies and their potential societal effects.

The methodology's structure, with its defined KPIs and data mining techniques, has worked well to organise and analyse the information. The mix of both technical and societal factors provides a balanced view of the innovation landscape. The methodology and the generated results for the first version of this Innovation Radar have been reviewed by work package leaders and technical reviewers.

The methodology will be fully applied in the second iteration of the Innovation Radar. This will include covering all measurements in the radar structure, from technology readiness to market and social aspects. The second iteration of the Innovation Radar will be reviewed by an extended audience across project consortium and stakeholder community.

### 5.2 Current Limitations

#### 5.2.1 Data Scrapping

Despite browse.ai's broad functionalities, one of the primary limitations is its difficulty in handling websites with layered structures or dynamically loaded content. For example, databases like Espacenet, which store extensive patent data and require navigation through multiple levels of categorised content, are typically too complex for Browse.ai to manage. The tool is not well-suited for extracting detailed information from such large-scale databases due to the complexity and volume of the data involved. It is a reason why the search of the European patents was not performed in the approach.

Instead, the tool's prebuilt robots were used to extract the relevant patents. However, they are restricted to US and Canadian databases. Even within those, the scope of extracted information is limited to the patent titles and the links to the documents. Essential elements such as abstracts, detailed descriptions, inventor names, or claims are generally not retrieved, which limits the output data needed for deeper analysis.

Browse.ai performs best on websites with simple, static structures where the data is presented in a clear and repetitive format, such as news sections of the websites. Its effectiveness reduces on websites that involve advanced interactivity or complex layouts.

### 5.2.2 Scoring system

Limitations of the methodology for the scoring come from a potential limitation of keyword quantities or the subjective selection of keywords, actor names, and weights. To address the limitation of the subjective selection, a sensitivity analysis has been conducted with 12 variations of keywords and weights and the variation with most promising results in the highest scores were used in this report.

### 5.2.3 Qualitative analysis – desk research

The results of the qualitative (desk research) part of the methodology in this report are limited to *“generating narratives in response to strategically developed prompts”* only. This part of the methodology was successfully applied and provided valuable insights. However, the second part of the qualitative research, which involves *“extracting valuable information from defined online sources”* (described in the chapter 3.2.1), was not performed in this iteration. This step, including the AI analysis of reports, publications, and other resources, will be carried out in the subsequent stages of the project, ensuring a more detailed qualitative assessment in the next iteration.

## 6 Annex

### 6.1 List of the URLs used for quantitative assessment

Nº	Source / URL	Search Terms / Key words
1	<a href="#">ADAS &amp; Autonomous Vehicle International</a>	Autonomous vehicle prototype test
2	<a href="#">Assembly</a>	Topics » Autonomous & Electric Mobility » Autonomy
3	<a href="#">CCAM</a>	News & events » CCAM News
4	<a href="#">Connected automated driving.eu</a>	News
5	<a href="#">Future Transport News</a>	Autonomous vehicle
6	<a href="#">SAE International</a>	Filter by trends: Autonomous; Automated
7	<a href="#">Traffic Technology Today (TTI)</a>	News » Autonomous Vehicles & ADAS
8	<a href="#">Zenzic</a>	CAM Community » News, Blogs & Case Studies

### 6.2 World map for regulatory overview

The graphical world map was developed with mapchart.net and can be updated for future changes of countries supporting L4 regulations. For future updates, visit below URL and upload the world map configuration which is embedded below. Mapchart.net will then load the current map configuration.

URL to the editable Worldmap: <https://www.mapchart.net/world.html>

World map configuration (for editing):



mapchartSave\_world\_AV\_regulations\_for\_deployment\_an.txt