



# STUDY ON FINANCING MECHANISMS FOR ZERO-EMISSION TRUCKS AND THEIR INFRASTRUCTURE

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## GLOSSARY

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Abbreviations	
BEV	Battery electric vehicles
CEF	Connecting Europe Facility
CO <sub>2</sub>	Carbon dioxide
CPCFA	California Pollution Control Financing Authority
CTF	Cleaner Transport Facility
ECTA	European Clean Trucking Alliance
EEA	European Environment Agency
EIB	European Investment Bank
EU	European Union
FCEV	Fuel-cell electric vehicles
GDP	Gross domestic product
GHG	Greenhouse gas
HGV	Heavy-duty vehicles
ICCT	International Council on Clean Transportation
ICET	Internal combustion engine trucks
LLR	Loan Loss Reserve
OEM	Original equipment manufacturer
RCF	Revolving Credit Facility
RVG	Residual value guarantee
SME	Small and medium enterprise
TCO	Total cost of ownership
T&E	Transport & Environment
UK	United Kingdom
VAT	Value added tax
ZETs	Zero-emission trucks

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# 1. EXECUTIVE SUMMARY

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The European Clean Trucking Alliance (ECTA) commissioned Ricardo to conduct a study to explore the financing mechanisms for Zero-Emission Trucks (ZETs) and their associated charging/refuelling infrastructure, directed to shippers and carriers within the road freight sector. The study covers ZETs, both battery-electric trucks (BEV) and fuel-cell electric vehicles (FCEV), but more focus is given to BEVs as this technology is currently more prevalent and mature.

The methodology involved a two-fold approach: desk research and literature review, and stakeholder consultation. Seventeen key sources were reviewed during the desk research phase, covering aspects such as ZET costs, operational expenses, barriers in accessing finance, and characteristics of financial institutions. The stakeholder engagement included an industry survey with 33 respondents from diverse EU, UK, and Swiss organizations, shedding light on their intentions, financing needs, and barriers related to ZET adoption. Additionally, a co-creation workshop with 35 participating organisations was conducted to collaboratively address gaps in the ZET financing framework and devise innovative concepts for industry needs. The study's conclusions, derived from both literature findings and stakeholder contributions, informed recommendations for fleet managers, shippers, carriers, policymakers, and industry leaders involved in ZET adoption.

ZETs are experiencing significant growth in the EU, with a notable surge in new registrations. While ZETs comprised a small fraction of the total fleet and new registrations, their uptake has increased substantially in recent years. Battery electric trucks have seen the most significant expansion, driven by policy support, technological advancements, and economic competitiveness. Adoption of hydrogen fuel-cell trucks (FCEV) remains limited, mainly confined to pilot programs.

The EU's commitment to reducing CO<sub>2</sub> emissions from road transport, supported by policy incentives and investments in infrastructure, has been a key driver of the trend. European vehicle manufacturers have also intensified their efforts to produce electric vehicles, diversifying options for operators, though technological challenges persist, particularly in developing long-haul ZETs. As technology advances and costs decrease, ZETs are expected to become more competitive in terms of pricing, efficiency, and range, appealing to commercial fleet operators across various applications. Nevertheless, manufacturers primarily focus on urban distribution, waste management, and regional transport as prominent use cases for electrification.

Survey data from ECTA members indicate a higher uptake of ZETs compared to general market levels, with many organizations already adopting sustainability procurement practices or considering ZET adoption in the future. A significant portion of respondents have sustainability requirements as part of tendering processes, indicating a growing emphasis on environmental considerations in procurement decisions.

Fleet owners and operators still face significant barriers to their adoption, including the high upfront investment costs and the uncertainty surrounding the residual value of ZETs. Financing mechanisms and innovative business models for ZET adoption must address the high upfront capital cost of both vehicles and their infrastructure since many fleet owners, particularly Small and Medium Enterprises (SMEs), lack the financial capacity to make large capital investments. Energy cost volatility and uncertainty pose significant barriers to the adoption of ZETs, as highlighted by literature and survey findings. Fleet managers express concern over unpredictable operating costs, which disrupt budgeting and financial planning. Uncertainty regarding the residual value of ZETs is a significant challenge for financial institutions, discouraging their participation in financing initiatives. This lack of clarity makes it difficult for lenders to accurately assess risks and develop sustainable financing models, hindering the growth of ZETs. Economic and financial barriers, including high maintenance costs, contribute to the reluctance of financial institutions to engage in ZET financing. Operational constraints, such as limited model availability and challenges in transporting dangerous goods, were also mentioned by stakeholders as impeding the uptake of ZETs.

Both the literature and the survey conducted among shippers and carriers, members of ECTA, suggests that there are limited number of financing options, an issue which is exacerbated by the strict criteria and conditions to access these financial products. These challenges impede fleet renewal and the adoption of ZETs, particularly for SMEs, which often also encounter challenges when attempting to navigate the intricate procedures to access finance.

To address these issues, existing and emerging financing instruments for ZETs and their charging/refuelling infrastructure were identified and assessed (Table ES 1). The analysis focused on understanding how different financial pathways could mitigate the higher upfront costs of ZETs compared to conventional ICETs (internal

combustion engine trucks). A comprehensive assessment of these financing mechanisms suitable for ZET adoption was undertaken, outlining the advantages and drawbacks of each within the specified context.

Table ES 1: Financing mechanisms and business models for the adoption of ZETs

Category	Measures	Public/Private	Description	Example
<b>Debt instruments</b>	Commercial bank loans	Private	Financial loans offered by various lending institutions, which can be specifically tailored for financing the purchase of ZETs. Depending on the lending institution's risk valuation and the borrower's credit score, borrowing terms (e.g., interest rate and other fees, loan repayment period, down payment requirements, etc.) can vary.	Commercial bank credit lines.
	Concessional loans	Public	Loans offered by green investment banks, development aid agencies, and quasi-public financial institutions specifically for green projects aligned with government agendas. These loans might not be available in all countries.	European Bank for Reconstruction and Development's loan for fleet operator in Ukraine.
	Green bonds	Public/Private	Entities such as companies or governments issuing bonds to raise funds for acquiring ZETs, in return for fixed interest payments over the bond's duration. The issuer sets interest rate and bond duration.	No evidence in European road freight sector. New York Metropolitan Transport Authority issued green bonds for public transport improvement.
<b>Equity instruments</b>	Seed equity and development capital scheme	Public/Private	Seed equity is early-stage funding to invest in promising start-ups intending to adopt ZET fleets, helping the start-up to grow and accelerate technological development and vehicle adoption. Development capital schemes typically fund more established companies looking to scale up their operations.	No evidence of its use by European firms for ZET adoption.
<b>De-risking instruments</b>	Credit guarantees	Public/Private	Credit guarantees reduce lenders' borrowing costs by providing additional security and confidence to creditors. Credit guarantees reduce the barriers to accessing credit faced by SMEs – due to the fact that SME credit is generally not publicly rated. Public bodies, development banks, credit agencies, NGOs, and financial institutions can offer credit guarantees.	EIB's Loan Guarantee Instrument for Trans-European Transport Network Projects.
	Collective purchase	Private	Aggregate the demand for ZETs from multiple organisations (typically SMEs), capitalising on a single high-value order to obtain vehicle unit discounts and additional offers from original equipment manufacturers (OEMs).	Fleet Electrification Coalition of CALSTART and Smart Freight Centre.



Category	Measures	Public/Private	Description	Example
	Residual value guarantees	Public/Private	Residual value guarantees (RVGs) have the potential to serve as a facilitative element for operational leases and other lending products based on residual values (RVs). These guarantees, whether offered by a third party or a government entity, aim to ensure a minimum residual value for a ZET at the conclusion of a lease term. Such assurances play a crucial role in instilling confidence among lenders, enabling them to establish higher RVs.	No evidence of its use by European firms for ZET adoption.
<b>Non-repayable financial support</b>	Subsidies and grants	Public/Private	Full or partial financial assistance provided by either public or private bodies to support the purchase of ZETs. An example would be a grant purchase scheme the public bodies offer for truck operators to purchase ZETs. The scheme covers a portion of the price differences between ICETs and ZETs, reducing the premiums paid by the operators for choosing ZETs over ICETs.	Subsidies on the purchase of a vehicle in Austria, Belgium, Croatia, Cyprus, Finland, France, Germany, Malta and Spain.
<b>Tax benefits</b>	Tax benefits on purchase of ZETs	Public	Tax benefits for purchasing ZETs (e.g., one-off discounts such as value added tax -VAT- deduction at the time of purchase, accelerated depreciation allowances, and registration tax exemptions/reductions) directly address the barrier of high upfront purchasing costs and shorten the period of reaching total cost of ownership (TCO) parity compared to ICETs.	Registration Tax Exemption in Finland, Greece, Poland among others.
	Other fiscal benefits	Public	Other fiscal benefits (e.g., road tax exemptions/reductions, road toll exemptions/reductions, income tax deductions) help reducing ongoing operating costs and, albeit not directly addressing the barrier of high upfront purchasing costs, contribute to shorten the timeframe in achieving total cost of ownership parity.	Road Tax Exemption in Slovenia, Italy, Czech Republic, among others.
<b>Leasing models</b>	Finance leasing	Private	A full pay-out agreement, meaning that the sum of the rentals includes the full capital cost of the equipment, plus the interest accrued.	Offered by firms linked to carmakers and banks, such as: Volkswagen Financial Services, Arval, Leasys, Alphabet, Athlon and Mobilize
	Operating lease	Private	An operating lease, also known as an operational lease agreement, resembles a long-term rental arrangement where the lessee (fleet operator) makes regular payments with interest to the lessor <sup>1</sup> . In return, the lessee gains access to ZETs for a specified period. It is important to note that throughout the lease	

<sup>1</sup> Since operators are not paying for the full cost of the vehicle under the lease agreement, monthly payments are typically lower, which means that operating leases can help enable greater access to ZETs.

Category	Measures	Public/Private	Description	Example
			duration, the ownership of the assets remains with the lessor.	Financial Services.
	Hire purchase agreements	Private	Long-term lease with the option of purchasing the vehicle at the end of the agreement. Unlike standard long-term lease agreements, the hire purchase model effectively allows operators to pay the total vehicle cost in instalments, leading to ownership transfers at the end when the last instalment is paid.	
<b>“XaaS” Service-based models</b>	Trucking-as-a-Service	Private	A service model that offers on-demand access to individual trucks. This subscription business model can also operate as a pay-to-use model, offering flexibility and scalability to users as an alternative to owning trucks.	Volta Trucks, Juna.
	Battery-as-a-Service	Private	A service model that offers vehicle operators the possibility to lease (or subscribe to) EV batteries independently from the vehicle, lowering vehicle upfront costs. The <u>lease model</u> involves regular fixed payments for the use of the leased batteries, without charges for electricity use. The <u>subscription business model</u> involves paying a fixed monthly fee and a variable fee based on the electricity usage and number of charges.	Nio’s battery-as-a-service (currently only available for passenger cars but expanding to heavier segments).
	Charging-as-a-Service	Private	A service model offered by infrastructure providers and operators with existing infrastructure. The subscription business model allows operators to use their charging facilities off-site. Some businesses also offer construction and management of depot charging facilities on behalf of the operators.	Fleete and Virta
	Fleet-as-a-Service	Private	A service model providing all-inclusive and comprehensive solutions for fleet management and transportation needs. The subscription business model offers features such as telematics tracking, driver management, operation efficiency enhancements, and insurance.	Einride and Zeem
<b>Income gains</b>	Green premium	Private	Road freight sector customers/shippers willing to pay a premium for contracting ZETs to fulfil their transport demand.	DHL Group’s climate-neutral freight service with carbon offsetting

The research revealed a preference for lease options over loans when it comes to adopting a ZET. This preference is influenced by various factors identified through the literature review, survey and co-creation workshop. Firstly, leasing offers a reduced upfront cost compared to purchasing, enabling fleet owners to allocate capital for other operational needs. Additionally, leasing provides flexibility to access evolving technology, avoids depreciation risks, and allows operational flexibility at the end of the lease term. The

streamlined process, single point of contact, and reduced paperwork in leasing contrast with the complexities of bank loans and the worse terms for commercial loans due to uncertainties in the ZET market. Furthermore, uncertainties related to ZETs, such as battery life, make leasing an attractive option.

It was also found that government-related initiatives, particularly tax incentives and direct financial assistance for the purchase of ZETs, stand out as the most recognised and utilised instruments among surveyed organisations aiming to transition their fleets. However, geographical variations and uncertainties, particularly regarding capital grants and accelerated depreciation schemes, are noted. Despite awareness of service-based models, respondents expressed hesitancy in adopting them, citing uncertainty about their practical applicability and alignment with operational needs in their survey response and during the co-creation workshop. As mentioned during the workshop, one of the main challenges for service providers is calculating an accurate 'per mile' charge due to uncertainty around different costs. In numerous cases, the concept of trucking-as-a-service seems to represent a typical leasing arrangement.

Furthermore, a relevance and gap analysis was conducted for each group of financing instruments, pinpointing existing availability and accessibility as well as their relevance for ZET adoption (summarised in Table ES 2 below). Overall, the analysis revealed that:

- Government-supported mechanisms (concessional loans, subsidies and grants, tax benefits) are, as expected, suitable to support the ZET transition but are undermined by limited accessibility and/or availability related to changing political circumstances
- Credit guarantees and collective purchase agreements are relevant mechanisms to de-risk the upfront investment – guarantees in particular could play an important role in minimising the risks associated with the residual value of ZETs
- Leasing models are suitable and flexible to support the adoption of ZETs but are also plagued by the uncertainties around the residual value of ZETs
- Loans seem to be less flexible to adapt to the fast technology change and less used under the current circumstances. But there is potential to leverage traditional banking to support the ZET transition
- Service-based models appear to be relevant to support the adoption of ZETs but these are newer mechanisms and their availability is still limited. There are also still operational uncertainties
- Green bonds and equity instruments seem to be less relevant mechanisms

Table ES 2: Relevance and gap analysis: summary

Mechanism	Availability	Accessibility	Suitability
Commercial bank loans		Recommendation 9 Recommendation 11	Recommendation 10
Concessional loans		Recommendation 3	
Green bonds		Recommendation 13	
Equity instruments			
Credit guarantees	Recommendation 4		
Residual value guarantees	Recommendation 4	Recommendation 7	
Collective purchase		Recommendation 8	Recommendation 8
Subsidies and grants	Recommendation 1		

Mechanism	Availability	Accessibility	Suitability
Tax benefits on purchase of ZETs	Recommendation 1		
Other fiscal benefits	Recommendation 2		
Leasing models		Recommendation 12 Recommendation 13	
Service-based models	Recommendation 5 Recommendation 6 Recommendation 14	Recommendation 15	
Green premium			

Based on the relevance and gap analysis, recommendations are proposed to address the financing challenges identified. They build upon existing research and solutions to address financing barriers in the ZET market - e.g., (World Economic Forum, 2021), (CALSTART, 2021) - and focus on specific solutions that emerged from the discussions with stakeholders in the co-creation workshop and/or specific challenges related to financing the ZET transition. In total, 15 recommendations are proposed aiming to:

- **Enhance public intervention:**
  - Recommendation 1: Reinforce government commitments (subsidies, grants, tax benefits)
  - Recommendation 2: Harmonisation of road toll exemptions across the EU
  - Recommendation 3: Clarification and awareness raising of concessional loans
- **De-risk investments and address residual value uncertainties**
  - Recommendation 4: Provision of government-supported residual value guarantees
  - Recommendation 5: Provision of government support to facilitate scalability of Battery-as-a-Service
  - Recommendation 6: Develop a more mature recycling and end-of-life battery ecosystem (Private sector)
  - Recommendation 7: Enhance the ZET second-hand market
  - Recommendation 8: Raise awareness and target collective purchase agreements to specific logistic corridors in order to de-risk investments for companies with shared interests
- **Leverage traditional banking to support the ZET transition**
  - Recommendation 9: Provide technical assistance and capacity building to traditional financial institutions
  - Recommendation 10: Provide longer repayment periods for commercial loans
- **Diversify and improve access to finance**
  - Recommendation 11: Diversifying financing sources beyond traditional banks
  - Recommendation 12: Develop EU-wide platform (marketplace) for firms seeking finance
  - Recommendation 13: Establish private partnerships for large firms to financially support their SME suppliers
  - Recommendation 14: Establish a robust framework, including legal and tax definitions for service-based models (European authorities and national governments)
  - Recommendation 15: Develop interoperable payment solutions for Charging-as-a-Service

## 2. INTRODUCTION

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### 2.1 OBJECTIVES OF THE STUDY

The European Clean Trucking Alliance commissioned Ricardo to conduct an in-depth analysis of the challenges for financing the transition towards ZETs faced by the logistics industry (shippers, carriers, logistic companies), considering the high upfront costs of vehicles and the associated charging/refuelling infrastructure. This study identifies the key financing needs and barriers of the sector and proposes tailored solutions that mitigate their impact. It explores various financing mechanisms available to shippers, carriers and logistic companies for the adoption of ZETs. This includes, among others, traditional loans, grants, tax incentives, and innovative financial instruments such as green bonds or green premiums. In addition to financing instruments, the study categorises and assesses different business models that can facilitate the adoption of ZETs (e.g., truck-as-service). The advantages and disadvantages of each option are analysed.

The findings from this study will help identify effective and suitable solutions to accelerate the adoption of ZETs within the logistics sector. This is essential for reducing carbon emissions, improving air quality, and addressing climate change. The study will also explore new business models and innovative financing mechanisms, contributing to fostering a culture of innovation that extends beyond vehicle adoption. This can lead to broader improvements in logistics efficiency and sustainability.

The study covers ZETs, both battery-electric trucks (BEV) and fuel-cell electric vehicles (FCEV), but more focus is given to BEVs as this technology is currently more prevalent and mature. It is organised as follows:

- Section 2 describes the objectives and the context of this study
- Section 3 provides an overview of the methodology, including both phases covered:
  - Desk research and literature review
  - Stakeholder engagement
- Section 4 provides an overview of the current situation of ZET uptake in Europe and an analysis of the financing needs and barriers that the logistics industry faces to transition to ZETs
- Section 5 presents an overview of the main financing mechanisms and business models for the adoption of ZETs and analysis of their strengths (pros) and weaknesses (cons)
- Section 6 provides an overview of the level of awareness and preference of surveyed stakeholders regarding financing mechanisms, and a detailed relevance and gap analysis
- Section 7 presents recommendations to improve the existing financing mechanisms and create new ones



Source: our own archive

## 2.2 CONTEXT OF THE STUDY

The European Union (EU) boasts one of the world's largest trucking sectors, accounting for 7% of global road freight activity (OECD, 2022). Additionally, the transport industry, as a whole, constitutes 5% of the EU's gross domestic product (GDP) and provides employment to more than 10 million individuals (European Commission, 2022).

The logistics industry plays a key role in the global supply chain, connecting manufacturers, suppliers, and consumers. However, it also faces multiple challenges related to sustainability, environmental regulatory compliance, and the ever-growing demand for faster and more efficient delivery services. One of the most demanding challenges is reducing the carbon intensity of transport operations, which directly contributes to climate change. In a rapidly evolving global landscape, the imperative to reduce carbon emissions and combat climate change has become increasingly urgent.

Decarbonisation of road freight in the EU is a key policy objective, as stated in the Sustainable and Smart Mobility Strategy. The transport sector, a significant contributor to greenhouse gas (GHG) emissions, is under mounting pressure to transition towards more sustainable practices. In the EU, over three-quarters of transport-related GHG emissions arise from the road sector<sup>2</sup> (EEA, 2022b). Within this sector, trucks<sup>3</sup> account for roughly 20% of the EU's road transport carbon dioxide (CO<sub>2</sub>) emissions (EEA, 2022c), despite representing only 2% of the vehicles on European roads (T&E, 2022). In the EU, the dominant fuel source for trucks is diesel, and the emissions resulting from its combustion constitute a substantial contributor to overall emissions. Despite improvements in the fuel efficiency of Heavy Goods Vehicles (HGVs) over the past decade, there has not been a reduction in total GHG (EEA, 2022a). This is primarily due to the fact that the rise in demand for road freight transport has outpaced the efficiency gains achieved.

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<sup>2</sup> CO<sub>2</sub> is the main GHG emitted by the road transport sector, representing almost 99% of all transport GHG emissions.

<sup>3</sup> In this study, every time we refer to trucks, we are considering trucks over 3.5 tonnes of gross vehicle weight (GVW).

Shippers and carriers, as the key stakeholders in logistics, find themselves at the crossroads of economic viability and environmental responsibility. Within this sector, the adoption of ZETs represents a major step toward achieving cleaner and more efficient logistics operations. Nevertheless, there are huge challenges for the fleet owners to obtain the required financing to adopt zero-emission vehicles in their fleet and the accompanying charging/refuelling infrastructure.

