



# Welcome to ZEFES

10 February 2023



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101095856

Fernando Liesa (ALICE)

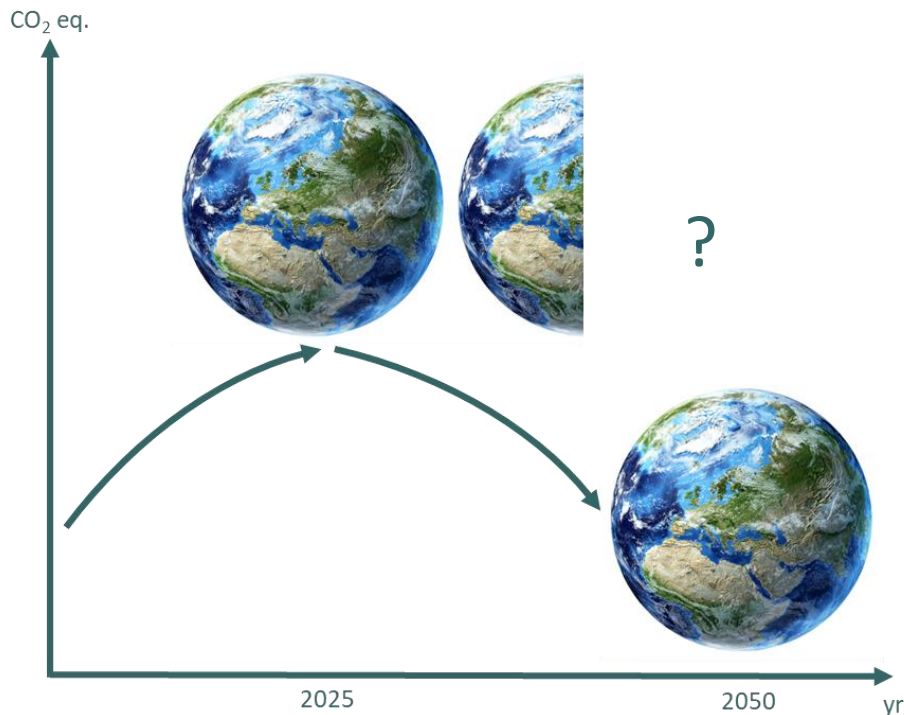
# WELCOME & INTRODUCTION

Ben Kraaijenhagen (VUB)

# INTRODUCTION ZEFES

# The challenges ahead, a paradigm shift

- ↻ New energy and new materials
- ↻ Rebuild and reform use of land
- ↻ Award investments in innovations

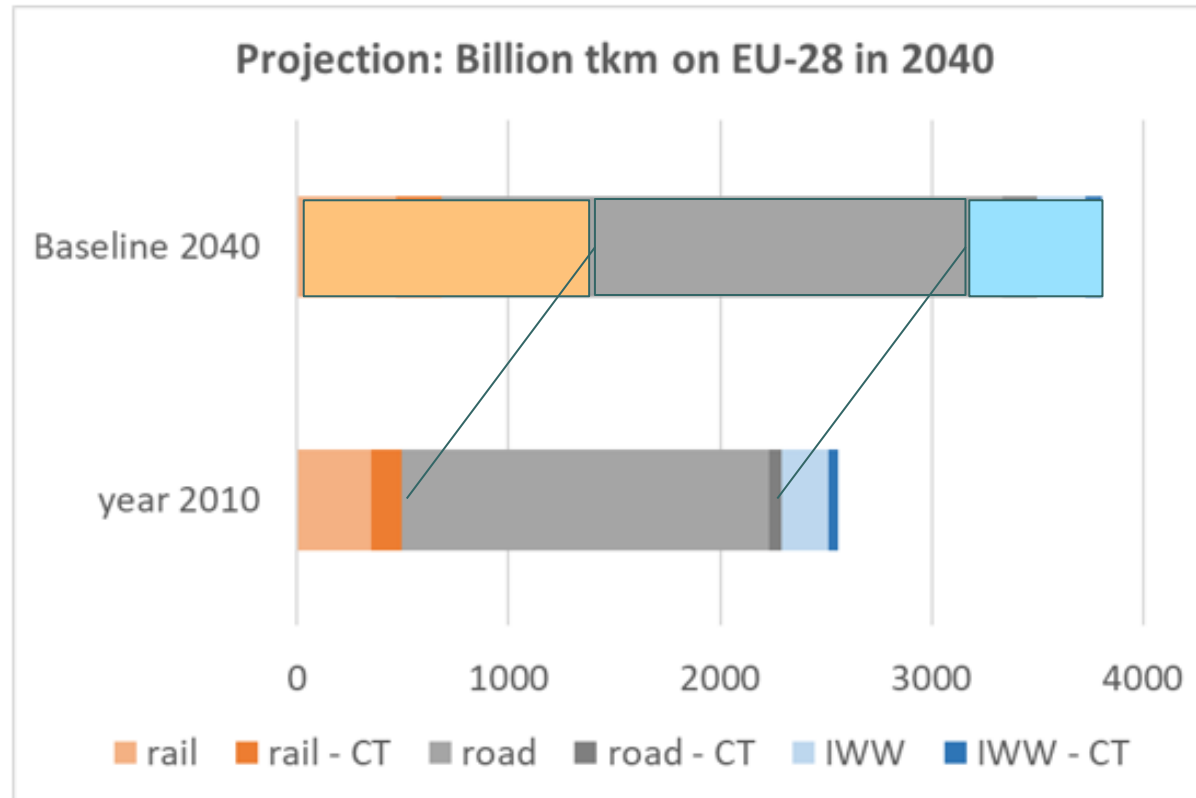


CO<sub>2</sub>eq.  
m<sup>2</sup>  
€

A large thought bubble contains three smaller thought bubbles with the symbols CO<sub>2</sub>eq., m<sup>2</sup>, and €. To the right of these bubbles is a photograph of a busy city street with many pedestrians.



