

Economic feasibility and challenges of electric trucks in Belgium

An analysis of costs, benefits and infrastructural barriers for a sustainable transition in freight transport

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Abstract

This study examines the economic feasibility and key challenges associated with the transition to electric heavy-duty vehicles in Belgium. Therefore, a cost analysis is conducted alongside a discussion of the potential benefits, obstacles and infrastructural challenges for a sustainable transition in the freight transport sector.

The research employs a mixed-methods approach, combining both quantitative and qualitative analyses. For the quantitative component, a total cost of ownership (TCO) analysis was carried out. The results of this analysis vary according to several factors, including the analysis period, region and company size. In 2020, the TCO for electric trucks was still above the TCO of diesel vehicles. By 2025, for small and medium-sized enterprises (SMEs) in Flanders, the TCO of electric trucks is lower than that of traditional diesel trucks. However, for larger companies or those operating in Brussels and Wallonia, diesel trucks remain the more economically viable option. By 2030, the TCO for electric heavy-duty vehicles is projected to be lower across all regions and company sizes.

The qualitative analysis is based on a survey conducted among 69 companies, all located in Belgium and active in various sectors and company sizes. Each respondent operates a fleet that includes at least one heavy-duty truck. The findings of the survey indicate that the adoption of electric trucks in Belgium still remains limited. Notably, the majority of companies that do not yet operate electric trucks are not considering adopting them in the near future - despite the need for a zero-emission future. In contrast, companies that have already purchased electric trucks tend to own multiple electric vehicles, with eight respondents reporting fleets of five BEVs or more.

The main barriers to expanding sustainable fleets include limited driving range, high purchase costs, long charging times, inadequate charging infrastructure and insufficient government support (Carlier, 2024). The survey results underscore the need for increased governmental aid to accelerate the transition. Many respondents emphasize the necessity of higher purchase subsidies and financial support for installing charging infrastructure. Furthermore, there is a clear demand for a more extensive development of truck-specific charging locations in Belgium.

Keywords: Total cost of ownership, electric heavy-duty vehicles, trucks, transportation industry, road transport, charging infrastructure, diesel, alternative fuels

Executive summary

Deze masterproef onderzoekt de economische haalbaarheid en de belangrijkste uitdagingen van de transitie naar elektrische zware vrachtwagens in België. Binnen dit onderzoek worden zware vrachtwagens gedefinieerd als voertuigen met een gewicht van meer dan 3,5 ton. De verduurzaming van de goederenvervoersector is noodzakelijk om tegemoet te komen aan de Europese klimaatdoelstellingen (European Commission, 2019; European Commission, 2021).

ONDERZOEKSMETHODEN

Voor dit onderzoek werd gekozen voor een mixed-methodsbenadering, waarbij kwantitatieve en kwalitatieve onderzoekstechnieken elkaar aanvullen. In het kwantitatieve deel werd een TCO-analyse uitgevoerd, waarbij elektrische en dieselvrachtwagens met elkaar werden vergeleken op basis van hun directe kostcomponenten: afschrijvingskost, brandstofkost, onderhoudskost, verzekeringskost, tolheffingen en loonkost (Sternad, 2019). De analyse werd uitgevoerd over drie tijdsperiodes - 2020, 2025 en 2030 -, met een onderscheid tussen de drie Belgische gewesten en naar ondernemingsgroottes, kleine en middelgrote ondernemingen (kmo's) of grote ondernemingen. Kmo's worden gedefinieerd als ondernemingen die minder dan 250 werknemers in dienst hebben, een jaarlijkse omzet genereren van minder dan 50 miljoen euro en een balanstotaal van minder dan 43 miljoen euro hebben (VLAIO, s.d.-b).

De kwalitatieve analyse vertrok vanuit een enquête die door 79 bedrijven werd opgestart. Niet alle respondenten voltooiden echter de enquête of behoorden tot de doelgroep, wat resulteerde in 69 volledig ingevulde enquêtes. Om de betrouwbaarheid van de bevindingen te verhogen, werd de enquête verspreid onder bedrijven uit diverse sectoren en met uiteenlopende ondernemingsgroottes. De enquête peilde naar de houding van bedrijven ten aanzien van elektrische vrachtwagens en kon worden ingevuld door zowel ondernemingen die reeds gebruik maken van elektrische vrachtwagens als door bedrijven die hier nog geen ervaring mee hebben.

LITERATUURSTUDIE

Als theoretische basis voor dit onderzoek werd een literatuurstudie ondernomen. In deze literatuurstudie worden traditionele dieselveertuigen met alternatieve brandstoffen vergeleken. Daarnaast worden ook de milieu-impact, marktontwikkelingen en adoptiebarrières van elektrische vrachtwagens geanalyseerd. Tot slot besteedt het literatuuroverzicht aandacht aan de beleidscontext, waarbij de rol van subsidies en laadinfrastructuur cruciaal blijkt voor de transitie naar een zero-emissie vrachtwagenpark.

METHODOLOGIE

De kwantitatieve benadering van dit onderzoek bestaat uit een TCO-analyse, die de totale kost (TC) over de gebruiksduur van de vrachtwagens in kaart brengt. De berekening van de TCO neemt alle directe voertuig gerelateerde kosten, route gerelateerde kosten en arbeidskosten in rekening (Sternad, 2019). De algemene formule is als volgt:

$$TC = C_{dep} + C_{fuel} + C_{main} + C_{ins} + C_{reg} + C_{toll} + C_{labor}$$

Waarbij:

- C_{dep} staat voor de jaarlijkse afschrijvingskosten
- C_{fuel} staat voor de jaarlijkse brandstofkosten
- C_{main} staat voor de jaarlijkse onderhoudskosten
- C_{ins} staat voor de jaarlijkse verzekeringskosten
- C_{reg} staat voor de registratiekost

- C_{toll} staat voor de jaarlijkse tolheffingen
- C_{labor} staat voor de jaarlijkse loonkost van de vrachtwagenchauffeur

Voor beide brandstoftypes, diesel en elektrisch, werd de TCO berekend voor de jaren 2020, 2025 en 2030, rekening houdend met gewestverschillen en bedrijfsgrootte. Zo wordt niet enkel de economische haalbaarheid geëvalueerd, maar ook de gevoeligheid van de resultaten voor beleidsmaatregelen.

RESULTATEN KWANTITATIEVE ANALYSE

De TCO-analyse onthult dat elektrische vrachtwagens in 2020 nog aanzienlijk duurder waren dan dieselvarianten. In 2025 verandert dit beeld gedeeltelijk. Kmo's in Vlaanderen behalen dankzij overheidssteun - een aankoopsubsidie van 35% voor kmo's - een lagere TCO voor elektrische vrachtwagens dan voor diesel vrachtwagens (VLAIO, s.d.-a). Grote ondernemingen in Vlaanderen en bedrijven in het Brusselse en Waalse gewest ondervinden daarentegen in 2025 nog een hogere TCO voor elektrische vrachtwagens.

Tegen 2030 wordt verwacht dat elektrische vrachtwagens in alle Belgische gewesten en voor alle ondernemingsgroottes een lagere TCO zullen hebben dan dieselloortuigen. Deze evolutie is voornamelijk toe te wijzen aan dalende aankooprijzen van elektrische vrachtwagens en stijgende aankooprijzen voor dieselloortuigen, een stijging in dieselprijzen en een verschil in tolheffingen tussen elektrische en dieselloortuigen (Sternad, 2019; Transport & Environment, 2021).

De TCO-analyse benadrukt dat overheidsbeleidsmaatregelen essentieel zijn om een versnelde adoptie van elektrische vrachtwagens mogelijk te maken. In 2024 werden in België slecht 77 nieuwe elektrische vrachtwagens ingeschreven, waarvan 76 in Vlaanderen en slechts één in Wallonië (De Spiegeleir, 2025). Dit onderstreept het belang van overheidstegemoetkomingen om de grootschalige implementatie van elektrische vrachtwagens voor 2030 te bevorderen.

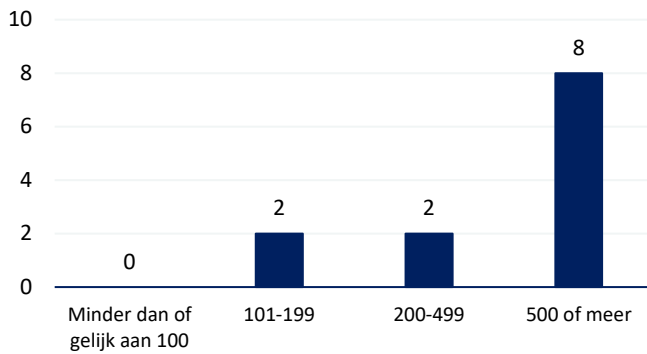
RESULTATEN KWALITATIEVE ANALYSE

De enquête toont aan dat slechts een minderheid van de bedrijven reeds elektrische vrachtwagens inzet. Van de bedrijven die nog geen elektrische voertuigen gebruiken, geeft de meerderheid aan dit ook in de nabije toekomst niet te overwegen. De meest aangehaalde belemmeringen voor het implementeren van elektrische vrachtwagens zijn de beperkte actieradius, de hoge aankooprijzen en de beperkte laadinfrastructuur in België.

Respondenten benadrukken dat operationele beperkingen - zoals het ontbreken van laadinfrastructuur op bouwerven of bij internationale transporten - het gebruik van elektrische vrachtwagens verder compliceren. Ook werd de houding van klanten aangehaald. Hoewel sommige klanten wel expliciet vragen naar zero-emissie voertuigen, zijn ze vaak niet bereid om hier een meerprijs voor te betalen.

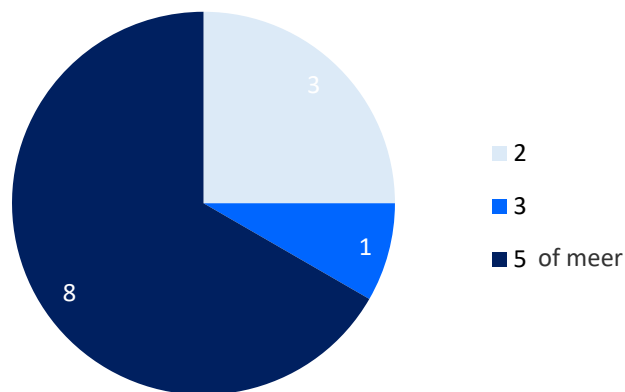
Uit de enquête blijkt dat elf bedrijven reeds elektrische vrachtwagens hebben geïmplementeerd, terwijl één bedrijf aangaf elektrische vrachtwagens in bestelling te hebben. Bij de analyse van de ondernemingsgrootte van deze bedrijven valt onmiddellijk op dat het merendeel behoort tot de categorie met 500 of meer werknemers. Daarnaast gaven in de categorieën van 101 tot en met 199 werknemers en van 200 tot en met 499 werknemers telkens twee bedrijven aan dat zij elektrische vrachtwagens in gebruik hebben genomen.

Grafiek 1: Aantal werknemers in bedrijven die al elektrische vrachtwagens implementeren



Opvallend is bovendien dat de meerderheid van de respondenten die reeds elektrische vrachtwagens inzetten, momenteel al vijf of meer van deze zero-emissievoertuigen in gebruik heeft. Dit suggereert dat bedrijven die de overstap naar elektrisch vervoer maken vaak niet op kleine schaal beginnen, maar meteen inzetten op een bredere integratie in hun wagenpark.

Grafiek 2: Aantal elektrische vrachtwagens



Daarnaast wijzen sommige respondenten op structurele belemmeringen die de integratie van elektrische vrachtwagens bemoeilijken. Zo wordt het noodzakelijke tussentijds laden tijdens ritten aangehaald als een factor die de dagelijkse planning verstoort. Verder plaatsen verschillende respondenten kanttekeningen bij de daadwerkelijke milieuwinst van elektrische vrachtwagens. Er worden vragen gesteld over de ecologische impact van de batterijproductie, en er heerst bezorgdheid over het lot van afgedankte dieselvrachtwagens die elders in de wereld een tweede leven krijgen, wat de globale uitstoot mogelijk slechts verplaatst in plaats van vermindert.

TOETSEN VAN DE HYPOTHESES

Aan de hand van de resultaten uit de kwantitatieve en kwalitatieve analyses kunnen de drie vooropgestelde hypothesen worden getoetst.

De eerste hypothese kan slechts gedeeltelijk worden bevestigd. Uit de TCO-analyse blijkt dat elektrische vrachtwagens in 2025 enkel voor kmo's in Vlaanderen financieel voordeliger zijn dan hun dieseltegenhangers, en dit dankzij de beschikbare aankoopsubsidies in Vlaanderen. In de andere twee Belgische gewesten en voor grotere ondernemingen blijft de TCO in 2025 hoger voor elektrische voertuigen. Pas tegen 2030 wordt verwacht dat in alle scenario's - en dus ongeacht regio of ondernemingsgrootte - de elektrische vrachtwagen een lagere TCO zal hebben dan de dieselvariant.

Hypothese 1: *De total cost of ownership (TCO) van elektrische vrachtwagens is lager dan die van dieselvrachtwagens over een tijdsperiode van vijf tot tien jaar.*

De tweede hypothese wordt volledig verworpen. Hoewel het gebrek aan laadinfrastructuur door veel respondenten wordt benoemd als een structurele barrière, blijkt dit niet de voornaamste reden te zijn waarom bedrijven aarzelen om elektrische vrachtwagens te implementeren. De beperkte actieradius en de hoge aankoopprijs worden vaker als grootste obstakels aangehaald in de enquête. Echter neemt dit niet weg dat investeringen in een bredere ontwikkeling van elektrische laadinfrastructuur in België noodzakelijk zijn.

Hypothese 2: *De beperkte laadinfrastructuur is de grootste structurele barrière voor bedrijven in België om over te stappen op elektrische vrachtwagens.*

De derde hypothese kan daarentegen op verschillende manieren worden bevestigd. De kwantitatieve analyse toont een significant verschil in TCO tussen de gewesten in 2025, waarbij Vlaamse bedrijven dankzij subsidies een lagere TCO ervaren dan bedrijven in Brussel en Wallonië, waar dergelijke steun ontbreekt. Dit verschil weerspiegelt zich ook in het aantal nieuwe inschrijvingen van elektrische vrachtwagens in België in 2024: 76 in Vlaanderen tegenover slechts één in Wallonië (De Spiegeleir, 2025). De kwalitatieve analyse benadrukt bovendien het belang van duidelijke en langdurige overheidsmaatregelen als stimulans voor investeringen in elektrische vrachtwagens. Het is noodzakelijk dat de overheid duidelijker communiceert welke ondersteuningsmaatregelen beschikbaar zijn en gedurende welke periode deze nog van kracht zijn.

Hypothese 3: *Overheidssteun (bijvoorbeeld subsidies of belastingvoordelen) is essentieel voor de adoptie van elektrische vrachtwagens.*

TOETSEN VAN DE ONDERZOEKSVRAGEN

De centrale onderzoeksvraag luidt: *Wat is de economische haalbaarheid van een elektrische zware vrachtwagenvloot in België, en welke uitdagingen gaan gepaard met deze transitie?*

Deze hoofdvraag wordt opgesplitst in deelonderzoeksvragen, die hieronder individueel getoetst worden op basis van de bevindingen van dit onderzoek.

De eerste deelonderzoeksvraag staaft naar het verschil tussen de TCO van beide brandstoftypen. Uit de TCO-analyse kan geconcludeerd worden dat in 2020 de TCO van elektrische vrachtwagens nog fors boven die van dieselvrachtwagens lag. Voor 2025 is de TCO voor kmo's in Vlaanderen lager, maar voor de overige gewesten en ondernemingsgroottes is dit nog niet het geval. In 2030 wordt verwacht dat de TCO in alle gewesten en voor alle bedrijfsformaten lager zal zijn dan die van dieseltrucks. Het verschil in TCO kan door verschillende kostcomponenten verklaard worden, waaronder de aankoopprijs, brandstofprijzen en tolheffingen (Sternad, 2019).

