MODI Project – CCAM Logistics Task Force

Kick-off Meeting – 28th January 2025

A LEAP TOWARDS SAE L4 AUTOMATED DRIVING FEATURES

How can automated trucks play a role in logistics?

MODI Ambitions

A leap towards SAE L4 automated driving features

- MODI seeks to advance automated freight vehicle adoption to boost efficiency in European logistics.

- CCAM solutions are expected to reduce costs, streamline operations, and improve transport safety and sustainability.

- MODI will showcase CCAM's feasibility and benefits through five use cases spanning confined areas and public roads.

- It will assess current automation capabilities and identify areas needing further development.

MODI ACCELERATING CCAM ADOPTION TO IMPROVE EUROPEAN LOGISTIC CHAINS

PORT OPERATIONS
NETHERLANDS
CCAM vehicles in current logistics operations at port site.

MOTORWAY TO HARBOUR
GERMANY
CCAM vehicles approaching a confined area at the harbour.

HUB-TO-HUB
SWEDEN
Hub-to-hub traffic with CCAM heavy-duty vehicle.

BORDER TO PORT
NORWAY
CCAM vehicles from EU border crossing to a port.

MODI CCAM CORRIDOR
MODI CCAM test corridor from Rotterdam to Oslo.

MODI Objectives and Key Results

The MODI objectives are to:

- Implement new CCAM technology in vehicles and infrastructure

- Define recommendations for the design of physical and digital infrastructure (PDI)

- Demonstrate viable business models for connected and automated logistics

- Perform technical and socio-economic impact assessments

Significant challenges include regulatory aspects and standardisation, border crossings, access control, charging, coordination with automated guided vehicles, loading/unloading and handover from the public to confined areas.

MODI KEY RESULTS

CCAM vehicles at TRL 7 suitable for L4 demonstration on public roads and confined areas on the logistic corridor between The Netherlands and Norway.

Interface for efficient coordination of vehicles in public and confined areas, adding more benefits to the use of CCAM vehicles.

Design of PDI for supporting L4 CCAM vehicles, co-created and verified by relevant stakeholders.

New viable business models and tools creating value along the logistic chain by utilizing CCAM technology and vehicles.

Assessment of environmental, safety, operational, and socio-economic impacts to support the recommendation of future deployment of CCAM in logistics.

Lessons learned and recommendations on CCAM vehicles, PDI, regulation, harmonization, and standardization to accelerate CCAM adoption in logistics.

Impact assessments

Perform technical and socio-economic impact assessments

- Environment

- Safety

- Operational aspects

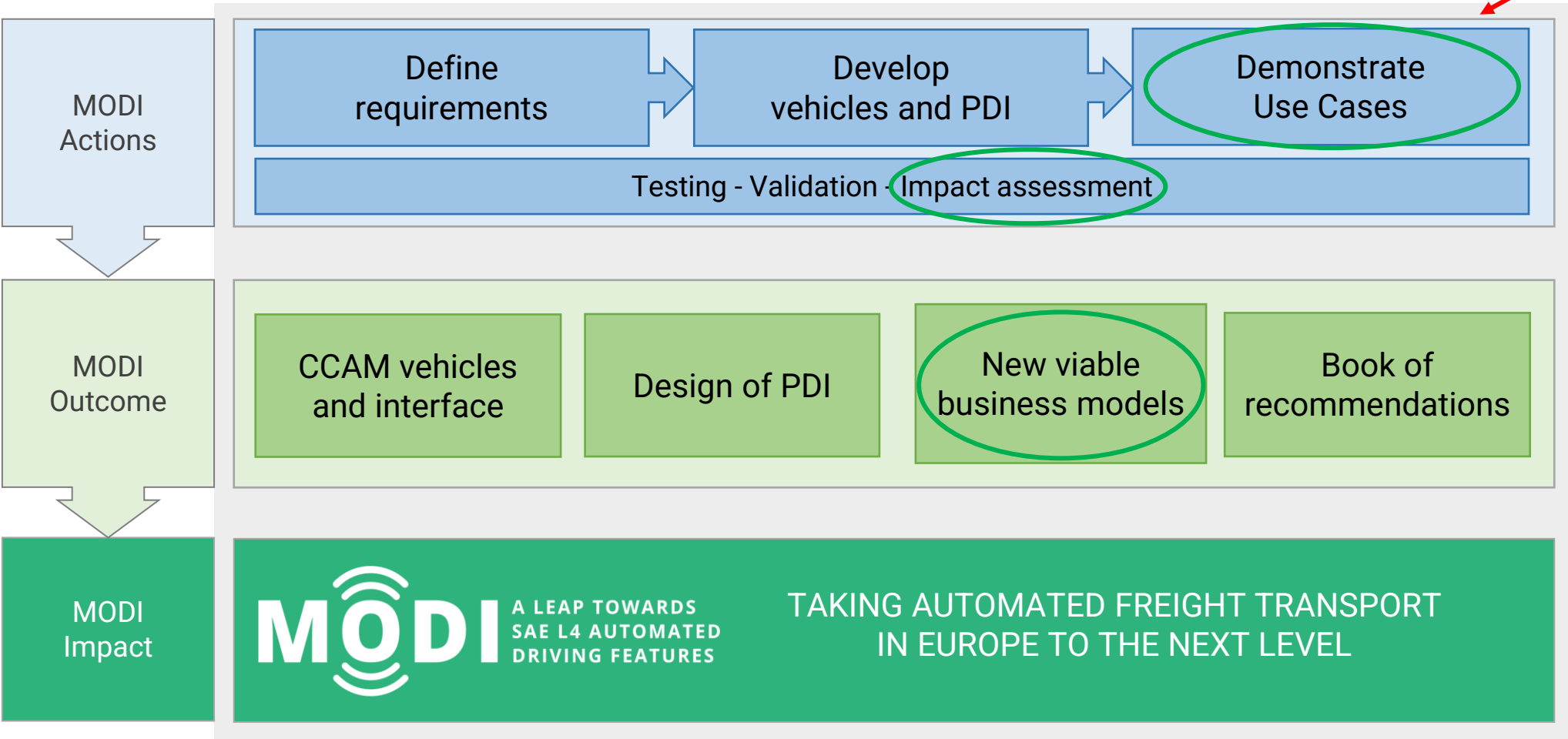- Economy, including socio-economics (work in progress)