## ↻ Growth of freight transport by 2040



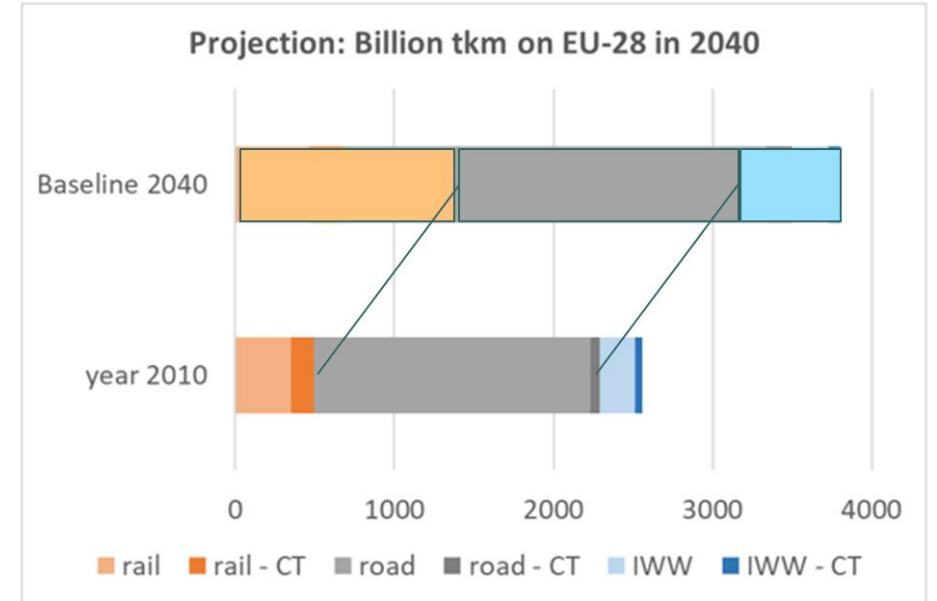
source: DLR; results of the model Demo-GV

## 🔄 Do more with less

- 🔄 Logistics need to become more efficient (less transport)
- 🔄 All modes need to become more efficient (rail, road, water, tube, air)

## 🔄 Road is inevitable and that will be for long.

- 🔄 Need to become as efficient as possible (vehicles **and** infrastructure)
- 🔄 Compatibility with other modes (hubs & terminals, loading units, weight & dimensions)



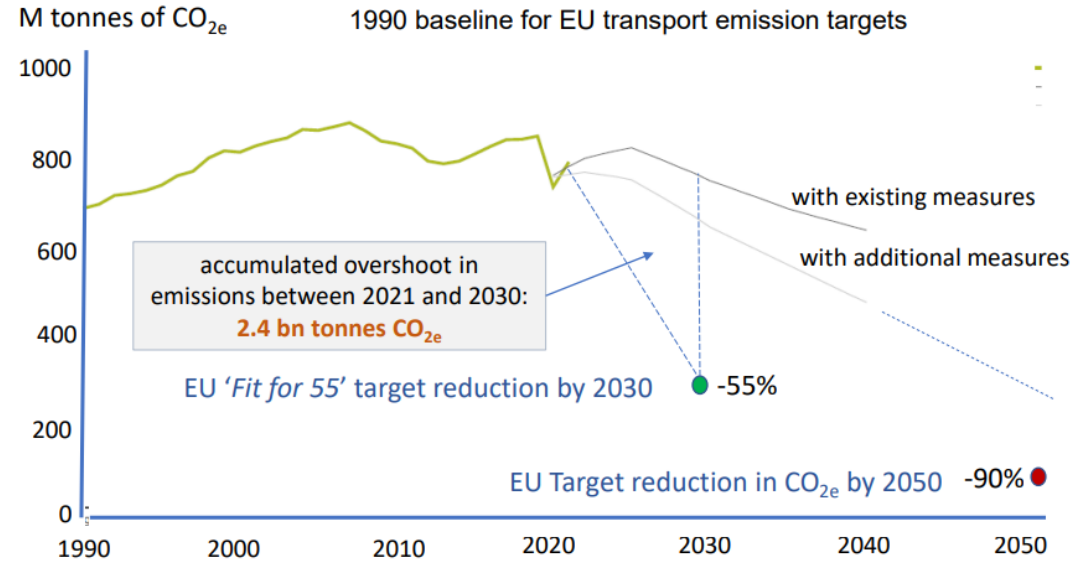
source: DLR; results of the model Demo-GV

- 🔄 Legislation and safety requirements
  - 🔄 EU directives
  - 🔄 Countries and regions
  