### 3. METHODOLOGY

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To understand the financing barriers and needs of the logistic sector as well as the different financing methods that exist or could be developed to adopt ZETs, the approach for this study required a combination of: (1) desk research and literature review and (2) stakeholder consultation.

The literature findings and the contributions of stakeholders were assessed to draw conclusions on the financing needs and barriers of fleet managers as well as to identify suitable financing mechanisms or business models to support the adoption of ZETs. These conclusions informed the development of recommendations for not only the shippers and carriers directly involved but also policymakers, industry leaders, and other stakeholders.

#### 3.1 DESK RESEARCH AND LITERATURE REVIEW

This initial desk research phase formed the groundwork to the project. The literature review included a series of reports, journal articles, company websites, and news articles that were identified as most relevant to the subject area. Reports were sourced from a range of key organisations within the industry including the Green Finance Institute, the International Council on Clean Transport (ICCT), and Transport & Environment (T&E).

The list of references identified were screened to determine which would be subject to a more detailed review. The selected sources to be reviewed were added to a spreadsheet to ensure the most relevant information in each source was captured. Column headings included information about the source material (e.g., source type, authors, company and geographic coverage) and also specific columns dedicated to the subject matter. Examples include:

- ZET acquisition cost
- ZET operational cost
- Barriers in accessing finance
- Type of instruments covered in the source
- Characteristics of finance institutions

In total, 17 sources were subject to a detailed review during the desk-research phase. During the literature review phase, careful consideration was given to selecting sources that were not only relevant to the broader topic of green finance but also pertinent to the specific focus on financing transport decarbonisation and on the adoption of zero-emission trucks. Moreover, literature was prioritised if covering activities or examples of European-level transport organisations or European-level financial assistance organisations in this area. This ensured that the sources we included were relevant within the European context.

Evidence relevant to the project scope was extracted and used to inform and support the development of the industry survey questions, stakeholder engagement activities and the analysis presented in this report.



Source: picture provided by Primafrio

## 3.2 STAKEHOLDER ENGAGEMENT

The stakeholder engagement for this study involved two main activities: (1) industry survey and (2) co-creation workshop.

### 3.2.1 Industry survey

To complement and validate the information collected during the desk-based research, a stakeholder survey was conducted. The aim of the survey was to gather information and insights on the following key aspects:

- The organisations' intentions or planned timeframes regarding transitioning to ZETs
- Understanding of capital and financing needs;
- Identification of obstacles/barriers (perceived or experienced) in accessing finance;
- Awareness of financing mechanisms and good practices.

The survey questionnaire is provided in the Appendix 1, while the analysis of the responses to the survey are provided in Appendix 2. The survey questions were developed to ensure all of the above desired outputs were covered, via quantitative and qualitative questions, and both open and closed questions. For example, to gauge the timeframes of when/if organisations intend to transition to ZETs, a closed question was presented to the participants, to which they could select from a range of pre-determined answers including “already operating zero-emission trucks”, “in less than a year”, “in 1-2 years”, “in 2-5 years” and so on.

Open-ended questions were included to offer an opportunity for respondents to elaborate on any financing barriers or potential solutions. For example, the following question was presented in the survey to allow participants to express their organisation's unique circumstances regarding financing ZETs along with any innovative ideas they may have to overcome any challenges:

“What are the deciding factors for your organisation when choosing financing mechanisms or other ownership models for the adoption of zero-emission trucks and their charging/refuelling infrastructure? What are the barriers to move to some of these new financing ways?”

Ricardo worked collaboratively with ECTA to develop a list of possible survey participants, including shippers and carriers (ECTA members). The survey was designed on Alchemer, an online survey tool, and distributed to more than 40 stakeholders. The survey remained open for five weeks, from 31<sup>st</sup> July 2023 to 15<sup>th</sup> September 2023.



A total of 33 stakeholders<sup>4</sup> responded to the survey including shippers and carriers from nine different countries in the EU, UK and Switzerland. These respondents use trucking services in their everyday operations. The majority of respondents appear to be larger organisations: 69% are large firms with 250 employees or more (18 out of 26 respondents); while 15% are organisations with less than 50 employees (4 out of 26 respondents). Around 77% of the organisations employ more than 20 trucks<sup>5</sup> in their everyday operations (20 out of 26 respondents), which further suggests that most of the respondents to the survey tend to represent a larger organisation. Survey results analysed in this report thus need to be interpreted considering this bias in the sample.

The survey's key findings are integrated into the analysis presented in the subsequent sections in this report, with detailed insights on each financing instrument. A comprehensive overview of the survey results, including charts and tables for all questions, can be found in Appendix 2 for further reference.

### 3.2.2 Co-creation workshop

A virtual co-creation workshop was conducted on the 3<sup>rd</sup> of October 2023. The aim of the workshop was to consolidate and elaborate on the information collected so far throughout the study. It brought together all relevant stakeholders into the co-design process to work together, prioritising the identification of gaps in the current ZET financing framework. In doing this, the workshop provided a platform and opportunity to develop new and innovative financing concepts to address the identified needs of the industry regarding ZET uptake and associated deployment of infrastructure.

In total, 35 organisations participated in the workshop, including shippers, carriers OEMs, financial and technical experts from within Ricardo, research institutes and other organisations.

The workshop had the duration of 1 hour and 30 minutes and was hosted on an online platform (MS Teams). The agenda is provided below. The co-creation workshop included various idea-generation exercises like Word Clouds and polls, designed to stimulate collective thinking and trigger discussions among participants. The Breakout Room function of MS Teams was also used during the session to enhance the level of engagement and to ensure all attendees have an opportunity to contribute. The Break Out rooms were organised as brainstorming sessions, for participants to generate creative ideas and solutions collaboratively in a free-form manner, encouraging diverse and innovative thinking. Whiteboard pages were developed, including questions that were covered during the session. Attendees were invited to add “sticky notes” to the whiteboard in response to the set of questions. The outcome of the idea-generation exercises and the discussions in the Breakout rooms is presented throughout this report.

Time	Activity
10:00 – 10:10	Introduction to ECTA and the Workshop
10:10– 10:25	Progress and key findings from the project so far  <u>Word cloud:</u> Are you aware of any other financing mechanisms that are used in other industries that could be adapted for ZET purchasing/adoption?
10:25 – 10:35	<u>Short poll:</u> In our survey, we found that operators prefer leasing over obtaining a commercial bank loan. In your view, what is the reason for this preference?
10:35 – 10:55	<u>Breakout Session One:</u> Unlocking private finance <ul style="list-style-type: none"> <li>• What are the current challenges regarding loans?</li> <li>• What measures/instruments/solutions can help to facilitate a transition away from government support towards more private finance?</li> </ul>

<sup>4</sup> Every question shows between 18 and 29 responses. This is due to partial responses, that is, respondents who answered only some of the questions in the survey.

<sup>5</sup> The threshold of 20 trucks is used as a proxy to indicate a significant scale of operations for a shipper/carrier. Managing a fleet of this size is likely to require substantial resources, including manpower, maintenance facilities, and operational infrastructure. In previous statistics reviewed, this threshold is used (Lytx, 2021). KU Leuven, within the project Transfair, also showed that the average number of trucks per freight operator is below 20 in all EU27+UK Member States but Malta (KU Leuven, 2020), which suggests that owning 20 trucks is above European average.

Time	Activity
10:55 – 11:15	<u>Breakout Session Two</u> : Discussion on innovative service-based instruments. Why aren't these instruments more widely used?
11:15 – 11:25	<u>Breakout Session feedback</u>
11:25 – 11:30	Session close (including next steps regarding the study e.g., finalisation, publication, etc.)

The combination of desk research findings and stakeholders' inputs (survey and the co-creation workshop) ensures that the research is not only grounded in empirical data but also enriched by the real-world experiences and forward-thinking ideas generated through collaboration.



Source: picture provided by Contargo

## 4. FINANCING NEEDS AND BARRIERS OF FLEET MANAGERS

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### 4.1 OVERVIEW

This section presents the current situation of the ZET uptake in the EU, and the most critical needs and financial barriers that fleet owners encounter in their pathway towards adopting ZETs, based on a combination of desk research and stakeholder consultation.

### 4.2 CURRENT SITUATION OF ZERO EMISSION TRUCKS UPTAKE IN THE EU

ZETs have gained substantial momentum in recent years across the EU. The region is witnessing a rapid surge in new registrations. Although ZETs represented 0.1% of the total fleet (ACEA, 2023) and 0.6% of new registrations in 2022, their uptake has increased significantly from approximately 100 registrations in 2017 to over 1,600 in 2022. (ICCT, 2023)

Notably, within ZETs, battery electric trucks have experienced the most substantial expansion. In 2020, 97% of ZET sales were attributed to battery electric vehicles (BEVs). This is accompanied by the introduction of a significant number of new models; before the end of 2023, 41 models of BE trucks over 3.5 tonnes were launched in the European market (CALSTART, 2024).

Adoption of hydrogen fuel-cell trucks (FCEV), however, is much less significant. While the number of models available is due to increase as models enter into production – six new FCEV models announced for launch by the end of 2023 (CALSTART, 2022) – FCEV adoption has to date been limited to pilots, with 50 FCEVs registered in Switzerland and eight in the Netherlands in 2021 (FCHO, 2022).

The EU's commitment to reducing CO<sub>2</sub> emissions from road transport has been a significant driving force behind this trend, supported by a range of policy incentives, including CO<sub>2</sub> emissions reduction targets for new vehicles, stricter Euro emissions standards, and tax benefits for electric vehicle buyers. Investments in charging/ refuelling infrastructure have accelerated, making ZETs use more practical. With these positive incentives, European vehicle manufacturers have strengthened their efforts to manufacture electric vehicles, with a variety of models now available on the market. Although the increasing ZET supply from OEMs has diversified the options for operators to an extent, technological challenges remain associated with developing long-haul ZETs (i.e., develop faster charging speed and higher battery capacity) (IEA, 2021).

As technology advances and costs decline, it is anticipated that ZETs will gain increased competitiveness in terms of their pricing, efficiency, and range. By 2035, virtually all new electric freight trucks - including long-haul - will be cheaper to operate than diesel trucks (considering Total Cost of Ownership), while covering the same distance and carrying equivalent loads (T&E, 2022). This will render them an appealing choice for commercial fleet operators across various applications. Manufacturers of these ZETs have primarily concentrated on urban distribution, waste management, and regional transport as prominent use cases for electrification (GlobalNewswire, 2022).

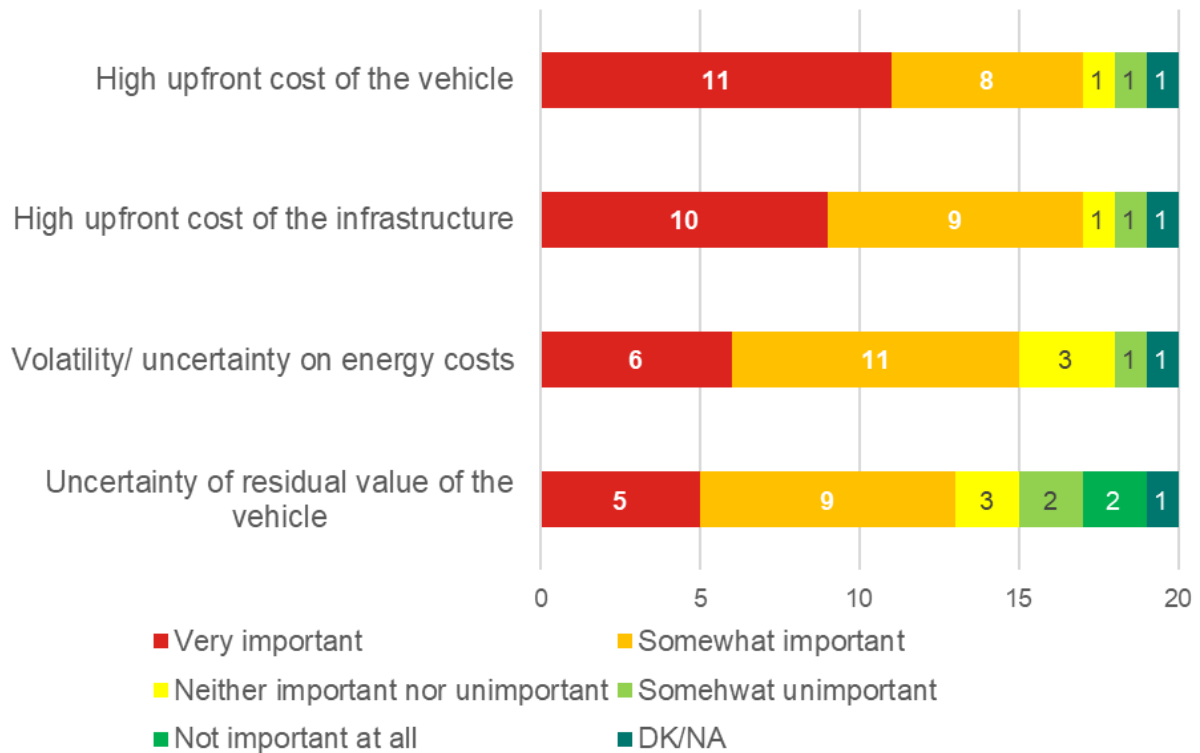
It is interesting that the survey among ECTA members that was conducted for this study shows a higher uptake of ZETs compared to general market levels, with many organisations having already adopted sustainability procurement practices or targets. In this context and considering the characteristics of the actual respondents which show a higher share of large organisations, 52% of the respondents' organisations (12 respondents) regularly operate ZETs for their operations and/or own ZETs. Other 22% (5 respondents) do not operate ZETs but are considering adoption in the future. Only one organisation (5%) recognised not having plans to ensure sustainable procurement, while the bulk of the sample have sustainability requirements as part of the tendering (19% or 4 respondents) or will have these requirements in the coming 2-3 years (14% or 3 respondents). Some already have targets of ZETs as share of the total fleet (33% or 7 respondents) or they will have targets for share of the fleet in the coming 2-3 years (10% or 2 respondents).

### 4.3 FINANCING NEEDS OF FLEET MANAGERS

The **high upfront capital cost of both vehicles and related infrastructure** are the top concerns at the moment of adopting ZETs, according to the results of the survey conducted for this study (see Figure 1) and similar research (Smart Freight Centre, 2023), (Deloitte, 2023), (McKinsey Center for Future Mobility, 2022). Compared to internal combustion engine trucks (ICETs), ZETs may initially cost three to four times the price

of a diesel equivalent (Deloitte, 2023), despite delivering potential long-term savings and operational benefits, such as lower fuel and maintenance expenses.

Figure 1 Main concerns at the moment of adopting ZETs (number of respondents)



Source: survey conducted for this study

The **volatility and uncertainty of energy costs** are also significant barriers to the adoption of ZETs according to the literature (Mission Possible Partnership, 2023) (ICCT & ECTA, 2022) and seem to be the third more important concern of participants in the survey for this study. Fleet managers typically rely on predictable operating costs to create budgets and financial plans. The fluctuating prices of energy sources, such as electricity or hydrogen, can make it challenging to accurately forecast and manage these expenses. Rapid price changes can strain financial resources and disrupt financial planning.

In addition, the **uncertainty surrounding the residual value of ZETs is less of a concern for fleet managers but poses a significant challenge for financial institutions**, dissuading them from participating in the financing of these vehicles. This lack of clarity regarding the future value of such trucks creates apprehension among lenders, making it difficult for them to assess the risks accurately and develop sustainable financing models. As a result, financial institutions hesitate to engage in financing initiatives related to ZETs, hindering its growth. During the co-creation workshop, there were comments on this topic. “There are uncertainties about the residual value of vehicles. Uncertainty prevents financial institutions from getting involved. Residual value depends much on the battery health”.

Another survey response also mentioned **high maintenance costs over a longer period** as a challenge<sup>6</sup>.

In addition to economic and financial barriers, there are other barriers which also prevent the uptake of ZETs currently – in the survey for this study, the availability of models and the operational constraints (such as the capacity to transport dangerous goods) were also identified. During the discussion in the co-creation workshop, it was argued that the challenge at hand is primarily a technological one, rather than a financial issue, because of uncertainties surrounding the lifespan of electric vehicles and the time required to achieve TCO parity across

<sup>6</sup> There are potential contradictions in this situation. Some experts argue that ZETs imply fewer repairs, while others express concerns about the availability and costs of spare parts. These differing perspectives create uncertainty about the overall impact of ZET maintenance.

diverse applications. If the specific use cases for electric vehicles remain ambiguous, economic concerns become secondary.

#### 4.4 BARRIERS TO FINANCING THE ADOPTION OF ZERO-EMISSION TRUCKS

Financing mechanisms and innovative business models for ZET adoption must address the high upfront capital cost of both vehicles and their infrastructure since many fleet owners, particularly Small and Medium Enterprises (SMEs), **lack the financial capacity to make large capital investments**. This is partly due to the market structure in which they operate. The trucking market is dominated by SMEs, comprising over 500,000 enterprises averaging 12 goods vehicles per company and with a significant proportion of these companies operating only one or two such vehicles (Smart Freight Centre, 2021). Micro-companies (i.e., fewer than 10 employees or self-employed) represent 90% of firms in the market and account for around 30% of turnover (Ricardo, 2017). These companies typically engage in price-based competition, and labour costs play a pivotal role in determining their competitiveness. This intense competition results in profit margins as low as 2–3%, constraining their ability to make substantial initial capital investments for fleet renewal (ICCT, 2022).

Based on the literature reviewed and the survey conducted among shippers and carriers who are members of ECTA, the **limited number of financing options**, especially for small fleet owners, is a serious financial challenge for logistic actors aiming at adopting ZETs. Bankers find it challenging to de-risk the business case due to the uncertainty on relevant aspects of the new technology (such as uncertainty over their lifetime), and smaller truck owners are "cut off" from financial support (Deloitte, 2023).

Additionally, many fleet operators, especially SMEs and owner-operators, often encounter **challenges when attempting to navigate the intricate procedures** associated with securing financing, grants, or subsidies. According to a report by Environmental Defense Fund (EDF, 2020), fleet owners often find existing grant programmes to be administratively difficult and costly to navigate, given constraints such as reporting, and vehicle scrappage requirements. These smaller organisations often lack access to specialised resources or advisory services that are commonly accessible to larger corporations. This information gap can be particularly problematic as it impedes their ability to identify and comprehend the diverse financial opportunities available to them. Inadequate access to resources, such as personnel with expertise in financial research and analysis, can significantly impede the capacity of SMEs and owner-operators to effectively explore, evaluate, and pursue available financial support mechanisms (EDF, 2020).

Furthermore, for smaller fleet owners, **access to financial products is subject to more stringent criteria**, reducing opportunities for financial support. In interviews with ECTA members carried out by the ICCT, it was suggested that banks lack incentives to increase or diversify their offering of financial solutions to small fleet owners (ICCT, 2022). For this reason, to facilitate this transition, it is essential to identify, classify, and assess financing mechanisms and business models tailored to the specific needs and barriers faced by shippers and carriers in the logistics industry.

Although most responses to this study's survey did not identify any challenges ("not challenges at all/ not relevant") when asked about obtaining financing<sup>7</sup>, those respondents who did find challenges to share offered an interesting panorama. The top answers are "lack of financing options" (3 responses "Completely agree") and "difficulty in navigating procedures to obtain financing (3 "Somewhat agree"). In addition, one respondent acknowledges the **challenge of remaining up to date on the existing instruments at European level**, whilst another respondent identified the **cost of financing and interest rates** as a key issue.

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<sup>7</sup> Which, once more, suggests the bias introduced by large organisations in the composition of the sample



Source: picture provided by DHL

## 5. FINANCING MECHANISMS FOR ZERO EMISSION TRUCKS' ADOPTION

This chapter identifies and summarises the most relevant financing mechanisms and business models that could support ZETs adoption and use in the European trucking industry. These are grouped into eight categories as outlined in , based on the findings from the literature review.

Table 1 Grouping financing mechanisms and business models for the adoption of ZETs

Category	Measures	Public/Private	Description
Debt instruments	Commercial bank loans	Private	Financial loans offered by various lending institutions, which can be specifically tailored for financing the purchase of ZETs. Depending on the lending institution's risk valuation and the borrower's credit score, borrowing terms (e.g., interest rate and other fees, loan repayment period, down payment requirements, etc.) can vary.
	Concessional loans	Public	Loans offered by green investment banks, development aid agencies, and quasi-public financial institutions specifically for green projects aligned with government agendas. These loans might not be available in all countries.