Gap Analyses

Technological and societal readiness for the introduction of automated freight transport

Source: Volvo

Co-funded by
the European Union

MODI Project Overview

MODI Actions

Define requirements	Develop vehicles and PDI	Demonstrate Use Cases

Testing - Validation - Impact assessment

MODI Outcome

CCAM vehicles and interface	Design of PDI	New viable business models	Book of recommendations

MODI Impact

MODI A LEAP TOWARDS SAE L4 AUTOMATED DRIVING FEATURES

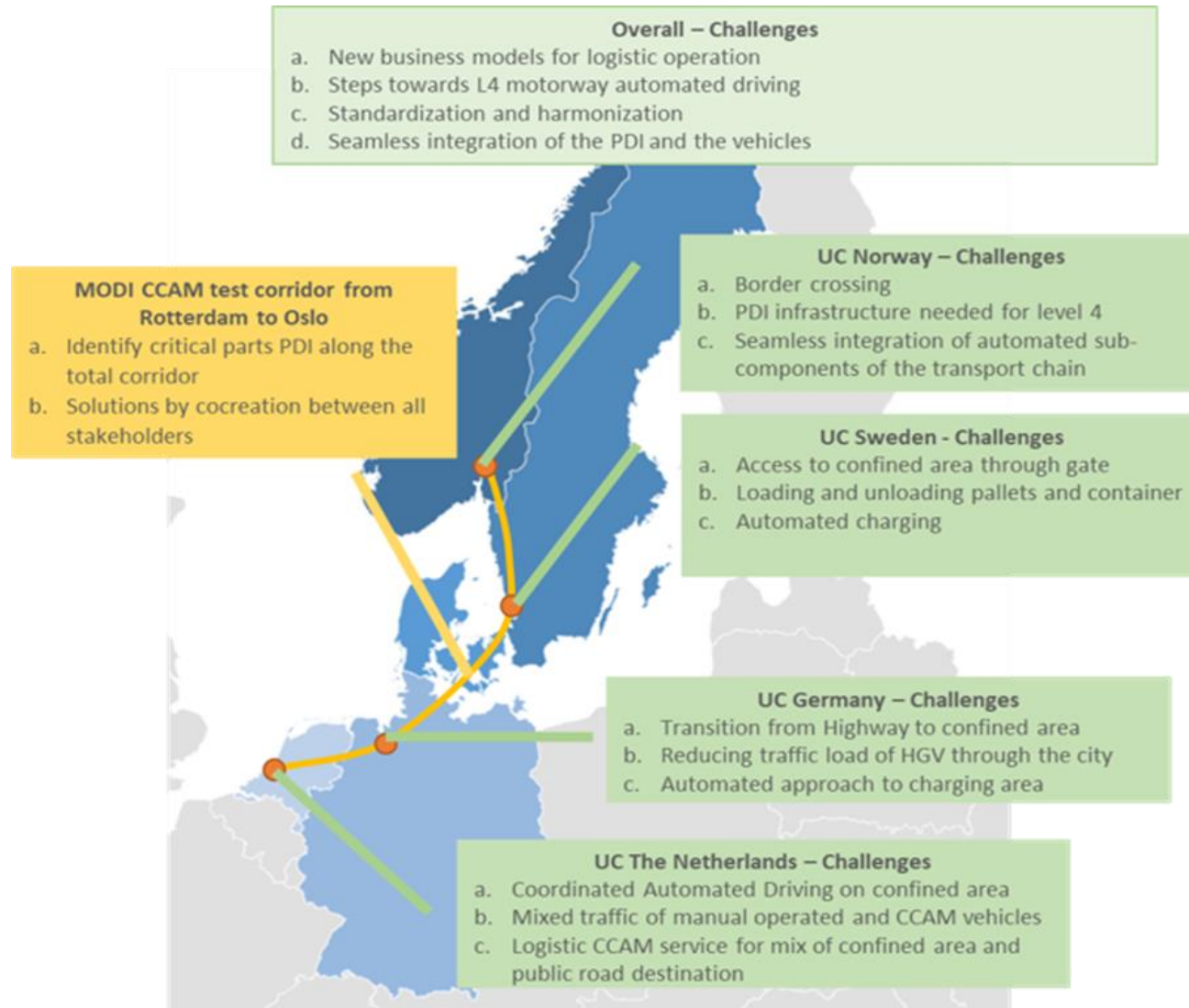TAKING AUTOMATED FREIGHT TRANSPORT IN EUROPE TO THE NEXT LEVEL

MODI

Co-funded by the European Union

MODI Storyline & Use Cases | Identify and resolve barriers in **confined areas** and on **public roads**