- 🔄 Economic (commercial),
  - 🔄 Energy prices
  - 🔄 Unbalanced energy taxes
  
- 🔄 Incentives to invest in sustainability

In the EU, transport well off-track to meet future emission reduction targets

Transport = quarter of total EU CO<sub>2e</sub> emissions in 2021

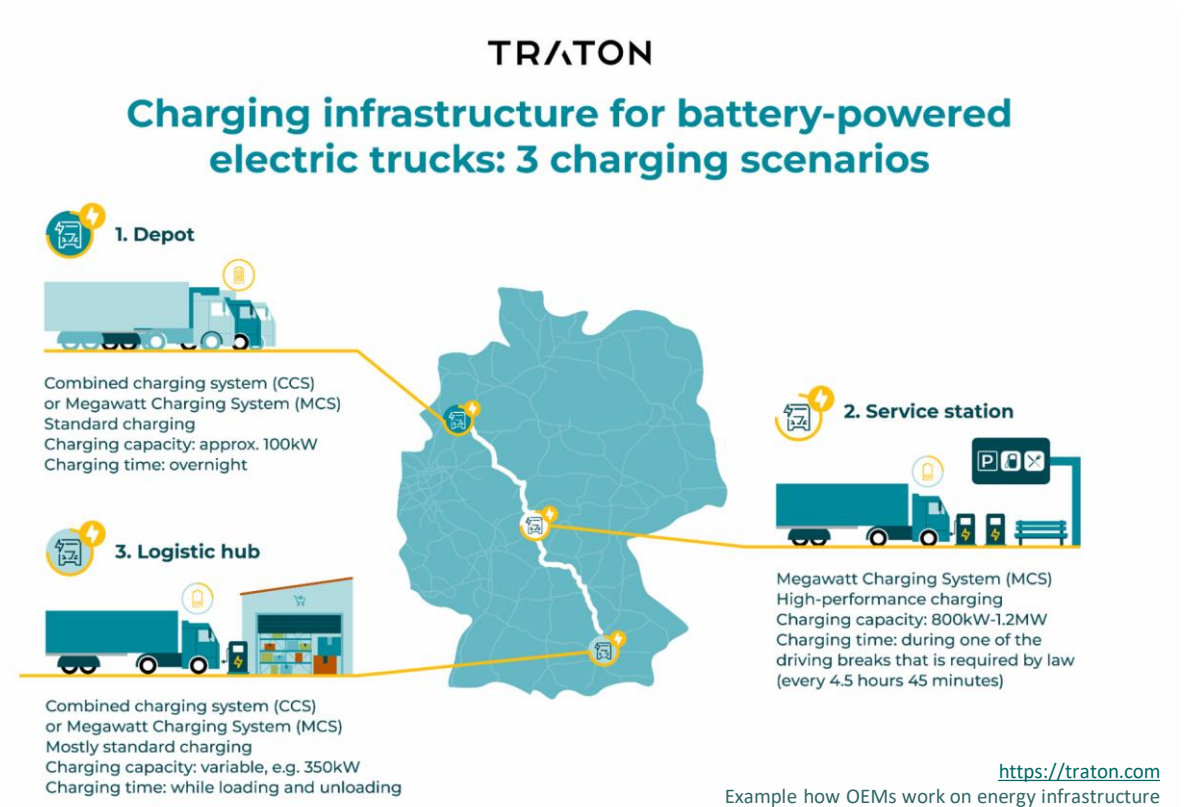
the **only EU sector** that increased its total emissions between 1990 and 2020



Provisional target freight road vehicles, -30% by 2030 for OEM sales at a fleet level



Data source: European Environment Agency (2022) <https://bit.ly/3hsawBr>

- 🔄 New technologies and concepts
  - 🔄 Trust and user acceptance
  - 🔄 Safety and knowledge gap
- 🔄 Lack of sufficient charging and hydrogen refueling infrastructure
- 🔄 Standards, compliance with European and worldwide standards
- 🔄 Sustainability of materials sourcing