Category	Measures	Public/Private	Description
	Green bonds	Public/Private	Entities such as companies or governments issuing bonds to raise funds for acquiring ZETs or their charging infrastructure, in return for fixed interest payments over the bond's duration. The issuer sets interest rate and bond duration.
<b>Equity instruments</b>	Seed equity and development capital scheme	Public/Private	Seed equity is early-stage funding to invest in promising start-ups intending to adopt ZET fleets, helping the start-up to grow and accelerate technological development and vehicle adoption. Development capital schemes typically fund more established companies looking to scale up their operations.
<b>De-risking instruments</b>	Credit guarantees	Public/Private	Credit guarantees reduce lenders' borrowing costs by providing additional security and confidence to creditors. In particular, credit guarantees reduce the barriers to accessing credit faced by SMEs – due to the fact that SME credit is generally not publicly rated. Public bodies, development banks, credit agencies, NGOs, and financial institutions can offer credit guarantees.
	Collective purchase	Private	Aggregate the demand for ZETs from multiple organisations (typically SMEs), capitalising on a single high-value order to obtain vehicle/charge point unit discounts and additional offers from OEMs.
	Residual value guarantees	Public/Private	Residual value guarantees (RVGs) have the potential to serve as a facilitative element for operational leases and other lending products based on residual values (RVs). These guarantees, whether offered by a third party or a government entity, aim to ensure a minimum residual value for a Zero Emission Truck (ZET) at the conclusion of a lease term. Such assurances play a crucial role in instilling confidence among lenders, enabling them to establish higher RVs.
<b>Non-repayable financial support</b>	Subsidies and grants	Public/Private	Full or partial financial assistance provided by either public or private bodies to support the purchase of ZETs. An example would be a grant purchase scheme the public bodies offer for truck operators to purchase ZETs. The scheme covers a portion of the price differences between ICETs and ZETs, reducing the premiums paid by the operators for choosing ZETs over ICETs.
<b>Tax benefits</b>	Tax benefits on purchase of ZETs	Public	Tax benefits for purchasing ZETs (e.g., one-off discounts such as value added tax -VAT- deduction at the time of purchase, accelerated depreciation allowances, and registration tax exemptions/reductions) directly address the barrier of high upfront purchasing costs and shorten the period of reaching TCO parity compared to ICETs.
	Other fiscal benefits	Public	Other fiscal benefits (e.g., road tax exemptions/reductions, road toll exemptions/reductions, income tax deductions) help reducing ongoing operating costs and, albeit not directly addressing the barrier of high upfront purchasing costs,

Category	Measures	Public/Private	Description
			contribute to shorten the timeframe in achieving total cost of ownership parity.
<b>Leasing models</b>	Finance leasing	Private	A full pay-out agreement, meaning that the sum of the rentals includes the full capital cost of the equipment, plus the interest accrued.
	Operating lease	Private	An operating lease, also known as an operational lease agreement, resembles a long-term rental arrangement where the lessee (fleet operator) makes regular payments with interest to the lessor. In return, the lessee gains access to ZETs for a specified period. It is important to note that throughout the lease duration, the ownership of the assets remains with the lessor.
	Hire purchase agreements	Private	Long-term lease with the option of purchasing the vehicle at the end of the agreement. Unlike standard long-term lease agreements, the hire purchase model effectively allows operators to pay the total vehicle cost in instalments, leading to ownership transfers at the end when the last instalment is paid.
<b>“XaaS” Service-based models</b>	Trucking-as-a-Service	Private	A service model that offers on-demand access to individual trucks. This subscription business model can also operate as a pay-to-use model, offering flexibility and scalability to users as an alternative to owning trucks.
	Battery-as-a-Service	Private	A service model that offers vehicle operators the possibility to lease (or subscribe to) EV batteries independently from the vehicle, lowering vehicle upfront costs. The <u>lease model</u> involves regular fixed payments for the use of the leased batteries, without charges for electricity use. The <u>subscription business model</u> involves paying a fixed monthly fee and a variable fee based on the electricity usage and number of charges.
	Charging-as-a-Service	Private	A service model offered by infrastructure providers and operators with existing infrastructure. The subscription business model allows operators to use their charging facilities off-site. Some businesses also offer construction and management of depot charging facilities on behalf of the operators.
	Fleet-as-a-Service	Private	A service model providing all-inclusive and comprehensive solutions for fleet management and transportation needs. The subscription business model offers features such as telematics tracking, driver management, operation efficiency enhancements, and insurance.
<b>Income gains</b>	Green premium	Private	Road freight sector customers/shippers willing to pay a premium for contracting ZETs to fulfil their transport demand.

These categories are discussed in separate sections below, each including an introduction to the different types of financing mechanisms/business models and a summary of their strengths and weaknesses.





Source: picture provided by Primafrío

## 5.1 DEBT INSTRUMENTS

Debt instruments are one of the most used financing tools, allowing entities such as governments, corporations and individuals to raise capital by borrowing funds from credit facilities or investors. Debt instruments offer fleet operators the credit needed to enable the purchase of ZETs, in return for periodic repayment plus interest charged as a percentage of the loan amount over the life of the loan. In general, most debt instruments can be tailored to the needs of different fleet operators in terms of conditions and repayment terms. In addition, most debt instruments also offer the flexibility for borrowers to allocate the borrowed amount to various expenses as they see fit.

There are three main types of debt instruments that can incentivise ZETs adoption: (a) commercial bank loans; (b) concessional loans; and (c) green bonds. While commercial bank loans are typically provided by stakeholders in the private sector, concessional loans are usually provided by public or quasi-public entities. Green bonds issuers can be both private and public sector stakeholders.

In the survey conducted for this study, only 12% of respondents (2 responses) confirmed having requested a loan to purchase ZETs. From the two respondents, one applied for a commercial bank loan and one for a concessional loan. In the co-creation workshop, it was highlighted that SMEs exhibit reluctance towards obtaining loans. This reluctance is especially pronounced in logistics firms, where a preference for utilising existing cash reserves prevails. This tendency explains their inclination towards purchasing second-hand vehicles instead of new ones. Consequently, SMEs are anticipated to be late adopters when it comes to embracing ZETs. Furthermore, in response to an open-ended survey question, a stakeholder expressed feeling "fortunate" for not relying on loans and having the option of direct procurement. This choice was driven by the increased risk associated with taking loans due to uncertainties in technology.

The table below summarises debt instrument mechanisms in terms of their strengths (pros) and weaknesses (cons).

Table 2 Overall pros and cons of debt instruments

Pros	Cons
<ul style="list-style-type: none"> <li><b>Spread of payments:</b> Debt instruments provide access to capital to finance the large upfront costs of purchasing ZETs and associated infrastructure,</li> </ul>	<ul style="list-style-type: none"> <li><b>Cost of debt:</b> Borrowers must pay interest on the debt, which can increase the overall cost of borrowing. High levels of debt can lead to financial</li> </ul>

Pros	Cons
<p>which can be repaid over time to reduce the impact on the balance sheet.</p> <ul style="list-style-type: none"> <li>• <b>Multiple sectors:</b> Longstanding and developed arrangements applying in different sectors. A range of different debt instruments exist offering different borrowing periods and terms.</li> <li>• <b>Predictability:</b> They offer predictable and fixed interest and principal payments, making budgeting and financial planning easier.</li> <li>• <b>Lower cost than equity:</b> Debt finance often has lower financing cost than equity finance.</li> <li>• <b>Flexibility in terms of capital:</b> Based on the size of operators, the borrowed amount can be adjusted to match the capital needed to purchase the right number of fleet vehicles.</li> </ul>	<p>strain for borrowers if they struggle to meet their debt obligations.</p> <ul style="list-style-type: none"> <li>• <b>Penalties and default:</b> Debt instruments leave little flexibility on interest and principal payments to avoid costly penalty charges or default on debt.</li> <li>• <b>Requirements:</b> Debt finance is largely offered to finance low-risk projects: financial institutions often lack the information needed to predict residual values for ZETs or rates of technology development and may therefore be deterred from entering agreements to fund ZETs.</li> <li>• <b>Credit scoring:</b> Debt finance is largely offered to borrowers who have high credit scores: small fleet owners may not be able to meet borrowing terms given their low or absent credit scores, therefore this financing option may not be suitable for many EU operators.</li> </ul>

The survey responses provide further insight into challenges that fleet managers face to use these instruments. Some stakeholders mentioned that loan options offer worse terms for ZETs than for diesel trucks (2 responses “Completely agree”) and that there is limited information about loan options available for ZETs (1 response “Completely agree” and 3 responses “Somewhat agree”). In the open-ended question to this topic there are contradictory comments. Some respondents find reasons for banks offering worse terms for ZETs, shown in responses such as “there is always a risk with the new technologies” and “finding better finance conditions by acting green is still area for improvement”. On the other hand, other comments contradict those assumptions (“banks are more willing to finance a green investment”), but also some believe terms are the same (“there is no difference between a loan for a diesel truck or ZETs”), and others state that loans are not available for the purchase of trucks (“there are no loans for vehicles”). The lack of consensus on what makes loans a challenging financing option suggests that fleet managers that responded to the survey are not so familiarised with loans because they tend to adopt ZETs more frequently through lease contracts.

### 5.1.1 Commercial bank loans

Commercial bank loans enable fleet operators to afford and spread out the high initial cost of accessing ZETs and their associated infrastructure such as charging/refuelling infrastructure.

The table below summarises pros and cons of raising debt finance through commercial bank loans to invest in ZETs.

Table 3 Pros and cons of commercial bank loans

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Accessibility:</b> Commercial bank loans are generally more accessible to a wide range of companies, including SMEs.</li> <li>• <b>Speed:</b> The approval process for bank loans is often faster than other types of financing.</li> <li>• <b>Customisation:</b> Loan terms can be negotiated to suit the company’s needs.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Access to funding:</b> Small fleet operators might find difficulty proving their creditworthiness to obtain bank loans.</li> <li>• <b>Repayment terms:</b> Interest rates may be relatively high, especially for riskier borrowers. Repayment terms may be shorter, leading to higher monthly payments.</li> <li>• <b>Collateral requirements:</b> Banks may require collateral, which can be a barrier for some companies.</li> </ul>

As summarised in the table above, commercial bank loans could be an important financing instrument for potential borrowers looking to invest in zero-emission trucks. Their main two advantages are:

- **Accessibility.** Commercial banks are a well-known organisation with widespread distribution across geographies and ability to provide access to various loan facilities and other kinds of debt instruments. Commercial banks are generally regarded as reputable and convenient for borrowers to enquire its services, especially for large banks with branches scattered across its market geographies. A European Central Bank survey found short-term bank finance products such as credit lines, overdrafts, and credit cards are the most popular financing mechanisms regardless of firm sizes (ECB, 2021).
- **Customisation.** Each loan agreement can be tailored to the needs of the fleet operator, including the loan amount, repayment plan, and conditions for the loan.

However, there appear to be a number of issues that jeopardise the wider use of commercial bank loans for ZETs purchases, including:

- **Access to funding.** Commercial banks typically consider a borrower's creditworthiness when deciding whether to lend money, especially to small and medium-sized enterprises: they rely on historic loan performances for similar types of projects to evaluate risks and protect itself against bad debt (CALSTART, 2021). Many small-scale fleet operators without credit ratings or with limited or no credit history may find it difficult to obtain a loan. Without information to conduct a thorough screening of the borrower, banks might only offer a partial loan or set stringent loan terms (e.g., a shorter repayment period) to reduce loan defaulting risk (World Economic Forum, 2021). This is likely to happen more often to businesses with a newer, unproven, and less predictable business models than large, established industries (Bańkowska, Ferrando, & Garcia, 2020).
- **Repayment terms.** Given that the concept of operating ZETs in a road haulage business is not widely tested, commercial banks might categorise a loan application to finance ZET purchases for road haulage business as higher risks in comparison to their ICET financing business. The latter are de-risked and commoditised, given that technology and demand have long been established (CALSTART, 2021). Therefore, commercial banks might offer less favourable repayment terms on loans to finance ZET purchases, i.e., interest rates may be relatively higher and repayment terms shorter.

One stakeholder that participated in the co-creation workshop also noted that the higher cost of financing is often a consequence of the short loan repayment periods required by banks. Loans with repayment terms of less than five years hardly offer acceptable terms for fleet owners, and that longer repayment terms are needed (around 7 or 10 years) so that the cost of financing can be spread over a longer period.

- **Collateral requirements.** Commercial banks usually require collateral from potential borrowers, often in the form of a mortgage on the same asset being purchased through the loan. This can be an obstacle especially for SMEs. Currently, the residual value of the ZETs is difficult to estimate, given the nascent nature of the industry, which could deter commercial banks from taking them as collateral. This is because banks might not recoup their losses by selling the collateral (ZET) recovered from the borrower after a loan default (World Economic Forum, 2021).

Some of these disadvantages come from the fact that financial institutions perceive ZETs as a risky asset and demand stringent requirements. Different financial institutions offering debt instruments can face the same dilemma where the exposed project risks justify the high credit spread (yield differences between two debt securities) it offers to fleet operators, essentially charging the borrower with a higher financing cost to compensate for the extra risks (CALSTART, 2021). Examples of these risks can be (a) tight debt coverage ratio (measures borrowers' ability to pay its debt obligations) for small fleet operators who might not generate enough cashflow to pay its debt off on time, and (b) insufficient proof of credit history.

Additionally, more innovative structure for repayments has recently been proposed. For example, utilisation linked financing, which links repayment to asset use, rather than requiring typical straight-line repayment (GFI, 2023), can help operators invest in charging infrastructure.



Source: our own archive

### 5.1.2 Concessional loans

A concessional loan (also known as “soft loan”) is a loan made on more favourable terms than the borrower could obtain in the marketplace. These loans are offered by public or quasi-public financial institutions such as development banks and green banks, which are funded by a mix of public funds from state members and private equity raised through green bonds (World Bank, 2021).

The size of these credit facilities and their lending capacity vary. Development banks tend to be international or multinational organisations, while green banks are smaller in size and operating at national and regional level. These credit facilities often provide funds to projects aligned with the government agenda and award public entities to undertake such projects to maximise societal gains (CALSTART, 2021).

There are case studies on the use of concessional loans to finance the purchase of cleaner heavy-duty vehicles for passengers or freight applications. For example:

- The EU provided RET, a Dutch public transport provider, with a loan of €115 million to acquire electric buses and charging infrastructure. The loan allows RET to keep cost of capital low due to the low interest rate offered by EIB (Transport Scotland, 2021).
- The European Bank for Reconstruction and Development offered a €2.6 million 5-year loan to an oversize cargo fleet operator in Ukraine to purchase up to 42 EURO VI low emission trucks and 18 trailers (EBRD, 2018).
- In California, the Zero-Emission Truck Loan Pilot Project is a pilot project designed to provide financing opportunities for both heavy-duty zero-emission vehicles and charging or fuelling infrastructure. The program is currently under development and staff is considering stakeholder feedback to develop the pilot with an anticipated 2024 launch date<sup>8</sup>. The program will be administered by the California Pollution Control Financing Authority through their California Capital Access Program (California Air Resource Board)

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<sup>8</sup> The exact day of launch is not specified.

- Concessional loans were made available by the Inter-American Development Bank for Bogota's e-bus rapid transit system, allowing for the purchase of e-buses with significantly higher purchase prices than traditional diesel buses (EDF, 2020).
- The South Korean government is providing blended concessional financing for hydrogen refuelling stations and HGVs, providing a one-time grant of up to 60% of the funding cost for stations and 50% for vehicles (The Scottish Government - Zero Emission Truck Taskforce).
- As part of the Cleaner Transport Facility, the European Investment Bank (EIB) has provided almost €200 million to cut the polluting emissions produced by buses in Spain's largest cities. The EIB has been providing this financing since 2017 under the Cleaner Transport Facility, which aims to promote cleaner transport systems. This joint EIB-European Commission financing instrument is enabling cities such as Las Palmas de Gran Canaria, Barcelona, Valencia and Palma de Mallorca to swap their older, more polluting diesel buses for new hybrid, electric or latest generation compressed natural gas replacements.
- There are some examples of lenders offering reduced rates for green activities in the transport space, for example John Lewis' green Revolving Credit Facility (RCF) includes a target of transitioning their fleet to net zero by 2030. As part of this offer, the interest rate the creditor pays on the facility will vary depending on whether they achieve three environmental targets over five years, two of which are directly related to transport: carbon emissions to be net zero by 2035 and end use of fossil fuels across the company's transport fleet by 2030 (John Lewis Partnership, 2021).

Other examples of concessional loans to support the switch to low- and zero-emission vehicles in road transport include:

- The EIB provided a €40 million loan to the Spanish multi-mobility platform Cabify to decarbonise its fleet of vehicles in Spain, by increasing the availability of new electric vehicles and charging infrastructure across the country. The project is financed under the EIB Future Mobility initiative, backed by the Connecting Europe Facility (CEF) (European Commission, 2022).
- The EIB and CargoBeamer AG signed a €12.6 million equity type financing in the form of a senior secured loan coupled with a profit-sharing mechanism to execute in the operations of Germany, Italy and France (European Investment Bank, 2020). The EIB loan is backed by the Future Mobility facility, a joint initiative established by the EIB and the European Commission under the CEF Debt Instrument.
- The EIB provided €250 million credit to vehicle leasing company ALD Automotive to accelerate demand for hybrid and electric vehicles across the EU. The financing supported the acquisition of around 15,000 vehicles for customers, with a particular focus on France, Germany, Italy, Spain, Belgium and the Netherlands. The funding was part of the Cleaner Transport Facility (CTF).

The table below summarises pros and cons of concessional loans to finance ZETs.

Table 4 Pros and cons of concessional loans

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Better repayment terms:</b> Concessional loans offer lower interest rates, particularly for projects with a social or developmental focus; as well as longer repayment periods, which provide breathing room for managing debt.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Limited availability:</b> These loans are currently not offered to purchase ZETs nor EVs in Europe</li> <li>• <b>Eligibility criteria:</b> Strict eligibility criteria and conditions regarding the use of funds for specific types of projects limit the pool of potential borrowers.</li> <li>• <b>Green banks are too scarce</b> and do not have enough capital to fund multiple large scale ZETs projects</li> </ul>

The main advantage of concession loans for ZETs purchases are their **repayment terms**. These vary but they typically have either: (a) an interest rate below the market rate (the most common); (b) deferred repayments and/or longer repayment periods than commercial bank loans; (c) income-contingent repayments; or a combination of these or other favourable terms.

However, there appear to be a few issues that jeopardise the use of concessional loans for ZETs purchases. The most critical ones are **eligibility criteria** - fleet operators might not meet the strict eligibility criteria or conditions regarding the use of funds – and **limited availability** since it does not seem to be available in Europe.

### 5.1.3 Green bonds

Green bonds are debt securities that can be bought and sold in financial markets to finance climate-friendly and sustainable projects. Green bonds can be issued by both public and private entities such as governments, NGOs, private financial institutions and corporates to raise funds from the financial market. Like traditional bonds, green bonds issuers are required to disclose financial information to regulators and financial market stakeholders with the help of investment banks as the underwriter, while rating agencies rate the bond before listing on the financial market for trading and purchase.

There is potential to accelerate ZET adoption in the road haulage sector using green bonds, although no specific example was identified at the time of writing. A potential application might involve large-scale fleet operators issuing green bonds to raise funds for purchasing ZETs. In this study’s survey, no respondent claimed to use green bonds to adopt ZETs, but four respondents were aware of their existence and availability, five were aware of their existence but uncertain about their availability, and six were unaware of this financing instrument or chose not to answer. Also, in the co-creation workshop, participants recognised the lack of examples involving the use of green bonds for the adoption of ZETs.

The table below summarises pros and cons of using green bonds to raise capital to finance an investment in ZETs.

Table 5 Pros and cons of green bonds

Measure	Pros	Cons
Green bonds	<ul style="list-style-type: none"> <li>• <b>Flexibility:</b> Bond terms can be customised (e.g., bonds can be issued with various maturities) to suit the company’s needs making them versatile for different types of projects.</li> <li>• <b>Access to ESG investors:</b> Green bonds attract investors who specifically seek environmentally and socially responsible investments, potentially expanding the investor base and increasing demand.</li> <li>• <b>Eco-friendly image:</b> Issuing green bonds demonstrates a commitment to sustainability and environmental responsibility, enhancing the company’s reputation among environmentally conscious investors and stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Complex issuance process:</b> Issuing green bonds requires compliance with specific principles and reporting standards, which can be complex and costly.</li> <li>• <b>Large transaction amount:</b> Bonds are typically purchased by institutional investors in large transactions. The need to cover the expensive process of bond issuance also require larger bond transactions to reduce total borrowing costs.</li> <li>• <b>Disclosure and reporting:</b> Bond issuers are often required to provide extensive financial and operational disclosures, which can be burdensome or even unwanted for large businesses and an insurmountable barrier for smaller businesses.</li> <li>• <b>Credit ratings:</b> Companies need to maintain favourable credit ratings to attract investors and secure lower interest rates. This limits the pool of potential bond issuers.</li> </ul>

Green bonds’ most significant benefit for fleet operators that are looking to raise the funds required for purchasing ZETs is their **flexibility**: large fleet operators can customise the green bond maturity to take account of their needs for ZETs and related-ZET infrastructure. For instance, the New York Metropolitan Transport Authority has raised a combined worth of \$40 billion bonds with different maturities in 2016 and 2021, respectively (MTA, 2023). The raised funds are used for improving the biggest public transport network in the US, with different projects ranging from light rail system, underground trains, low-emission buses, and transport infrastructure.