Overall – Challenges
a. New business models for logistic operation
b. Steps towards L4 motorway automated driving
c. Standardization and harmonization
d. Seamless integration of the PDI and the vehicles

MODI CCAM test corridor from Rotterdam to Oslo
a. Identify critical parts PDI along the total corridor
b. Solutions by cocreation between all stakeholders

UC Norway – Challenges
a. Border crossing
b. PDI infrastructure needed for level 4
c. Seamless integration of automated sub-components of the transport chain

UC Sweden - Challenges
a. Access to confined area through gate
b. Loading and unloading pallets and container
c. Automated charging

UC Germany – Challenges
a. Transition from Highway to confined area
b. Reducing traffic load of HGV through the city
c. Automated approach to charging area

UC The Netherlands – Challenges
a. Coordinated Automated Driving on confined area
b. Mixed traffic of manual operated and CCAM vehicles
c. Logistic CCAM service for mix of confined area and public road destination

Driving on public roads

Transitions from public road to confined area

Motorway

City traffic and VRU protection

Border-crossing

Customs

Automated charging

On-terminal driving

Gate access

Automated loading and unloading

Port-road traffic optimisation

Drayage

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UC NL: Automated driving and Drayage

Summary:

The demonstration is a combination of Automated driving on a port terminal and Drayage over public, which will be executed at APM's terminal at Maasvlakte Rotterdam and the route to a nearby warehouse

Execution plan: The demonstration will be executed Q2-Q4/2025

Scenario:

1. The demo will be executed using a DAF automated Truck

2. Driving on APM's terminal will be done in automated driving mode with a safety driver on-board. The driving speed will not exceed 30 km/h, which is the speed limit at the terminal

3. Scenarios at APM's terminal include gating processes, loading/unloading of the container, driving on a roundabout or signalized intersection (depending on the terminal road configuration at the time of the demo), reverse docking, manoeuvring in mixed traffic, parking, and driving at road sections with different number of lanes and driving rules

4. From APM's terminal to the nearby warehouse is a Drayage route. This route will be driven in so-called unarmed mode, having all sensing and communication systems for automated driving active, but with a driver operating the vehicle

5. The driving speed on the Drayage route is at the legal speed limit. There are sections of 50 km/h and 80 km/h.

6. Scenarios on the Drayage route include signalized intersections (left-turn and right-turn), crossroad with barriers, roundabout driving and driving on roads with different number of lanes

Partners: TNO, APM, Broekman Logistics (associate), DAF, De Rijke (associate), Maersk, Q-Free, Rijkswaterstaat, Technolution, TU Eindhoven

0: Start
0a: [OPT] Admin Building Parking
1: Security Check In
2: OCR/Radiation Check In
3: Gate In
4: [OPT] Parking Space
5: Merge Area
6: Enter Roundabout (give priority)
7: Leave Roundabout
8: Waiting Area Entry
9: [OPT] Waiting Area Parking
10: Merge Area
11: Select Correct Lane
12a: Reverse into Transfer Lane
12b: Container Transfer
12c: Drive away
12d: Select Correct Lane
13: Enter Roundabout (give priority)
14: Leave Roundabout
15: OCR/Radiation Check Out
16: Gate Out
17: Security Check Out

APM Terminal

1: Gate out
2: Signalised intersection
3: Signalised intersection
4: Roundabout (give priority)
5: Signalised intersection with barriers
6: Corner (vehicle has priority)
7: Arrive at warehouse

Warehouse

MODI

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UC Germany: Vulnerable Road Users (VRU), Merge and Time-to-Green (GLOSA)

Summary:

The demonstration focus on transportation in the city centre of Hamburg where Trucks leaves and enters the highway through city traffic, using C-ITS services as enabler for future L4 vehicles.

Execution plan: Demonstration Q3-Q4 2025

Scenario: VRU

1. Truck does right turn between „Am Sandtorpark" and „Überseeallee"

2. Truck crosses pedestrian & cycling-paths

3. Driver-assist in Truck reacts

Scenario: MERGE

1. Entering federal street network and following it onto the highway in short succession

2. Change of regulation within minutes

3. Location subject to discussion

Scenario: GLOSA / Time to Green

1. Use of SPaT message along a few kilometers within port-road-network

2. Test impact of C-ITS services like GLOSA and potential of C-ITS services for a more efficient and sustainable transport