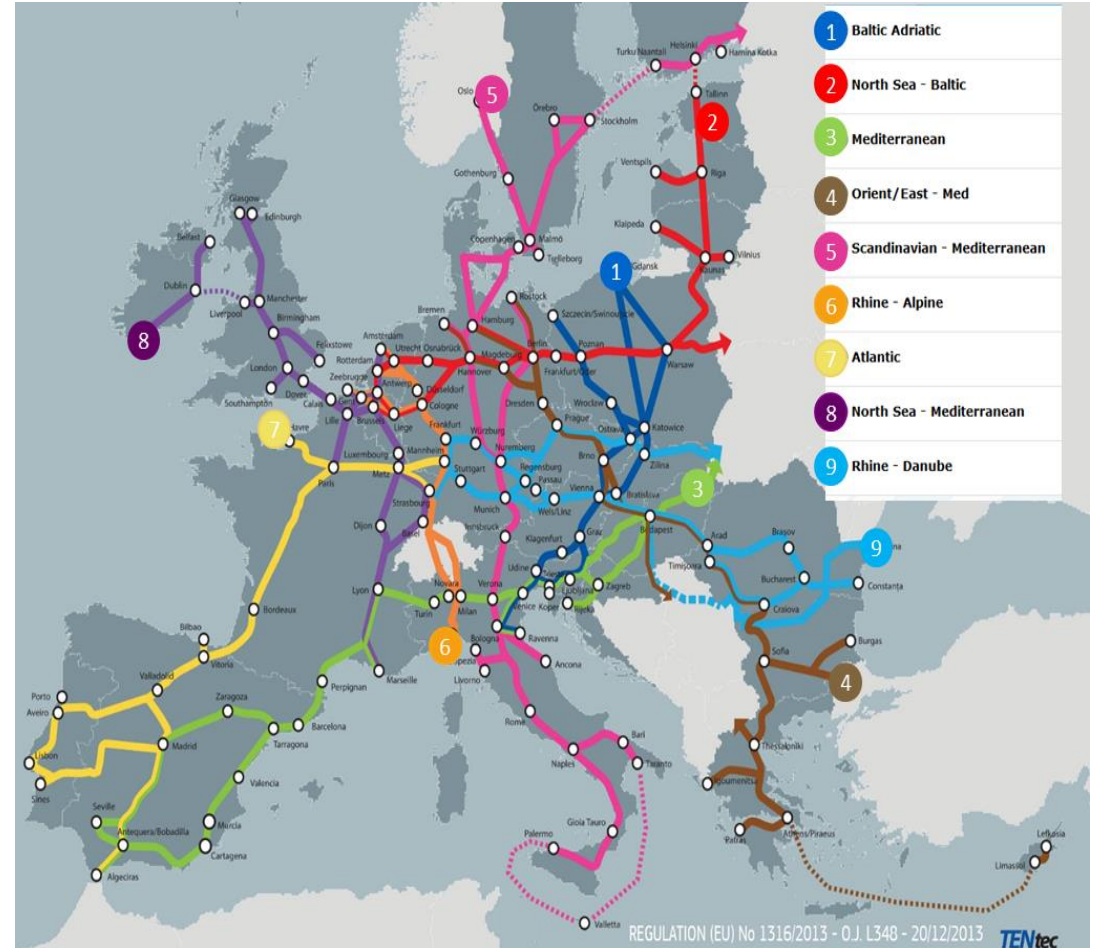




## Intermodal freight transport, supported by digital platforms

Mode	Time	Probability	Cost (€/tkm)
	-	0	+
	0	0	+
	+	+	0
	++	+	-

- Time, duration of the journey from A -> B
- Probability, time slot and quality
- Cost, today €/tkm -> including external cost



## Reflections from previous EU funded R&I projects

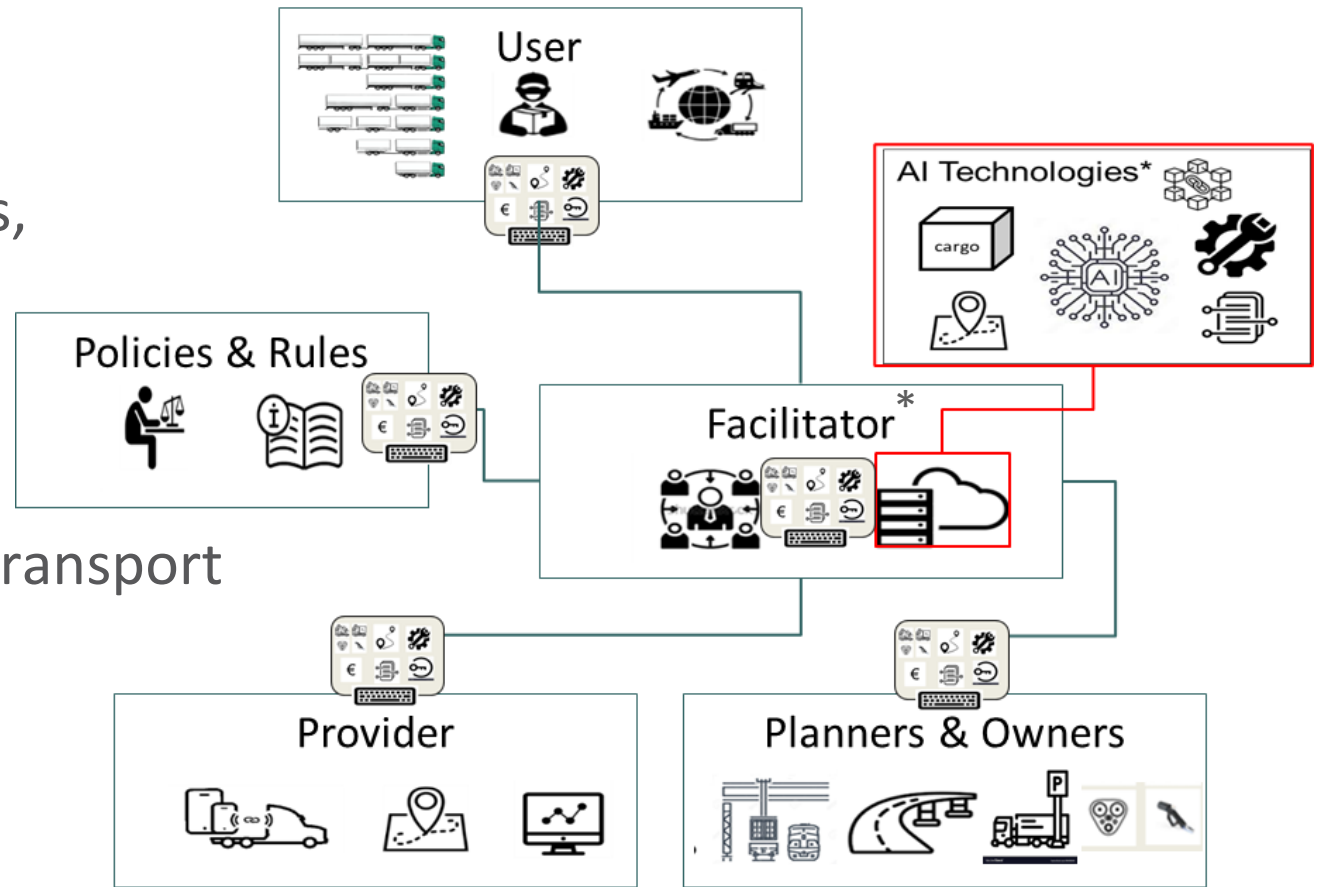
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- 🔄 **Engage with freight transport and logistics companies** to test new technologies in real operations and learn from them...
- 🔄 **More focus on Palletised goods:** Intra-European road flows
- 🔄 **More granularity** is needed to assess impact.  
Impact may change from industry to industry and across regions (e.g., if no intermodal options available).
- 🔄 **Combine EMS systems with zero emissions technologies.**  
Work on concrete use cases for which EMS can be truly integrated in intermodal operations even enable them.
- 🔄 **Efficiency gains used to transition assets not to reduce prices!**  
To avoid reverse modal shift (i.e., AEROFLEX model) but having a positive impact.
- 🔄 **Review Weight and Dimensions directive to allow innovations**