Deelonderzoeksvraag 1: *Hoe verhoudt de **total cost of ownership** (TCO) van een elektrische vrachtwagen zich tot die van een dieselvrachtwagen?*

De tweede deelonderzoeksvraag richt zich op de factoren die het adoptieproces van elektrische vrachtwagens vereenvoudigen of belemmeren. Uit de literatuurstudie en de enquête kwamen verschillende factoren naar voren die de transitie naar elektrische vrachtwagens positief of negatief beïnvloeden. Bedrijven geven aan dat financiële stimulansen - zoals subsidies voor de aankoop van vrachtwagens en laadinfrastructuur - de overstap vergemakkelijken. Het afschaffen van tolheffingen voor elektrische vrachtwagens wordt ook aangehaald als mogelijke stimulans.

Daartegenover staan echter ook een aantal structurele en operationele belemmeringen. De meest genoemde struikelblokken zijn de beperkte actieradius, hoge aankoop prijs, gebrek aan laadinfrastructuur, tijdsverlies door lange laadtijden, beperkt laadvermogen door het gewicht van de batterijen, complexere routeplanning en een tekort aan overheidssteun (Carlier, 2024).

Hoewel er dus enkele gunstige voorwaarden bestaan, geven de meeste ondernemingen momenteel nog aan dat de nadelen nog te zwaar doorwegen. De financiële en operationele onzekerheden blijven voor veel bedrijven een rem op de effectieve implementatie van elektrische vrachtwagens.

Deelonderzoeksvraag 2: Welke factoren faciliteren of hinderen de transitie van elektrische vrachtwagens voor Belgische ondernemingen?

De derde deelonderzoeksvraag onderzoekt in welke mate de huidige laadinfrastructuur in België voorbereid is op de elektrificatie van het vrachtwagenpark en welke investeringen noodzakelijk zijn om deze transitie te ondersteunen. Uit de analyse blijkt dat de bestaande infrastructuur op dit moment nog onvoldoende is. De meeste bedrijven beschikken niet over eigen laadinfrastructuur en publieke laadpunten voor vrachtwagens worden als schaars en weinig betrouwbaar ervaren. Hoewel er ongeveer dertig publieke laadstations gepland zijn om te openen in België, blijven ongelijkheden tussen gewesten en provincies en een beperkte netcapaciteit belangrijke knelpunten. Voor een grootschalige uitrol van elektrische vrachtwagens zijn dan ook aanzienlijke investeringen vereist, zowel in het plaatsen van laadpalen als in het versterken van het elektriciteitsnet om verzadiging te voorkomen (Steel & Kurstjens, 2024). Het is duidelijk dat de overheid niet enkel moet inzetten op de uitbouw van laadinfrastructuur, maar ook op netversterking om de elektrificatie van vrachtvervoer in België haalbaar en toekomstbestendig te maken.

Deelonderzoeksvraag 3: In welke mate is de huidige laadinfrastructuur in België voorbereid op de elektrificatie van vrachtwagens, en welke investeringen zijn nodig?

De vierde en laatste deelonderzoeksvraag onderzoekt welke overheidsmaatregelen of subsidies het adoptieproces van elektrische vrachtwagens kunnen versnellen. Uit de enquêteresultaten blijkt dat een uitgebreidere aankoopsubsidie - die bovendien niet beperkt wordt tot slechts twee voertuigen per onderneming - als een van de meest doeltreffende stimulansen wordt beschouwd. Daarnaast wordt het vrijstellen van zero-emissievoertuigen van tolheffingen, voorzien van subsidies voor de installatie van laadinfrastructuur en het verlagen van elektriciteitskosten vaak genoemd als noodzakelijke vormen van ondersteuning.

Voor een effectieve werking van deze maatregelen is het echter cruciaal dat de overheid helder communiceert over de tijdspanne van deze maatregelen. De onzekerheid over hoe lang bepaalde steunmaatregelen van kracht blijven, veroorzaakt terughoudendheid bij bedrijven om de overstap naar een elektrische vloot te maken.

Deelonderzoeksvraag 4: Welke overheidsmaatregelen of subsidies kunnen het transitieproces van elektrische vrachtwagens versnellen?

CONCLUSIE

Op basis van de vier deelonderzoeksvragen kan geconcludeerd worden dat de economische haalbaarheid van een elektrische vrachtwagenvloot in België sterk afhankelijk is van overheidsbeleid en verdere technologische ontwikkelingen voor het verbeteren van de actieradius en oplaadtijd. Ondanks dat de economische haalbaarheid van zero-emissievoertuigen in België toeneemt - vooral richting 2030 - zijn er op korte termijn nog belangrijke drempels. De hoge investeringskosten, beperkte laadinfrastructuur en operationele drempels hebben voor veel ondernemingen nog een te grote impact. Bovendien speelt overheidssteun ook een cruciale rol, zonder duidelijke en langdurige stimuleringsmaatregelen dreigt de overgang in gedrang te komen. De transitie vraagt dus niet enkel technologische vooruitgang, maar ook gericht beleid en duidelijke communicatie.

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1 Introduction

For the purposes of this research, road transport is defined as the movement of goods by heavy-duty vehicles (Reis & Macário, 2019). One of the main advantages of road transport over other transport modes lies in its ability to provide direct door-to-door service. Road transport is considered highly reliable and flexible, with the capacity to adapt to unexpected challenges. The characteristics contribute to the continued dominance of heavy-duty vehicles as the most used mode of freight transport within Belgium (Mayeres, 2008; Departement Mobiliteit & Openbare Werken, 2024a; Reis & Macário, 2019). Moreover, the transportation industry acts as an engine for the Belgian economy (Verbond van Belgische Ondernemingen, 2017).

1.1 Road transport in Belgium

Belgium plays a pivotal role in international freight transport, serving as a key hub within both the European and global logistics networks (Verbond van Belgische Ondernemingen, 2017). Due to Belgium's strategic geographic location, a significant volume of freight traffic passes through the country (Verbond van Belgische Ondernemingen, 2017; Mayeres, 2008; Departement Mobiliteit & Openbare Werken, 2024a). In 2019, approximately 77% of freight transport in Flanders was carried out by road transport.

Beyond its logistical importance, road transport also plays a vital role in creating employment opportunities for both Belgian residents and international workforce (Verbond van Belgische Ondernemingen, 2017; FEBETRA, 2024; Heinen, 2022). The sector is a major employer, with over 120,000 individuals working in road transport in 2023, most of them being blue-collar workers. In recent years, employment in this sector has continued to grow.

1.2 Problem statement

To meet the climate targets, the transport sector must drastically reduce its emissions in the coming decades (European Commission, 2019; European Commission, 2021). As full decarbonization is especially difficult in transport modes such as aviation, road transport is expected to be the key player in reducing emissions through the adoption of zero-emission heavy-duty trucks.

However, the transition to an electric fleet presents several challenges. Carlier (2024) identifies five key barriers to the electrification of freight transport. The first barrier is the lack of adequate charging infrastructure. According to Acea (2021), Belgium should have approximately 350 truck charging points by 2025, increasing to 1,100 by 2030. The first dedicated truck charging station in Belgium only opened in June 2024, suggesting that the current infrastructure does not meet the projected needs (Port of Antwerp-Bruges, 2024; Steel & Kurstjens, 2024).

Closely related to this is the second barrier: long charging times required for electric heavy-duty vehicles, which limits operational efficiency (Carlier, 2024). A third major obstacle is the limited driving range of electric trucks, which is often insufficient for international transport. In addition, many companies are concerned about the high cost of battery replacement, as well as maintenance and repair expenses.

Perhaps the most significant barrier remains the high initial investment cost (Statista Research Department, 2023). Electric trucks are often two to three times more expensive than their diesel counterparts, which discourages many potential buyers (Statista Research Department, 2023; Luman, 2024). As a result, manufacturers have had to adapt their sales strategies (Scania Belux, 2024). Rather than focusing on purchase price, the total cost of ownership is now presented to potential buyers. The TCO provides a comprehensive overview of both the costs and benefits over the vehicle's lifetime.

1.3 Electric trucks in Belgium

While electric heavy-duty vehicles are considered essential for the sustainable transformation of the road transport sector, their adoption has been limited (SCANIA, 2024a; Van Apeldoorn, 2024). Despite the fact that most major truck manufacturers now offer electric models, their presence on Belgian roads remains minimal. Only 77 electric trucks were newly registered in Belgium in 2024 (De Spiegeleir, 2025). Strikingly, 76 of these registrations took place in Flanders, while just one electric truck was registered in Wallonia. This regional disparity can largely be attributed to the absence of purchase subsidies for electric trucks in Wallonia.

When powered by renewable energy sources, electric trucks can play a significant role in reducing greenhouse gas emissions (Volvo, 2024). Considering that current global emissions are approximately 50% higher than in 1990, the importance of transitioning to zero-emission vehicles can no longer be overlooked (UNDP, s.d.). Electric transport vehicles are an important component in achieving the United Nations' thirteenth Sustainable Development Goal, abbreviated as SDG, which focuses on urgent action to combat climate change. As climate change escalates, its consequences are becoming unavoidable, affecting both people and planet. Therefore the transport sector holds a crucial responsibility in trying to reduce these emissions.

1.4 Research objective

The objective of this research is to assess the economic feasibility of electric heavy-duty vehicles in Belgium. In addition, the study aims to identify and analyze the key challenges currently associated with the use of electric trucks. More broadly, the research seeks to map the total costs involved in operating an electric fleet and to compare these with the costs of conventional diesel trucks, in order to determine which fuel type offers greater economic viability.

Beyond the cost analysis, the study also considers the benefits of electric trucks in relation to their potential drawbacks and limitations. To support this, both a quantitative total cost of ownership assessment and a qualitative survey will be conducted to gather insights from professionals within the transport sector.

Furthermore, the research will examine the current state of charging infrastructure for electric trucks in Belgium and evaluate whether it is necessary to support wider development. Finally, the role of government in facilitating and accelerating this transition will be explored. Based on these combined insights, the study will provide a well-founded answer to the central research question.

What is the economic feasibility of an electric heavy-duty fleet in Belgium, and which challenges are faced during this transition?

1.5 Structure

The structure of this research is as follows: after this introduction, the existing literature in electric trucks is discussed. This is followed by a presentation of the research questions and hypotheses. Subsequently, the research methodology is outlined, serving as a foundation for the empirical results. The results section consists of both a quantitative and qualitative component. Based on these findings, a discussion addresses the research questions and hypotheses. Finally, the study concludes with a general conclusion that summarizes the findings of the research.

2 Literature review

Although electric trucks play an important role in making the road transport industry more sustainable, their adoption has faced a challenging start (SCANIA, 2024a; Van Apeldoorn, 2024). Despite the availability of electric models from most truck manufacturers, their presence on Belgian roads remains very limited. While more than 200,000 electric cars are in circulation, the national fleet of electric trucks counts less than 200. This study will explore the underlying reasons for this slow uptake.

The research begins with a review of the literature, starting with a definition of road transport, followed by a closer examination of the concept of electric trucks. The study aims to map the current infrastructure for electric trucks in Belgium, and therefore, the fourth section of the literature review will assess the present state of this infrastructure. Finally, the study will address how government measures aim to support the purchase and use of electric trucks, potentially easing their difficult introduction to the market.

2.1 Overview of road transport

Within the next five years, the transport industry must achieve a 55% reduction in emissions compared to 2005 levels, and a 94% reduction compared to 1990 levels in 2050 (European Commission, 2019; European Commission, 2021). Given that certain segments of the transport sector, for example aviation, are particularly challenging to fully decarbonize, an emphasis is being placed on the adoption of zero-emission vehicles in road transport. Therefore, this research focuses on the economic feasibility and potential challenges associated with electric trucks in Belgium.

2.1.1 Definition road transport

In this research road transport refers to the movement of goods by using trucks, which constitutes the majority of freight transport within the European Union (Reis & Macário, 2019). The success from road transport is attributed to its reliability, flexibility and ability to handle unexpected challenges during the transit while still being capable of responding to dynamic demands. Unlike other modes of transport, road transport offers door-to-door service, facilitating both the initial and final stages of multimodal transport chains. This combination of adaptability and efficiency positions road transport as a vital component of freight logistics across Europe.

2.1.2 Importance of road transport in the Belgian economy

The transportation sector acts as an engine for the Belgian economy (Verbond van Belgische Ondernemingen, 2017). One key reason for this is that Belgium acts as a major hub for European and global transportation. Belgium's role as a transportation hub is attributed to various factors, including its geographic location. Positioned at the heart of the European market and the "Blue Banana" - also known as the European megalopolis - the country benefits from proximity to key economic routes.

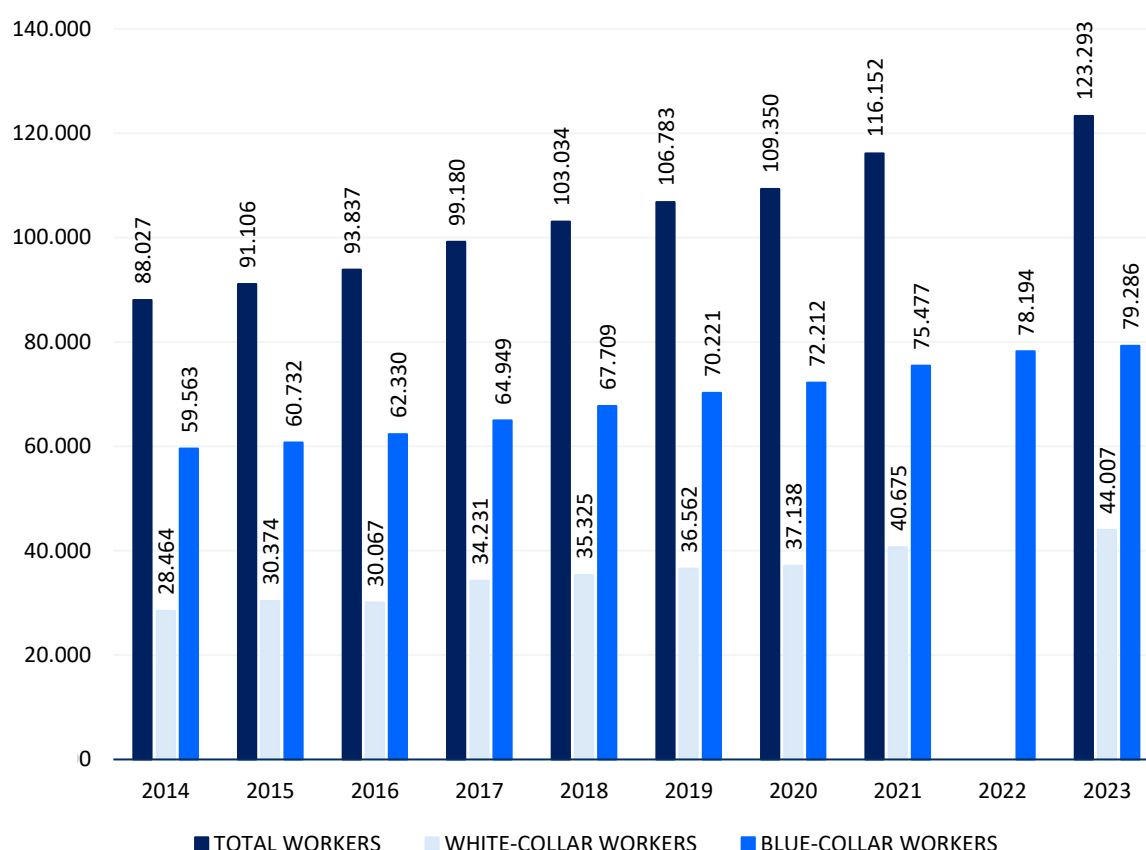
Road freight transport, carried out by trucks, emerges as the most dominant mode of goods transportation in Belgium (Mayeres, 2008; Departement Mobiliteit & Openbare Werken, 2024a). Trucks account for the largest share of freight transport in Flanders, namely 77% in 2019, far surpassing the share of inland waterways, 13%, and rail transport, 10%. This dominance of heavy-duty vehicles underscores the importance of road transport in ensuring a smooth and efficient flow of goods in and out Belgium.