Partners: NMS, DAF, Volvo, FHH (LSBG), HHVA, Enide, BASt, Gruber
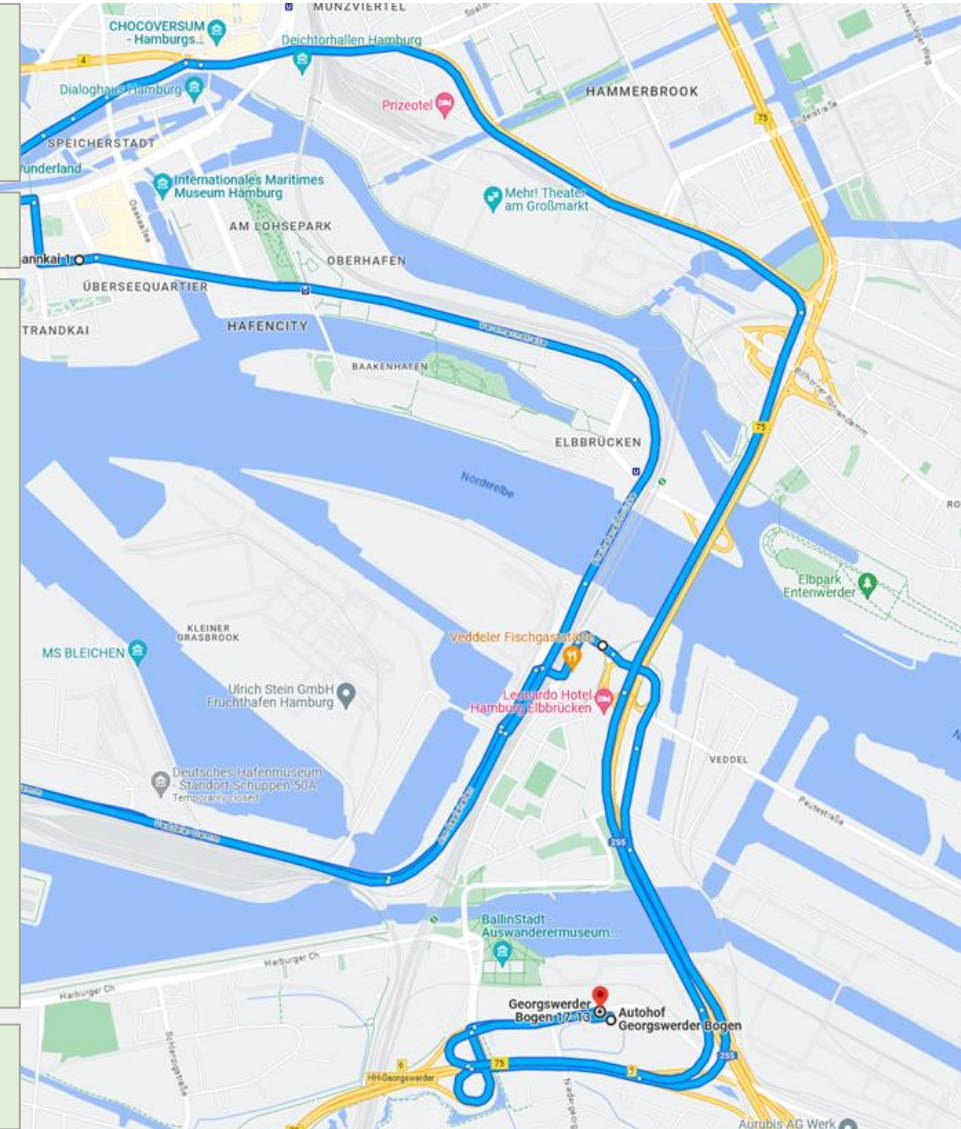
UC Sweden: Hub-to-Hub transport

Summary:

The Swedish use case is demonstrating hub2hub transports from the perspective of two different vehicle providers, showcasing how automation can provide value to the logistics system already today.

Execution plan: Demonstration Q1-Q3 2025

Scenario:

o UC-SE explores, demonstrates how to close the GAP of "hub-to-hub transport" from two different perspectives:

    o From the manual driven truck (VOLV) using L2-L4 functionalities

    o and from the automated truck (EIN)

o Volvo

    o Hub-to-Hub transport between Gothenburg harbour, using the highway to the DFDS warehouse in Viared logistics centre close to Borås.

    o Focus on digitalization and C-ITS for logistics efficiency.

o Einride

    o Hub-to-Hub transport between a factory and nearby warehouse (short distance).

    o Focus on creating an automated logistic chain

    o And showcasing the role of a remote operator

Partners: LSP, Volvo, Einride, AstaZero, DFDS, GRT, Q-FREE and STA (Swedish Transport Administration)

UC Norway: Border, Motorway, Customs and Port area

Summary:

An Einride vehicle will in the demo drive from Sweden on the E6 motorway crossing the border and through customs utilizing digitoll for automatic green light clearance. One can imagine this vehicle continue e.g. to the Moss area and the inland harbour or the ASKO central storage, where cargo is shifted onto a Volvo L2 equipped vehicle to continue to drive down to the port of Moss for connection to the ASKO sea drone. On its way it needs to tackle a range of traffic situation by utilizing V2X and perception technologies, which will be subject for demo activities as well.