However, the biggest drawback to their application to ZETs relates to the **large transaction amount**: to achieve cost efficiency in the issuance of green bonds, issuers typically opt for larger transaction amounts beyond what is needed for most fleet operators. This approach helps covering the costly process of issuing

green bonds in financial markets. Although there are increasingly more opportunities for retail investors to invest in green bonds at smaller transaction amounts, these green bonds are not designed to fund smaller transactional amount projects (Financial Times, 2021). Therefore, it might only be sensible for corporates operating a large fleet to utilise the mechanism.

## 5.2 EQUITY INSTRUMENTS

Equity instruments such as seed capital and development capital schemes refer to private sector investors injecting funds into a company or project in return for a share of ownership. While seed capital is typically the initial funding used to start a new business or project, development capital is investment provided to help a company grow and expand once it is already established.

To date there is no evidence that they have been used to finance start-ups or more established companies wishing to invest in ZET purchases. Instead, ZET technology developers, logistic service providers, and other stakeholders within the research and development segment of the ZET ecosystem are the prevailing beneficiaries of equity instruments.

The table below summarises different equity instrument mechanisms by their strengths (pros) and weaknesses (cons) to finance ZETs.

Table 6 Pros and cons of equity instruments

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Less barriers than loans:</b> Help fleet operators overcome the credit barriers associated with debt instruments: equity financing can offer resources to fleet operators who have been unsuccessful through a debt financing route due to e.g., their sub-optimal credit scores.</li> <li>• <b>No interest payments:</b> Unlike debt, equity investments do not require regular interest payments and repayment of the principal amount. This can provide financial relief, especially in the early stages of a project when cash flow may be limited.</li> <li>• <b>System of incentives:</b> Investors in equity share in the company's risks and rewards. If the company faces financial difficulties, equity investors bear some of the losses, which can be less stressful for the business owner.</li> <li>• <b>Flexibility:</b> Equity financing terms can be more flexible than debt terms, allowing the company more freedom in its operations.</li> <li>• <b>Synergies:</b> A sizeable equity financing received by a project can reassure other credit facilities and investors, improving the project outlook.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Pressure on the profits:</b> Equity investors demand a return for their investment and, therefore, profits directed to the business owners and available to invest back into the business are reduced.</li> <li>• <b>Operational control:</b> The resulting share of ownership means business owners might forego over a portion of operational control to the investors. Moreover, equity financing typically requires greater transparency and information disclosure about the company's operations and financials.</li> <li>• <b>Complexity:</b> Access to equity financing is typically more complex than access to debt financing, and involves higher legal and administrative costs, e.g., linked to preparing offering documents, negotiating terms, and complying with securities regulations.</li> <li>• <b>Poor suitability:</b> Equity capital is generally provided by investors who wish to invest in high-growth projects, while investing in ZETs would not generate significant additional revenue to fleet operators.</li> </ul>

Distinct advantages of equity instruments are their ability to **overcome the credit barriers often linked to debt instruments** as well as **provide funding without burdening the company with excessive debt payments**.

A key disadvantage is that, for companies to attract equity investors, they need to **demonstrate high growth potential**, that is, provide a solid business case that demonstrates how the capital infusion can yield a favourable return on investment, e.g., in the case of development capital, by expanding the company's capacity or generating new revenue streams. Fleet operators may find it difficult to attract equity investors as replacing their ICET fleet with an equivalent number of ZETs (and establishing the necessary ZET-related infrastructure) would not significantly increase their earnings potential. In fact, while adopting ZETs may initially stimulate demand due to the newfound capacity to provide zero tailpipe emission trucking services (which may be required by specific customers), this increase in demand will be short-lived as more and more fleet operators with ZETs enter the market.

In addition, investors in a CALSTART research also cited several risks associated with funding fleet operators ZET projects using equity instruments, including operators' lack of experience in operating ZETs, and rapid technological advancement making vehicle residual value redundant (CALSTART, 2021).

### 5.3 DE-RISKING INSTRUMENTS

ZETs can be regarded as an untested technology and perceived as high-risk projects by commercial banks as covered in section 1. These instruments aim to make an investment more attractive by decreasing its exposure to factors that could lead to financial losses.

When it comes to the adoption of ZETs in the logistics industry, de-risking instruments can play a significant role in facilitating the transition, and they are already used for that purpose. This group of instruments include different types of assurance provided by third parties to lenders, reducing the risk of default.

Three main measures can be identified under this category that can incentivise ZET adoption: (a) credit guarantees; (b) collective purchases; (c) residual value guarantees.

The table below summarises de-risking instruments by their strengths (pros) and weaknesses (cons) to provide fleet operators with finance for ZETs.

Table 7 Overall pros and cons of de-risking instruments

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Risk Mitigation:</b> De-risking instruments help reduce or manage various types of risks associated with investments or financial decisions.</li> <li>• <b>Improved Attractiveness:</b> They can make an investment or project more appealing to investors or lenders by lowering perceived risks.</li> <li>• <b>Flexibility:</b> De-risking strategies offer flexibility in adapting to changing market conditions and uncertainties.</li> <li>• <b>Higher effectiveness of government intervention:</b> Guarantees often make better use of government funding compared to grants because they can attract multiple private capital sources. Additionally, through guarantees, the funds guaranteed by the government are not immediately accessed or spent, allowing them to remain available for other purposes.</li> <li>• <b>Capped amount:</b> Guarantees are often cheaper than grants (assuming that they are capped).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Costs:</b> Some de-risking measures, such as guarantees, come with associated costs, which can impact the overall financial viability of a project.</li> <li>• <b>Complexity:</b> Implementing de-risking instruments can be complex and require specialised expertise, which may increase administrative burdens.</li> <li>• <b>Demand of time:</b> both applying for a credit guarantee or setting up the consortium to purchase fleet are time-consuming and demand resources and efforts.</li> </ul>

#### 5.3.1 Credit guarantees

Credit guarantees reduce borrowing costs by providing additional security and confidence to lenders via a reputable third party that acts as creditor of last resort in case of (partial of full) default of the original borrower.

Credit guarantees can come in different forms, ranging from a signed document from the guarantor to the participation of the guarantor within the project. Some European-based commercial banks have participated in electrification projects as the government backs most public utilities. Lenders are supported by the guarantee of the government who are not exposed to any project-specific risks (CALSTART, 2021). Similarly, co-financing projects involving development and green banks increase confidence in the financial market, reducing project borrowing costs (McKinsey, 2022). More traditional credit guarantee programme such as the Loan Guarantee Instrument for Trans-European Transport Network Projects involves the EIB as a guarantor setting up a fund which would be used to pay private lenders when the borrower involved in the transport network project failed to meet its debt obligations (EIB, 2014).

Currently, there are limited case studies on credit guarantees aimed at assisting fleet operators in securing the necessary financing for ZETs. One illustrative example of such instrument is the Loan Loss Reserve (LLR) coverage, provided by the California Pollution Control Financing Authority (CPCFA) through the CalCAP program. Under CalCAP, enrolled lenders can access loan loss reserve accounts, encouraging lending by



offering up to 100% coverage on specific loan defaults. Through participation in CalCAP, lenders gain a proven credit enhancement to address the financing needs of California's small businesses. Loans within the Heavy-Duty Vehicle Air Quality Loan Program can finance heavy-duty trucks (over 14,000 lbs. gross vehicle weight rating) equipped with engines certified to specified engine emission standards for 2010 and newer model year engines (CPCFA, Unknown). It is noteworthy, however, that this programme uses emission standards, not electric powertrain criteria.

In this study's survey, no respondent used a credit guarantee to adopt ZETs, with no justification provided. Low awareness might be a possible explanation: five respondents were aware of their existence and availability, four were aware of their existence but uncertain about their availability, and eight were unaware of this financing instrument or chose not to answer.

The table below summarises pros and cons of raising debt finance supported by credit guarantees to invest in ZETs.

Table 8 Pros and cons of credit guarantees

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Risk reduction:</b> Credit guarantees reduce the credit risk for lenders, making it easier for the company to secure loans.</li> <li>• <b>Improved credit access:</b> Companies with weaker credit profiles can gain access to financing that might otherwise be unavailable.</li> <li>• <b>Lower interest rates:</b> With reduced risk, lenders may offer lower interest rates, reducing borrowing costs.</li> <li>• <b>Access to expertise:</b> De-risking instruments often involve collaboration with other entities or institutions, providing access to resources and expertise.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Cost:</b> Credit guarantees often come with fees or premiums that can increase the overall cost of borrowing.</li> <li>• <b>Restrictions:</b> These instruments usually come with eligibility requirements that companies must meet, as well as restrictions or control over the company's operations.</li> <li>• <b>Application process:</b> Applying for credit guarantees can be time-consuming and may require extensive documentation.</li> <li>• <b>Availability:</b> Credit guarantees may not be available for all stakeholder classes and locations.</li> </ul>

The main benefit that credit guarantees provide is the **risk reduction** by tackling the problem of information asymmetry between lenders and borrowers, especially for small and medium enterprises (World Bank, 2015). For example, lenders might lack sufficient evidence to approve the loan based on the borrower's limited (or non-existing) credit scores. Third parties offering credit guarantees can be governments, development banks, credit agencies, NGOs, or financial institutions.

One of the most relevant disadvantages is the **cost implication**, given that a costly guarantee premium might hinder the use of credit guarantees to purchase ZETs. The premium can refer to any additional costs on top of the loan interest that might apply to borrowers, which can be financial or non-financial cost. The cost may come in the form of requiring a set amount of minimum capital requirements for fleet operators to be eligible for considering the application, which could be difficult for small fleet operators given their business scale (OECD, 2010). The OECD report contains some examples of the guarantee premium. The guarantor imposes a risk-based pricing structure, pricing the borrowers based on their default risks, or charges a membership fee for borrowers to access the mechanism.

It is worth highlighting as well that financial costs or premiums for credit guarantees linked to ZETs could be lower compared to ICE trucks since loan default rates also tend to be lower for EVs compared to ICE vehicles. This is attributed to EV users experiencing reduced exposure to oil price levels and a more regular repayment behaviour. After accounting for variables such as credit score, payment-to-income ratio, loan-to-value, and income aging, Klee et al. (2023) discovered that EVs default 30.3% less in percentage change terms (Klee, Morse, & Shin, 2023). However, these findings were obtained for electric cars, no specific results for trucks were provided.



Source: picture provided by Contargo

### 5.3.2 Collective purchasing

Collective purchasing is another de-risking instrument to reduce the cost of acquiring ZETs. This measure sees multiple prospective buyers forming a coalition to bundle their investments and orders, aiming to capitalise the flow of capital at scale (European Commission, 2023). An aggregated order placed by a venture of jointly liable partners would decrease the risk of default (compared to the case of one single borrower) as well as leverage significant unit discounts from OEMs and suppliers. Furthermore, OEMs and suppliers can offer additional modifications or conversions for collective purchase orders according to the needs of fleet operators. This allows greater user experience for fleet operators by tailoring the product to their needs (Eurocities, 2022).

This instrument is currently in use for the adoption of ZETs. Collective purchasing is an established measure widely used in large organisations, such as governmental organisations, with a proven track record of achieving cost savings and pooling information about other products and services to enable better decision-making. Some examples include:

- The European Commission's Big Buyers Working Together project provided a platform for European cities to utilise their collective market power to purchase ZETs for their respective piloting schemes and use these vehicles as service vehicles (i.e., refuse collection, maintenance) and share information about their procurement experience (Eurocities, 2022).
- For private ZETs operators, the Sustainable Freight Buyers Alliance and CALSTART run a Fleet Electrification Coalition programme to aggregate the demand for ZETs. This launch was reinforced by the announcement of a demand signal for over 60,000 battery-electric heavy-duty trucks in the United States and Europe by 2030. The operators in the programme benefit from easier access to contract incentives and financing mechanisms as well as purchasing discounts (Sustainable Freight Buyers Alliance, 2023).
- The Corporate Electric Vehicle Alliance, a group coordinated by Ceres representing collective purchase plans for at least 330,000 electric vehicles over the next five years in US<sup>9</sup>.

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<sup>9</sup> Web page: [Corporate Electric Vehicle Alliance | Ceres](#). Ceres programme has a focus on class 5 through 8 medium- and heavy-duty vehicles, although it does not specify the mix of the collective purchase plans.

In this study's survey, two respondents used collective purchases to adopt ZETs, five respondents were aware of their existence and availability, two were aware of their existence but uncertain about their availability, and eight were unaware of this financing instrument or chose not to answer. During the co-creation workshop, existing collective purchase initiatives were discussed. Participants believe that these initiatives encountered more problems than expected in implementing the plan (as explained in more detail below).

The following table summarises pros and cons of creating collective purchasing agreements specifically for the purchase of ZETs:

Table 9 Pros and cons of collective purchasing

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Increased bargaining power:</b> By acting as a group, companies may have more bargaining power when negotiating with suppliers.</li> <li>• <b>Bulk discounts:</b> Companies can pool their resources to make larger and more cost-effective purchases: collective purchases can lead to bulk discounts, reducing the overall cost of acquiring ZETs.</li> <li>• <b>Risk sharing:</b> Risks associated with purchases can be shared among participants.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Coordination challenges:</b> Coordinating collective purchases among multiple companies can be complex and time-consuming.</li> <li>• <b>Dependency:</b> Relying on collective purchases may limit the company's ability to make independent procurement decisions. Collective purchases may introduce inefficiencies or delays in decision-making.</li> </ul>

The main benefits of collective purchasing agreements include a **reduction of the risks** associated with the purchase (namely, the risk of debt default of a larger partnership is lower than for a single borrower, meaning that banks would be more willing to lend to the partnership than to individual members) as well as the **increased bargaining power** of the partnership: fleet operators could obtain advantages from OEMs and suppliers such as customisation of the vehicles purchased as well as bulk discounts.

The main challenge related to collective purchasing agreements is a **coordination** one: the group needs unanimous agreement to decide their purchase order, with stakeholders in the group each having their vested interest and preferences. This was highlighted during the co-creation workshop. Stakeholders involved encountered more challenges than anticipated when attempting to create a coalition for purchase agreements. Their experience was a predominantly top-down approach, which posed significant complexities in terms of coordination of the vehicles that would be purchased and its specifications. In addition, the diversity of use cases further complicated matters, each operator having its own requirements for the vehicles.

### 5.3.3 Residual value guarantees

Residual value guarantees (RVGs) are financial instruments designed to mitigate the risks associated with the depreciation of assets. In the case of ZETs, where the technology is still evolving and the market is in its early stages, RVGs can play a crucial role in incentivising fleet operators and businesses to invest in these environmentally friendly vehicles.

RVGs could be an enabling factor for operating leases and loans. They could be provided by a third party or government to guarantee a minimum residual value of a ZET at the end of a lease period or financing term which would help provide lenders enough confidence to set higher residual values, lowering the cost of finance for borrowers and improving access to ZETs.

The table below summarises the pros and cons associated with the use of residual value guarantees for zero-emission trucks:

Table 10 Pros and cons of residual value guarantees

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Risk mitigation:</b> RVGs provide a safety net for fleet operators by assuring a predetermined residual value for the ZETs at the end of the lease or financing term. This helps mitigate the uncertainty</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Costs:</b> Offering residual value guarantees can be costly for manufacturers or financial institutions. Predicting the future residual value of a ZET, especially in a rapidly evolving market,</li> </ul>

Pros	Cons
<p>associated with the evolving technology and potential market fluctuations.</p> <ul style="list-style-type: none"> <li> <b>Financial incentives:</b> RVGs can act as a financial incentive for businesses to adopt ZETs. By guaranteeing a certain value for the vehicle at the end of its useful life, businesses may find it more attractive to make the initial investment in cleaner technologies. </li> </ul>	<p>can be challenging, and miscalculations can lead to financial losses for the guarantor.</p> <ul style="list-style-type: none"> <li> <b>Dependency on technology evolution:</b> The success of ZETs depends on the continued evolution and improvement of battery and EV technology. If advancements in technology outpace the predictions made in the RVGs, the guaranteed residual values may end up being higher than the actual market values, leading to financial losses. </li> <li> <b>Market acceptance risks:</b> If the market for ZETs does not develop as anticipated due to factors such as slow infrastructure development, limited consumer acceptance, or regulatory changes, the residual values may be adversely affected (imposing worse conditions to users of RVG). </li> </ul>



Source: our own archive

## 5.4 SUBSIDIES AND GRANTS

Subsidies and grants are financial assistance mechanisms provided by public sector bodies such as government and public research bodies to support specific activities or industries. While both do not require any reimbursement, they do have some differences:

- Subsidies** are financial incentives that lower the overall cost of certain goods or services through direct or indirect support: direct subsidies involve providing cash payments or reduced prices for certain goods or services, while indirect subsidies may involve tax breaks or regulatory benefits that

reduce the cost of production or operation. In this section, the term “subsidies” is used to refer to direct subsidies only; while tax breaks are discussed in more details in section 5.5 below.

- **Grants** are financial contributions awarded to fund specific projects, research, or activities, typically based on competitive applications and specific objectives. The amount of grants depends on the project size and budget and can either fully or partially fund the project. There are national and sub-national government programmes currently offering capital grants to companies who are willing to adopt ZETs into their fleets, as shown in Table 11 below.

The table below summarises different pros and cons of subsidies and grants to finance the adoption of ZETs.

Table 11 Pros and cons of subsidies and grants

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>No repayment needed</b>, provided that the spending was in line within the terms of agreement. This reduces the purchasing costs needed for organisations to own ZETs outright.</li> <li>• <b>No interest costs</b>: Unlike other instruments (e.g., loans) subsidies/grants do not carry interest costs, which can significantly reduce the overall cost of an investment.</li> <li>• <b>Improved liquidity</b>: Subsidies/grants provide an injection of cash without depleting a company's liquidity. This can be especially beneficial for companies with limited available capital.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Entry barriers</b>: Depending on funding terms and conditions, some subsidies have higher entry barriers for organisations to secure funding, e.g., they may come with stringent eligibility criteria (i.e., companies may need to meet specific requirements or conditions to qualify). Capital grants are often competitive, and not all companies that apply for them will receive funding. Additionally, grant programmes may have limited funding available.</li> <li>• <b>Accountability</b>: Companies receiving grants may be subject to public scrutiny and accountability, which can include reporting on the use of funds and compliance with project goals.</li> <li>• <b>Limited availability</b>: Public support in the form of subsidies and/or grants may be limited in amount and time. Support schemes may end up not be confirmed, for example, due to changes in political or fiscal circumstances. This could lead to fleet operators becoming dependent on the influx of public support and put at risk the sustainability of the transition to ZETs when support is removed, and companies are left to compete in the market with traditional and possibly more cost-effective options.</li> </ul>

**Subsidies** directly reduce the cost of acquiring ZETs: they may come in the form of lump sum payments (often proportional to the vehicle purchase prices and capped at a maximum value) or be designed to partially or fully subsidise the price difference between ZETs and ICETs benchmarks. A particular form of subsidy, the scrappage scheme, is a government incentive that encourages companies to replace their old vehicles with new, more environmentally friendly ones: fleet operators are offered a subsidy when they exchange their old vehicles for new ones that meet the programme's criteria.

As there is **no obligation for repayment**, this can represent a significant reduction of the purchase cost, making ZETs more financially accessible.

Subsidies may take different forms across the EU Member States, with the most common being:

- **Direct purchase subsidies** involve governments providing financial incentives to reduce the upfront cost of acquiring ZETs. These subsidies can be in the form of grants or rebates, effectively lowering the purchase price for fleet operators.
- **Scrappage schemes** encourage the retirement of older, high-emission vehicles by offering financial incentives when these vehicles are scrapped and replaced with ZETs.

**Grants** provide financial flexibility by **freeing up capital** that would otherwise be tied up in vehicle acquisition costs. This capital can then be redirected towards other critical operational needs or sustainability initiatives, allowing organisations to allocate resources more efficiently.

While not a direct subsidy for truck purchases, some EU governments also provide grants for the purchase, development and installation of charging/refuelling infrastructure for ZETs. This indirectly supports the adoption of vehicles lowering the aggregated cost of ownership.