The dominant role of road freight transport is also reflected in the government spending (Departement Mobiliteit & Openbare Werken, 2024a). Between 2018 and 2022, 56% of the Flemish government's transport infrastructure budget was allocated to road transport. The remaining funds were directed to inland waterways and rail

transport, respectively 42% and only 2%. The relatively low investment in rail may be explained by the fact that these figures only reflect Flemish budgets. Later in the study, the importance of government spending for the implementation of electric trucks is revisited.

Moreover, the road transport sector plays a critical role in employment, by providing jobs for a large portion of the Belgian workforce (Verbond van Belgische Ondernemingen, 2017; FEBETRA, 2024). In addition, the sector not only provides employment opportunities to Belgian residents, but also to a significant share of international workers, who made up 25.2% of the workforce in 2022 (Heinen, 2022). Recent years have seen an overall rise in employment within this sector, as illustrated in the graph below (FEBETRA, 2024).

Figure 1: Total employment road freight transport per year in Belgium¹



Source: Own processing based on data from FEBETRA (2024)

2.1.3 Comparison of traditional and alternative fuels

There are various fuel options available for trucks, in addition to traditional diesel. Alternative fuels, such as electricity, natural gas – in the forms of CNG and LNG –, hydrogen and biogas, offer companies different viable options (Verbond van Belgische Ondernemingen, 2017).

In 2023, a total of 10,058 new commercial trucks were registered in Belgium (Acea, 2024; Dejaeger, 2024). Diesel trucks accounted for 97.9% of the new truck registrations in Belgium, while electrically chargeable trucks represented 1.1%. The remaining 1% of new commercial vehicles were powered by other alternative fuels.

¹ Employment figures for white-collar workers and total workforce numbers for 2022 were not available.

The selection of the most suitable fuel depends on the specific application and type of vehicle (Verbond van Belgische Ondernemingen, 2017). In the following sections, a comparison and explication of the various fuel types is presented.

2.1.3.1 Diesel

In Flanders, 94.7% of trucks operate by using diesel as fuel (Statistiek Vlaanderen, 2024). In contrast, the share of trucks running on gasoline is minimal, accounting for only 1.6%. Given that gasoline has a limited use compared to diesel, the focus in this research is on diesel running trucks.

The primary advantage of diesel trucks is their widespread availability across countries, supported by a dense network of fuel stations (Hu et al., 2024). Additionally, these truck models benefit from decades of advanced technologic development and refinement. However, diesel trucks also have notable drawbacks. Firstly, diesel fuel prices are highly vulnerable to market fluctuations. Secondly, they are not environmentally friendly, posing significant harm to both the environment and human health due to their emissions.

2.1.3.2 Electricity

Currently, three types of electric trucks are available: hybrid electric trucks (HEV), plug-in electric trucks (PHEV) and battery electric trucks (BEV) (Volvo, 2024). Unlike HEVs and PHEVs, BEVs operate solely on electricity, as they lack both an internal combustion engine and a fuel tank (Albatayneh et al., 2023). Since this study focuses on zero-emission vehicles, the emphasis is placed on BEVs. Below is a short explanation of the disadvantages and advantages of electric trucks provided, a more detailed explanation can be found in section 2.2.

There are several disadvantages associated with electric trucks (Volvo, 2024). The purchase price of an electric truck is much higher than the purchase price of a diesel truck. A second drawback is that the charging infrastructure in Belgium is still underdeveloped (Volvo, 2024; European Commission, 2025). Additionally, load capacity may be reduced due to the weight of the batteries, and the production of these batteries has a considerable negative environmental impact. Another significant drawback is the limited driving range of electric trucks compared to those with traditional fuels.

However, electric motors in trucks also bring numerous advantages (Volvo, 2024). For instance, they do not produce CO₂ emissions, and the well-to-wheel CO₂ emissions can be nearly eliminated when renewable electricity is used. Well-to-wheel refers to all the emissions generated throughout the entire lifecycle of a fuel, from its production to its final use in the truck (Volvo, s.d.). Additionally, electric powertrains are characterized by higher efficiency and lower noise levels than diesel engines (Volvo, 2024). Moreover, electric powertrains require also 30-35% less maintenance compared to traditional trucks (Volvo, 2024; Nijenhuis, 2024).

2.1.3.3 Natural gas

There are two types of natural gas: Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) (Verbond van Belgische Ondernemingen, 2017; Volvo, 2024). Below, an explanation of both types is provided, starting with CNG. It is worth noting that, although natural gas is considered as an alternative fuel, its use would only reduce CO₂ emissions to a limited extent compared to diesel (Renault Trucks, 2024a).

2.1.3.3.1 CNG

Compressed Natural Gas, abbreviated as CNG, is an alternative fuel for trucks in Belgium and is produced by compressing gas to a pressure of approximately 200 to 250 bar (Volvo, 2024). One advantage from CNG is that it emits approximately 10% less CO₂ than diesel trucks. In contrast to the recharging infrastructure for electric

trucks, CNG refueling stations are relatively widespread. However, it is important to note that not all CNG stations are accessible for trucks.

Despite CNG being a cleaner alternative, it is still a fossil fuel and is therefore not the most environmentally friendly alternative (Volvo, 2024). Another drawback from CNG is that it has a more limited driving range compared to LNG due to its lower energy density. Due to this lower energy density, CNG is primarily used for urban and regional transport, where shorter distances are typically driven and the reduced driving range is less of a problem.

2.1.3.3.2 LNG

In addition to CNG, LNG, abbreviation for Liquefied Natural Gas, is another type of natural gas fuel (Verbond van Belgische Ondernemingen, 2017; Volvo, 2024). LNG is created by cooling natural gas to -160°C , which turns it into a liquid.

Although LNG remains a fossil fuel, the fuel emits 10-20% less CO_2 than diesel, resulting in lower carbon emissions (Volvo, 2024). Additionally, this fuel is widely available, with approximately 700 LNG refueling stations across Europe, and this number continues to grow in the future. Another big advantage from LNG is that it is more affordable than diesel.

Unlike CNG, LNG is suitable for long-haul transportation, offering a driving range of up to 1,000 kilometers (Volvo, 2024). However, despite the expanding infrastructure for LNG refueling stations, LNG's availability is not yet even widespread across all European countries. Establishing these LNG refueling stations is costly and energy-intensive. Furthermore, using LNG involves additional expenses, as it must be stored in specially insulated tanks designated for LNG purpose.

2.1.3.4 Hydrogen

Hydrogen is another potential alternative fuel (Verbond van Belgische Ondernemingen, 2017; Volvo, 2024). Currently hydrogen is still a fossil fuel because it is created by using steam methane reforming, SMR, to produce on industrial scale, if electrolysis would be used it would be a clean and carbon-free energy source (U.S. Department of Energy, s.d.; Volvo, 2024). Hydrogen can be utilized in two ways. It can either replace diesel by powering a hydrogen combustion engine (H_2 ICE), or it can be integrated in an electric vehicle via a fuel cell. In this system, hydrogen reacts with oxygen to generate electricity through an electrochemical process.

One of the main advantages of hydrogen as a fuel is its abundant presence on earth and its versatility in terms of production methods (Volvo, 2024). Additionally, using hydrogen as a fuel offers many of the same benefits as electric trucks, but without utilizing the electricity grid of a country. Lastly, the use of hydrogen can reduce the emissions from the truck.

However, there are also some notable drawbacks (Volvo, 2024). Despite its potential to cut emissions, 95% of hydrogen is currently produced from fossil fuel, which is not environmentally friendly. Furthermore, hydrogen is an expensive fuel. Refueling a truck with hydrogen costs three to four times more than refueling a diesel engine truck. Moreover, the infrastructure for hydrogen refueling stations is still limited and establishing such a network requires a large investment.

A significant drawback of hydrogen is the considerable challenge of making its production economically viable (Winckelmans, 2024). In 2024, many investors in both green and blue hydrogen either withdrew or postponed their projects. Green hydrogen refers to hydrogen produced by using renewable electricity, while blue hydrogen involves the use of natural gas for its production. The breakthrough for hydrogen - if it will happen - , will occur

much later than anticipated. The European targets for hydrogen by 2030 have become unattainable, this further delays any potential breakthrough for hydrogen as a fuel alternative. Belmans (2024) even argues that the use of hydrogen-powered vehicles is entirely energy-inefficient compared to electric vehicles.

2.1.3.5 Bio alternatives

In addition to traditional natural gas, there is also a biological alternative available, known as biogas (Verbond van Belgische Ondernemingen, 2017; Volvo, 2024). These natural biogases are categorized into two types: Bio-CNG and Bio-LNG. They are similar to traditional CNG and LNG, but derived from organic sources. Lastly, biodiesel is also an available biological alternative.

2.1.3.5.1 Bio-CNG

The main difference between traditional CNG and Bio-CNG, also known as Compressed Bio Gas (CBG), lies in the source of the fuel (Volvo, 2024). While traditional CNG is derived from fossil natural gas, Bio-CNG is produced from biomass and waste materials, such as food scraps and manure. As a result, BIO-CNG offers much lower CO₂ emissions. While traditional CNG reduces emissions by about 10% compared to diesel, Bio-CNG can lower emissions by 70% to 100%. However, a drawback of Bio-CNG is that it has a higher production cost compared to traditional CNG.

2.1.3.5.2 Bio-LNG

Similar to Bio-CNG, is Bio-LNG produced from organic waste materials (Volvo, 2024). One key advantage of Bio-LNG is its ability to reduce total CO₂ emissions even more compared to traditional LNG. Additionally, there is an abundance of raw materials available for the production of Bio-LNG, making it possible to produce the fuel locally. Like LNG, Bio-LNG is suitable for long-haul transportations. However, its production process requires more financial resources than the one of LNG, resulting in higher costs. Lastly, the availability of infrastructure for Bio-LNG is still quite limited, which hinders the use and implementation of Bio-LNG.

2.1.3.5.3 Biodiesel

Although biodiesel would reduce emissions by 75%, their adoption and development process is characterized by some obstacles (Renault Trucks, 2024b). In the first place, trucks will need to have a specially-adapted tank. A second issue is that biodiesel requires vegetable oil, and the production of this type of oil is predominantly reserved for the agri-food sector in the coming years. Because of these adoption and development difficulties bio alternatives are hard to implement.

2.1.3.6 Overview

The table below provides a schematic overview of the available fuels, their advantages and disadvantages and their CO₂ emissions. A distinction has been made between electricity produced with non-renewable energy and renewable energy.

Table 1: Overview types of fuel

		SOURCE	ADVANTAGES	DISADVANTAGES	CO2 EMISSION
FOSSIL FUELS	DIESEL	Oil	+ Relatively cheap and very accessible due to extensive network	- High CO2 impact - Not environmentally friendly	Reference point
	CNG	Natural gas	+ Better accessible than LNG	- Not for long distances	Up to 10% reduction
	LNG	Natural gas	+ Higher range than CNG	- Limited infrastructure	Up to 20% reduction
	HYDROGEN	Natural gas via steam methane reforming	+ High efficiency	- Limited infrastructure - Production is not environmentally friendly	Up to 15% reduction
	ELECTRICITY	Coal and natural gas	+ High efficiency	- Limited infrastructure - Production is not environmentally friendly	Up to 20% increase
NON FOSSIL FUELS	HYDROGEN	Sun, wind, water	+ No CO2 emissions	- Limited infrastructure - High price	No CO2 emissions
	BIO-CNG	Biomass and waste	+ More environmentally friendly than traditional CNG	- Higher production costs - Limited infrastructure	Up to 70% - 100% reduction
	BIO-LNG	Biomass and waste	+ More environmentally friendly than traditional LNG	- Higher production costs - Limited infrastructure	Up to 80% - 100% reduction
	BIO-Diesel	Vegetable oil	+ More environmentally friendly than traditional Diesel	- Needs a special tank - Necessary vegetable oil is reserved for agrifood culture	Up to 75% reduction
	ELECTRICITY	Sun, wind, water	+ No CO2 emissions	- Access to renewable energy - Limited infrastructure	No CO2 emissions

Source: Own processing based on data from Volvo (2024), U.S. Department of Energy (s.d.), Renault Trucks (2024b) and O'Connell et al. (2023)

2.2 Electric trucks

As previously mentioned, the presence of electric trucks on Belgian roads remains very limited (Acea, 2024; Dejaeger, 2024). In 2024, a total of 9,280 new trucks were registered in Belgium, 98% of which were diesel-powered, while only 1.4% were electric (Acea, 2025). Notably, this number is significantly lower than the expected range of 200 to 300 electric trucks that were anticipated to be sold in 2024 (Steel & Kurstjens, 2024). Similarly, in 2023, only 113 out of 10,058 newly registered trucks were electric (Acea, 2024; Dejaeger, 2024; Steel & Kurstjens, 2024). This represents a notable increase compared to 2022, when only 24 of the 8,566 newly registered trucks over 3.5 tons were electric. While the number of electric trucks in Belgium remains relatively small, these figures are consistent with broader European trends. It is anticipated that by 2025, 40,000 electric trucks will be operating on European roads, and this number is expected to rise to 270,000 by 2030 (Acea, 2021; Steel & Kurstjens, 2024).

2.2.1 Available brands

Belgium's truck market features a diverse range of manufacturers, each contributing to a competitive landscape (Yvens, 2024). Overall, DAF Trucks leads as the most popular brand, followed by Volvo Trucks and Mercedes-Benz, which secure strong positions in the top three. MAN and Scania occupy fourth and fifth places, while Iveco, Renault Trucks and Ford Trucks complete the top eight.

While the electric truck market in Belgium is gradually growing, sales volumes for smaller brands remain very limited (Yvens, 2024; Dejaeger, 2024). In 2023, Maxus sold three electric trucks in Belgium, while Sany and Tatra

each registered only one heavy-duty vehicle sale. All manufacturers offering battery-electric trucks collectively provide a total of 100 different models (Scania EV Academy, 2023).

2.2.2 Battery systems

Electric trucks either use LFP batteries, Lithium Iron Phosphate, or Nickel Manganese Cobalt, abbreviated as NMC, batteries (Schneider et al., 2023; Scania EV Academy, 2023). LFP batteries are primarily suitable for short-distance transport and volume-constrained operations. Additionally, LFP batteries are often considered safer, more cost-effective and more sustainable than NMC batteries (Paco, s.d.; Schneider et al., 2023). In contrast, NMC batteries are more appropriate for longer distances - between 350 and 600 km - and for weight constrained transport.

2.2.3 Charging methods

There are two possible ways to charge an electric truck, namely AC and DC charging (Engelhardt et al., 2023). DC charging, abbreviation for Direct Current charging, is a required feature in all electric trucks. A second method of charging is AC, Alternating Current charging, where the current must be converted to DC before it can be used to charge the truck. This conversion can either be done by the truck itself - and then it is called AC charging - or in the case of DC by the charging station itself. The advantage of DC charging is that it requires less time to charge. On the contrary, the charging stations are typically larger and more expensive due to the need for the conversion process to occur at the station directly.

2.2.4 Current generation of electric trucks

The current generation of electric trucks show considerable variation in terms of driving range, battery technology and charging times (Scania EV Academy, 2023). Manufacturers such as DAF, Mercedes-Benz and Renault offer models with a maximum range of up to 500 km, while MAN and Scania even provide trucks capable of reaching 600 to 800 km (Scania EV Academy, 2023; DAF, 2024; Daimler Truck AG, 2024; MAN België, 2024; SCANIA, 2024a; SCANIA, 2024c). In contrast, brands like Iveco and Renault combine higher ranges with limited payload capacity, reducing their suitability for heavy-duty transport (Transport en Milieu, 2023; Renault Trucks, 2024a). Volvo, whose models reach up to 300 km, primarily focuses on urban distribution (Scania EV Academy, 2023; AB Volvo, 2024). Ford plans to introduce its first battery-electric truck to the Belgian market in 2025 (Yvens, 2022; Roosens, 2023). A more detailed explanation of the available electric models from the top eight manufacturers can be found in appendix 1.

Charging times also differ significantly (Scania EV Academy, 2023). When using DC fast chargers, many models can be charged to 80–100% in 1.5 to 3 hours, while Scania offers full DC charging in less than 90 minutes (SCANIA, 2024c; Scania EV Academy, 2023).