Execution plan: Q1 - Q2 2025 Testing and verification at AstaZero, Q2 - Q3 2025 Demo

Scenario: Einride

1. Enter the motorway from the staging areas on the Swedish side of the border

2. Merge at the motorway where the merging lane ends

3. The AV will drive in the right lane on the bridge, crossing the border over to Norway

4. The AV will take the exit lane to the customs and slow down at the exit, proceeding through the digitoll solution.

Scenario : Volvo

1. Awareness Driving via V2X demonstrating vehicles blocking line-of-sight

2. V2X RWW manoeuvre where vehicle will negotiate a merger approaching an RWW

3. VRU and vehicle detection and sharing demonstrating safe overtake.

Partners: SINTEF, Einride, Q-FREE, Kartverket, Tolletaten, Statens Vegvesen, Trafikverket, Volvo, Østfold, Moss Harbour, ASKO

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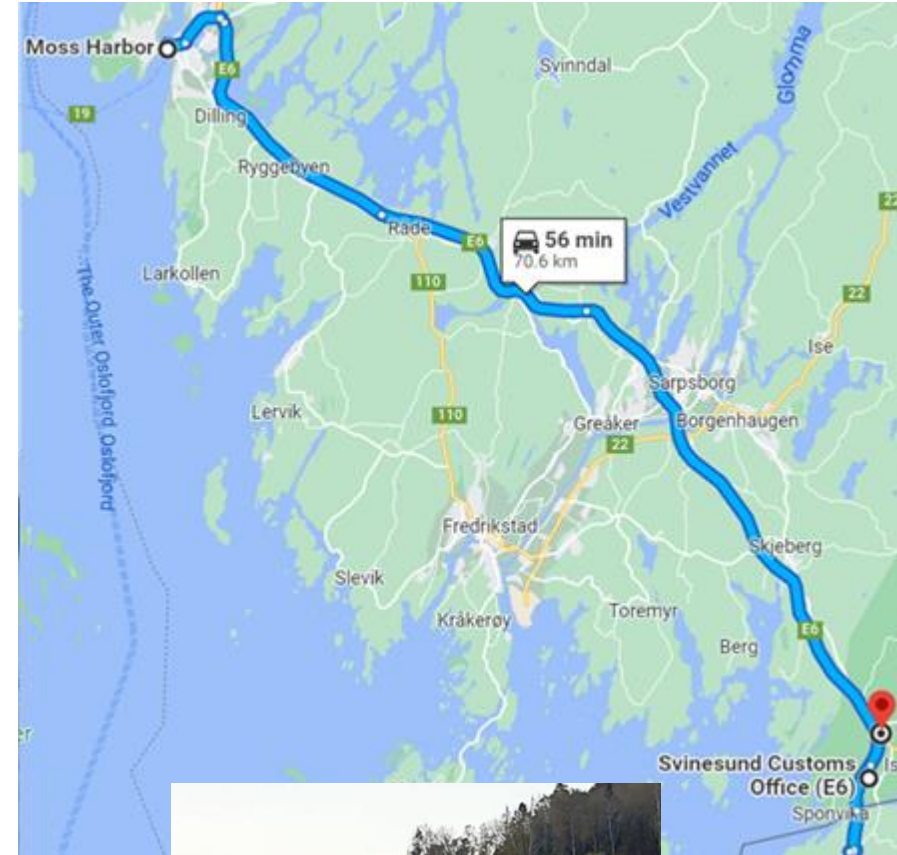
UC CCAM: Rotterdam – Oslo Corridor

Summary:

Investigate Physical-Digital-Infrastructure and vehicles barriers for L4 driving the full stretch Rotterdam-Oslo. Mapping infrastructure status, performing data collection and analysis to assess the readiness of the MODI corridor, which is part of the TEN-T network.

Execution plan: Q2 2024 Infrastructure mapping, Q2 2024 - Q3 2025 data collection. No demo.

Scenario:

Infrastructure mapping and data collection of identified relevant parameters will be collected on the whole route or parts of it in a series of data collection

- Mapping of current infrastructure status

- Vehicle measurements (part and/or whole route):
  - LiDAR and video for vehicle trajectory (other traffic) registration/prediction
  - Connectivity from android app, video (e.g. for line and signage detection) and events
  - Lane and signage detection from vehicle system
  - GNSS and connectivity in vehicle QoS
  - Energy usage