# Collaboration is key supported by digital platform(s)

- 🔄 Develop a **digital platform** to cover
  - 🔄 logistics-assignment,
  - 🔄 vehicle performance & diagnostics,
  - 🔄 dynamic navigation,
  - 🔄 road access management,

supporting ZE-HDV in road transport to meet the “Fit for 55” targets for road transport

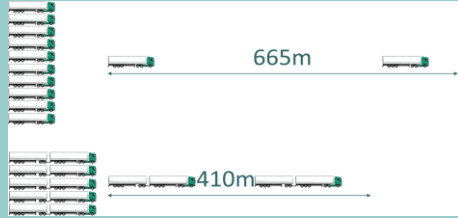


\*To comply with General Data Protection Regulation (GDPR) to process personal data on behalf of Controllers (Processors)

# Do more with less

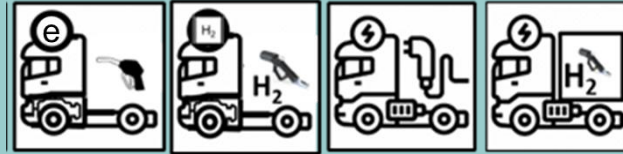
## Opportunities through collaboration

### High-Capacity Transport



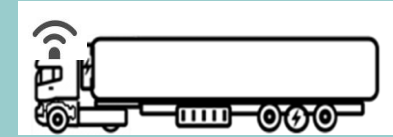
Less vehicles  
Less tkm  
Less space

### ZE tailpipe vehicles & non fossil fuels & aerodynamics



Less emissions

### Automation of vehicles



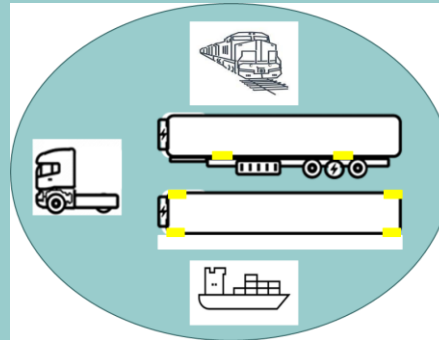
Less accidents  
Less space

### Digital platforms



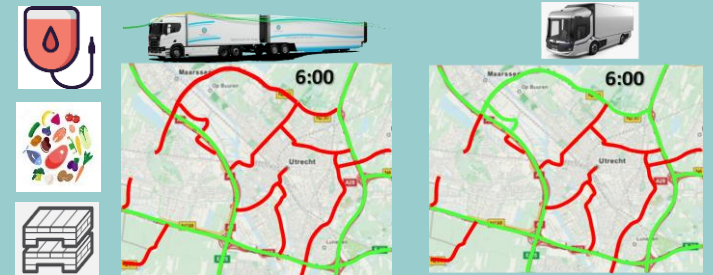
Less tkm  
Less traffic

### Mode compatibility



Less road

### Intelligent access



Less traffic  
Secure access e-infrastructure



## Q&A

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# ZEFES project

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**ZEFES: Zero Emission, flexible vehicle platforms with modular powertrains serving the long-haul Freight EcoSystem**

Addressed call:

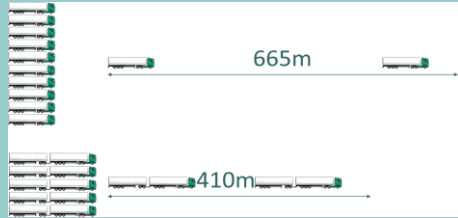
HORIZON-CL5-2022-D5-01

Clean and competitive solutions for all transport modes



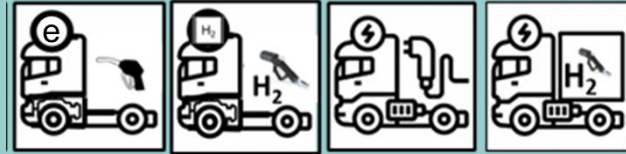
This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101095856