Overall, the selection of a suitable electric truck is highly dependent on the intended transport application - urban, regional or international -, the required payload capacity and the availability of charging infrastructure (DAF, 2024).

2.2.5 Drivers and barriers behind electrification in freight transport

The potential of electric trucks heavily depends on the intended use of the vehicle (Liimatainen et al., 2018). Below is an explanation of the advantages and disadvantages associated with transitioning to an electric vehicle fleet.

2.2.5.1 Drivers of electrification in freight transport

One of the main drivers behind the adoption of electric vehicles is the increasing regulatory pressure to reduce emissions and to contribute to climate goals (Schneider et al., 2023; SCANIA, 2024c). By using electric vehicles, CO₂ emissions are significantly reduced, making road transport less harmful to the environment.

Another key benefit of electric trucks is the reduction in operational costs for businesses (SCANIA, 2024c; Volvo, s.d.). This is partly due to the lower cost of charging electric vehicles compared to refueling diesel trucks, as well as the reduced maintenance needs of electric vehicles. Electric trucks also have a longer lifespan, due to advanced battery technologies and less wear on braking systems thanks to regenerative braking.

Furthermore, the ownership costs of electric trucks can be lowered through tax incentives and subsidies offered during purchase and use (Scania, 2024c). In addition, there are often tax advantages associated with electrifying a fleet, as well as exemptions from tolls and environmental zone restrictions, leading to further cost reductions. This will later in the research be discussed more in detail.

Additionally, electric trucks provide direct benefits for drivers (Scania, 2024c; Volvo, s.d.). According to driver experiences, electric trucks are highly comfortable to drive, partly due to ergonomically designed cabins and smooth acceleration, as well as the rapid response of the electric drive system. Furthermore, electric vehicles are known for their quieter operation, which not only makes driving more pleasant but also improves safety. The quieter nature of electric vehicles reduces driver fatigue, thereby decreasing the likelihood of accidents.

2.2.5.2 Barriers to electrification in freight transport

Carlier (2024) researched the possible barriers of electrification in freight transport. The study, involving 19,000 respondents, identified five key barriers to purchasing electric vehicles. The number one obstacle is the lack of charging stations. On top of this obstacle, respondents have the perception that charging times for electric vehicles are too long. However, the charging time of an electric truck could be largely decreased by implementing a MCS adapter instead of only a CCS connection (Steel & Kurstjens, 2024). A simple - yet somewhat oversimplified - way to estimate the charging duration of an electric truck is to divide the total battery capacity by the charger's power output (Nijenhuis, 2022b).

Additionally, a quarter of the participants consider the range of these vehicles to be too limited (Carlier, 2024). Two other pitfalls include concerns about the high cost of battery replacement and the maintenance and repair of these vehicles.

Another barrier of electrifying a heavy-duty fleet is the high purchase cost compared to diesel trucks (Statista Research Department, 2023). The purchase price of an electric truck ranges on average between €250,000 and €350,000 (Luman, 2024). This purchase price is roughly two to three times higher than the purchase price of a diesel truck. While it is forecasted that the price of diesel trucks will increase in the future, the purchase price of electric trucks will decrease (Statista Research Department, 2023). In 2030, it is estimated that an electric truck will cost around €145,346.00 (Transport & Environment, 2021).

2.2.6 Total Cost of Ownership

As discussed above, the transition to electrifying heavy-duty vehicles comes with a high cost (Luman, 2024; Scania Belux, 2024). This makes the overall financial picture of an electric truck very important. According to the experience of truck manufacturer Scania, selling electric trucks requires a different approach compared to diesel trucks. While it is common to present only the purchase price in a diesel truck offer, this is not feasible for electric

trucks. The reason lies in their substantially higher purchase price - up to three times higher - which can deter potential buyers.

To address this, negotiations for electric trucks go beyond just the purchase price (Scania Belux, 2024). Instead, the full service cost of electric driving is presented. This includes an analysis of the total cost of ownership (TCO), which considers the vehicle's entire lifecycle costs and benefits. The TCO accounts for expenses such as the purchase price, maintenance, insurance, taxes and energy costs. On the benefit side, it includes potential subsidies, tax reductions and the vehicle's residual value. In conclusion, TCO offers an overview of the total financial costs and benefits when investing in an electric truck. Later in this research the TCO from an electric truck is compared with the one from a traditional diesel truck.

2.2.7 Market analysis

As previously mentioned, the heavy-duty vehicle industry has been tasked with a full transition from diesel engines to zero-emission models by 2050 (European Commission, 2019). In recent years, the transition has gradually been set in motion (Yvens, 2024; Dejaeger, 2024). Below, a market analysis is provided.

2.2.7.1 Market

The heavy-duty vehicle market in Belgium has experienced consistent growth in recent years, with forecasted figures indicating further expansion in the future (Acea, 2024; Dejaeger, 2024; Statista Market Insights, 2024). Looking ahead, the market is expected to grow annually by 3.57% between 2024 and 2030, reaching a total of 13,790 newly registered trucks by 2030. The market for electric trucks in Belgium is also on the rise, driven by the country's strong commitment to promoting sustainable transport solutions.

The increasing demand for trucks in Belgium is driven by a combination of market trends and external factors (Statista Market Insights, 2024). One reason for the increase in demand is the growth of e-commerce and online shopping. This has placed a bigger pressure on logistics systems, pushing businesses to seek for larger and more versatile trucks that can handle higher volumes. As a result, there is a rising need for trucks that offer better efficiency, larger payload capacities and advanced safety features. Manufacturers are trying to offer this by developing trucks that meet these customer preferences, which has resulted in a broader selection of options being offered in the market.

This trend is further supported by growing concerns over environmental sustainability, with more businesses opting for electric and hybrid trucks due to their lower emissions and reduced fuel consumption (Statista Market Insights, 2024). As sustainability and efficiency become ever more important, Belgium's truck market is expected to continue growing, with electric models playing an increasingly central role. Moreover, there is also an increase in interest towards autonomous driving and connectivity, such as real time monitoring and GPS-tracking, in trucks.

Another reason for this rise in demand is that for both truck manufacturers and suppliers Belgium is an attractive market (Statista Market Insights, 2024). On the one hand due to Belgium's well-developed infrastructure and strategic location, on the other hand because there are several production facilities from global truck manufacturers located in the country. This proximity enables manufacturers to better address the preferences of Belgian customers and facilitates easier market access.

2.2.7.2 Target group

The introduction of electric trucks to the market is unfolding gradually (Scania EV Academy, 2023; Earl et al., 2018; Dejaeger, 2024). Although the goal is to transition all trucks to zero-emission models by 2050, the rollout

is tailored to different user groups. According to internal materials provided by the Scania EV Academy (2023) each group is introduced to electric trucks at a different stage, depending on their specific needs and the feasibility of replacing their fleet.

Initially, five primary target groups are being focused on (Scania EV Academy, 2023). These include companies that operate over limited daily distances, businesses that do not require overnight stays away from their homebase, companies that follow predictable or scheduled routes, businesses whose daily mileage is within the range of a full battery charge and lastly companies that need to deliver in zero-emission zones.

An example of this could be a waste collection truck (SCANIA, 2024b). These vehicles typically operate within a limited daily distance on a well-known route and do not require overnight stays, making it feasible for them to complete their tasks without needing to recharge during their route.

In the final phase of the introduction, international transport companies are addressed (Scania EV Academy, 2023). These companies, which require long daily distances, frequent overnight stays in varying locations, or have highly irregular and unpredictable transport needs, will only transition to zero-emission vehicles once these models fully meet the operational requirements for international transports.

2.2.7.3 Competitors

Currently, the biggest competitor for electric trucks remains the traditional diesel truck (Statistiek Vlaanderen, 2024). As previously discussed, eleven brands offer electric trucks in Belgium (Yvens, 2024; Dejaeger, 2024; Scania EV Academy, 2023; DAF, 2024; AB Volvo, 2024; Daimler Truck AG, 2024; MAN België, 2024; SCANIA, 2024c; Transport en Milieu, 2023; Renault Trucks, 2024a; Roosens, 2023). Including eight established brands and three new market entrants that have made only a few sales so far. Although the sales of electric trucks in Belgium are currently still limited, the market remains competitive. Major manufacturers like DAF, Volvo, Mercedes-Benz, MAN, Scania and Iveco dominate the European market, including Belgium. These companies offer a range of electric trucks, mainly focusing on battery electric vehicles for urban and regional transportation.

2.2.7.4 Trends, developments and opportunities

The market for electric trucks is shaped by several significant trends. One notable trend is the projected annual growth of 3.57% over the coming years for the whole heavy-duty market (Statista Market Insights, 2024). This growth potential is supported by sales data from 2022 and 2023, where sales for electric trucks increased from 24 units to 113 units in Belgium (Dejaeger, 2024).

Another promising factor is the availability of government subsidies in Flanders for purchasing electric trucks (VLAIO, s.d.-a). These incentives can cover up to 35% of the net cost for small and medium-sized enterprises and up to 21% for larger businesses. This financial support is likely to stimulate further adoption, a detailed discussion will follow in section 2.5.

Moreover, the goal has been set to transition to a fleet of exclusively zero-emission trucks by 2050 (Earl et al., 2018). Achieving this target requires manufacturers to continuously invest in research and development to advance and improve technologies (SCANIA, 2024c). These ongoing efforts are essential to accelerate the transition and make zero-emission trucks a viable solution for the transportation industry.

2.2.7.5 Adoption barriers

Despite the various advantages associated with electric trucks - as discussed in 2.2.5.1 -, several adoption barriers exist (Qasim & Csaba, 2021). The most significant barriers include charging time, limited range and high initial

purchase prices. Battery electric vehicles are known for their high upfront costs, which can be a major deterrent for fleet owners (Liimatainen et al., 2018). Furthermore, the still underdeveloped charging infrastructure for electric trucks presents another challenge to the widespread adoption of these vehicles (Qasim & Csaba, 2021).

2.3 Environmental impact

It is no secret that road freight transport has a significant negative environmental impact (Earl et al., 2018; European Environment Agency, 2025). This section focuses on how electric transportation can provide a solution to this issue.

2.3.1 Environmental benefits of electric trucks

A move towards more sustainable transport is necessary to decrease the sector's effects on the environment, climate and human health (European Environment Agency, 2025). First and foremost, an electric truck does not emit harmful gases, resulting in improving air quality and reduced environmental pollution (Onnen, 2023; Van den Brink, 2023). This is because electric trucks produce minimal nitrogen oxides and particulate matter. These both have a very harmful impact on human health and could potentially lead to respiratory and cardiovascular diseases, such as asthma and cardiac arrhythmias (Krzyszowiak et al., 2016). Therefore, the reduction of these emissions by using electric trucks is very important for human health.

A second environmental benefit of electric trucks is their reduced noise pollution (Onnen, 2023; Ravi et al., 2023). Electric vehicles operate at lower sound levels, leading to a decrease in noise-related pollution (Van den Brink, 2023). Additionally, excessive noise is not only disruptive to the environment but also has a negative effect on human well-being.

Moreover, many countries have introduced environmental zones in recent years, making electric driving a strategic advantage for businesses as it allows access to zero-emission zones (Onnen, 2023; Van den Brink, 2023). This is particularly relevant for Belgium, where the Flemish government plans to strongly enforce zero-emission zones for urban logistics starting in 2025 (Departement Mobiliteit en Openbare Werken, s.d.-b). This measure aims to significantly reduce emissions in city centers and substantially lower CO₂ emissions in urban areas.

2.3.2 Comparison with alternative fuels

Traditional trucks emit large amounts of carbon dioxide, also known as CO₂ (Schouten, 2023). While CO₂ is naturally present on earth, it is also produced through the combustion of fossil fuels. For every liter of diesel not consumed, 2.6 kg of CO₂ emissions are avoided. Heavy-duty trucks account for approximately 25% of total greenhouse gas emissions from road transport.

The excessive presence of CO₂ in the atmosphere contributes to the greenhouse effect, causing a rapid rise in global temperatures (Schouten, 2023). This leads to severe climate consequences, such as extreme rainfall and prolonged droughts. To mitigate these impacts, a strong focus on alternative fuels is essential.

The table below shows the reduction in CO₂ emissions when diesel is used as a reference point. When comparing the possible reduction in CO₂ emissions, an electric or hydrogen truck is the best alternative (Volvo, 2024; Renault Trucks, 2024b). This is because when renewable energy is used for the production of hydrogen or electricity no CO₂ emissions are produced. BIO-CNG and BIO-LNG also have a large reduction in emissions, but their implementation is more limited as mentioned earlier.

Table 2: Comparison CO₂ emissions

		SOURCE	CO ₂ EMISSION
FOSSIL FUELS	DIESEL	Oil	Reference point
	CNG	Natural gas	Up to 10% reduction
	LNG	Natural gas	Up to 20% reduction
	HYDROGEN	Natural gas via steam methane reforming	Up to 15% reduction
	ELECTRICITY	Coal and natural gas	Up to 20% increase
NON FOSSIL FUELS	HYDROGEN	Sun, wind, water	No CO ₂ emissions
	BIO-CNG	Biomass and waste	Up to 70% - 100% reduction
	BIO-LNG	Biomass and waste	Up to 80% - 100% reduction
	BIO-Diesel	Vegetable oil	Up to 75% reduction
	ELECTRICITY	Sun, wind, water	No CO ₂ emissions

Source: Own processing based on data from Volvo (2024), U.S. Department of Energy (s.d.), Renault Trucks (2024b) and O'Connell et al. (2023)

2.4 Infrastructure for electric trucks

This section provides a brief description of the current infrastructure for electric trucks in Belgium. First, an overview is presented of the current state of the infrastructure, followed by an analysis of the investment costs. Lastly, the challenges associated with infrastructure for electric trucks are examined.

2.4.1 Current state: number of charging stations and geographic distribution

At the beginning of 2025, Belgium had a total of 76,819 charging points for electric vehicles, of which 72,193 were AC chargers and 4,626 were DC chargers (European Commission, 2025). However, not all of these are suitable for charging electric trucks. Table 3 provides an overview of all types and amounts of charging points in Belgium.

Table 3: Charging points Belgium

Type of charging point	Amount of charging points in Belgium
Slow AC ($P < 7.4$ kW)	1,702
Medium Speed AC ($7.4 \text{ kW} \leq P \leq 22$ kW)	70,009
Fast AC ($P > 22$ kW)	482
Slow DC ($P < 50$ kW)	229
Fast DC ($50 \text{ kW} \leq P \leq 150$ kW)	1,153
Level 1 Ultra-Fast DC ($150 \text{ kW} \leq P \leq 350$ kW)	2,732
Level 2 Ultra-Fast DC ($P \geq 350$ kW)	512

Source: Own processing based on European Commission (2025)

The majority of charging points in Belgium, specifically 71,711 chargers, have a maximum capacity of 22 kW, which is insufficient for charging an electric truck (European Commission, 2025; Chargeguru, 2022; Nijenhuis, 2022b). While it is theoretically possible to charge a truck at these charging points, it is practically unfeasible due to the extremely long charging time. When considering that the average battery capacity of electric trucks ranges between 200 and 540 kWh, the charging process at these charging capacity could take anywhere from half a day to a full day. This clearly demonstrates that such charging capacity is not sufficient for electric trucks or usable for overnight charging.

Across Europe, approximately 160 charging stations are specifically designed for electric trucks (IEA, 2024). However, in Belgium, there are still relatively few charging points specifically developed for trucks (Steel & Kurstjens, 2024). This is due to the significantly larger space requirements for truck charging compared to passenger vehicles.

In June 2024, Belgium's first public charging hub for electric heavy-duty vehicles became operational at the Port of Antwerp-Bruges at the Ketenis truck parking (Port of Antwerp Bruges, 2024; Steel & Kurstjens, 2024). This charging point is operated by Milence, a joint venture between Daimler Truck, Traton Group and Volvo Group. These are Combined Charging System (CSS) chargers, which supply twenty charging points, each capable of delivering up to 400 kW.