Partners: <u>SINTEF</u>, BASt, Q-FREE, NMA, RWS, BASt, Vejdirektoratet, Trafikverket, NPRA, DAF, Volvo, Einride, Gruber, DFDS, ALICE
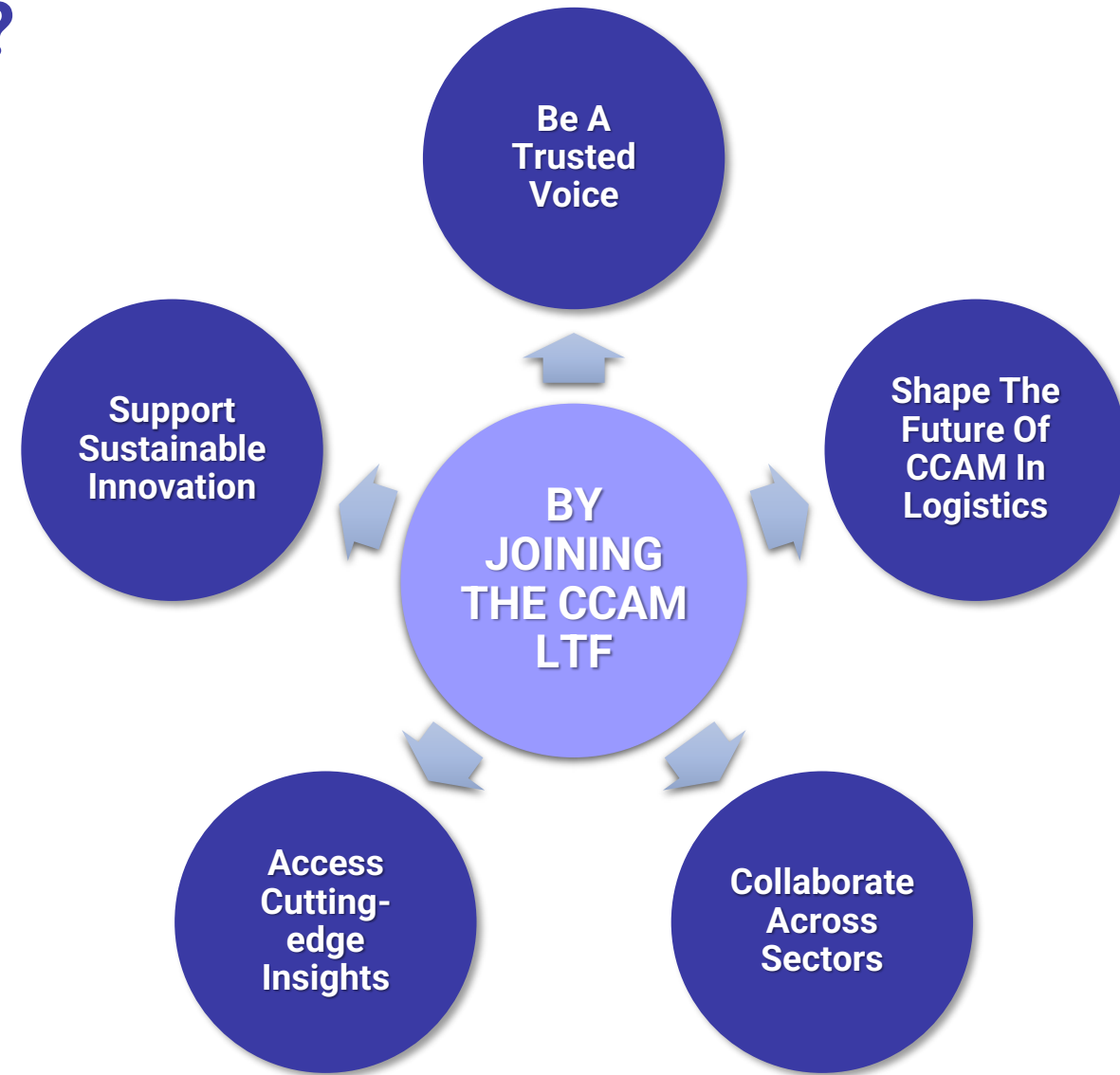
Co-funded by the European Union

What is CCAM Logistics Task Force?

The CCAM Logistics Task Force aim is to bring together logistics stakeholders such as: shippers, forwarders, logistics operators, logistics hubs, technology centers, research organizations, etc., to discuss MODI's findings and provide valuable feedback.

The Task Force contributes to developing business models, identifying needs and requirements, and conducting gap analyses.

In return, participants will gain insights into the latest advancements in automated road logistics and MODI's solutions to challenges like permitting and technical barriers.

Be A Trusted Voice

Support Sustainable Innovation

Shape The Future Of CCAM In Logistics

BY JOINING THE CCAM LTF

Access Cutting-edge Insights

Collaborate Across Sectors

Planning of the CCAM LTF for 2025/2026

Interviews on Societal
Readiness, led by
SINTEF

Logistics Task Force – Gantt Chart – 15 months in total

Jan 2025	Feb 2025	Mar 2025	April 2025	May 2025	June 2025	July 2025	Aug 2025	Sept 2025	Oct 2025	Nov 2025	Dec 2025	Jan 2026	Feb 2026	Mar 2026

Discussion on Business
Models, led by TOI

Initial findings of MODI
interviews

Results from the
interviews and UCs data

Final Event on MODI
demonstrations & outcomes

Other topics or focus areas you would like to propose for the CCAM Logistics Task Force?

- At this moment, the focus of the Task Force will be related to:
  - Societal Impact Assessment of automated logistics,
  - Business Models development.

- We welcome your recommendations or suggestions on other topics or focus areas to include in our Logistics Task Force discussions and events.

Why are you being invited to participate?

- In [MODI](#), the overall objective is to speed up the introduction of L4 automated trucks for logistics by demonstrations and to overcome barriers for the roll-out of automated transport systems and solutions in logistics.

- The different work packages and Use Cases in the MODI project have already contributed with numerous significant deliverables and valuable insights, such as the deliverable *D1.1 User and stakeholder requirements for automated transport in logistics*

- In this phase of the project, we focus on how to achieve societal impact for logistics. It is crucial to know more about the benefits and challenges of automation from the perspectives of the logistics sector.

- We will therefore conduct stakeholder interviews in collaboration with ALICE to identify the readiness for using automated trucks in logistics services.

Interview process

Who: Key logistics professionals involved in operations, management or strategic decision-making within your organisation.