## High-Capacity Transport



Less vehicles  
Less tkm  
Less space

## ZE tailpipe vehicles & non fossil fuels & aerodynamics



Less emissions

## Automation of vehicles



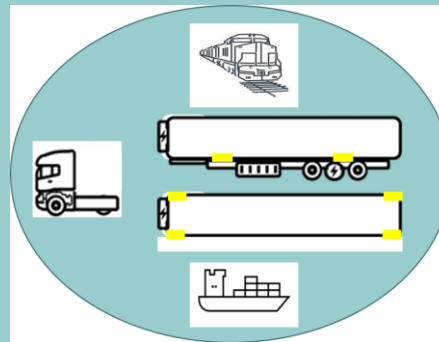
Less accidents  
Less space

## Digital platforms



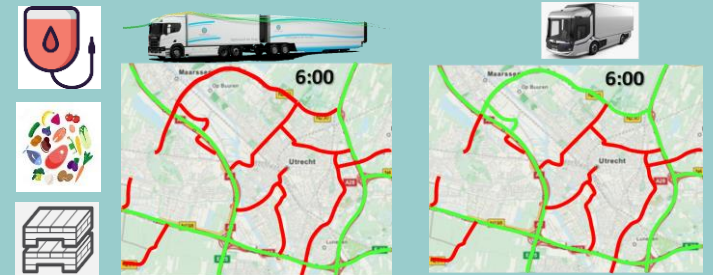
Less tkm  
Less traffic

## Mode compatibility



Less road

## Intelligent access



Less traffic  
Secure access e-infrastructure



- 🔄 40 partners
- 🔄 7 OEM's
- 🔄 10 Suppliers
- 🔄 8 Shippers & retail
- 🔄 9 Research
- 🔄 Project number: 101095856
- 🔄 Duration: 42 months
- 🔄 Start date: 01 January 2023
- 🔄 Total project costs: € 39Mio
- 🔄 Total EC funding: € 23Mio

🔄 AEVETO cluster (Advanced Electric Heavy-duty Vehicles for Efficient and Economic Transport Operations), led and coordinated VUB/UNR, include all funded projects (ESCALATE, EMPOWER, NextETRUCK, H2HAUL) under the call CL5-2022-D5-01-08.



- 🔄 **OEMs, suppliers and research partners** work together towards the overall goal of ZEVs for long distance heavy transport, by focusing on
  - 🔄 efficiency improvements,
  - 🔄 mass production capabilities and
  - 🔄 demonstrating the use of the technology in daily operations
  
- 🔄 Key is a **Stakeholders Group**, advising and guiding the project team achieving the goals and objectives to bring ZEV adoption in the freight transport ecosystem a big step further.

# Ambition and objectives

🔄 ZEFES ZE-HDV innovations implemented by 2028/2029 (Market readiness)

🔄 **Modular** vehicle platforms with multi powertrains

🔄 **Demonstrate energy infrastructure**

🔄 interoperable Megawatt Charging System (MCS)

🔄 deployment strategy for hydrogen refueling stations (HRS)

🔄 **Digital and fleet management tools**

🔄 **Demonstrate missions** on cross-border, TEN-T corridors,

🔄 fulfilling the requirements for range and payload

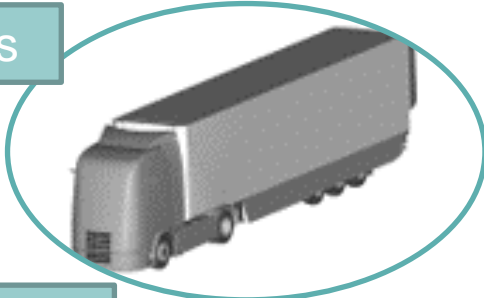
🔄 comparing the deployment of BEVs and FCEVs

🔄 **Define pathways** for price reduction and volume increase

🔄 **Analyze the impact** on business, society and energy efficiency

## Project expected outcomes

### Vehicles



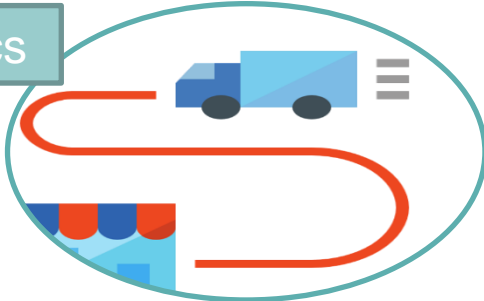
- 5 flexible vehicle platforms
- Optimal operation
- Competitive TCO
- FC > 30,000 hr
- Connected trailers: eTrailer, bTrailer and eCooled

### Framework



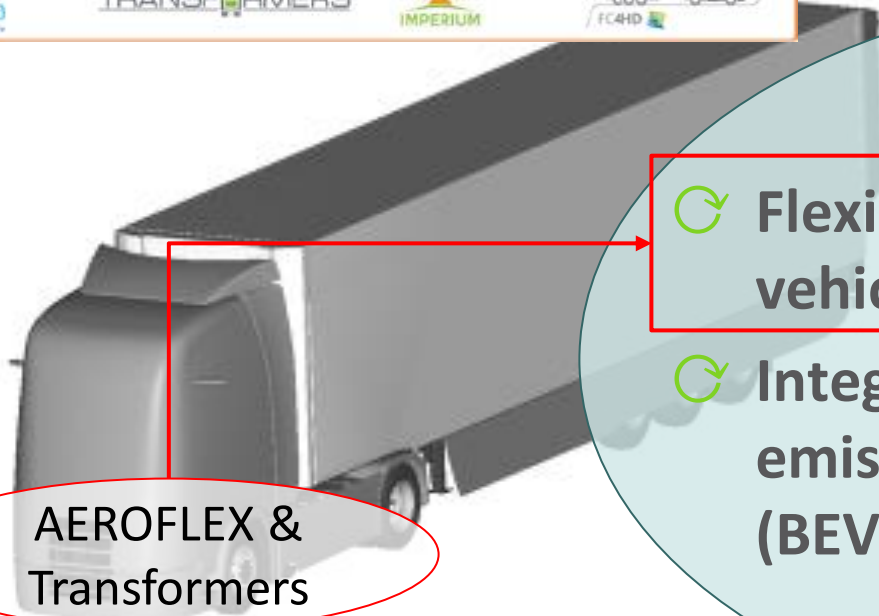
- DT of vehicles
- DT of logistic operation
- TCO models
- Co-design tools for right sizing