The charging hub is equipped with various services, including fences, access control, lighting, security cameras, Wi-Fi and sanitary facilities, ensuring both convenience and safety for truck drivers during charging (Port of Antwerp Bruges, 2024).

The opening of Belgium's first dedicated charging station for electric trucks marked the beginning of a broader rollout of charging infrastructure, covering in total around 30 projects (Steel & Kurstjens, 2024). Milence aims to expand its charging network by establishing an additional station at Goordijk, on the opposite side of the Schelde from its existing location at the Ketenis parking, as well as a new charging station at Volvo Group in Ghent in 2025.

Furthermore, Fastned is expanding its charging network for heavy-duty vehicles across Belgium (Steel & Kurstjens, 2024). In February 2025, the company opened its first two locations in Peutie and plans to add new stations in Walshoutem and Gentbrugge in the near future (Kurstjens, 2025; Fastned, 2025). These charging points have a capacity of 400 kilowatt.

Additionally, G&V Energy Group intends to convert sixteen of its 35 truck fueling stations into electric charging stations by late 2025 or early 2026 (Steel & Kurstjens, 2024). Lastly, Group Aers will expand charging infrastructure for heavy trucks in the Zeebrugge region. By 2026, these efforts are expected to result in approximately 30 public charging hubs for electric trucks across Belgium. The location of most of these 30 public charging points can be consulted in Figure 2.

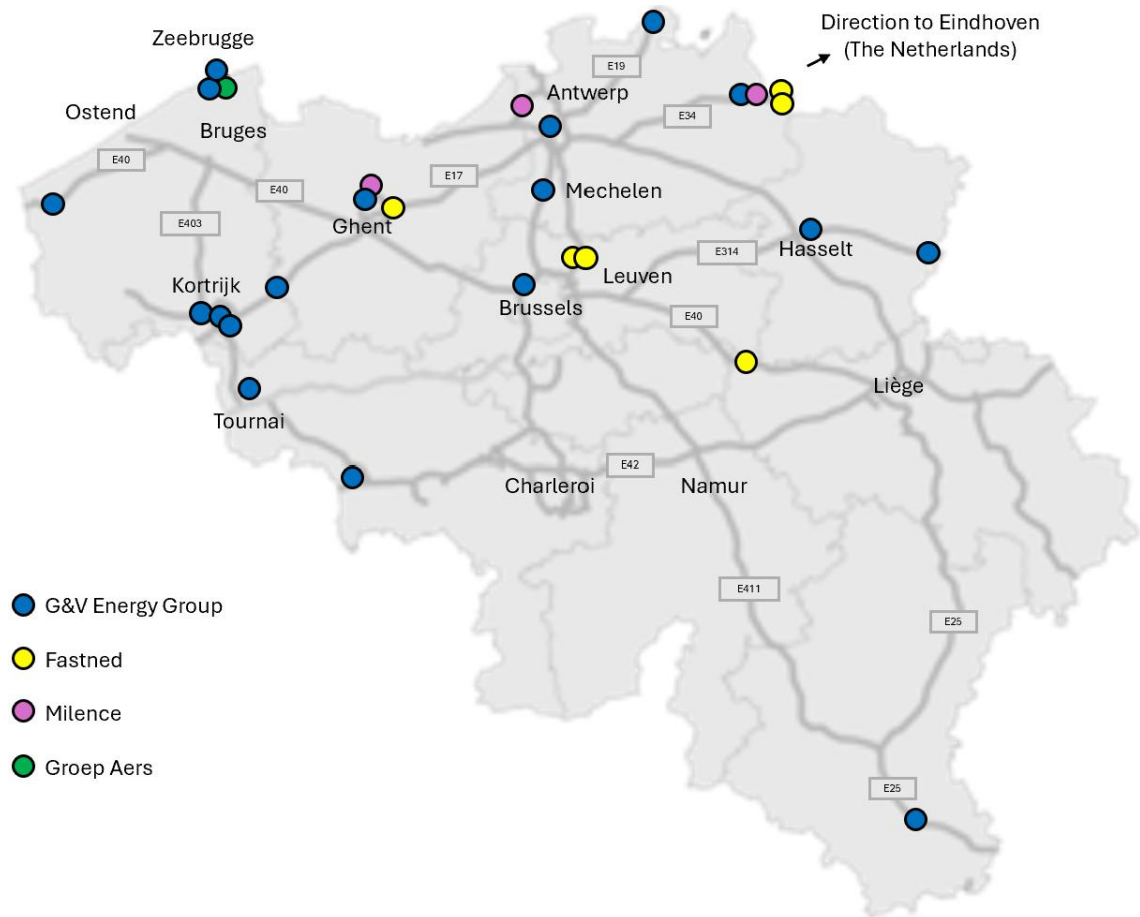
A notable aspect of the map is the limited number of planned charging stations in Wallonia and the province of Limburg. In Wallonia, this shortage is largely due to inadequate power connections in remote areas, making grid upgrades costly (Steel & Kurstjens, 2024; Deweer, 2023; EV Belgium, 2024). The research by Steel and Kurstjens (2024), based on insights from companies within the sector, demonstrates that several infrastructure projects have already been scaled down or cancelled due to insufficient grid connection capacity and the high costs associated with upgrading it.

Neighboring countries such as the Netherlands and Germany are facing challenges related to grid saturation (Steel & Kurstjens, 2024). Preventing such issues is a key priority, and Fluvius, Sibelga and Elia, Flemish, Brussels and Walloon grid operators, are planning large investments to do so (Bollen & Matheys, 2023; Sibelga, s.d.; Elia, s.d.). These investments will be discussed further in section 2.4.2.

Secondly, Limburg, and particularly along the North-South connection, also requires further expansion (Steel & Kurstjens, 2024). Strengthening the electricity grid is also essential in this province before additional charging stations can be installed. Potential solutions include battery storage systems to manage energy reserves or the local storage of solar and wind power. In this regard, Christophe Degrez, co-founder of energy company Bnewable and former CEO of Eneco Belgium, states that the company is planning large-scale battery projects, with a total capacity exceeding 125 megawatt-hours, at public charging stations designed for heavy-duty transport.

The advantage of integrating batteries at charging stations is twofold (Steel & Kurstjens, 2024). First, they help bridge the initial phase when occupancy rates are still uncertain. Secondly, they provide crucial support during peak demand periods, ensuring a more reliable and efficient energy supply.

Figure 2: Future mega charging points for electric trucks in Belgium



Source: Own processing based on data from Steel & Kurstjens (2024), Kurstjens (2025) and Fastned (2025)

There is also a distinction between a CCS (Combined Charging System) and an MCS (Megawatt Charging System) connection (Steel & Kurstjens, 2024). The electric trucks currently in operation are equipped with a CCS connection, which is the same type used for electric passenger vehicles and has a maximum charging capacity of 400 kilowatts. However, the latest generation of electric trucks is being designed with both CCS and MCS connections. The MCS system enables charging at power levels of up to 1,000 kilowatts or even higher.

The charging stations operated by G&V Energy Group will include CCS connections with a capacity of up to 400 kilowatts, as well as MCS connections ranging from 600 to 800 kilowatts (Steel & Kurstjens, 2024). Fastned is also investing in this development by installing an additional medium-voltage cabin to support higher-powered chargers. Meanwhile, since February 2025, Milence has installed two MCS charging points in Antwerp, capable of delivering up to 1,440 kilowatts (Kurstjens, 2025).

This advancement significantly reduces the charging time for electric trucks - by up to 90% - resulting in a full charge in just 30 minutes (Kurstjens, 2025). However, it is important to note that, as of now, no electric truck is capable of utilizing this maximum charging capacity yet as the battery's ability to handle such a charge depends on factors like its temperature and technical characteristics (Kim et al., 2025).

2.4.2 Cost of charging infrastructure and investment needs

The installation of charging infrastructure for electric trucks is also associated with high costs (Nijenhuis, 2024). Based on Nijenhuis (2024) the cost of installing the charging system ranges between 300 and 550 euros per kilowatt. For example, a 50-kilowatt charging point would result in an investment cost between 15,000 and 27,500 euros. Additionally, the charging system requires maintenance, with a repair and maintenance contract for electric truck charging stations this is an annual cost of 1.5% of the investment amount.

However, this is not the end of the investment, the connection to the energy grid often needs to be upgraded (Nijenhuis, 2024). This requires an estimated cost of about 250 euros per installed kilowatt of transformer capacity. When a charging station and transformer needs to be installed, the cost can quickly exceed 150,000 euros.

An example of a business project in Belgium is the development of the charging station at Van Moer Logistics in 2025 (Goyvaerts, 2024; van Stijn, 2024; Kurstjens, 2025). The company will initially invest 1.2 million euros to install a portion of the charging infrastructure, which includes six public fast chargers and 30 regular private chargers. The public chargers will have a capacity of 400kW, while the private chargers will offer 50kW. Over time, the station will be gradually expanded to include the full complement of six public fast chargers and 30 private chargers, allowing the total investment to be spread out across different phases of development.

Milence plans to build a network of 300 charging stations specifically for trucks across Europe by 2027 (Steel & Kurstjens, 2024). These 300 stations will feature 1,700 charging points, with a total investment cost of 500 million euros. The in Waregem based operator of truck fueling stations, G&V Energy Group, estimates an investment of 15 million euros for transforming 16 of its stations into electric charging locations.

Another investment that will have to be done, is on the Belgian electricity grid (Steel & Kurstjens, 2024). It is expected that the use of electric trucks will lead to an annual increase in electricity consumption by 1-3% (Liimatainen et al., 2018). This further emphasizes the significant impact of electric trucks on the local electricity grid. To prevent grid saturation issues – as seen in the Netherlands and Germany – Fluvius is making a major investment of 11 billion euros between 2024 and 2033 (Bollen & Matheys, 2023; Steel & Kurstjens, 2024).

2.5 Government policies and subsidies

The transition to electric vehicles is hindered by factors such as the high purchase price of electric trucks (Luman, 2024). To facilitate this process, a variety of subsidies and financial incentives are available (SCANIA, 2024c).

2.5.1 Subsidies and financial incentives for electric trucks

In Flanders, companies can apply for a subsidy to support the purchase of an electric truck (SCANIA, 2024c; VLAIO, s.d.-a; International Council on Clean Transportation, 2024). This incentive helps reducing the high initial investment cost and can be requested for a maximum of two trucks per company. In Wallonia and Brussels, there are no purchase subsidies, primarily due to the high costs associated with such programs for the government and the limited budgets available (D. De Braekeleer, Regional sales manager at Scania Brussel, personal communication, 30 April 2025; Philippe, 2024).

The subsidy in Flanders is only available for businesses acquiring a new, fully electric truck weighing more than 3.5 tons, with a maximum investment cost of €400,000 (VLAIO, s.d.-a). The financial incentive covers 35.00% of the cost for small and medium-sized enterprises and 21% for large enterprises. However, it only applies to the purchase of the truck itself and does not include costs related to the superstructure of the truck.

Driving electric trucks is often accompanied by the possibility of obtaining tax benefits (SCANIA, 2024c). Additionally, it can lead to exemptions from kilometer charges, road tolls and environmental zones (VLAIO, 2025a; SCANIA, 2024c). In Flanders and Brussels, electric trucks are exempt from the kilometer charge (Viapass, 2025). In Wallonia, however, this benefit does not exist, and electric trucks are subject to a kilometer charge of €0.191 excluding VAT.

2.5.2 Initiatives and policies for infrastructure development

In 2024 nineteen projects aimed at expanding charging infrastructure for heavy-duty trucks received support from the Flemish government (Departement Mobiliteit & Openbare Werken, 2024b). It was possible in 2024 to apply for subsidies for the installation of charging stations for trucks (Vlaams Netwerk van Ondernemingen, 2024). Depending on the type of project - standard, software-based or innovative - a subsidy of 20% or 40% was granted, with a funding cap ranging from €25,000 to €250,000.

Since 2025, the rules have changed, but it is still possible to obtain tax benefits and subsidies for the installation of charging stations for trucks (VLAIO, 2025b). On the one hand, there is the investment deduction, this tax benefit allows companies to deduct part of the acquisition cost of the installation from their taxable profit. There are two types of deductions: first, the basic deduction of 10%, which is available to only small companies. Second, there is an increased thematic deduction, which allows sole proprietorships and small companies to deduct 40%, while large companies can deduct 30%. On the other hand, the Ecology Premium+ is available, providing subsidies of 30% for SMEs and 10% for large enterprises. The investment deduction and the Ecology Premium+ cannot be combined.

Moreover, the costs associated with installing charging stations remain tax-deductible in Flanders (Departement Mobiliteit en Openbare Werken, s.d.-a). From September 2021 through December 2022, these expenses were 200% deductible, decreasing to 150% between January 2023 and August 2024. Since then, such costs have been deductible at a rate of 100%.

In Brussels in 2025 a 24% investment deduction applies for the installation of non-public charging infrastructure (Leefmilieu Brussel, 2023). This rate will decline to 18.5% in 2026 and to 13.5% in 2027. The same 24% investment deduction is applicable in Wallonia but no other direct regional subsidies are available (Beborne, s.d.).

3 Research question and hypotheses

In this section, the research question and hypotheses are presented. This research consists of multiple sub-research questions and hypotheses.

3.1 Research question

The primary objective of this research is to assess the feasibility of electric heavy-duty vehicles in Belgium. This research is structured around two key dimensions: first, an evaluation of the economic feasibility of an electric fleet, and second, an analysis of the challenges associated with the transition to electric heavy-duty transport. The central research question is:

What is the economic feasibility of an electric heavy-duty fleet in Belgium, and which challenges are faced during this transition?

To address the main research question, several sub-research questions have been formulated. Each sub-question focuses on a specific aspect that contributes to the understanding of the feasibility of driving an electric truck in Belgium.

The first sub-question focuses on cost analysis. Specifically, the aim of the sub-research question is to compare the total cost of ownership (TCO) of electric trucks with the TCO of traditional diesel-powered heavy-duty vehicles. This comparison will provide insights into the financial implications of adopting electric trucks in terms of purchase costs, operational expenses, maintenance and potential savings over the vehicle's lifespan.

Sub-research question 1: *How does **the total cost of ownership (TCO)** of an electric truck differ from that of a diesel truck?*

The second sub-question examines the market dynamics and adoption process of electric trucks. It investigates the factors that either facilitate or hinder the transition to an electric fleet, considering variables such as technological readiness and operational constraints.

Sub-research question 2: *What **factors facilitate or hinder** the transition to electric trucks for Belgian companies?*

The third sub-question explores the current state of the charging infrastructure in Belgium. This analysis will assess whether the existing infrastructure is sufficiently developed to support a large-scale transition to zero-emission heavy-duty transport and identifies the necessary investments required if the infrastructure isn't sufficiently developed.

Sub-research question 3: *How well-prepared is the current charging **infrastructure** in Belgium, and what investments are needed?*

Finally, the fourth sub-question investigates the role of government policies in accelerating the adoption of electric trucks. It aims to identify which policy measures, financial incentives or subsidies could effectively support transport companies in making the transition to electric vehicles.

Sub-research question 4: *What **government measures** or subsidies could accelerate the adoption process of electric trucks?*

By addressing these research questions, this study seeks to provide a comprehensive understanding of the economic and practical feasibility of electric heavy-duty vehicles in Belgium, while also identifying the key obstacles and potential policy interventions necessary for a successful transition.

3.2 Hypotheses

In this section of the paper, the hypotheses of this research are discussed. To determine the economic feasibility and challenges of electric trucks in Belgium, three hypotheses are drawn up.

The first hypothesis will investigate the TCO of an electric truck. Recent literature indicates that electric trucks are increasingly able to compete with diesel trucks, but it still remains a question if there is a break-even point (Kerkhofs, 2024; Danielis et al., 2025). Therefore, this hypothesis will examine whether electric and heavy-duty vehicles have already reached a break-even point in terms of total cost of ownership or if a positive difference for electric trucks has already emerged. And if not, when and how it could be achieved.