How: Interviews where you will be encouraged to share your perspectives on the topics described below. The interviews will be performed as digital meetings and will take approximately one hour.

When: Interviews will be conducted from February until April 2025.

Topics: The interviews will gather insights on how automated trucks could impact your operations, potential benefits (e.g., efficiency), challenges (e.g., regulatory issues, workforce adaptation) and what need to be in place for automated trucks to play a relevant role in logistics.

How will the results be used?

- These outcomes will help understanding what role automated trucks can play in logistics operations and what it will take to get there.

- These insights will be important for the MODI Project and the further development of technology, functionality and business models related to automated trucks.

- Findings from interviews and demonstrations will be presented on 3 occasions. You will be invited to:
  1. **A webinar in mid-2025 discussing preliminary results on interview findings.**
  2. **A webinar in late-2025 presenting results from the interviews and UCs data.**
  3. **Final event focused on the demonstrations and outcomes of the Project.**

- You will also get access to the relevant MODI reports when available.

MODI T1.3 Business Models

CCAM Logistics Task Force Kick-off Meeting
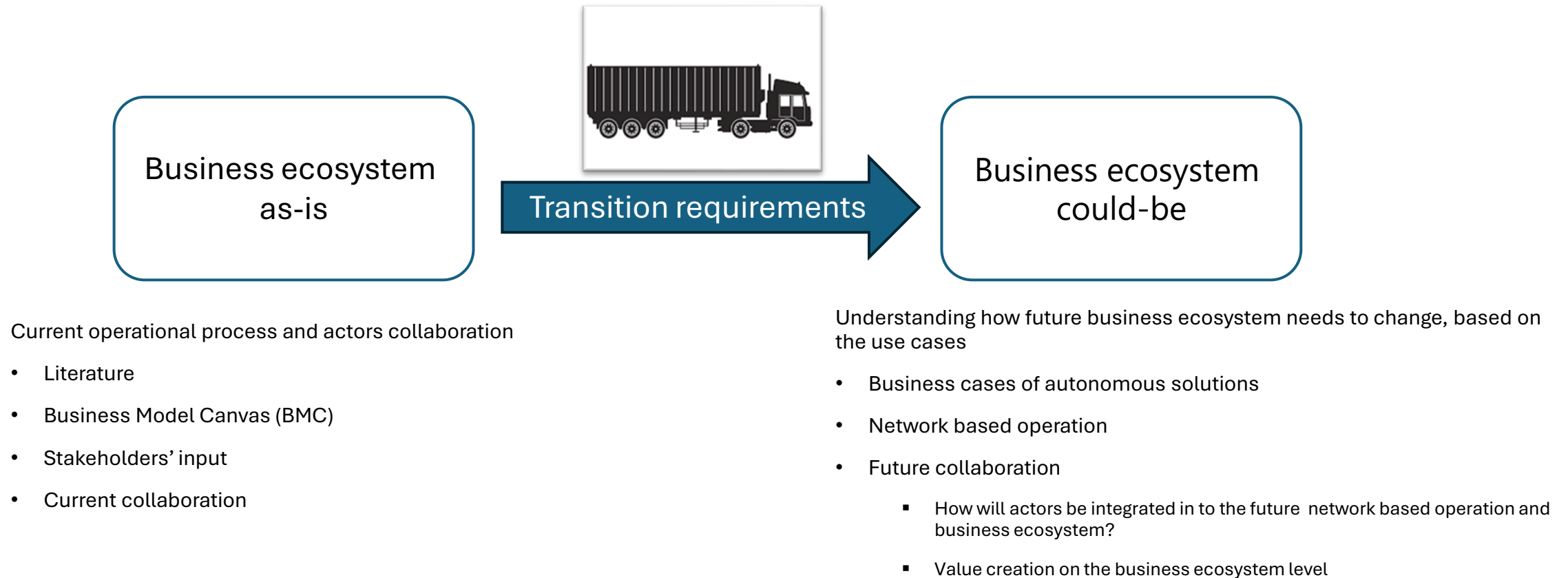
January, 2025

Business Models T1.3 Objectives

Objective 1: Show how the business models of logistics operators will be affected by CCAM technologies and services.

Objective 2: Capture the different perspectives on business opportunities of CCAM from various stakeholders, as their interplay is key (CCAL ecosystem).

Objective 3: Demonstrate innovative cross-sector business models and partnerships for CCAM systems and services involving both private and public key stakeholders.

Objective 4: Show if and how the technologies and services demonstrated in the MODI use cases may be further tuned to create more value for logistics operators and overcome barriers and triggers for mass adoption.