### Logistics



- Needs and requirements
- Collaborative business model
- Legal and admin barrier
- Infra mapping CPO, HRS

# Innovations, making a modular world workable for integrated solutions



- Flexible and modular vehicle concepts
- Integration of modular Zero-emission multi-powertrains (BEV / FCEV)

**Thermal management**

**Integrated auxiliaries**

**Energy infrastructure**

**Modular energy management**

# Digital platform, ZEV-specific managerial tools for zero tailpipe emission vehicle integration into fleets



## Seamless integration of ZE-HDV into fleets

- impact of the innovations towards the overall objectives of the 2Zero partnership

## Efficient assignment of

- tasks and routes,
- matching vehicles, infrastructure, and cargo (payload)
- charging strategies, range, charging time, parking



## Proper data protection framework

- Data exchange model for digital twins
- Coordination of different digital twins

## Predictive maintenance,

incl. deployment of prognostic & diagnostic techniques

# Demonstrations, challenges and KPIs

Diversity of logistic service providers		Challenging route components		Challenging factors and KPIs	
Temperature controlled goods		Long-haul: up to 1300 km oneway		Minimise extra waiting time for charging/refuelling	
General cargo		Shorter hub-to-hub and factory-to-factory transport		Availability of technology	
Consumer goods		Cross mountains		Having the right energy carrier and quantity on board	
Parcel distribution		Multi-modal (including train and ferry)		Reducing extra costs	
Heavy steel		Stretching across Europe using TEN-T corridors		Remote optimisation and predictions	
Automotive components				Permissions to drive (incl. tunnels)	

- 🔄 15 demonstrations
- 🔄 vehicle and fast charging concepts
- 🔄 **intermodal and cross border**
- 🔄 15 months under real conditions (M27-38, Q2/2025 - Q2/2026)
- 🔄 >1Mio kilometers of data



# Overview diversity of logistic service providers

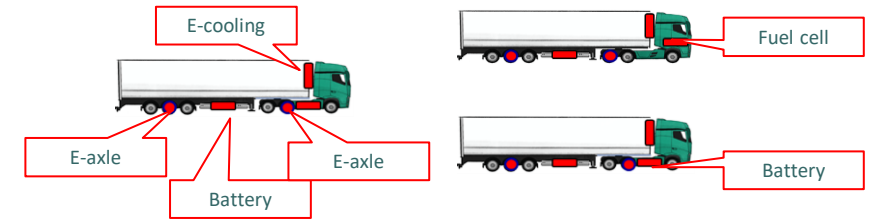


## Diversity of logistic service providers

Scania Volvo	Temperature controlled goods	
Ford	General cargo	
Ford Volvo	Consumer goods	
Ford Hyundai	Parcel distribution	
Volvo	Heavy steel	
Renault & Volvo Scania	Automotive components	



# Overview vehicle configurations



9 vehicle configurations, 5 BEV, 4 FCEV, std and EMS1-2

44t, 1300km daily  
**Scania**

44t, 500km daily  
**Scania**

44t, 500km daily  
**Volvo**

44t, 500km daily  
**Ford**

44t, 500km daily  
**Ford**

64t, 500km daily  
**Volvo**

64t, 600km daily  
**Renault**

44t, 700km daily  
**Ford**

64t, 750km daily  
**Hyundai**

64t, 1300km  
**Scania**

44t, 700km daily  
**Renault**

44t, 600km daily  
**Volvo**

64t, 1300km  
**Scania**

44t, 700km daily  
**Renault**

64t, 1300km  
**Volvo**

## Diversity of logistic service providers

Temperature controlled goods

General cargo

Consumer goods

Parcel distribution

Heavy steel

Automotive components



## Q&A

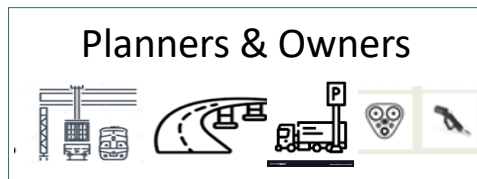
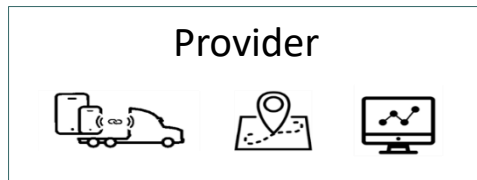
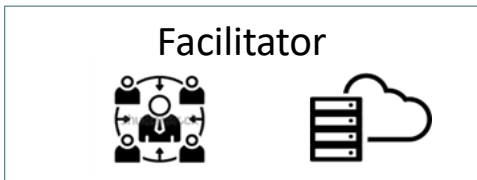
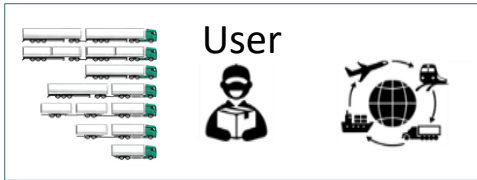
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Marcel Huschebeck (PTV)

Fernando Liesa (ALICE)