Hypothesis 1: *The total cost of ownership (TCO) of electric trucks is lower than that of diesel trucks over a five to ten year period.*

The second hypothesis explores the structural barriers that may hinder the transition to electric trucks. While technological advancements, such as an increase in driving range and cost reductions have made electric heavy-duty vehicles more competitive, practical challenges remain (Volvo, 2024; European Commission, 2025; Carrier, 2024). Among these, the availability and accessibility of charging infrastructure plays a crucial role. If charging stations are insufficient or poorly distributed, companies may be reluctant to invest in electric fleets despite their long-term benefits (Steel & Kurstjens, 2024; Schneider et al., 2023; SCANIA, 2024c; Volvo, s.d.). This hypothesis will examine whether limited charging infrastructure is the primary structural barrier preventing companies in Belgium from transitioning to electric trucks and how this challenge might be addressed.

Hypothesis 2: *Limited charging infrastructure is the primary structural barrier preventing companies from transitioning to electric trucks in Belgium.*

The third and last hypothesis focuses on the role of government intervention in accelerating the adoption process of electric trucks in Belgium, because the national fleet is still limited (Van Apeldoorn, 2024). Many countries, Belgium being one of them, have introduced financial incentives, such as subsidies and tax benefits, to encourage business to transition to electric vehicles (SCANIA, 2024c; VLAIO, s.d.-a; International Council on Clean Transportation, 2024). These measures can significantly reduce the purchase and operational costs of electric trucks, and thereby improve their overall cost-effectiveness. However, the extent of their impact still remains a question. Therefore, this hypothesis will investigate whether government support has a substantial influence on the adoption of electric trucks and if these policies are decisive factor in companies' investment decisions.

Hypothesis 3: *Government support (for example subsidies or tax incentives) is essential for the adoption of electric trucks.*

4 Methodology

In this part of the research the methodology is presented. The methodology is the framework that guides the research.

4.1 Data collection

This research utilizes multiple data sources to enhance its credibility. Secondary data - information previously collected by institutions or individuals - is used for the quantitative analysis (Wagh, 2025). Data for the TCO calculations is collected from academic literature, industry reports, manufacturer websites and government sources. These sources provide insights into various cost components, including purchase price, maintenance, energy consumption, subsidies, insurance and residual value (Scania Belux, 2024). To ensure the reliability of the data obtained from online sources, a survey is conducted among Belgian companies that operate at least one truck, gathering insights into their experiences and cost structures.

4.2 Method of analysis

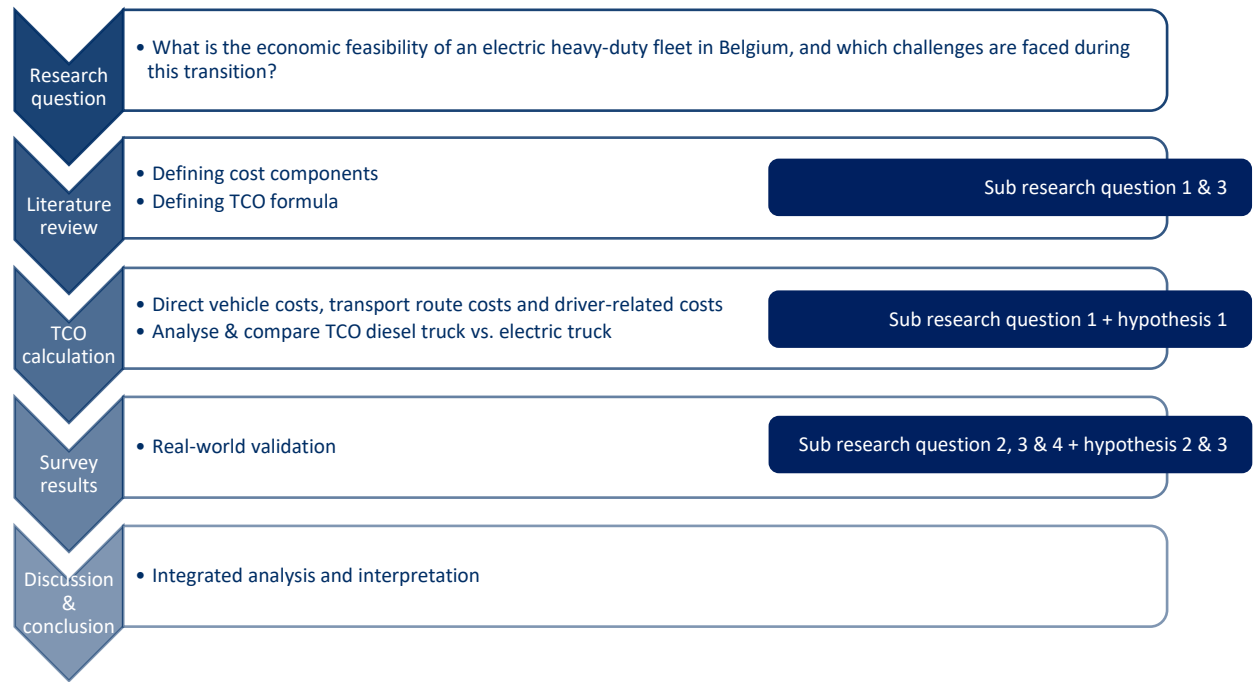
To address the research question, a mixed-method approach is utilized, combining both quantitative and qualitative research methods (Wagh, 2025). The research process begins with a literature review to identify and define the key cost components and to construct the TCO formula. The insights from this phase contribute to answering sub-research questions 1 and 3.

In the second phase, a TCO calculation is conducted. This enables a direct comparison between electric and diesel trucks based on clearly defined cost categories. The outcome of this analysis provides a basis to answer sub-research question 1 and to test hypothesis 1, leading to either accepting or rejecting it.

Next, a survey is distributed among professionals in the sector to gather insights into real-world experiences and perceptions. These qualitative results contribute to answering sub-research questions 2, 3 and 4 and hypotheses 2 and 3.

Finally, all findings are brought together in an integrated discussion and conclusion, where the results from both the quantitative and qualitative phases are combined to formulate a comprehensive answer to the main research question.

Figure 3: Description and overview steps research process



4.3 Calculation TCO

The total cost of ownership formula is based on both academic literature and manufacturer data, providing a realistic and well-supported framework.

As mentioned before, when selling electric trucks, stating the purchase price will not be sufficient, as it is significantly higher than the one of diesel trucks (Scania Belux, 2024). Instead, the Total Cost of Ownership (TCO) is emphasized. This cost analysis considers the entire operational lifecycle costs, including factors such as purchase price, maintenance costs and insurance costs (Scania Belux, 2024; Sternad, 2019; Danielis et al., 2025). The total cost (TC) of operating a heavy-duty vehicle over a one year period can be calculated via:

$$TC = C_{dep} + C_{fuel} + C_{main} + C_{ins} + C_{reg} + C_{toll} + C_{labor}$$

Where:

- C_{dep} represents the annual depreciation costs
- C_{fuel} represents the annual fuel or energy costs
- C_{main} represents the annual maintenance costs
- C_{ins} represents the annual insurance costs
- C_{reg} represents the registration costs
- C_{toll} represents the annual toll costs
- C_{labor} represents the annual labor costs of the driver

This research identifies three types of direct costs: costs related to the vehicle, costs related to the transport route and costs related to the driver (Sternad, 2019). Indirect costs are not included, as they are linked to the company itself rather than the operation of an electric or diesel truck.

4.3.1 Direct costs related to the vehicle

Direct costs related to the vehicle can be subdivided in five categories of costs: depreciation cost, fuel or energy cost, maintenance cost, insurance costs and lastly the registration costs (Scania Belux, 2024; Sternad, 2019; Danielis et al., 2025).

4.3.1.1 Depreciation costs

First of all, the annual depreciation cost. The basis of the depreciation is the purchase price of the vehicle (Sternad, 2019). Research by Sternad (2019) suggests a depreciation period of seven years. However, in Belgium, due to strict environmental regulations and the intensive use of trucks, a depreciation period of four years is more commonly applied for tractor units and five years for trailers (De Spiegeleir, 2023; Taxwin, 2021). For this study, a straight-line depreciation over a period of five years is chosen for diesel trucks and a straight-line depreciation period of seven years is chosen for electric trucks. This choice is made because electric trucks retain a higher residual value compared to diesel trucks, as their batteries depreciate by only 5% per year (Sturgeon et al., 2022). The resale value of a truck is between 20 and 35% of its purchase price (Craglia, 2022). To ensure a cautious approach, following the principle of overestimating costs and underestimating revenues, the lower bound of 20% is used in this research. The formula for the annual depreciation cost is (Sternad, 2019; Volvo, 2025):

$$C_{dep} = \frac{\text{Purchase value} - \text{Rest value}}{\text{Depreciation period}}$$

4.3.1.2 Fuel or energy costs

Secondly, a closer look will be taken at the annual fuel or energy costs. The average fuel cost for diesel trucks is calculated first. The average diesel pump price for professional road transport in 2025 is €1.4731 per liter VAT excluded (Statbel, 2025). However, the maximum excise duty refund rate for fuel at the pump, applicable from January 1, 2025, must also be considered (Rekenhof, 2024). For professional diesel, this rate is set at €203.0665 per 1,000 liters in 2025, resulting in an adjusted average diesel fuel price of €1.2700 per liter. On average, a diesel truck consumes one liter of fuel per four kilometers, which corresponds to 25 liters per 100 kilometers (Mobilyze, 2023). Additionally, the cost of AdBlue must be considered (Sternad, 2019; Jansen, s.d.). The average price is €0.60 per liter excluding VAT, and a truck consumes approximately 1.5 liters per 100 kilometers. This brings the total fuel cost for diesel trucks to €1.2790 per liter.

A comparable electric truck typically uses 1.5 kWh of energy for every kilometer driven (Mobilyze, 2023). Charging an electric truck with purchased electricity at the company's own site costs on average €0.20 per kWh. Fast charging is more expensive: at Milence, the rate is €0.399 per kWh, excluding VAT, plus an additional €2 per charging session (Steel & Kurstjens, 2024). Competitor Fastned charges €0.483 per kWh.

The formula for calculating the annual fuel or energy cost is (Sternad, 2019):

$$C_{fuel} = \frac{\text{Fuel consumption}}{100 \text{ kilometer}} * \text{fuel price} * \text{annual kilometers}$$

4.3.1.3 Maintenance costs

Maintaining and repairing a heavy-duty vehicle also is a direct cost that needs to be accounted for (Sternad, 2019). A BEV is characterized by lower maintenance costs than a traditional heavy-duty vehicle (Cunanan, 2021). Research from Kleiner and Friedrich (2017) indicates that maintenance and repair costs for a diesel-powered tractor-trailer in long-haul operations amount to €0.147 per kilometer. For trucks with an electric powertrain, these costs decrease to €0.098 per kilometer. The annual maintenance cost can be calculated as follows (Sternad, 2019):

$$C_{main} = \text{Maintenance cost per driven kilometer} * \text{annual kilometers}$$

4.3.1.4 Insurance costs

Research from Burnham et al (2021) and Murray & Glidewell (2019) assume that the insurance cost of a heavy-duty vehicle is independent of the powertrain from the vehicle. Their research concluded an insurance cost of €0.049 per driven kilometer. The formula for the calculation of the annual insurance cost is (Sternad, 2019):

$$C_{ins} = \text{Insurance cost per driven kilometer} * \text{annual kilometers}$$

4.3.1.5 Registration fee

In Belgium, this cost is equal to zero, as trucks are exempt from paying a registration fee (Vlaanderen, s.d.-a; Vlaanderen, s.d.-b). The registration fee in Belgium is called *belasting op de inverkeerstelling*, abbreviated as BIV.

4.3.2 Direct costs related to the transport route

The direct costs of the transport route for diesel heavy-duty vehicles are estimated at €11,960.00 in road tolls (Sturgeon et al., 2022). Starting in 2023, the European Union introduced regulations offering the advantage that zero-emission trucks are only required to pay 50% of the tolls. For electric trucks, this results in an annual cost of €5,980.00.

A truck operating in the European transport sector typically covers an annual distance between 100,000 and 150,000 kilometers (Ermsers, 2024). Considering the principle of overestimating costs and underestimating revenues, this equates to a toll cost of €0.1196 per kilometer for diesel vehicles and €0.0598 per kilometer for electric vehicles. The formula for calculating toll costs can be described as follows (Sternad, 2019):

$$C_{toll} = \text{Toll costs per driven kilometer and fuel type} * \text{annual kilometers}$$

4.3.3 Direct costs related to the driver

The last type of direct costs in this research are the costs related to the driver (Sternad, 2019). A heavy truck driver in Belgium earns on average 25 euro per hour (Economic Research Institute, 2025). The average truck speed in Belgium is 80.02 km/h (Trotta, 2016; Nijenhuis, 2022a). However, due to significant congestion issues faced by drivers and obligated rest periods, this speed is adjusted downward by five km/h, resulting in an average speed of 75.02 km/h (Verbond van Belgische Ondernemingen, 2017; European Commission, s.d.).

Given that a truck covers an average distance of 565 kilometers per day, this corresponds to a driving time of 7.53 hours (Nijenhuis, 2022a). However, as European regulations mandate a 45-minute break after four and a half hours of driving, the total working time amounts to 8.28 hours (European Commission, s.d.). Consequently,

the average labor cost per kilometer is €0.367. However, this is only the salary costs, following the research of Sternad (2019) a variable cost of €0.125 per kilometer should also be accounted for. This way not only the salary cost is included, but also other costs such as education expenses and travel expenses. The formula to calculate the labor cost can be defined as:

$$C_{labor} = \text{Labor cost per driven kilometer} * \text{annual kilometers}$$

4.4 Validity and reliability

To ensure the validity and reliability of this research a couple measures are taken. First of all, data will only be sourced from reliable and up-to-date references. Due to the nature of this research and the rapid advancements in technology and innovations within the electric truck industry, it is essential to use recent sources. Relying on older sources may quickly result in outdated data. Furthermore, the quantitative and qualitative aspects of the study are compared to assess whether the findings from the literature align with real-world experiences.

Additionally, the survey aims to achieve a representative sample. To ensure this, the goal is to have at least 50 to 100 Belgian companies complete the survey, providing a well-rounded and reliable perspective on the real-world situation. Moreover, industry experts can often provide valuable insights that clarify key issues and introduce new perspectives, further enhancing the research.

Lastly, the TCO model is based on existing literature and input from manufacturers. To ensure its accuracy, the model is benchmarked against existing TCO calculations, validating the research findings.

4.5 Scientific integrity

I acknowledge the use of AI tools, ChatGPT (<https://chat.openai.com/>) to refine the academic language and accuracy of my own work. The output was modified further to better represent my own tone and style of writing. In addition, the AI tool was used to reflect on the results analysis and to have the TCO analysis assessed. This output was critically used.

5 Empirical results

In this part of the research the results are discussed. First the quantitative analysis is explained and second the qualitative analysis.

5.1 Quantitative analysis

For the quantitative analysis, a TCO analysis is conducted for both a traditional diesel truck and an electric truck. This enables a comparison of the total cost of ownership between the two vehicle types.

5.1.1 TCO Traditional diesel heavy-duty vehicle

The total cost of ownership is calculated by accounting for various cost components, including depreciation, fuel, maintenance, insurance, toll and labor costs.

5.1.1.1 Depreciation cost

This section presents the depreciation cost of a diesel truck as part of the overall cost analysis. The annual depreciation cost is calculated as the difference between the initial purchase price and the residual value, divided by the depreciation period (Sternad, 2019; Volvo, 2025). In this research a straight-line depreciation method of five years is applied (De Spiegeleir, 2023; Taxwin, 2021).

To calculate the annual depreciation, the initial purchase price of diesel trucks was first determined. The analysis considers three moments in time to reflect changes in the truck's purchase value over the years 2020, 2025 and 2030. In 2020, the purchase price of a diesel truck was on average €145,484.00, and its residual value was calculated at 20% of the purchase price, amounting to €21,096.80 (Transport & Environment, 2021; Craglia, 2022). With a depreciation period of 5 years, the annual depreciation cost for 2020 was €16,877.44.