Defining Business Models for CCAM in Logistics

Business ecosystem as-is → Transition requirements → **Business ecosystem could-be**

Current operational process and actors collaboration

- Literature
- Business Model Canvas (BMC)
- Stakeholders' input
- Current collaboration

Understanding how future business ecosystem needs to change, based on the use cases

- Business cases of autonomous solutions
- Network based operation
- Future collaboration
  - How will actors be integrated in to the future network based operation and business ecosystem?
 - Value creation on the business ecosystem level

Status

- Develop approach to **qualitative** (Business Model Canvases) and **quantitative** data collection (via MODIs UCs and interviews of logistic actors)

- Interviews for qualitative data collections are ongoing with:
    - Shipping actors
    - Freight forwarders
    - Truck OEMs
    - Port and terminal operators
    - Others: PDI, Charging technology suppliers, Authorities

Qualitative data collection

BUSINESS MODEL CANVAS — The Power MBA
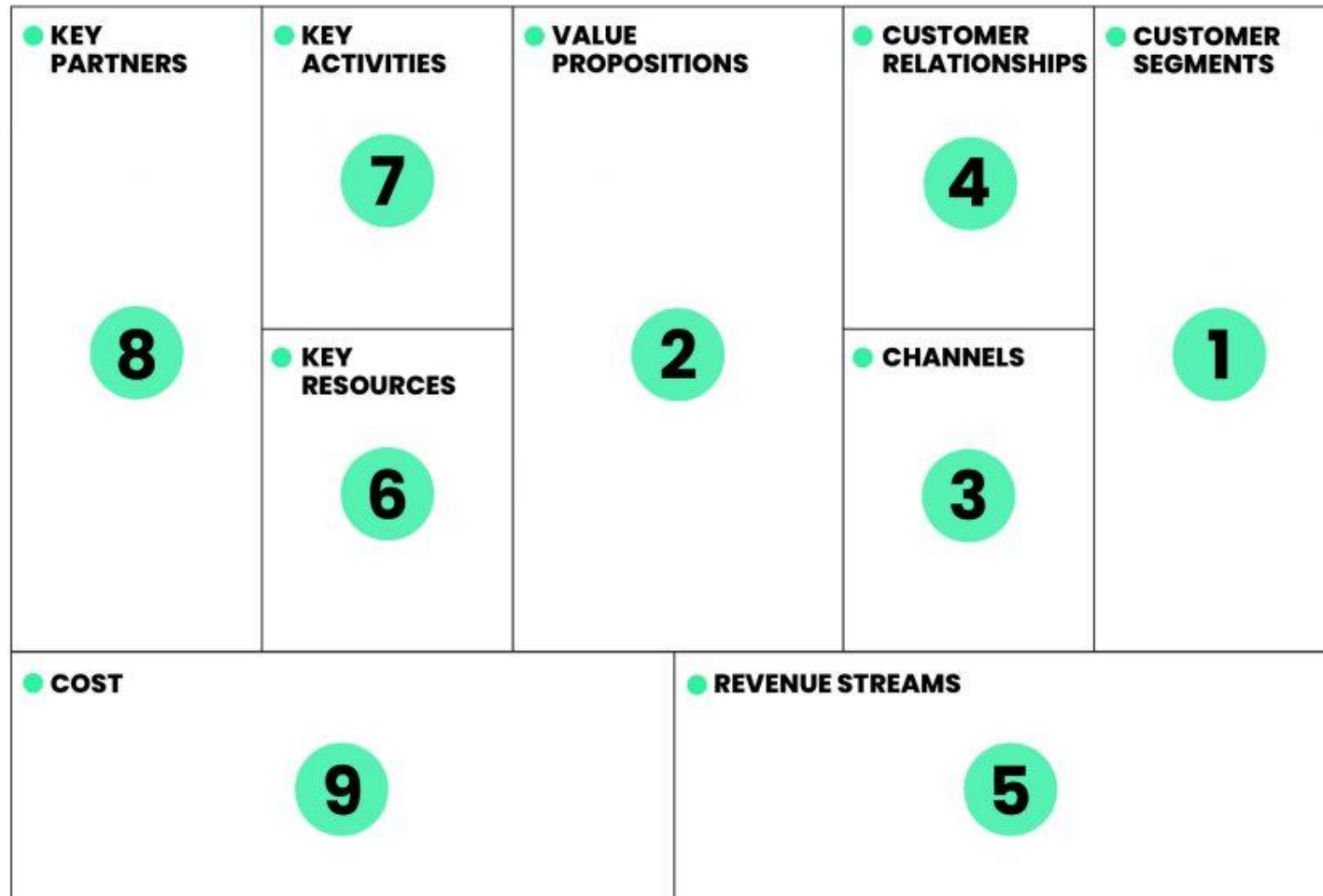
Quantitative data collection

Current challenges

- Getting estimations of changes in the cost structure and revenue streams of (automated) logistics

- Insights on the future roles in the logistic network (workforce shift)

- MODI UCs will be short (days/weeks), may not provide enough data on OPEX

How to solve them

Collaborate with the MODI CCAM Logistic Task Force to **assess assumptions** and **business model parameters,** to gain insights on

- what creates the highest value for logistics using CCAM solutions

- business models for specific use cases

Next steps

- We want to invite you to participate in a 1-to-1 interview
- Focus on certain stakeholder groups:
    Shipping actors, Freight forwarders, Truck OEMs, Port and terminal operators, PDI suppliers, Charging technology suppliers, Authorities
- Starting from March-April 2025

- Qualitative data collection – Business Model Canvas
    - Gather feedback on the drafted canvases per stakeholder group
- Quantitave data collection
    - Gather feedback on the taken assumptions and business model parameters per stakeholder group
    - Use case assessment on relevance

Questions from the Audience?

THANK YOU FOR YOUR TIME!

MODI A LEAP TOWARDS SAE L4 AUTOMATED DRIVING FEATURES

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