# STAKEHOLDERS' ENGAGEMENT

# Expectations, your contribution is needed



- ✔ **Logistics and transport (metrics for use cases)**
- ✔ Needs and requirements vehicle systems and powertrain
- ✔ Needs and requirements for ZE-HDV
  - ✔ Ecosystem consolidation
  - ✔ Business Case (BC) and specification
  - ✔ Total Cost of Ownership (TCO)
- ✔ **Legal and administrative needs and requirements**
  - ✔ Type approval and road permissions for ZE-HDV
  - ✔ Cross border permission for EMS ZE-HDV
- ✔ **Energy Infrastructure, supply chain and energy usage**
  - ✔ Charging and H2 refueling within driver's drive & rest schedule

## 🔄 Save the Dates for workshops

🔄 **PTV, Brussels 27 February 2023, 13:00-17:00hr**

🔄 IRU, Brussels 9 March 2023

🔄 Transport Logistics Munich, 9-12 May 2023

🔄 CLECAT, 9 Mai 14:30-15:30hr

🔄 ALICE, 11 Mai 14:00-18:00hr

🔄 IDI, Virtual meetings Feb-May 2023

ZEFES WP1 Workshop



<b>Stakeholder Workshop on e-Trucks Mission Planning and Business Cases</b> 27 February 2023 BluePoint - Brussels	
Meeting address	Bd A. Reyers 80 1030 Brussel
Meeting info	<a href="https://www.bluepoint.be/en/brussels">https://www.bluepoint.be/en/brussels</a>
Organiser	PTV & ALICE

Aim of the meeting is to discuss on mission profiles and business cases of heavy BEV and FCEV trucks based on first experiences and plannings.

Agenda			
Time	Presentation	Partner	
12:00 to 13:00	Registration and light lunch		
13:00 to 13:30	Mission planning and business cases from electric truck fleet	Primafrio	
13:30 to 14:00	Distribution planning and business cases with electric fleets	Colryut	
14:00 to 14:30	Interplant operation planning with electric fleets	Volkswagen (Tbc)	
14:30 to 15:00	Coffee break		
15:00 to 15:30	Mission planning and business cases from Fleet-Management view	Einride	
15:30 to 16:00	Results and experiences from the HoLa project	ABB	
16:00 to 16:30	Mission planning and business cases from electric truck fleet	Gruber	
16:30 to 17:30	Discussion		

- 🔄 Provide and give input to ZEFES requirements setting, the identification of needs of the logistics ecosystem (stakeholder requirements), future policies and standardisation issues, etc.
- 🔄 Discuss and validate intermediate and not restricted results, and
- 🔄 Be a communication and dissemination channel and be closely informed on ZEFES developments through exchanges & WS participation.

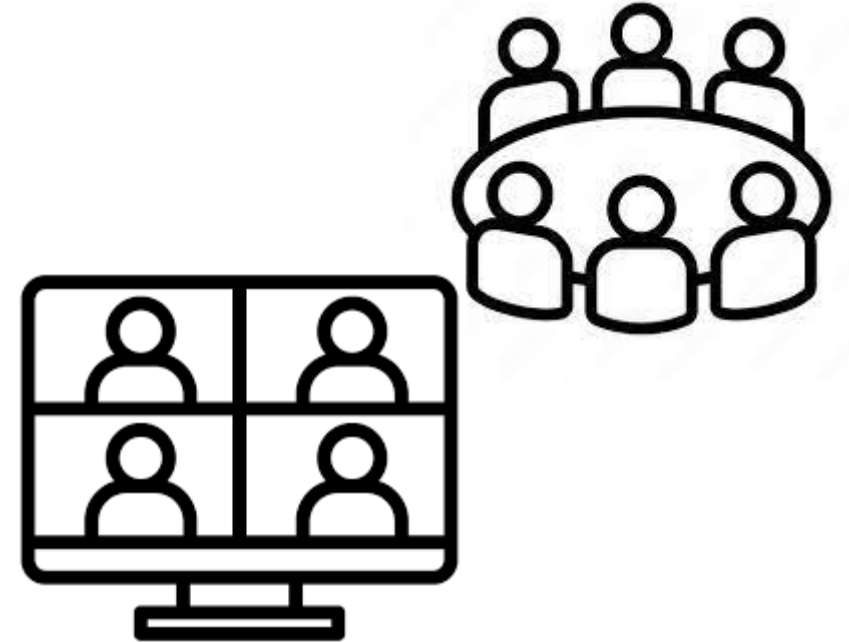
## Stakeholder Group invitation. Get engaged

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- 🔄 how to **design use cases** to ensure a successfully operation 2025 onwards?
- 🔄 would you like to **get involved** in defining use cases, **learning from the results** in the demonstrations and/or running tests with the developed vehicles?
- 🔄 how to make compatible the **transition to electric and hydrogen heavy duty trucks and the cross-border operation of the European Modular Systems** (combination of two trailers and one tractor)?
- 🔄 how to get **road permissions and licensees to perform tests** with non-homologated trucks and permissions to cross border between countries in European countries?
- 🔄 how to get the developed **vehicles homologated** in European countries?
- 🔄 how to get the **energy infrastructure (charging and hydrogen)** in place to ensure to run the mileage the vehicles are scheduled for?
- 🔄 which **other questions** come to your mind when thinking on the transition?



- 🔄 Thank you for your support
- 🔄 We stay connected by mail and teams
- 🔄 We see you back during the month February – August





Thank you

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