In 2025, the purchase price of a truck increased to €109,159.00 and the residual value to €21,831.80 (Transport & Environment, 2021; Craglia, 2022). Consequently, the depreciation cost for 2025 is €17,465.44. By 2030 it is expected that the purchase value will further increase to €115,252.00, with the residual value rising to €23,050.40 and the depreciation cost for 2030 is €18,440.32.

Table 4: Depreciation cost diesel truck

	Purchase price	Residual value	Depreciation cost
2020	€105,484.00	€21,096.80	€16,877.44
2025	€109,159.00	€21,831.80	€17,465.44
2030	€115,252.00	€23,050.40	€18,440.32

Source: Own processing based on Sternad (2019), Volvo (2025), De Spiegeleir (2023), Taxwin (2021), Transport & Environment (2021) & Craglia (2022)

5.1.1.2 Fuel cost

The second cost component in the TCO-analysis is fuel expenditure (Sternad, 2019). In 2020, the average price of professional diesel in Belgium was €1.13 per liter, excluding VAT (Statbel, 2025). Considering the partial refund of excise duties - €203.07 per 1,000 liters of diesel - and the additional cost of AdBlue - €0.01 per liter diesel -, the effective fuel cost in 2020 was €0.892 per liter (Rekenhof, 2024; Sternad, 2019; Jansen, s.d.).

The diesel price for 2025 is calculated using the same methodology and results in a cost of €1.279 per liter (Statbel, 2025; Rekenhof, 2024; Sternad, 2019; Jansen, s.d.). The diesel price for 2030 is not yet known, however, forecasts suggest three possible scenarios (Van Lindt, 2024). In a careful scenario, prices are expected to rise by €0.12 per liter. A neutral scenario anticipates an increase of €0.50 per liter, while a worst-case scenario projects a rise of up to €0.70 per liter. These large increases are primarily attributed to fuel taxes. For this analysis, the neutral scenario is applied in 2030.

Assuming an average annual driving distance of 100,000 kilometers and a fuel consumption of 25 liters per 100 kilometers, these fuel prices translate into a yearly fuel cost of approximately €22,297.11 in 2020, €31,975.00 in 2025 and €44,475.00 in 2030 (Ermers, 2024; Mobilyze, 2023).

Table 5: Fuel cost diesel truck

	Fuel price per liter	Annual fuel cost
2020	€0.892	€22,297.11
2025	€1.279	€31,975.00
2030	€1.779	€44,475.00

Source: Own processing based on Sternad (2019), Statbel (2025), Rekenhof (2024), Sternad (2019), Jansen (s.d.), Ermers (2024) & Mobilyze (2023)

5.1.1.3 Maintenance cost

A third cost component in the total cost of ownership analysis is the maintenance cost (Sternad, 2019). In 2017, the maintenance cost for diesel trucks was estimated at €0.147 per kilometer (Kleiner & Friedrich, 2017). Adjusted for inflation, this corresponds to a cost of approximately €15,279.43 in 2020. By 2025, this figure rises to €19,095.79 and the projected cost for 2030 is estimated at €21,281.98.

Table 6: Maintenance cost diesel truck

	Maintenance cost per kilometer	Annual maintenance cost
2020	€0.153	€15,279.43
2025	€0.191	€19,095.79
2030	€0.213	€21,281.09

Source: Own processing based on Sternad (2019), Kleiner & Friedrich (2017), Ermers (2024), FOD Economie (2025) & NBB (2024)

5.1.1.4 Insurance cost

The insurance cost of a truck is another relevant factor within the TCO analysis (Sternad, 2019). Burnham et al. (2021) and Murray & Glidewell (2019) estimate this cost at €0.049 per kilometer in 2020. When adjusted for inflation, the insurance cost rises to €0.061 per kilometer in 2025, with a projected increase to €0.069 per kilometer by 2030.

Table 7: Insurance cost diesel truck

	Insurance cost per kilometer	Annual insurance cost
2020	€0.049	€4,919.60
2025	€0.061	€6,148.37
2030	€0.069	€6,851.98

Source: Own processing based on Sternad (2019), Burnham et al. (2021), Murray & Glidewell (2019), FOD Economie (2025) & NBB (2024)

5.1.1.5 Toll cost

The annual costs associated with operating a truck are also significantly influenced by toll charges (Sternad, 2019). For a diesel truck, these toll costs increase from an average of €10,384.82 per year in 2020 to €14,633.98 by 2030 (Sturgeon et al., 2022; Dalerstedt, 2024).

Table 8: Toll cost diesel truck

	Toll cost per kilometer	Annual toll cost
2020	€0.104	€10,384.82
2025	€0.131	€13,131.26
2030	€0.146	€14,633.98

Source: Own processing based on Sternad (2019), Sturgeon et al. (2022), Dalerstedt (2024), FOD Economie (2025), NBB (2024)

5.1.1.6 Labor cost

The final - and largest - component in the TCO is labor cost (Sternad, 2019). This cost includes not only wages, but also additional expenses such as training, accommodation for overnight stays and other related personnel

costs. In 2020, the average labor cost for transport companies was €0.388 per kilometer (Economic Research Institute, 2025; Trotta, 2016; Nijenhuis, 2022a; Verbond van Belgische Ondernemingen, 2017; European Commission, s.d.). Over a five-year period, this increased to €0.492 per kilometer in 2025, and it is expected to reach €0.548 per kilometer by 2030. Over the course of a decade, this represents a projected increase in labor costs of more than €15,000 per driver.

Table 9: Labor cost diesel truck

	Labor cost per kilometer	Annual labor cost
2020	€0.388	€38,784.54
2025	€0.492	€49,200.00
2030	€0.548	€54,830.37

Source: Own processing based on Sternad (2019), Economic Research Institute (2025), Trotta (2016), Nijenhuis (2022a) Verbond van Belgische Ondernemingen (2017), European Commission, (s.d.) & Ermers (2024)

5.1.1.7 Total cost of ownership diesel truck

When all of the above-mentioned cost components are combined, the total cost of ownership of a truck is obtained (Sternad, 2019). In 2020, the average TCO of a diesel truck amounted to €108,542.94. By 2025, this cost is expected to increase to €137,015.87, and by 2030, it is projected to reach €160,512.75. This sharp rise is primarily driven by rising fuel and labor costs, which represent the most dynamic components within the TCO framework.

Table 10: Total cost of ownership diesel truck

	Total cost of ownership diesel truck
2020	€108,542.94
2025	€137,015.87
2030	€160,512.75

Source: Own processing based on aforementioned sources in 4.1.1.1 – 4.1.1.6

5.1.2 TCO Battery electric heavy-duty vehicle

The aim of this study is to assess the economic viability of electric trucks in Belgium. Therefore, this section calculates the total cost of ownership of electric trucks, which will later be compared to the TCO of conventional diesel trucks, which is calculated above.

5.1.2.1 Depreciation cost

As previously mentioned, the average purchase price of an electric truck is two to three times higher than that of a diesel heavy-duty vehicle (Luman, 2024). In 2020, the average cost of an electric truck in Belgium was approximately €414,225.00 (Transport & Environment, 2021). For 2025, the purchase price was estimated at €200,006.00 excluding VAT. However, based on more recent research, this figure appears to be unrealistic. Therefore, this analysis adopts a revised price of €300,000.00 for 2025 (Luman, 2024). By 2030, the purchase price of an electric truck is expected to decline significantly to approximately €145,346.00. A plausible explanation for this sharp decrease can be the effect of economies of scale and technological advancements.

When assessing the purchase price of an electric truck, it is important to distinguish between Flanders, Brussels and Wallonia. This differentiation is necessary because the Flemish government provides financial support for the purchase of electric trucks, where such subsidies are not available in Brussels or Wallonia (VLAIO, s.d.-a; D. De Braekeleer, Regional Sales Manager at Scania Brussels, personal communication, 30 April 2025; Philippe, 2024).

In 2020, the Flemish government provided a €3,000.00 subsidy per truck to support the greening of trucks (Desmidt, s.d.). For 2025 a distinction must also be made between small and medium-sized enterprises (SMEs) and large companies (VLAIO, s.d.-a). In Flanders, in 2025 SMEs are eligible for a subsidy covering 35% of the purchase cost of an electric truck, where large enterprises receive a subsidy of 21%. No official information is available regarding potential subsidies for electric trucks in Belgium in 2030. Given the substantial public cost associated with such support measures, this analysis assumes that no government subsidies are granted for electric trucks in 2030 (D. De Braekeleer, Regional Sales Manager at Scania Brussels, personal communication, 30 April 2025; Philippe, 2024).

As a result, the purchase price of an electric truck in Flanders decreased to €414,225.00 in 2020 (Transport & Environment, 2021; Desmidt, s.d.). In 2025, after applying the regional subsidies available in Flanders, the price is reduced to €195,000.00 for SMEs and €237,000.00 for large companies (Transport & Environment, 2021; Luman, 2024; VLAIO, s.d.-a). By 2030, the purchase price is expected to be harmonized across Flanders, Brussels and Wallonia.

Moreover, the depreciation period of an electric truck is two years longer than that of a diesel truck (De Spiegeleir, 2023; Sturgeon et al., 2022). Due to the higher initial investment and the relatively slow degradation of batteries, electric trucks are depreciated over a seven-year period.

Table 11: Depreciation cost electric truck

	FLANDERS		BRUSSELS & WALLONIA
	SME	LARGE	
Purchase price			
2020	€414,225.00	€414,225.00	€417,225.00
2025	€195,000.00	€237,000.00	€300,000.00
2030	€145,346.00	€145,346.00	€145,346.00
Residual value			
2020	€82,845.00	€82,845.00	€83,445.00
2025	€39,000.00	€47,400.00	€60,000.00
2030	€29,069.20	€29,069.20	€29,069.20
Depreciation			
2020	€47,340.00	€47,340.00	€47,682.86
2025	€22,285.71	€27,085.71	€34,285.71
2030	€16,610.97	€16,610.97	€16,610.97

Source: Own processing based on Sternad (2019), Volvo (2025), Transport & Environment (2021), Luman (2024), Desmidt (s.d.), VLAIO (s.d.-a), Craglia (2022), De Spiegeleir (2023), Sturgeon et al. (2022), Taxwin (2021), Ermers (2024), De Braekeleer (personal communication – 30 April 2025) & Philippe (2024)

5.1.2.2 Fuel cost

The second cost component included in the TCO analysis is energy consumption (Sternad, 2019). An electric truck consumes approximately 1.5 kWh per kilometer (Mobilyze, 2023). Charging can take place at various types of charging points: on private property, at public charging stations or at fast-charging stations (Lanz et al., 2022). Charging at public or fast-charging stations is generally more expensive than charging on private property.

In 2020, the average cost of charging a truck on private property in Belgium was €0.08 per kWh (Eurostat, 2025). For public charging infrastructure, this cost increased significantly to an average of €0.35 per kWh, while fast charging cost approximately €0.70 per kWh (De Paepe, 2019).

By 2025, the cost of charging on private infrastructure rises to €0.20 per kWh, while public charging increases slightly to €0.40 per kWh (Steel & Kurstjens, 2024; LaadKaarten.be, 2025). The cost of fast charging drops to €0.48 per kWh, likely due to the increased availability of fast-charging stations, including those specifically designed for trucks.

By 2030, electricity prices are expected to be lower due to a growing supply of renewable energy and falling fuel costs, but price volatility is still possible due to fluctuations in supply and demand (Villers, 2025). Charging prices for trucks are likely to decrease slightly or stabilize as a result. Due to the principle of overestimating costs and underestimating revenues, the 2025 prices are maintained.

The exact proportions of how often trucks use private, public or fast charging are not fully known yet. Therefore, based on the studies by Dons et al. (2023) on the proportions of private, public and fast charging for electric cars, and Herlt & Hildebrandt (2024), which provide limited predictions for trucks, an estimated ratio is developed. This can be found in the table below.

Table 12: Ratio private, public and fast charging

	Private charging	Public charging	Fast charging
2020	90%	9%	1%
2025	78%	15%	7%
2030	60%	25%	15%

Source: Own processing based on Dons et al. (2023) & Herlt & Hildebrandt (2024)

Due to the significant price difference between private and public charging, it is in this research assumed that private charging will remain the most frequent option. Moreover, a smart use of solar panels and batteries can help reduce the cost of private charging. Given the current development of electric trucks, with an initial focus on regional transport, the share of fast charging in 2020 is expected to be negligible (Scania EV Academy, 2023). However, this share is projected to increase in the future as international transport volumes rise.

When all the information above is combined, this results in an annual energy cost of €16,533.75 in 2020, €37,471.50 in 2025 and €43,867.50 in 2030. The significant increase between 2020 and 2025 can be explained by the energy crisis of 2022, caused by geopolitical factors (Europese Raad, 2025).

Table 13: Fuel cost electric truck

	Private (€ per kWh)	Public (€ per kWh)	Fast (€ per kWh)	Annual fuel cost
2020	€0.080	€0.350	€0.650	€16,533.75
2025	€0.200	€0.400	€0.483	€37,471.50
2030	€0.200	€0.400	€0.483	€43,867.50

Source: Own processing based on on Sternad (2019), Mobilyze (2023), Lanz et al. (2022), Eurostat (2025), De Paepe (2019), Steel & Kurstjens (2024), LaadKaarten.be (2025), Villers (2025), Dons et al. (2023), Herlt & Hildebrandt (2024), Ermers (2024) & Scania EV Academy (2023)

5.1.2.3 Maintenance cost

As previously mentioned, the maintenance cost of an electric truck is lower than that of a diesel variant (Cunanan, 2021). In 2017, the maintenance cost for a BEV was on average €0.098 per kilometer (Kleiner & Friedrich, 2017). Accounting for inflation, this cost rises to €0.102 in 2020, €0.127 in 2025 and is expected to reach €0.142 in 2030. This represents a difference of more than €0.50 per kilometer compared to a diesel truck.

Table 14: Maintenance cost electric truck

	Maintenance cost per kilometer	Annual maintenance cost
2020	€0.102	€10,186.29
2025	€0.127	€12,730.53
2030	€0.142	€14,187.39

Source: Own processing based on Sternad (2019), Kleiner & Friedrich (2017), Ermers (2024), FOD Economie (2025) & NBB (2024)

5.1.2.4 Insurance cost

The insurance cost of a truck is assumed to be similar for both fuel types (Burnham et al., 2021; Murray & Glidewell, 2019). The methodology used to determine this cost can be consulted in section 4.3.1.4 and 5.1.1.4.

Table 15: Insurance cost electric truck

	Insurance cost per kilometer	Annual insurance cost
2020	€0.049	€4,919.60
2025	€0.061	€6,148.37
2030	€0.069	€6,851.98

Source: Own processing based on Sternad (2019), Burnham et al. (2021), Murray & Glidewell (2019), Ermers (2024), FOD Economie (2025) & NBB (2024)

5.1.2.5 Toll cost

The fifth cost component is toll charges (Sternad, 2019). Here, a significant difference arises between sustainable and non-sustainable trucks. In 2020, no distinction was found in toll charges between electric and diesel trucks. However, starting in 2025, electric trucks are only required to pay 50% of the toll fees, and by 2030, Sturgeon et al. (2022) predict that this will decrease further to just 25%. As a result, the toll cost is €10,384.82 in 2020, €6,565.63 in 2025 and is expected to decline to €4,967.69 by 2030.

Table 16: Toll cost electric truck

	Toll cost per kilometer	Annual toll cost
2020	€0.104	€10,384.82
2025	€0.066	€6,565.63
2030	€0.050	€4,967.69

Source: Own processing based on Sternad (2019), Sturgeon et al. (2022), Dalerstedt (2024), FOD Economie (2025), NBB (2024)

5.1.2.6 Labor cost

For the labor cost component, no difference is expected between diesel and electric trucks in this study. The steps taken to obtain the results presented below can be consulted in section 4.3.3 and 5.1.1.6.