A list of selected subsidies and grants offered in European countries are displayed in Table 12. In this study's survey, three organisations used a capital grant to adopt ZETs, six respondents were aware of their existence and availability, three were aware of their existence but uncertain about their availability, and five were unaware of this financing instrument or chose not to answer.

Table 12 List of selected European countries non-repayable subsidies scheme for purchasing ZETs

Countries	Lump-sum subsidies and grants for vehicles	ZET infrastructure subsidies and grants
Austria	Purchasing subsidies up to €72,000 per vehicle for ZETs from federal government	Maximum €30,000 depending on charger type and public access
Belgium	40% of additional cost up to €400,000/vehicle for a maximum of two BEVs (N2 and/or N3). (In Flanders and for SMEs)	None
Croatia	Purchasing subsidies up to €53,000 or not more than 40% of the vehicle sale price)	None
Cyprus	Scrappage scheme payment up to €12,000 plus purchasing subsidies up to €20,000	None
Finland	Purchasing subsidies up to €50,000 from 2022-2025	Refund up to 35% (50% for 11kW or more chargers) of the purchase and installation cost
France	Scrappage scheme payment up to €9,000 for trucks <12t plus purchasing subsidies	None
Germany	Maximum €25 million per company per calendar year for vehicles, infrastructure, and feasibility studies (subsidised by 50%)	Maximum €25 million per company per calendar year for vehicles, infrastructure, and feasibility studies (subsidised by 50%)
Malta	Purchasing subsidies up to €70,000	None
Spain	Purchasing subsidies up to €190,000	Percentages of the infrastructure cost ranging from 30 - 55% depending on the size of the company and charger types (with maximum cap)
Poland	In January 2024, the National Fund for Environmental Protection and Water Management of Poland published a draft support programme for the purchase of zero-emission trucks for public consultation. The maximum subsidy value per vehicle is up to 400,000 PLN (around €93,000) for zero-emission N2 vehicles and 750,000 PLN (around €175,000) for a zero-emission N3 vehicle	Subsidy covering 100% of eligible costs for the construction of a public DC charging station of at least 350 kW or for the improvement of an existing DC charging station with an increase in power output

Source: (ACEA, 2023), (Transport & Environment, 2022), (PSPA, 2024) and (EVBox, 2022)

It is interesting to note that among the six countries which collectively account for 80% of ZET sales in the EU in 2022, four of them have established subsidies for acquiring these vehicles<sup>10</sup> (ICCT, 2023)

Although many countries already provide some sort of subsidy or grant, some issues remain:

- Several European countries also offer a separate grant scheme for the infrastructure in addition to a vehicle grant scheme. All subsidy schemes require separate applications for ZETs and their infrastructure which leads to additional burden<sup>11</sup>. Combining the separate applications can reduce administrative workload for both fleet operators and the authorities (Transport & Environment, 2022) (EVBox, 2022) (ACEA, 2023).
- Table 12 shows that the current ZETs subsidies offered to fleet operators are only redeemable by purchasing a vehicle outright, and do not extend to other forms of access to ZETs. Fleet operators who lease their vehicles are unable to directly benefit from these policies.
- In the open-ended responses provided in the survey, one participant highlighted that the varied nature of subsidy schemes across the EU creates a barrier to understanding and utilising this instrument effectively.

## 5.5 TAX BENEFITS

Tax benefits (also known as tax relief or tax breaks) and other concessions on fees and levies can make a significant contribution to reducing the life cycle costs of ZETs. Deploying effective tax benefits can reduce the cost parity between ZETs and ICETs for fleet operators, making ZETs more competitive.

Two main categories of tax benefit can be identified:

- a. Tax breaks aimed at reducing vehicle purchase and registration costs; and
- b. Other fiscal benefits aimed at reducing the cost of operating the vehicle.

The table below summarises different pros and cons of tax benefits to finance the adoption of ZETs.

Table 13 Pros and cons of tax benefits

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Reduced upfront cost:</b> Tax benefits result in a reduced upfront cost for asset acquisition, freeing up capital for other investments or operational needs.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Navigation of administrative procedures:</b> Navigating the rules and regulations related to tax benefits may be complex and may require professional assistance.</li> </ul>

### 5.5.1 Tax benefits on purchase of ZETs

Tax benefits for purchasing ZETs (e.g., one-off discounts such as VAT deduction at the time of purchase, depreciation allowances, and registration tax exemptions/reductions) directly address the barrier of high upfront purchasing costs and **shorten the period of reaching total cost of ownership (TCO) parity** compared to ICETs (World Economic Forum, 2021).

Depending on the tax regulations and laws, tax benefits can amount to substantial savings on the total vehicle purchasing cost. One of the most common schemes in this category, depreciation allowances such as **accelerated depreciation** for ZETs, allow operators to amortise the purchase cost of ZETs over a shorter timeframe, thus **reducing their taxable income** in the years following the purchase.

The following Table 14 provides a list of some tax benefits offered for the purchase of ZETs in European countries.

<sup>10</sup> The countries that concentrated 80% of the ZET sales in 2022 are Germany (1,452 sales), France (962 sales), Denmark (490 sales), Sweden (438 sales), Spain (318 sales) and Finland (310 sales).

<sup>11</sup> In Germany, it is one grant scheme, but the application processes are separate and therefore could still be a burden for SMEs. See (ACEA, 2023).

Table 14 Tax benefits for purchasing ZETs in selected European countries.

Countries	Tax benefits on purchase of ZETs
Austria	VAT deduction and commercial vehicle tax exemption
Belgium	Reduced electricity VAT rate of 6% (normally 21%)
Czech Republic	Accelerated depreciation of vehicle
Finland	Registration tax exemption
Germany	10-year registration tax exemption until 2030
Greece	Registration tax exemption
Ireland	Accelerated depreciation of vehicle- deduct the full cost of the vehicle or €24,000 in the year of purchase (whichever the lowest)
Poland	Exemption from excise duty
Slovenia	Discounted registration tax with maximum charge of €33

Source: (ACEA, 2023) and (SAEI, 2023)

In this study's survey, four organisations used an accelerated depreciation scheme to adopt ZETs, one respondent was aware of their existence and availability, four were aware of their existence but uncertain about their availability, and eight were unaware of this financing instrument or chose not to answer.

The table below summarises different pros and cons of accelerated depreciation schemes.

Table 15 Pros and cons of accelerated depreciation schemes

Pros	Cons
<ul style="list-style-type: none"> <li><b>Faster tax write-offs:</b> Accelerated depreciation allows companies to deduct a larger portion of the ZET purchase cost in the earlier years, reducing immediate tax liability and providing cash flow relief.</li> <li><b>Enhanced ROI:</b> Accelerated depreciation can improve the return on investment by reducing taxable income (and therefore the associated tax liability).</li> </ul>	<ul style="list-style-type: none"> <li><b>Reduced future deductions:</b> While beneficial in the short term, accelerated depreciation can lead to lower depreciation deductions in the later years, potentially increasing tax liability in the future.</li> <li><b>Complexity:</b> Implementing accelerated depreciation correctly can be complex and may require a deep understanding of tax regulations or professional guidance.</li> </ul>

### 5.5.2 Other fiscal benefits

Other fiscal benefits (e.g., road tax exemptions/reductions, road toll exemptions/reductions, income tax deductions) help reducing ongoing operating costs and, albeit not directly addressing the barrier of high upfront purchasing costs, contribute to shorten the timeframe in achieving total cost of ownership parity.

Table 16 Other fiscal benefits for the ownership of ZETs in EU

Countries	Other fiscal benefits directed at ZETs
Czech Republic	Road tax exemption Road toll exemption



Countries	Other fiscal benefits directed at ZETs
Germany	Road tax exemption until 2025
Ireland	Reduced road tax (€120 per year)
Italy	Road tax exemption for the first five years and 75% discount in subsequent years compared to equivalent petrol vehicles
Poland	Increased possibilities for depreciation write-offs up to PLN 225,000
Slovenia	Road tax exemption
Spain	75% road tax reduction in main cities (Barcelona, Madrid, Valencia, etc)

Source: (ACEA, 2023)

The following table summarises the various pros and cons of reductions/exemptions from taxes, fees and duties which are aimed at reducing vehicle operating costs.

Table 17 Pros and cons of other fiscal benefits

Pros	Cons
<ul style="list-style-type: none"> <li><b>Immediate cost savings:</b> Exemptions from e.g., VAT and registration taxes can result in immediate savings on ZET purchase costs.</li> </ul>	<ul style="list-style-type: none"> <li><b>Limited applicability:</b> These exemptions may not be available in all jurisdictions.</li> </ul>

An example of the effect of other fiscal benefits is the use of differentiated tolls based on Euro class in Germany which have been shown to influence the composition of truck fleets and vehicle use patterns. The significant difference between the composition of fleet in a differentiated toll system versus a non-differentiated one highlights the substantial impact of tolls on encouraging the use of cleaner trucks. TML offers a comparison between the German and the Belgian case to prove the impact of differentiated tolls in Germany (T&E, 2017). In Belgium, Euro V vehicles accounted for 27.6% of truck kilometres, while Euro VI vehicles contributed 16.5% in year 2014 before the implementation of differentiated tolls by Euro standard in the country. In contrast, in the same year with differentiated road tolls in place<sup>12</sup>, approximately 90% of truck kilometres in Germany were attributed to Euro V and Euro VI vehicles (T&E, 2017).

## 5.6 LEASING MODELS

A ZET leasing agreement involves the lessor (which can be a truck OEMs or a leasing company) providing the fleet operator with access to its vehicles in return for fixed, regular payments. During the lease term, lessees only have access to the ZETs in line with the leasing agreement, with the vehicle ownership belonging to the lessor (ICCT, 2022).

Leaseurope, a trading association representing European lessors, suggests that the market for commercial vehicle leasing in Europe has reached €63.6 billion in 2020 (Leaseurope, 2020). Due to the competitive nature of the leasing market, lessors often do not disclose specifics of their leasing deals publicly.

In this study's survey, 50% of respondents (10 responses) entered a lease contract for the adoption of ZETs. These contracts tended to be long-term (80% or 8 respondents) and vehicle maintenance was stated to be the responsibility of the lessee (50% or 4 respondents)<sup>13</sup>.

The following table present pros and cons of leasing models.

Table 18 Overall pros and cons of leasing models

Pros	Cons
<ul style="list-style-type: none"> <li><b>Operational flexibility:</b> Leasing models provide flexibility for fleet operators to change the number of</li> </ul>	<ul style="list-style-type: none"> <li><b>Regulatory implications:</b> Different regulatory and legal implications for ZET operators leasing their</li> </ul>

<sup>12</sup> Germany implemented Euro class differentiation for trucks in road tolls in year 2007.

<sup>13</sup> In the market, most of the times the maintenance is in charge of the lessor unless this is otherwise specified in the leasing contract.

Pros	Cons
<p>vehicles in their fleet to align with the demand for their service at a relatively low cost.</p> <ul style="list-style-type: none"> <li>• <b>Spread of payments:</b> Fleet operators can spread the expensive upfront purchasing cost over a long period and own the ZETs at the end of the lease term.</li> <li>• <b>Tax savings:</b> Regular payments made for leasing are tax deductible and therefore allow a reduction in taxable income and tax payments.</li> <li>• <b>Predictability:</b> Leasing payments including deposits and regular payments are predictable and agreed upon the lease term begins, making budgeting and financial planning easier.</li> <li>• <b>Options after the lease period:</b> Lessees can choose to continue the lease, using the same vehicle but with more flexible lease/rental terms, or return the vehicle to the lessor. They can also choose to purchase the vehicle in the cases of hire purchase agreements</li> </ul>	<p>vehicle from the third-party lessor (i.e., vehicle is not accounted as an asset but rather as an expense on the balance sheet).</p> <ul style="list-style-type: none"> <li>• <b>Vehicle use restrictions:</b> Lessors usually sets mileage and operational restrictions for leased ZETs that lessees must abide.</li> <li>• <b>Limited choice and high cost:</b> Limited number of vehicle lessors offering ZET models given the infancy of ZETs. Some lessors might charge a premium for ZETs compared to ICETs.</li> <li>• <b>Requirements:</b> Fleet operators require to pass checks on credit history and evaluate their eligibility for the lease.</li> <li>• <b>Conservative residual values:</b> Residual values for ZETs tend to be conservative, primarily due to a lack of sufficient data. Consequently, leasing a ZET can be relatively more expensive compared to leasing a diesel one.</li> </ul>

Leasing models deliver several benefits for fleet operators, including **flexibility in adding or reducing the number of vehicles**, and **not having to handle vehicle maintenance** (although this depends on the specific agreements) (SMMT, 2021).

In addition to the drawbacks outlined in the table above, the respondents to the survey conducted for this study provided some additional insights on the top challenges associated with the use of these instruments for ZET adoption compared to their application to ICETs: the long-term costs of leasing are much higher for a ZET than for a diesel truck (five responses “Completely agree” and three responses “Somewhat agree”) and the assessment of the creditworthiness of the organisation before approval of the lease is more stringent for a ZET than for a diesel truck (one response “Completely agree” and three responses “Somewhat agree”).

Some of the responses suggest that the real challenge is the duration of the leasing contract as fleet owners do not know what the lifetime of a ZET is going to be. On the one hand, OEMs promise longer lifetime for ZETs. On the other hand, financial institutions account for the lifetime of the ZETs as similar to that of a diesel truck, since they have uncertainties on the duration of batteries. There is therefore a discrepancy between the expectations of OEMs, logistic operators, and financing institutions on this point.

The vehicle value at the end of the leasing period is critical point, since (a) some leasing contracts offer a purchase option; and (b) the value that can be recovered from selling the vehicle after a period of operation is important to estimate the economic convenience of leasing over purchasing. The literature seems to agree that leasing models for ZETs remain underdeveloped due to the unclear residual values of these vehicles (CALSTART, 2021).

In the next sections three of the most prevailing leasing models for ZETs are discussed: finance lease, operating lease, and hire purchase model. These leasing models can be differentiated based on: (a) lease terms; (b) tax deductions; (c) residual value risks; and (d) whether it leads to vehicle ownership at the end of the lease term. As the leasing taxonomy differs between European Member States, a general comparison is made between the three most prevailing leasing models for ZETs in this report, as summarised in the Table 19 below.

Table 19 General comparison of key differences of leasing models

	Lease term	Tax deductions	Residual value risks	Monthly leasing cost	Ownership	Transfer of ownership after expiry
<b>Finance lease</b>	Long	Yes – capital allowance, plus	Lessee bears the risk	Low	Lessor remains the owner of the leased	No

	Lease term	Tax deductions	Residual value risks	Monthly leasing cost	Ownership	Transfer of ownership after expiry
		payment offset profit tax			ZET during lease term	
<b>Operating lease</b>	Short to Medium	Yes – capital allowance, plus payment offset profit tax	Lessor bears the risk	Depends		No
<b>Hire purchase model</b>	Depends	Yes – capital allowance, plus interest payment offset profit tax	Lessee bears the risk	Depends		Yes – at the end of lease term

Source: own elaboration

### Case study – Amazon leases electric delivery vehicle for delivery providers

- Amazon leasing their electric delivery vans to smaller package delivery businesses sets the precedence of large firms financially supporting smaller suppliers or even leasing vehicles to suppliers. The large electric vehicle order from Amazon might reduce the unit cost of both purchase and manufacturing of the vehicle. By leasing its electric delivery vehicles to smaller delivery partners at a discount, Amazon expands its delivery capability by increasing the number of delivery service partners and ultimately cuts back its transport-related emissions.
- Delivery service providers are third-party small, independent businesses working with Amazon to fulfil their delivery services. To increase its delivery capability, Amazon has set up a delivery service provider scheme in selected UK and US cities. The scheme lowers the upfront costs to start a package delivery business, by providing options to lease Amazon-branded trucks through the programme from a third-party fleet management company (Amazon, 2023b).
- Amazon has invested heavily on electrifying its last-mile delivery van fleet in both the US and Europe, with a global commitment of rolling-out 100,000 Amazon-branded Rivian electric delivery vehicles on the road by 2030 (Rivian, 2023). In Europe, the first 300 Rivian vans joined the existing thousands of electric delivery vehicle fleet around the same time, as part of the e-commerce platform pledge to invest more than €1 billion in the future to electrify its European transport network (Amazon, 2023a).
- These electric delivery vehicles feature on-board technologies to improve safety, drivers experience, and optimise delivery operations. For example, the on-board data collection system analyses real-time traffic information to notify delivery drivers about road closures, allowing better route optimisation to reduce delivery time and energy consumption (CNBC, 2023). The same CNBC article reported that delivery drivers are satisfied with the capability and capacity of the electric delivery vehicle, compared to the ICE counterpart in the US.

#### 5.6.1 Finance lease

A finance lease is a full pay-out agreement, meaning that the sum of the rentals includes the full capital cost of the equipment, plus the interest accrued.

A finance lease transfers substantially all the risks and rewards of ownership of a fixed asset to the lessee: while the lessor remains the legal owner of the asset for the duration of the lease, the lessee not only has operating control over the asset but also some share of the economic risks and returns, e.g., those from the change in the valuation of the underlying asset.

At the end of the lease period, the lessee can face several options, including returning the vehicle to the lessor (and usually signing up to another contract); extending the lease period for continued use of the vehicle; acquiring ownership of the vehicle by paying a final “balloon payment”; and selling the vehicle to a third party and settling the contract with the lessor via the “balloon payment”.

The table below summarises pros and cons of using finance lease to access ZETs.

Table 20 Pros and cons of finance lease

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Tax deduction:</b> The leased ZET appears as an asset on the lessee’s balance sheet, which allow the lessee to benefit from asset depreciation for tax purposes.</li> <li>• <b>Less stringent limitations on use than operating leasing:</b> Fleet operators enjoy fewer mileage and operating restrictions than operating lease.</li> <li>• <b>Lower monthly leasing payments:</b> Compared to operating lease, finance leases have lower monthly payments due to their longer lease terms.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Residual value risk:</b> The lessee can settle the contract with the lessor with a final balloon payment, which reflects the valuation of the vehicle at the beginning of the contract. The proceeds for the balloon payment could come from a sale to a third party at market prices, which could be affected by a greater than expected depreciation of the assets.</li> <li>• <b>Long leasing term:</b> The long leasing term offers little flexibility for fleet operators to exchange for a newer truck or end the lease early without incurring a penalty charge.</li> </ul>

As outlined in the table presented above, finance leases offer several benefits for fleet operators – the most significant are:

- **Tax deduction:** Fleet operators can benefit from tax benefits such as asset depreciation tax deduction through capital lease. On top of offsetting their annual leasing expenses against their taxable profit, the asset depreciation tax deduction further reduces lessees’ business tax payment (DAF, 2023a).
- **Lower monthly leasing payments:** The longer lease terms of finance lease reduces the monthly payments, spreading the cost for longer (Car and Driver, 2023)

However, a major drawback that discourage finance lease of ZETs is the **long leasing term**, i.e., lessees lack the flexibility to change vehicles during lease term or to end the lease early. Depending on the lease, a finance lease can last up to 10 years (CALSTART, 2021). Lessees would be penalised financially if they wish to amend the leasing before end of lease term.

### 5.6.2 Operating lease

Operating lease (or operational lease) agreement is comparable to a long-term rental agreement which involves the lessee (fleet operator) paying the lessor regular payments with interests in exchange for ZET access over a period. The assets remain in the ownership of the lessor.

These contracts are usually short-term, and it is up to the lessee to maintain the equipment throughout the period of payments. There are no purchasing options with an operating lease, so the lessee will not be able to own the equipment.

The table below summarises pros and cons of using operating lease to access ZETs.

Table 21 Pros and cons of operating lease of ZETs

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Operational flexibility:</b> Operating leases provide flexibility for fleet operators to meet seasonal demand for their service, or obtain newer, better ZETs at a relatively low cost.</li> <li>• <b>‘Off balance sheet’ tax benefits for short term lease:</b> The leased ZET does not appear as a liability (“off balance sheet”) under the lessee’s balance sheet, which improves the financial positions of the lessees.</li> <li>• <b>No bearing of vehicle residual risk:</b> Lessee do not bear the risk of ZET residual value fluctuations in operating leasing.</li> <li>• <b>Lower expenses:</b> Because operators are not covering the entire vehicle cost in the lease agreement, monthly payments are generally lower.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Strict vehicles use restrictions:</b> Lessors usually sets mileage and operational restrictions for leased ZETs that lessees must abide. This poses an issue since the advantage of owning a ZET often lies in lower operating costs, thereby providing an incentive to utilise it to the fullest extent.</li> <li>• <b>No option to purchase ZETs:</b> Lessors are limited to either extending the lease term or returning the vehicle to the lessor at the end of lease term.</li> </ul>

One of the most significant benefits of using operating leases for accessing ZETs is the **operational flexibility** it offers to fleet operators, allowing operators to access additional ZETs during high seasonal demand. Another way operating lease can provide operation flexibility is enabling more frequent vehicle fleet update with the latest, better performance ZET due to the rapid changes in ZET development cycle (Taxoo, 2023).

Another benefit of operating lease is the availability of **tax benefits for short term leases**: similar to other leasing models, operating lease payments are offset against the fleet operators' taxable profit (DAF, 2023c).

However, one key drawback is **stricter vehicle use restrictions**: Fleet operators may have to comply with usage limits (e.g. mileage limits) and/or pay higher fees for additional services, e.g. maintenance and repair (CALSTART, 2021). These limits on usage are due to the fact that lessors wish to preserve a higher as possible residual value of the leased ZE trucks.



Source: picture provided by DHL

### 5.6.3 Hire purchase agreements

In hire purchase (or lease-purchase) agreement, the fleet operator enters a fixed term agreement with the lessor, contributing regular payments with interest until the lease term ends, then a fixed agreed lump sum must be paid before the ownership transfer to the fleet operator (DAF, 2023b).

The table below summarises pros and cons of using hire purchase agreements to access ZE trucks.

Table 22 Pros and cons of hire purchase agreements

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>'On balance sheet' tax deduction:</b> The leased ZET appears as an asset and a corresponding liability ("on balance sheet") under the lessee's balance sheet,</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Higher total cost:</b> The total cost of acquiring the asset through a hire purchase agreement is usually</li> </ul>

Pros	Cons
<p>which allow lessees to benefit from asset depreciation tax deductions.</p> <ul style="list-style-type: none"> <li>• <b>Transfer of ownership at the end of the lease period:</b> The ownership of the leased ZET will be transferred from the lessor to the lessee after the final payment of the lease agreement.</li> </ul>	<p>higher than an outright purchase due to interest and fees.</p> <ul style="list-style-type: none"> <li>• <b>Upfront costs:</b> Some hire purchase agreements require a substantial down payment, which may strain a business's immediate cash flow.</li> </ul>

Hire purchase agreements deliver two main advantages for fleet operator accessing ZETs:

- **'On balance sheet' tax deduction:** Fleet operators can benefit from tax benefits such as asset depreciation tax deduction through capital lease. On top of offsetting their annual leasing expenses against their taxable profit, the asset depreciation tax deduction further reduces lessees' business tax payment (DAF, 2023b).
- **Transfer of ownership at the end of the lease period:** The ownership of the leased ZET will be transferred from the lessor to the lessee after the final payment of the lease agreement. The transfer of ownership will reflect as a gain in asset on the lessees' balance sheet, while other leasing models do not see a change in balance sheet position when lease agreement ends.

However, the main drawback is the **higher total cost:** hire purchase agreements requires interest payments compared to outright purchase due to interest and fees, and in some case the interest payment is not explicitly stated, which fleet operators might end up paying substantially more for the vehicle ownership (CFI, 2023).



Source: our own archive

## 5.7 SERVICE-BASED MODELS

Service-based models are a new business model for the road haulage sector, offering fleet operators on-demand access to ZETs by charging a regular subscription fee without requiring significant upfront costs.

Four service-based models have been identified to accelerate ZET uptake, these include:

- Trucking-as-a-Service
- Battery-as-a-Service
- Fleet-as-a-Service
- Charging-as-a-Service

The table below summarises service-based mechanisms in terms of their strengths (pros) and weaknesses (cons) to provide fleet operators access to ZETs.

Table 23 Overall pros and cons of service-based models

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Spread of payments:</b> Fleet operators can spread the expensive upfront purchasing cost in exchange for regular monthly payments to access ZETs.</li> <li>• <b>No bearing of maintenance:</b> Service providers handle the vehicle or infrastructure maintenance for fleet operators.</li> <li>• <b>Support and additional services from service providers:</b> Fleet operators receive support from service providers to troubleshoot issues related to vehicle and technology.</li> <li>• <b>Operational flexibility:</b> Service-based models provide operational flexibility for fleet operators, by having options to change their fleet size in short notice and at a relatively low cost to align with demand for their service.</li> <li>• <b>Predictability:</b> Service-based model payments such as regular membership payments are predictable and transparent, making short-term budgeting and financial planning easier provided the cost remain unchanged.</li> <li>• <b>Access to latest technology:</b> Fleet operators can benefit from the latest technology offered by service providers and access to newer vehicle fleet without bearing the technology risk.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>New concept for the trucking industry:</b> The business model is relatively new for the industry, involving more stakeholder groups across the value chain. It might take some time for the business model to reach its maturity.</li> <li>• <b>Vehicle use restrictions:</b> Service providers usually set mileage and operational restrictions for their ZETs that fleet operators must abide.</li> <li>• <b>Limited choice and geographical locations:</b> Limited number of service providers given the infancy of ZETs and the business models.</li> <li>• <b>Requirements:</b> Fleet operators might require passing checks on credit history and evaluate their eligibility for the use of service.</li> </ul>

The key advantage of the service-based model is that it offers an **alternative to vehicle ownership without requiring significant upfront cost**. It can also provide charging/refuelling infrastructure plus other value-added services such as route optimisation to fleet operators in some cases (McKinsey, 2022). In addition, the service-based model offers **consistent and predictable vehicle access**. The same applies to service-based charging model where the charging infrastructure is designed to fit specific operations profile (CALSTART, 2021).

During the co-creation workshop, it was discussed that some service-based products are just a rebranding of the already existing leasing models. Stakeholders noted that OEMs generally show limited enthusiasm for offering service-based products, as their primary focus lies in vehicle sales rather than service provision. While a few OEMs are cautiously exploring this arena, they require further in-depth analysis to accurately gauge the anticipated demand before making substantial commitments. It was also suggested that the services provided seem to vary widely based on the provider, underlining the need for consistent definitions.

### 5.7.1 Trucking-as-a-Service

Fleet operators pay a regular subscription fee to receive on-demand access to the service providers' fleet of ZETs and infrastructure such as charging/refuelling facilities. Apart from the access to vehicle and infrastructure, operators also receive services and support required to operate ZETs. The service providers are usually ZETs OEMs and large fleet operators.

In this study's survey, three organisations indicated that they have used Trucking-as-a-Service to adopt ZETs, six respondents were aware of their existence and availability, two were aware of their existence but uncertain about their availability, and five were unaware of this financing instrument or chose not to answer. There are a few examples of their use in the EU:

- PragmaCharge has hubs across UK and Europe (PragmaCharge, 2023).
- Volta Trucks' truck-as-a-service had operations in the Western European region (UK, France, Spain, Germany, Sweden, Benelux) (Volta Trucks, 2023) but, on October 17<sup>th</sup> 2023, it was reported that Volta Trucks had filed for bankruptcy in Sweden and was set to enter administration in the UK (FleetNews,

2023). Despite the negative circumstances, Luxor Capital Group closed a deal to buy the business (Reuters, 2023)<sup>14</sup>.

- In November 2023, Scania confirmed its project to offer pay-per use electric trucks through a joint venture with the Berlin-based logistics start-up Sennder (Financial times, 2023)

The table below summarises pros and cons of using Trucking-as-a-Service to access ZETs.

Table 24 Pros and cons of Trucking-as-a-Service model

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Flexible service plans:</b> Fleet operators can choose different service plans based on the business needs and are able to change the service plans with relative ease upon agreement with service providers.</li> <li>• <b>Support fleet operators with ZET transition:</b> Support from service providers can reduce the learning curve for fleet operators to get familiarised with operating ZETs.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Geographical limitations:</b> Not all geographies currently offer Trucking-as-a-Service model.</li> <li>• <b>Lack of differentiation with leasing model:</b> This service model appears to lack unique selling point compared to traditional leasing model.</li> </ul>

The main benefits of Trucking-as-a-Service for fleet operators are the **flexible service plans** offering different service levels and add-ons for fleet operators. Fleet operators can choose different service plans based on the business needs. For example, PragmaCharge offers a modular model that includes items such as: simple mileage-based battery-electric truck leasing contract, run-time analytics to optimise use cases, cost optimisation based on analytics, OEM predictive and corrective maintenance agreements, bookable charging slots at hubs, opportunity use of charging infrastructure (PragmaCharge, 2023). Fleet operators can also get **additional support for the ZET transition** from service providers, including drivers training, route planning, operational support and troubleshooting, which fleet operators found helpful to get familiarise with ZETs (ICCT, 2022).

### 5.7.2 Battery-as-a-Service

Battery-as-a-Service subscription model separates ZET's battery and vehicle costs into two parts, allowing fleet operators to pay them independently. This separation effectively spread the cost of the battery which makes up a huge portion of an EV's cost (Wang, Miller, & Fulton, 2022). The service providers are usually battery manufacturers and OEMs.

The Battery-as-a-Service model can be offered in the form of a subscription or a lease model (Guidehouse, 2021). The former model involves fleet operators paying a fixed monthly fee for the battery use or access to the battery swapping network if the vehicle battery is swappable. On the other hand, the lease model involves fixed instalment payments to spread the battery costs over a period.

To date, there is limited information on Battery-as-a-Service model being offered in Europe apart from a construction and mining machinery manufacturer (Epiroc, 2023). In this study's survey, one organisation used Battery-as-a-Service to adopt ZETs, eight respondents were aware of their existence and availability, two were aware of their existence but uncertain about their availability, and six were unaware of this financing instrument or chose not to answer.

The table below summarises pros and cons of Battery-as-a-Service.

<sup>14</sup> Legacy OEMs are offering digital services such as fleet tracking and management software. Volta and PragmaCharge seems to be the first mover player in the European TaaS market at present.



Table 25 Pros and cons of Battery-as-a-Service model

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Initial cost savings:</b> Splitting the costs of the battery and the vehicle can result in a reduction of initial payments for ZETs. This proves advantageous, considering the substantial expense associated with batteries compared to the vehicle itself, with estimates suggesting that batteries constitute around 40% and 60% of vehicle list price (FleetNews, 2022).</li> <li>• <b>Spreading of payments:</b> The expensive battery component on ZETs is spread with regular fixed payments.</li> <li>• <b>Cost advantages to replace degraded battery:</b> Fleet operators do not need to pay for a new battery after the old one is degraded.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Geographical limitations:</b> Not all geographies currently offer Battery-as-a-Service model. For swappable battery, ZETs are restricted to operate in areas where service providers' battery swapping facilities are located.</li> </ul>

The main benefits of Battery-as-a-Service for fleet operators is the **reduction in the upfront purchase cost**, enabling some fleet managers to buy the vehicle in the first place. Additionally, fleet operators can save on paying for the degraded battery and receive a new one at relatively low cost, compared to having to pay for the expensive battery pack to retain vehicle performance.

### 5.7.3 Fleet-as-a-Service

Fleet operators subscribed to the Fleet-as-a-Service model receive an all-inclusive and comprehensive fleet management service, from financing and choosing vehicles to driver management, vehicle maintenance, and insurance.

This subscription business model is currently available for company cars and short-term rental companies with private cars and vans, and it is a multi-billion-dollar industry in Europe (Deloitte, 2018). For the trucking industry, Zeem is a US-based firm that provides electric truck fleet leases, including charging, maintenance, and parking for an all-in monthly fee (Zeem, 2024). Einride, in the EU, US, and UAE, does something similar by providing a turnkey solution covering different aspects of fleet management (Einride, 2024). In this study's survey, two organisations indicated that they have used Fleet-as-a-Service to adopt ZETs, seven respondents were aware of their existence and availability, two were aware of their existence but uncertain about their availability, and six were unaware of this financing mechanisms or chose not to answer.

The table below summarises pros and cons of Fleet-as-a-Service.

Table 26 Pros and cons of Fleet-as-a-Service

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Individualised service:</b> Service operators present multiple bespoke solutions for fleet operators based on the business needs.</li> <li>• <b>Cost advantages:</b> Compared to managing fleet with internal resources, outsourcing might achieve cost advantages.</li> <li>• <b>Flexibility to access rapidly evolving technology:</b> Technology is advancing rapidly and there are new models entering the market every year. By leasing, fleet owners can regularly upgrade to the latest models with improved efficiency, longer ranges, and enhanced features (FleetOwner.com, 2020).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Availability:</b> Fleet-as-a-Service is not offered in the trucking market segment yet.</li> </ul>

## 5.7.4 Charging-as-a-Service

Charging-as-a-service refers to a comprehensive solution that offers charging infrastructure and related services to EV owners, businesses, and organizations. Within this basic framework of providing access to charging infrastructure for a fee, there may be two different variants:

- 1) Fleet operators subscribed to Charging-as-a-Service (typically offered by charging infrastructure providers and operators) receive the design, installation, and maintenance of charging facilities in their depot.
- 2) Some service providers who own or operate charging sites are also offering access to fleet operators subscribed to their services, allowing fleet operators to top up their vehicle mid-journey (Fleete, 2023).

Currently, there are providers offering their service to passenger cars in Europe (including some automotive brands such as Audi Charging Service<sup>15</sup>), but only a few of them have targeted ZETs (see the case of Fleete<sup>16</sup> and Virta<sup>17</sup>). In this study's survey, two organisations indicated that they have used Charging-as-a-Service to adopt ZETs, eight respondents were aware of their existence and availability, two were aware of their existence but uncertain about their availability, and five were unaware of this financing instrument or chose not to answer.

The table below summarises pros and cons of Charging-as-a-Service.

Table 27 Pros and cons of Charging-as-a-Service model

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Spreading of payments:</b> The expensive charging infrastructure for ZETs is spread with regular fixed payments.</li> <li>• <b>Service package options:</b> Service operators present multiple bespoke solutions for fleet operators based on the business needs.</li> <li>• <b>Cost advantages:</b> Compared to managing charging with internal resources, outsourcing might achieve cost advantages.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Availability:</b> Few service providers currently offer Charging-as-a-Service to ZETs.</li> <li>• <b>'Locked-in' contract:</b> Fleet operators might not be able to change service providers as their depot charging facilities might not be compatible with another service provider.</li> <li>• <b>Infrastructure mostly offered in the operator's depot:</b> if no public chargers are available, it is inconvenient to manage fleet and charging time.</li> </ul>

The main benefits of Charging-as-a-Service for fleet operators are the **spreading of payments** as the charging infrastructure can be expensive to small fleet operators to invest in and acquire ZETs at the same time. The flexibility to spread the payments and negotiate payment plan with service providers poses as an advantage to encourage more ZET uptake.

However, there are also some disadvantages in the Charging-as-a-Service model, when this covers the design, installation, and maintenance of charging facilities in their depot. There is a risk that fleet operators might be **'locked-in' the contract**, unable to switch service providers, stuck to the service provider who originally installed the equipment in the customers' facilities. Because the service provider assumes full responsibility for the installation and management of depot charging facilities at the fleet operator's depot, there is a possibility that these facilities may not align with the systems of other service providers.

Additionally, it was discussed in the co-creation workshop that the current charging infrastructure installed under this business model is **mostly offered in the operators' depot**, due to the lack of public infrastructure. This is inconvenient for fleet operators to manage their fleet and charging time. It was also mentioned that electricity providers are beginning to offer charging-as-a-service; however, they require a minimum annual consumption in kilowatt-hours (kWh), which proves challenging to estimate accurately. They face the same uncertainty that other players in the field. At the same time, it was mentioned that interoperable payment solutions for public and private charging are needed.

<sup>15</sup> [Audi Charging Service > Charging > Audi UK](#)

<sup>16</sup> [Fleete supporting businesses to achieve a fully electric vehicle \(EV\) fleet. | Home](#)

<sup>17</sup> [EV Charging Business As A Service: What you need to know | Virta](#)



Source: our own archive

## 5.8 INCOME GAINS

The “green premium” concept refers to a voluntary payment from shippers when purchasing goods and services to support sustainable practices and reduce overall environmental impact. To stimulate demand for ZETs, shippers need to be willing to pay their contracted ZET carriers a green premium for their service, which will generate a demand-pull for ZETs among carriers.

In this study’s survey, two organisations indicated that they have used green premiums to adopt ZETs, five respondents were aware of their existence and availability, two were aware of their existence but uncertain about their availability, and eight were unaware of this financing instrument or chose not to answer.

The table below summarises different pros and cons of using income gains to finance ZETs.

Table 28 Overall pros and cons of income gains

Pros	Cons
<ul style="list-style-type: none"> <li>• <b>Additional income with no spending limitations:</b> The option for ZET fleet operators charging green premium would reduce the time required to reach ZET cost parity.</li> <li>• <b>Negotiable premium:</b> Shippers and ZET operators can negotiate the premium.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Voluntary payments:</b> Shippers might not be willing to pay for the voluntary premium.</li> <li>• <b>Competitive markets:</b> Small ZET operators might not be able to compete with more competitive pricing from large ZET operators.</li> </ul>

The main advantage of fleet operators receiving a green premium is to gain **additional income with no spending restrictions**: the income can reduce the time required to pay off the costs associated with acquiring ZETs or contribute to other aspects of the fleet operators’ business; there is no limitation to how this additional income must be spent on.

However, there are a few drawbacks. One is related to the **voluntary payment** arrangement. Although a survey found a majority of the respondents willing to pay a 10% premium for eco-friendly shipping and

packaging (Freightwaves, 2021), a McKinsey and the World Economic Forum report interviewed some shippers who claimed they would pay a 5-10% green premium, but they anticipated that the green premium to be reduced over time (WEF and McKinsey, 2022).

Given the **competitive markets** within the European road haulage market, the free provision of green freight services could undercut small fleet operators' businesses. For example, the large freight service provider DHL Group offered a "climate-neutral freight service" with lower emission trucks and carbon offsetting to consumers without additional cost (DHL, 2020).

A similar idea is that of emissions 'insetting' whereby customers pay a green premium on the contract with their logistics provider for a lower emission service, enabling them to claim a reduction in their Scope 3 emissions (Kuehne+Nagel, 2023). This gets around the challenge that some routes are harder to decarbonise than others. For example, though the premiums paid may not enable the decarbonisation of their own shipments, the 3PL can use the premium to pay for decarbonisation of other routes where it is easier to adopt low/zero emission technologies. Kuehne & Nagel, a Swiss global logistics company, have started to trial this innovative concept. Their customers purchasing HVO (Hydrotreated vegetable oil, a biofuel) can now reduce carbon emissions in their value chains. They are working on incorporating electric trucks to this model. This will increase the demand and therewith the supply of low-emission technologies, to accelerate the decarbonisation of road logistics. A part of this solution is a Book & Claim system in which the firm purchases biofuel "booked" by customers, the fuel is used in transport services and CO<sub>2e</sub> savings can be passed on to a customer who claims the benefits.

## 6. PREFERENCE, AWARENESS, RELEVANCE AND GAPS

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This section provides an overview of the preferences and level of awareness of the financing mechanisms analysed in the previous section by the surveyed stakeholders, and assesses the availability, accessibility and relevance of these mechanisms to identify the most promising financial solutions for the ZET transition as well as any gaps that should be addressed.

### 6.1 PREFERENCE FOR AND AWARENESS OF FINANCING MECHANISMS FOR ZERO EMISSION TRUCKS TRANSITION

Commercial bank loans and leasing options are the two most traditional ways to purchase or gain access to trucks. When considering the financing options that enabled the stakeholders surveyed for this study to adopt ZETs into their fleets, it appears that, between commercial bank loans and leasing, the latter seems to be used by more respondents. Only 2 respondents confirmed having requested a loan to purchase a ZET, while 50% of respondents (10 responses) have/had a lease contract for the adoption of ZETs.

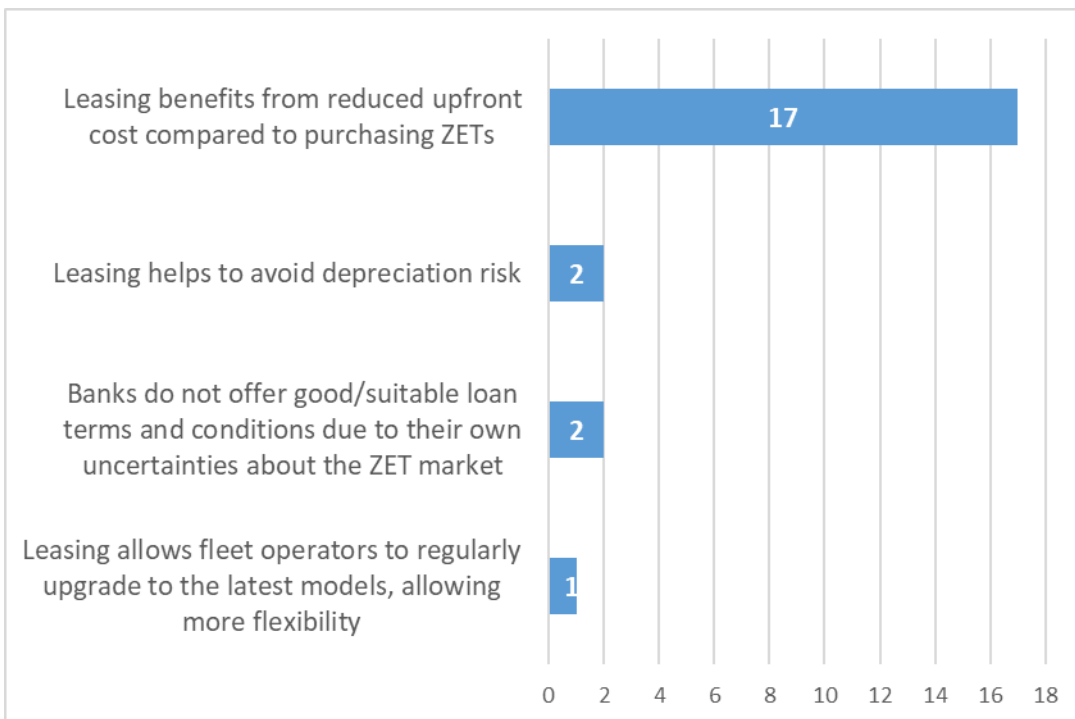
From the survey it was not completely clear the reasons for this preference for lease contracts over loans (and purchase of the ZETs), and thus this was explored in more detail during the co-creation workshop (see Figure 2). Based on literature review and the co-creation workshop discussion, some possible factors accounting for this preference are:

- One of the most significant advantages of leasing ZETs is the **reduced upfront cost compared to purchasing ZETs** which can be a sizable investment. Leasing typically requires a smaller initial down payment or even none. This allows fleet owners to preserve their capital for other operational needs or investments (Mission Possible Partnership, 2023) or to avoid having to find finance to cover a sum of initial capital they do not have available. In the co-creation workshop, this was also the main reason suggested by the participants (see Figure 2).
- **Flexibility to access rapidly evolving technology.** Technology is advancing rapidly and there are new models entering the market every year. By leasing, fleet owners can regularly upgrade to the latest models with improved efficiency, longer ranges, and enhanced features (FleetOwner.com, 2020).
- **Avoiding depreciation risk.** With an operating lease, fleet owners do not bear the risk of the ZET's depreciation, which can be more uncertain with emerging technologies. At the end of the lease term, they can return the vehicle and avoid any potential resale value fluctuations (FleetOwner.com, 2020).
- **Flexibility in terms of operations.** Leasing offers flexibility at the end of the lease term. Evaluating their current demand and operational needs, fleet managers can choose to return the vehicle, purchase it at a predetermined price (residual value), or even lease a newer model. This flexibility aligns with changing business needs and market conditions, in the same way that airlines tend to lease

most of their aircrafts and turn their planning more flexible (FleetOwner.com, 2020). In the open-ended question of the survey about the “deciding factors for the organisation at the moment of adopting ZE vehicles”, one response was “operational lease is standard for trucks in our company”.

- **Single point of contact and less paperwork.** In the workshop discussion, it was highlighted that leasing vehicles offers a streamlined approach with a single point of contact, namely the lessor. This simplicity contrasts sharply with bank loans, which require coordination among numerous stakeholders, including governments and banks. An example was cited involving German Government funding for procuring ZETs, a process riddled with complexity and time-consuming interactions between various entities. Consequently, due to its efficiency and ease of navigation, leasing has remained the preferred choice for procuring trucks over the past two decades in the business. This opinion was endorsed by another participant who claimed that leasing reduces paperwork and workload for fleet operators in comparison to applying for a bank loan.
- **Better way of tackling uncertainties related to technology.** Additionally, unknowns associated with ZETs (e.g., battery useful life, service frequencies) are another motivation to choose to lease over traditional ownership model.
- Another reason behind the preference for leasing over obtaining loans may be the bad terms and **conditions that banks impose on commercial bank loans** based on their own uncertainties over the outlook of the ZETs market. Financial institutions perceive high credit risks of borrowing to small or individual operators in a fragmented, competitive trucking market. In a report of the World Economic Forum (World Economic Forum, 2021) it is suggested that, when it comes to financing projects, banks are cautious about providing funding that is contingent on the successful completion of the project and are typically more comfortable with shorter-term financing options. Non-banking financial companies however are typically less risk adverse than traditional banks. This underlines the importance of blending capital from various sources to address investment gaps.

Figure 2 Reasons of preference for leasing over commercial bank loans (number of responses). Poll during the co-creation workshop.



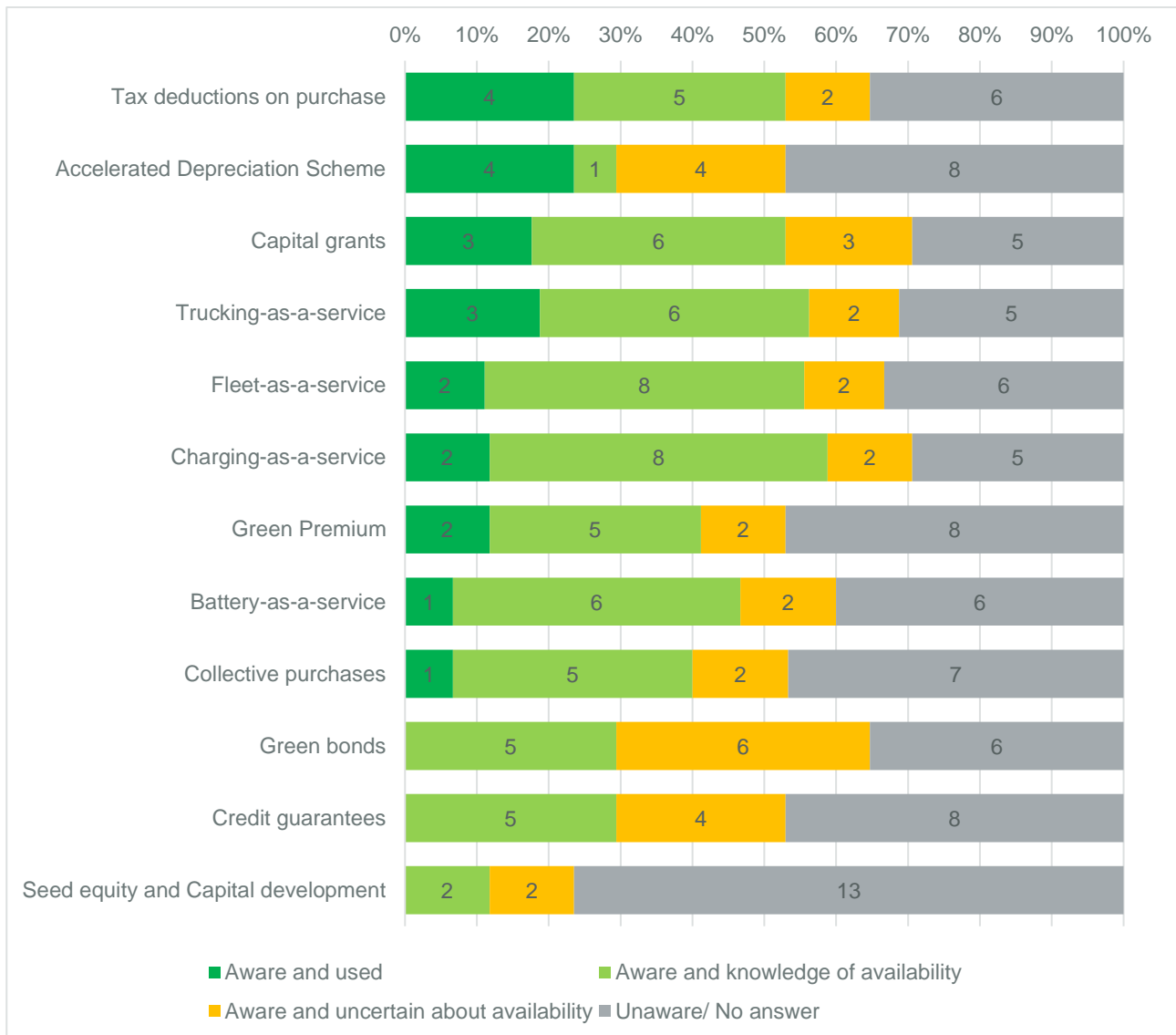
Source: own elaboration

In addition to soliciting input from survey participants regarding their experiences and obstacles associated with the more “traditional” financing mechanisms (loans and leasing), the survey also aimed to assess their awareness and perspectives regarding financing mechanisms alternative to commercial bank loans and leasing, i.e., either:

- (a) mechanisms provided by the private sector, including equity finance, credit guarantees, as well as emerging financing mechanisms and business models (such as service-based models);
- (b) targeted support from the government in the form of e.g., grants and subsidies, and tax breaks.

These additional mechanisms are either already accessible or on the brink of becoming available for facilitating the adoption of ZETs. provides a summary of the responses.

**Figure 3 Awareness and knowledge of availability of financial instruments and business models for ZET adoption**



Source: survey conducted for this study

The most prominent instruments and business models in terms of both awareness and utilisation are **government-related initiatives**. These initiatives are integral components of government programmes at various levels, spanning national, regional, and local jurisdictions, all aimed at bolstering the transition by offering financial assistance to companies seeking to progressively convert their vehicle fleets. Two of them fall within the category of tax incentive and tax benefit (Tax deductions on purchase and Accelerated Depreciation Scheme), while the remaining is a direct financial assistance from the government on the purchase of ZETs (Capital grant). It is important to note that this aspect exhibits geographical variations, as capital grants and accelerated depreciation schemes raise some uncertainties for some of the respondents.

Another salient point is that most of the surveyed firms are not only aware of the existence of **service-based models** but also aware of their availability for their respective operations. However, despite this awareness and accessibility, they have not embraced these models.

Green bonds and credit guarantees are a good example of instruments that respondents are aware of but are uncertain about whether these schemes are available for their operations. In general terms, they express uncertainty regarding the practical applicability of these models within their operations and whether they align with their convenience and needs. This may also reflect geographical variability.

Lastly, it is worth noting that a substantial portion of respondents lacks awareness regarding the seed equity and development capital schemes. These options might be more closely linked to entrepreneurial ecosystems and potentially less mature or interesting for well-established mainstream companies.



Source: picture provided by Primafrio

## 6.2 RELEVANCE AND GAP ANALYSIS

The following table provides a summary of the relevance and gap analysis for all financing mechanisms identified previously. Overall, the analysis reveals that:

- Government-supported mechanisms (concessional loans, subsidies and grants, tax benefits) are, as expected, suitable to support the ZET transition but are undermined by limited accessibility and/or availability related to changing political circumstances
- Credit guarantees and collective purchase agreements are relevant mechanisms to de-risk the upfront investment – particularly guarantees could play an important role in minimising the risks associated with the residual value of ZETs
- Leasing models are suitable and flexible to support the adoption of ZETs but are also plagued by the uncertainties around the residual value of ZETs
- Loans seem to be less flexible to follow the fast technology change and less used under the current circumstances. But there is potential to leverage traditional banking to support the ZET transition
- Service-based models appear to be relevant to support the adoption of ZETs but these are newer mechanisms and their availability is still limited. There are also still operational uncertainties
- Green bonds and equity instruments seem to be less relevant mechanisms

Table 29 Relevance and gap analysis

Legend	Satisfactory	Some issues	Unsatisfactory
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Mechanism	Availability	Accessibility	Suitability	Gap analysis
Commercial bank loans	Green	Grey	Grey	Across Europe, commercial bank loans are widely accessible, although access to them is hampered by certain barriers, namely the solvency checks carried out by banks and collateral requirements applied. Commercial bank loans are suitable tools to finance the upfront costs of ZETs, although unfavourable lending conditions (compared to those applied to loans granted to finance ICE trucks) mean a higher capital cost.
Concessional loans	Red	Red	Green	<p>The availability of concessional loans is limited: the desk research shows limited examples of concessional loans available to EU companies for investment in ZETs.</p> <p>Moreover, barriers to entry are often higher than for commercial bank loans (strict eligibility criteria and conditions generally apply regarding the use of funds for specific types of projects).</p> <p>Concessional loans represent a particularly suitable instrument given the more favourable financing conditions applied.</p>
Leasing models	Grey	Grey	Green	<p>Although generally available, access to and use of leasing models for ZETs remain underdeveloped, largely due to the unclear residual value of these vehicles.</p> <p>Findings from the stakeholder consultation activities suggest that leasing is the favoured method of accessing ZET for fleet owners: fleet operators prefer that risks related to uncertain ZET residual value are borne by lessors rather than themselves (when the truck would be owned outright). This underscores the high suitability of this instrument despite the mentioned limitation of a still underdeveloped offer.</p>
Tax benefits on purchase of ZETs	Grey	Green	Green	Tax schemes aimed at reducing the cost of purchasing ZETs are available in many EU countries and generally accessible to companies wishing to benefit from them. Like grants and subsidies, they are a generally suitable instrument to bridge price differentials between ICET and ZET. However, availability may be limited in time and the prospects of their existence in the future uncertain.
Other fiscal benefits	Grey	Green	Grey	The availability of other fiscal benefits (e.g., reduction/exemption of road taxes and tolls) appears to be more limited and irregular across Europe. Given that they target operating expenses rather than capital costs, these instruments are generally less suited to addressing upfront costs than tax benefits specifically aimed at reducing the purchase price differential between ICET and ZET. Considering that the Total Cost of Ownership (TCO) is as crucial a factor as purchase prices, a reduction in road tax for ZETs can significantly enhance the overall TCO.
Residual value guarantees	Red	Grey	Green	While they are not currently mainstream instruments, their untapped potential suggests they could become significant tools in the future.
Subsidies and grants	Grey	Green	Green	Subsidies and grants aimed at supporting fleet operators in purchasing ZETs are available and generally accessible in the EU. They also constitute a generally suitable instrument for bridging the price gap between ICETs and ZETs. However, availability may be time-limited, jeopardising the role of these tools in signalling government support for the decarbonisation agenda as well as posing risks in terms of the sustainability of the transition to ZETs if support is removed.
Service-based models	Grey	Red	Green	<p>The business model appears as a suitable alternative to more traditional options (truck/fleet purchase or leasing).</p> <p>However, it is relatively new to the industry, and it may take some time for it to reach maturity and scale-up availability.</p> <p>The options currently available appear to vary widely between different providers, limiting clarity and creating a barrier to accessibility.</p>



Mechanism	Availability	Accessibility	Suitability	Gap analysis
Green premium	Green	Grey	Grey	The voluntary nature of green premium systems is both the reason for their theoretically wide availability and a barrier against their wider use. Suitability is conditioned by the level of contribution they could make to reducing the difference between ICET and ZET cost of ownership. The outcome significantly hinges on the contractual agreement with the customer. In the case of a long-term commitment for a consistent ZET route, the green premium can substantially enhance the TCO, making it a determining factor.
Collective purchase	Green	Red	Grey	In Europe, collective purchasing programmes appear to be available for fleet operators. However, the large proportion of respondents to the survey who stated they were unaware of their existence or availability suggests that a barrier exists in terms of accessibility, possibly due to limited information or publicity of these programmes and/or their benefits. Moreover, although this instrument appears as a suitable solution to address several barriers to investment, findings from the co-creation workshop highlighted significant coordination and implementation difficulties.
Green bonds	Grey	Red	Red	The issuance of green bonds is a possibility, albeit primarily viable for large, well-established corporations, thereby restricting accessibility for small and medium-sized enterprises (SMEs). Green bonds are a suitable instrument only for some companies (i.e., larger, established companies with a good credit rating), but not for smaller companies not equipped to issue them.
Credit guarantees	Grey	Grey	Green	In Europe, several credit guarantee schemes seem to be available. However, the available evidence (including from the survey) does not indicate frequent utilisation by fleet operators. This suggests a potential problem in terms of the accessibility or suitability of this type of instrument (or both): Regarding accessibility, some stakeholders have suggested that the costs of these tools are prohibitive. Regarding suitability, some stakeholders have emphasised that it is not merely the repayment of the debt that would need to be guaranteed but, more importantly, the residual value of the truck.
Equity instruments	Grey	Grey	Red	Equity funding, especially for established companies and startups with high growth potential, is generally available through various means such as venture capital and private equity (as well as public stock markets for public listed companies). The challenges of these instruments lie primarily in their poor suitability for cargo fleet operator companies <sup>18</sup> , as well as the risks associated with, for example, ownership dilution and relinquishment of control on the company.

<sup>18</sup> As mentioned in Table 6, equity capital is generally provided by investors who wish to invest in high-growth projects, while investing in ZETs would not generate significant additional revenue to fleet operators.

## 7. RECOMMENDATIONS

This section includes recommendations that are designed to address the financing challenges identified throughout the course of this study, capitalise on the opportunities, and leverage the identified financing mechanisms effectively. They provide actionable insights to the industry and policymakers, offering an outlook on how to navigate and strengthen the evolving landscape of sustainable transport financing. They build upon existing research and solutions to address financing barriers in the ZET market - e.g., (World Economic Forum, 2021), (CALSTART, 2021) - and focus on specific solutions that emerged from the discussions with stakeholders in the co-creation workshop (see section 3.2.2) and/or specific challenges related to financing the ZET transition.

### 7.1.1 Introduction

The following table presents a summary of the relevance and gap analysis provided in section 6.2. The table also maps the recommendations put forward below in this section against specific gaps identified in the relevance and gap analysis. In the case of some instruments that score poorly against one or more criteria (e.g., equity instruments scoring poorly especially in terms of suitability), no recommendations are put forward as their potential in solving the high upfront costs barrier is not considered sufficient.

Table 30 Relevance and gap analysis: summary

Mechanism	Availability	Accessibility	Suitability
Commercial bank loans		Recommendation 9 Recommendation 11	Recommendation 10
Concessional loans		Recommendation 3	
Green bonds		Recommendation 13	
Equity instruments			
Credit guarantees	Recommendation 4		
Residual value guarantees	Recommendation 4	Recommendation 7	
Collective purchase		Recommendation 8	Recommendation 8
Subsidies and grants	Recommendation 1		
Tax benefits on purchase of ZETs	Recommendation 1		
Other fiscal benefits	Recommendation 2		
Leasing models		Recommendation 12 Recommendation 13	
Service-based models	Recommendation 5 Recommendation 6 Recommendation 14	Recommendation 15	
Green premium			

In total, 15 recommendations are proposed aiming to:

- **Enhance public intervention:**
  - Recommendation 1: Reinforce government commitments (subsidies, grants, tax benefits)
  - Recommendation 2: Harmonisation of road toll exemptions across the EU
  - Recommendation 3: Clarification and awareness raising of concessional loans
- **De-risk investments and address residual value uncertainties**
  - Recommendation 4: Provision of government-supported residual value guarantees
  - Recommendation 5: Provision of government support to facilitate scalability of Battery-as-a-Service
  - Recommendation 6: Develop a more mature recycling and end-of-life battery ecosystem (Private sector)
  - Recommendation 7: Enhance the ZET second-hand market
  - Recommendation 8: Raise awareness and target collective purchase agreements to specific logistic corridors in order to de-risk investments for companies with shared interests
- **Leverage traditional banking to support the ZET transition**
  - Recommendation 9: Provide technical assistance and capacity building to traditional financing institutions
  - Recommendation 10: Provide longer repayment periods for commercial loans
- **Diversify and improve access to finance**
  - Recommendation 11: Diversifying financing sources beyond traditional banks
  - Recommendation 12: Develop EU-wide platform (marketplace) for firms seeking finance
  - Recommendation 13: Establish private partnerships for large firms to financially support their SME suppliers
  - Recommendation 14: Establish a robust framework, including legal and tax definitions for service-based models (European authorities and national governments)
  - Recommendation 15: Develop interoperable payment solutions for Charging-as-a-Service

These are described below.

## Enhancing public intervention

### 7.1.2 Recommendation 1: Reinforce government commitments (subsidies, grants, tax benefits) (National and local governments)

The findings from the desk research and stakeholder consultation indicate that, currently, fleet owners predominantly use public instruments to adopt ZETs, namely grants and subsidies.

In this context, some stakeholders have emphasised the ongoing significance of government assistance through grants, subsidies, and tax incentives, a necessity that is expected to persist. These forms of support are crucial for achieving decarbonisation objectives in road freight transport. They serve a dual purpose: firstly, by partially bridging the cost disparity between traditional ICETs and ZETs; and secondly, by communicating the government's backing for the transition, thereby instilling confidence within the private sector.

Considering the evidence highlighting the significance of taxes, grants, and subsidies in nurturing the ZET ecosystem during its initial stages, alongside the potential for emerging second-hand markets of ZETs in the near term, **governments could reinforce these commitments and extend their duration where relevant to enhance trust among fleet owners**, assuring them of sustained support without the risk of diversion for other purposes. In the co-creation workshop, participants recognised that certain EU countries offer excellent subsidies along with exemptions from road taxes or tolls. This approach naturally leads to the emergence of a broader market, fostering the growth of second-hand markets. The prospect of these secondary markets is highly promising and is part of the possible solutions.

As part of the recommendation, the **harmonisation of incentives** to support the purchases and operation of ZETs across EU Member States could be strengthened in such a way as to create a common European playing field and signal a common desire to support the decarbonisation of road freight transport.

Whilst government support is important to close the financing gap between ZETs and ICETs in the short-term, they are also limits to how much they can support the ZET transition:

- Firstly, their long-term sustainability is questionable due to the strain they may place on the tax system, especially given the anticipated rise in future ZET purchases.
- Secondly, these mechanisms predominantly target ZET purchases rather than leasing, which, as indicated by the survey and workshop findings, is the prevailing method through which fleet operators typically access ZET.
- Additionally, a consistent insight from the stakeholder consultations is that a significant obstacle hindering widespread adoption of ZETs is not solely the higher initial purchase cost, but perhaps more crucially, the uncertainties associated with their value at the conclusion of their economic lifespan (known as the residual value). These uncertainties pose barriers to securing loans at favourable terms and hinder access to more and better leasing options, which necessitate accurate valuation of the leased asset.

As such, excessive dependence on these mechanisms should be minimised and there is a need to explore market-oriented solutions in conjunction with government-based options (e.g., see Recommendations 4 and 5).

### **7.1.3 Recommendation 2: Harmonisation of road toll exemptions across the EU (European authorities, National governments)**

While most government aid programmes primarily focus on addressing the substantial upfront costs of ZET initiatives, there is a tendency to underestimate the potential of addressing the ongoing operational costs associated with ZETs. For the second aim, the **harmonisation of road toll exemptions** for ZETs throughout the entire Trans-European Transport Network could play an important role. Ensuring uniform benefits across all countries within this EU common infrastructure is relevant given the frequent cross-border movement of trucks. By standardising road toll exemptions, regardless of the country in which the ZETs operate, it is possible to create a seamless and consistent environment for businesses. This harmonisation not only simplifies administrative processes for companies and creates a level playing field for users and businesses but also encourages the widespread adoption of ZETs. The Eurovignette Directive, a set of road charging regulations within the European Union (EU), serves as a crucial tool for achieving the intended purpose, particularly in the context of the core Trans-European Transport Network (TEN-T). However, it is important to note that while this legislation significantly contributes to the objective, it does not fully harmonise exemptions. Instead, it provides valuable guidance by outlining suggested criteria for the implementation of road charging mechanisms. In the revised version of the mentioned Directive, hauliers operating ZET must be given discounts of at least 50% on distance-based road tolls. Member States could opt to levy extra CO<sub>2</sub>-based charges on fossil fuel trucks instead or implement both measures (T&E, 2023).

### **7.1.4 Recommendation 3: Clarification and awareness raising of concessional loans (National governments)**

Despite the suitability of concessional loans for ZET purchases, their availability and accessibility are limited. To address these gaps, governments should define the purpose of concessional loans aimed at environmental objectives, guaranteeing transparency and precise eligibility criteria, especially for truck fleet operators. By outlining explicit environmental goals and **indicating whether these loans are accessible to truck fleet owners**, the government can encourage focused environmental initiatives in the transport industry.

Furthermore, it is crucial to invest in comprehensive publicity campaigns to inform potential beneficiaries, ensuring they are well-versed in the availability, application process, and advantages of these loans.

## **De-risking investments and addressing residual value uncertainties**

### **7.1.5 Recommendation 4: Provision of government-supported residual value guarantees (National and local governments)**

Because of the uncertainty on the residual value of ZETs, stakeholders during the co-creation workshop observed that the focus of public intervention should be shifted from direct government aid (seen as more conditional on certain political and economic circumstances) to guarantees aimed at improving capacity of banks to extend loans to fleet owners. Particularly, stakeholders recommended implementing **residual value**

**guarantee schemes** to mitigate risks for adopters, i.e., guarantees focusing on reducing the risks associated with uncertainties surrounding the residual value of ZETs. This type of guarantee would assure adopters of a predetermined value for their ZET at the conclusion of the loan or lease term, safeguarding them from market fluctuations. Having a guaranteed future value would enable adopters to secure financing more readily as well as more and better leasing options. It is important to highlight, however, that (a) guarantees, based on stakeholder experiences, tend to be prohibitively expensive, and (b) stakeholders have not encountered organisations offering residual value guarantees specifically.

As a solution, stakeholders recommended that **governments play a proactive role in increasing the availability and facilitating fleet owners' access to residual value guarantees**. This could be achieved by directing specific government agencies to offer such guarantees at a controlled cost. Through these guarantees, the government can incentivise the mobilisation of private capital to support the transition. Market-driven initiatives play a vital role in promoting sustainability, encouraging businesses to invest in financially viable green technologies and ensuring the adoption of long-term, self-sustaining green practices.

#### **7.1.6 Recommendation 5: Provision of government support to facilitate scalability of Battery-as-a-Service (National and local governments)**

Battery-as-a-Service has gained significant popularity as an effective method for mitigating residual value risk outside Europe, especially considering that 60% of a vehicle's cost is attributed to the battery (Roberts, 2022). In Europe, it has not been widely adopted. Stakeholders noted that OEMs potentially interested in offering Battery-as-a-Service are reluctant due to the risks associated with variations in battery degradation. This degradation hinges on factors such as charging frequency, driving habits, and diverse degradation patterns, posing a significant concern for OEMs.

During the workshop, it was emphasised that OEMs often have limited experience in providing services, as their primary focus lies in manufacturing and selling vehicles. To address this gap, government financing of initiatives, such as pilots and demonstrations, within the realm of Battery-as-a-Service, could prove central. This financial support would serve as a leverage, mitigating startup risks and encouraging not only OEMs but also other interested organisations to venture into the market of service-based models. This approach represents a strategic reorientation of government economic support, incentivising organisations to pioneer the Battery-as-a-Service market.

#### **7.1.7 Recommendation 6: Develop a more mature recycling and end-of-life battery ecosystem (Private sector)**

To ensure the preservation of value at the end-of-life of a vehicle, it is imperative to have a well-established and mature battery recycling industry in place. Having a mature end-of-life battery recycling industry and standardised recycling protocols not only ensures the safe disposal of batteries and electronic components but also remove, in part, uncertainties on the residual value of vehicles. The knowledge that materials from batteries can be efficiently recycled and reused translates into a higher resale value because buyers are more inclined to invest in a vehicle integrated into a circular economy.

The New Sustainable Batteries Regulation (2023/1542), which was adopted in August 2023, will be contributing to this objective. The new Regulation sets forth goals for recycling efficiency, material recovery, and recycled content, which will be implemented gradually starting in 2025. It mandates the recycling of all collected waste batteries, emphasising the high recovery levels, especially for critical raw materials like cobalt, lithium, and nickel. This ensures the recovery of valuable materials at the end of their lifecycle, fostering their reintroduction into the economy through progressively stricter targets for recycling efficiency and material recovery.

#### **7.1.8 Recommendation 7: Enhance the ZET second-hand market (National government)**

Another way of reducing uncertainties about the residual value of vehicles subject to lease or loan contracts is to strengthen the ZET second-hand market.

In addition to encouraging the buying, selling, and upgrading of used ZETs, the presence of a mature second-hand market serves as an incentive for the expansion of the first-hand market, providing owners with assurance that the vehicle's cost is not a sunk investment and can be recouped through resale, so, building the confidence that surrounds the purchase decision. This symbiotic relationship creates a virtuous cycle, where the availability of first-hand vehicles also enriches the offerings in the second-hand market, further stimulating demand.

In addition to improving the accessibility and availability of trucks<sup>25</sup>, the second-hand market also provides a wealth of historical data and transaction records. These records offer valuable insights into how specific truck models depreciate over time, considering factors such as mileage, maintenance, and overall wear and tear. Analysing this bulk of data will allow stakeholders, including manufacturers, buyers, and financial institutions, to make informed predictions about the future residual value of similar vehicles. Additionally, a robust second-hand market creates a benchmark for pricing. When there are numerous comparable transactions occurring in the market, it becomes easier to establish a standard price range for used ZETs. This benchmarking helps in setting realistic expectations for both sellers and buyers, leading to fairer and more accurate assessments of a truck's residual value.

Besides providing incentives to the purchase of new ZET, there are other actions that governments can implement to strengthen these secondary markets of ZE vehicles. According to the Vehicle Remarketing Association of UK, the primary objective is to achieve a balanced approach in providing support to both new and used vehicles, i.e., implementing various tax incentives and subsidies for buyers of used vehicles, mirroring those available for new vehicles (FleetNews, 2023). This approach has already been explored for light-duty EVs. For instance, Scotland offers interest-free loans to buyers of used electric cars, while the Netherlands provides a €2,000 subsidy. In France, a payment of €1,000 is available, and in Germany, a grant of up to €6,000 can be obtained for used vehicle purchases (FleetNews, 2023). Another potential intervention could involve enhancing transparency by providing open and public access to information regarding the resale value of these vehicles. This initiative could empower organisations to make more informed decisions and foster trust in the market for such vehicles.

Additional recommendations are to extend residual value guarantees, mentioned in Recommendation 4, to be used with second-hand vehicles. This would provide assurance to buyers and sellers alike, stimulating confidence in the durability and longevity of zero-emission trucks. And, finally, incorporating assessments of battery health into national roadworthiness certificates and periodic technical inspections (PTI) in jurisdictions where this practice is not already in place. Ensuring the health of the battery is a very relevant aspect of evaluating the overall condition and performance of electric trucks.

#### **7.1.9 Recommendation 8: Raise awareness and target collective purchase agreements to specific logistic corridors in order to de-risk investments for companies with shared interests (Private sector)**

Together with guarantees, collective purchasing is another mechanism that can support the ZET transition by de-risking the upfront investment (as discussed in section 5.3). However, coordination barriers and disagreements on the technical specifications of the vehicles to be procured are key challenges that could limit the effectiveness of such a mechanism. These issues were also raised during the co-creation workshop, where a stakeholder mentioned specifically the challenge of coordinating the needs of operators which have different vehicle use cases.

One potential solution is **pooling the needs of several companies that operate on a common logistics corridor**. As discussed during the co-creation workshop, focusing on a common logistics corridor implies similar use cases and, thus, similar vehicle specifications, facilitating negotiations between participants. With a consolidated demand, stakeholders, including local governments and private investors, are more likely to recognise the potential return on investment, making funding and resource allocation more feasible. Moreover, this collaborative effort fosters a supportive environment where knowledge, best practices, and resources can be shared among the participating businesses. Another benefit of the shared corridor is the possibility of integrating infrastructure into the collective arrangement

In addition, in the survey, many stakeholders were not aware of the existence of such mechanisms, which suggests that there could be limited information or publicity of these programmes and/or their benefits. As such, the development of targeted collective purchase agreement programmes should be associated to **awareness raising campaigns** to help improve the level of awareness of operators on the existence and advantages of this mechanism.

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<sup>25</sup> A robust second-hand market often leads to competitive pricing, making ZETs more affordable for a broader range of buyers. Lower prices attract buyers who might not have considered transitioning to cleaner technologies, thereby increasing the overall market for these vehicles. A developed second-hand market means there are more pre-owned ZETs available for buyers. This availability makes it easier for organisations to find the specific model, features, and price point they desire, enhancing their willingness to adopt.

## Leveraging traditional banking to support the ZET transition

### 7.1.10 Recommendation 9: Provide technical assistance and capacity building to traditional financial institutions (European authorities, national governments and private sector)

In addition to the challenge posed by uncertainties surrounding ZETs' residual value that deter banks from providing financing for ZETs, findings from the co-creation workshop also suggest a general limited knowledge about ZETs in the banking sector, which can affect the loan conditions offered for ZET purchases: given that ZETs are a relatively new technology, commercial banks might categorise a loan application to finance ZET purchases as riskier in comparison to their ICET financing business.

To increase trust in ZETs and improve loan conditions, it was suggested during the co-creation workshop that **industry associations could partner with commercial banks and other financial institutions and offer these institutions technical assistance and capacity building initiatives**, with particular attention to areas such as battery degradation. Directly involving logistics as well as specialised consulting firms in these initiatives could be highly beneficial, as these firms can provide valuable data and insight.

### 7.1.11 Recommendation 10: Provide longer repayment periods for commercial loans (Banks)

Challenging repayment terms are a key barrier to the use of loans for ZET purchases. In the co-creation workshop, participants emphasised that logistics operators, operating within narrow profit margins, require extended loan durations to effectively manage their financial commitments. The standard loan periods of 5 years, 3 years, or even 1 year do not align with the unique business needs of these companies.

It was suggested that **longer repayment periods, specifically 7 to 10 years, are essential** to provide the needed breathing room for these businesses. Surprisingly, a participant of the co-creation workshop indicated that the need for extended loan durations often goes unnoticed, highlighting an overlooked aspect in financial planning and support initiatives within the logistics sector.

## Diversifying and improving access to finance

### 7.1.12 Recommendation 11: Diversifying financing sources beyond traditional banks (Private sector and national governments)

Given the challenges that affect commercial banks' ability to provide tailored products to finance ZET purchases, another potential solution discussed in the co-creation workshop was to **diversify financing sources beyond traditional banks, such as OEMs and pension funds**.

In particular, pension funds might be more suitable financing sources for long-term loans. Pension funds usually have a stable and predictable source of funds through regular contributions and investment income. This stability allows them to plan for long-term investments and commitments, making them more suitable for providing long-term loans with fixed interest rates. This aligns better with the longer repayment periods demanded by prospect borrowers for ZET purchases. Commercial banks, on the other hand, typically have shorter investment horizons and may face liquidity constraints that make long-term lending more challenging.

Concerning OEMs and their distributors and concessionaries as financiers, this implies enhancing the financing options and conditions they offer to the end-users for acquiring ZETs.

### 7.1.13 Recommendation 12: Develop EU-wide platform (marketplace) for firms seeking finance (European authorities)

In the workshop, it was observed that the documentation and application processes for both purchasing and leasing vehicles are often very similar, that is, in many cases, lessors request similar documents as financial institutions that provide loans. Consequently, a proposed solution discussed in the workshop to streamline access to both financing and leasing options involves the **creation of an EU-wide online platform, functioning as a marketplace, that would allow companies seeking financing or leasing arrangements to confidentially upload relevant documents into a reserved access area, and engage with various loan or leasing providers**, simplifying the process and enhancing accessibility to suitable financial solutions.

#### **7.1.14 Recommendation 13: Establish private partnerships for large firms to financially support their SME suppliers (Private sector)**

The relevance and gap analysis suggests that green bonds are more appropriate for large corporations capable of issuing them and that require larger financing amounts, as opposed to SMEs that also tend to lack the necessary expertise and resources.

One potential approach could involve linking the issuance of green bonds by large companies with mechanisms enabling them to provide financial support to their SME logistics partners for the adoption of cleaner fleets. This support might take various forms, such as offering soft loans, deducting financial commitments from regular payments to suppliers, or leasing vehicles to SME suppliers, similar to the model employed by Amazon as previously discussed in section 5.6.

#### **7.1.15 Recommendation 14: Establish a robust framework, including legal and tax definitions for service-based models (European authorities and national governments)**

Service-based models appear to be a suitable alternative to more traditional options (truck/fleet purchase or leasing) but they are a relatively new approach, and it may take some time to reach maturity and scale up their availability. The main issue raised during the co-creation workshop that could be preventing their scalability is the lack of legal and tax definitions. The absence of specific legal definitions means that issues related to liability, property rights, and contractual obligations are not clearly delineated. For instance, in the case of Charging-as-a-Service, in the event of equipment malfunctions or accidents at charging stations, it may be unclear who bears the legal responsibility – the service provider, the infrastructure owner, or the end-user. Furthermore, tax implications, such as how these services are categorised for taxation purposes, remain ambiguous, leading to uncertainties for both providers and users.

The recommendation is to establish a robust framework, including legal and tax definitions, for service-based business models. Clear legal definitions provide businesses with a precise understanding of their rights and responsibilities. They reduce legal ambiguities and uncertainties, making it easier for companies to operate within the legal framework. This clarity is especially crucial in service-based models where multiple parties are involved, ensuring that each entity understands its role and obligations. Well-defined tax definitions ensure that service providers are aware of their tax liabilities.

Besides legal aspects, service providers should improve their communication clarifying the different provisions of the model. A stakeholder explained during the co-creation workshop that they recently started using the Fleet-as-a-Service model and it was difficult to project manage because the system is split into different categories, which leads to delay.

#### **7.1.16 Recommendation 15: Develop interoperable payment solutions for Charging-as-a-Service (National governments and private sector)**

The EU Alternative Fuels Infrastructure Regulation (AFIR) aims to standardise charging infrastructure by ensuring uniformity in plugs, various payment options, and smart charging capabilities. However, its primary focus is on public access charging points within the TEN-T network and does not specifically address the charging-as-a-service model or the interoperability between different service providers in this business category. Just as in the case of public charging infrastructure, stakeholders have emphasised the need for interoperable payment solutions within the Charging-as-a-Service model. When multiple providers offer similar services along a typical route, interoperability becomes essential. Interoperable payment systems enable users of ZETs to effortlessly charge their vehicles at various charging hubs, eliminating the hassle of managing multiple accounts or payment methods. This seamless experience not only enhances user convenience but also promotes wider adoption of ZETs among organisations. With a standardised payment process in place, businesses can confidently embrace ZETs, knowing they can rely on a consistent and user-friendly charging system.

#### **7.1.17 Mapping of recommendations**



Table 31 below maps the list of recommendations based on two critical dimensions:

- **The level of impact** is important to discern which recommendations hold the potential for substantial transformative change within the context of these recommendations. Some recommendations might yield immediate, high-impact outcomes, while others could lead to more gradual, yet equally significant, changes over time. This assessment enables the prioritisation of efforts, focusing on the high-impact strategies for swift implementation while simultaneously planning for the long-term, sustainable transformations that certain recommendations may require.
- **The stage of adoption** is crucial for understanding the timeline within which these recommendations can be effectively implemented. Shorter-term recommendations are those that can be swiftly put into action, leading to rapid results and immediate benefits. On the other hand, longer-term strategies require meticulous planning, collaboration, and often, gradual societal shifts for comprehensive adoption.

By mapping recommendations along these dual axes, it is possible to gain a clear roadmap: not only the high-impact, short-term initiatives that can yield immediate results are identified but it is also possible to strategically plan for the more profound, enduring changes that will shape long-term sustainability goals. This approach ensures that efforts are both impactful and sustainable, aligning actions with a well-informed, evidence-based strategy.

Table 31 Recommendations mapping

	Shorter term	Longer term
<b>Higher impact</b>	<p>Recommendation 1: Reinforce government commitments (subsidies, grants, tax benefits)</p> <p>Recommendation 4: Provision of government-supported residual value guarantees</p> <p>Recommendation 8: Raise awareness and target collective purchase agreements to specific logistic corridors in order to de-risk investments for companies with shared interests</p> <p>Recommendation 13: Establish private partnerships for large firms to financially support their SME suppliers</p>	<p>Recommendation 6: Develop a more mature recycling and end-of-life battery ecosystem (Private sector)</p> <p>Recommendation 7: Enhance the ZET second-hand market</p> <p>Recommendation 10: Provide longer repayment periods for commercial loans</p> <p>Recommendation 11: Diversifying financing sources beyond traditional banks</p> <p>Recommendation 14: Establish a robust framework, including legal and tax definitions for service-based models (European authorities and national governments)</p>
<b>Lower impact</b>	<p>Recommendation 3: Clarification and awareness raising of concessional loans</p> <p>Recommendation 5: Provision of government support to facilitate scalability of Battery-as-a-Service</p> <p>Recommendation 9: Provide technical assistance and capacity building to traditional financial institutions</p>	<p>Recommendation 2: Harmonisation of road toll exemptions across the EU</p> <p>Recommendation 12: Develop EU-wide platform (marketplace) for firms seeking finance</p> <p>Recommendation 15: Develop interoperable payment solutions for Charging-as-a-Service</p>

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# 9. APPENDIX 1 SURVEY QUESTIONNAIRE

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The survey questionnaire is provided in a separate PDF file: "Questionnaire in Alchemer".

## 10. APPENDIX 2 SURVEY RESPONSES

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The survey responses are provided in a separate PDF file: “Study financing mechanisms 20102023”.





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