Table 17: Labor cost electric truck

	Labor cost per kilometer	Annual labor cost
2020	€0.388	€38,784.54
2025	€0.492	€49,200.00
2030	€0.548	€54,830.37

Source: Own processing based on Sternad (2019), Economic Research Institute (2025), Trotta (2016), Nijenhuis (2022a) Verbond van Belgische Ondernemingen (2017), European Commission, (s.d.) & Ermers (2024)

5.1.2.7 Total cost of ownership electric truck

The total cost of ownership (TCO) of an electric truck varies across regions and enterprise sizes in Belgium, primarily due to regional subsidy policies in 2025 (VLAIO, s.d.-a; D. De Braekeleer, Regional Sales Manager at Scania Brussels, personal communication, 30 April 2025; Philippe, 2024).

In 2020, the TCO is estimated at €128,149.00 for all companies in Flanders and €128,491.85 in Brussels and Wallonia. In 2025 small and medium-sized enterprises in Flanders benefit from a 35% subsidy on the purchase price, resulting in a lower TCO of €134,401.75 (VLAIO, s.d.-a). Large enterprises in Flanders, which receive a 21% subsidy, face a slightly higher TCO of €139,201.75. In contrast, companies in Brussels and Wallonia, where no subsidies are provided, bear the highest TCO of €146,401.75 (D. De Braekeleer, Regional Sales Manager at Scania Brussels, personal communication, 30 April 2025; Philippe, 2024). By 2030, the TCO is projected to equalize across all regions and company sizes at €141,315.91, as it is assumed that regional subsidies are phased out by then.

Table 18: Total cost of ownership electric truck

	FLANDERS		BRUSSELS AND WALLONIA
	SME	LARGE	
2020	€128,149.00	€128,149.00	€128,491.85
2025	€134,401.75	€139,201.75	€146,401.75
2030	€141,315.91	€141,315.91	€141,315.91

Source: Own processing based on aforementioned sources in 4.1.2.1 – 4.1.2.6

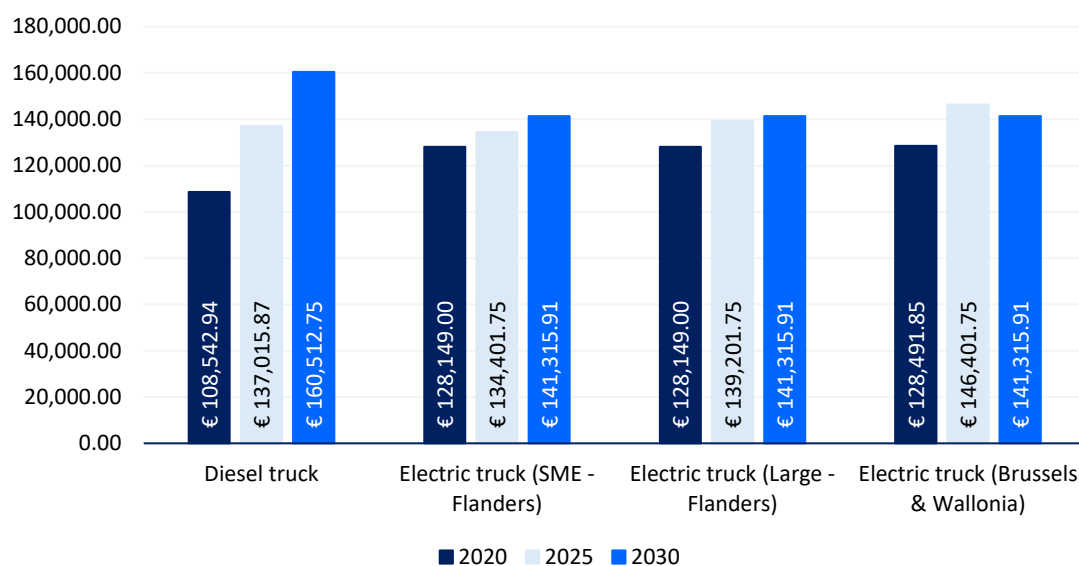
5.1.3 Comparison

When comparing the total cost of ownership of diesel and electric trucks, several important patterns are found. In 2020, the TCO of a diesel truck remains lower than that of an electric truck. However, by 2025, this situation begins to shift, but only for SMEs in Flanders. From that point on, SMEs in Flanders benefit from a lower TCO when operating an electric truck compared to a diesel counterpart. In contrast, large companies in Flanders and businesses located in the Brussels or Walloon regions still experience a more favorable economic outcome with diesel trucks.

A full transition occurs by 2030, when electric trucks become the more economical choice for all enterprises across Belgium, with a notable cost difference of nearly €20,000.00.

An interesting takeaway is that, apart from the Brussels and Walloon regions between 2025 and 2030, the TCO of an electric truck increases rather than decreases. Several factors may explain this upward trend, including the phase-out of subsidies, the growing reliance on more expensive public and fast-charging infrastructure as electric truck use expands and the influence of inflation.

Figure 4: Comparison total cost of ownership diesel and electric truck



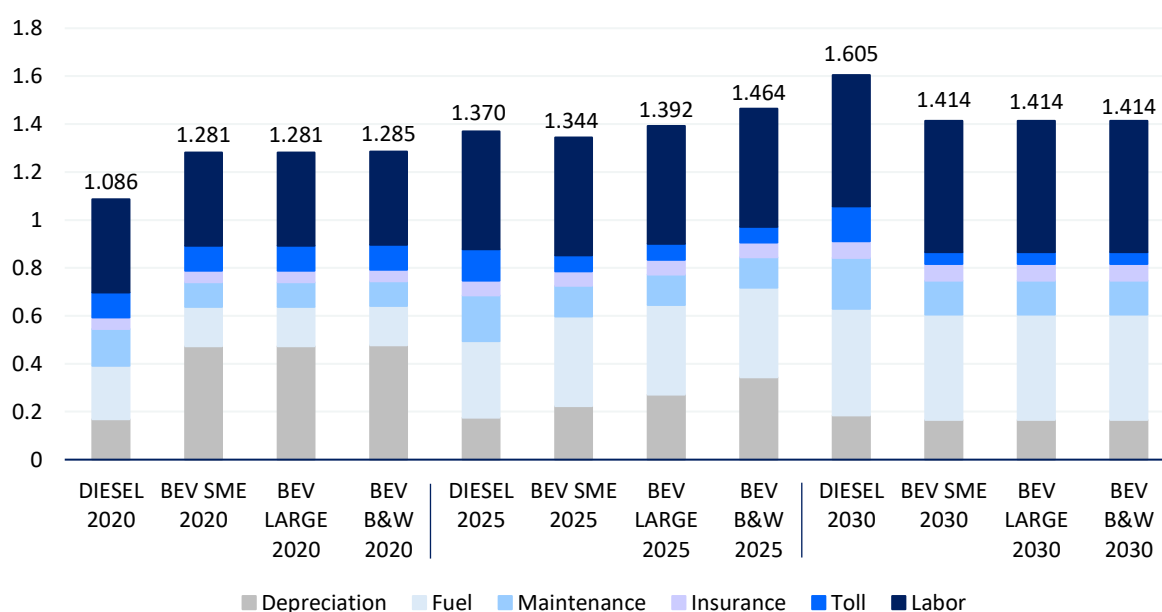
Source: Own processing based on aforementioned sources in 4.1.1.1 – 4.1.2.6

Figure 5 presents an overview of the total cost per kilometer for diesel and BEVs across the three reference years. In 2020, diesel trucks were characterized by the lowest total cost per kilometer, €1.086, primarily due to a lower depreciation cost. In contrast, BEVs - especially those in Brussels and Wallonia - show significantly higher costs, largely driven by elevated depreciation costs, reflecting the higher initial investment in electric vehicles.

Over time, a clear trend emerges: the gap between diesel and electric heavy-duty vehicles narrows and eventually reverses. By 2025 and especially by 2030, BEV costs decrease substantially, particularly in depreciation, suggesting improvements in technology and economies of scale.

Labor cost is the dominant cost component across all vehicle types and years. Toll costs decline significantly for BEVs, reflecting incentives or policy support aimed at promoting zero-emission freight transport. By 2030, diesel trucks become the most expensive option per kilometer, €1.605, while all BEV variants cost around €1.414.

Figure 5: Comparison cost per kilometer diesel and electric truck



Source: Own processing based on aforementioned sources in 4.1.1.1 – 4.1.2.6

5.2 Qualitative analysis

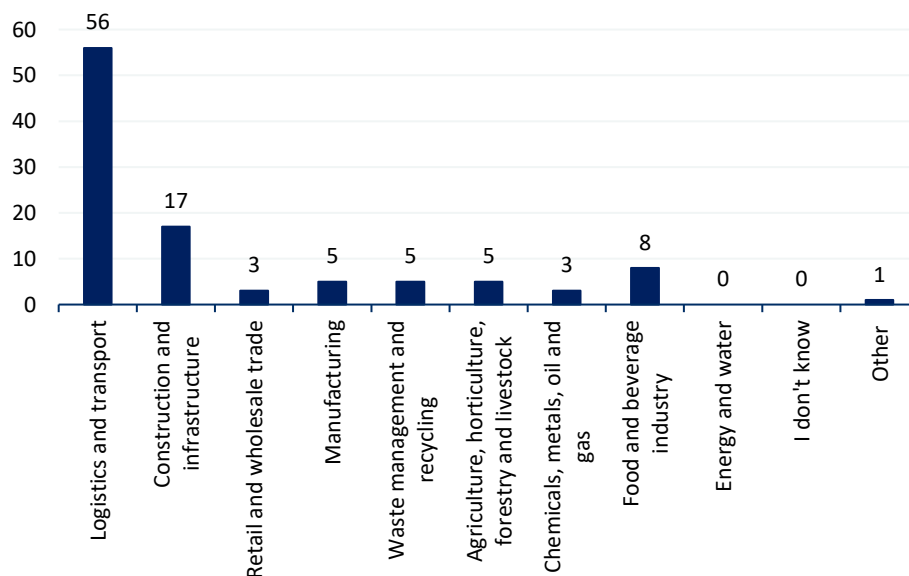
An additional aspect of the research involves conducting a survey among companies that operate at least one truck in Belgium. The survey consists of a total of twenty questions, although the number of questions may vary depending on the responses to particular inquiries. The aim of the survey is to gather more information about the perspectives about electric heavy-duty vehicles from professionals in the sector.

5.2.1 Respondents

The survey was distributed via email to over 500 transport companies in Belgium. In total, 79 responses were received. However, not all responses were usable, as some participants did not complete the survey or were not part of the intended target group. For instance, respondents who answered 'no' to the initial question '*Does your fleet include at least one truck?*' were automatically excluded from further participation. As a result of the aforementioned reasons, a total of 69 surveys were fully completed. The survey was primarily answered by company owners or fleet managers.

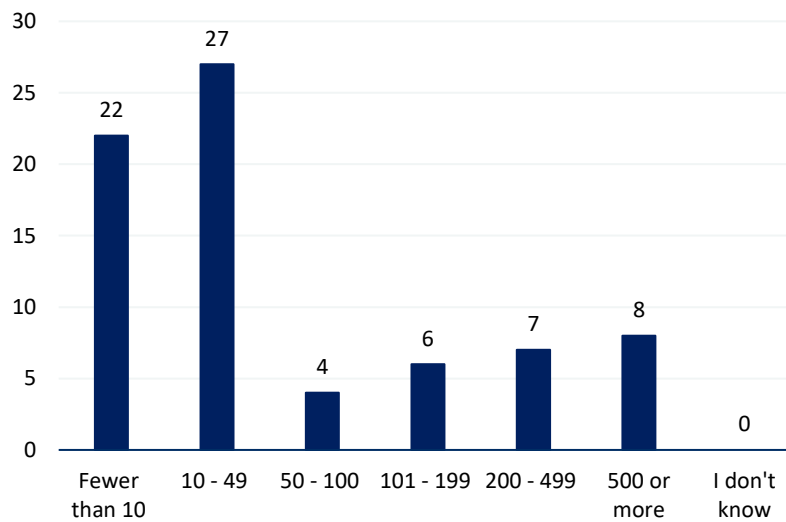
To gain a comprehensive understanding of various perspectives on electric trucks, the survey was conducted across multiple sectors and company sizes. Respondents were given the opportunity to select more than one sector in which their company operates. The results indicated that the majority is active in the logistic and transportation sector, followed by construction and infrastructure. Other sectors, such as retail and wholesale trade, food and beverage and waste management and recycling, were represented to a lesser extent. No responses were received from the energy and water sector. The respondent who selected 'other' is active in the repair service industry.

Figure 6: Distribution of respondents by sector



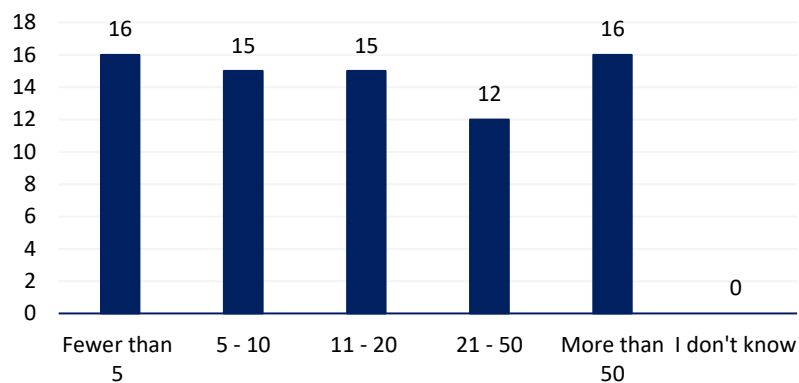
The companies participating in the survey vary widely in size. The majority of respondents indicate that their company employs between 10 and 49 people, followed by companies with fewer than ten employees. Larger companies are also represented, with eight respondents reporting more than 500 employees and seven indicating a workforce between 200 and 499. This variation allows for insights into small, medium and large enterprises.

Figure 7: Distribution of respondents by amount of employees



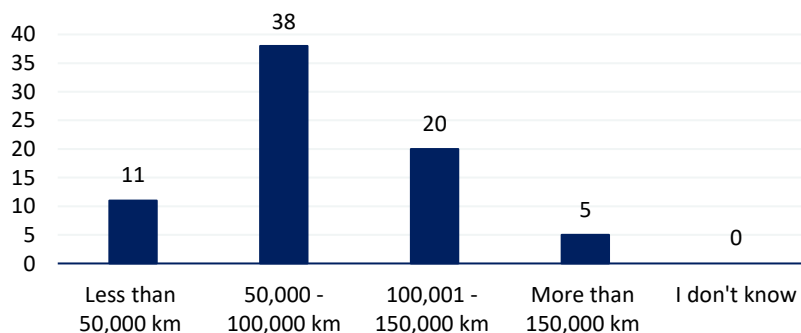
Fleet size also shows a broad distribution. Sixteen respondents report having more than 50 trucks in their fleet, while a similar number indicate having fewer than five, 5 – 10 or 11 – 20 trucks.

Figure 8: Distribution of respondents by fleet size



In terms of vehicle usage, the average annual distance driven by a truck most commonly falls within the range 50,000 to 100,000 km. Twenty companies report distances between 100,001 and 150,000 km, while eleven indicate less than 50,000 km per truck per year. Only a small number of respondents, five in total, report distances exceeding 150,000 km.

Figure 9: Distribution of respondents by average annual distance driven



5.2.2 Survey results

The remaining fifteen questions in the survey were divided into different thematic categories to obtain the necessary insights. First, respondents were asked about the current status of their fleet. This is followed by questions addressing economic, operational and infrastructural considerations. Lastly, the survey explores environmental and strategic aspects related to the electrification of the fleet.

5.2.2.1 Current fleet and electrification status

First respondents were asked whether their company currently operates electric heavy-duty vehicles. The results show that only a small portion, 15% or eleven companies, already use electric trucks, while the majority, 84%, do not. One respondent mentioned they have recently ordered electric trucks. These findings are in line with the expectations, given that the national electric fleet in Belgium is still in its early stages of development (Van Apeldoorn, 2024).

Depending on the response to the previous question, participants received a different follow-up question. Companies that indicated they currently operate or have ordered at least one electric truck were asked how many electric trucks they currently have in use or on order. Three respondents report operating two electric heavy-duty vehicles, one respondent indicates having three and eight respondents state their company has five or more electric trucks in operation or on order. Considering that in Flanders subsidies can only be requested for up to two electric trucks, the results are quite remarkable (VLAIO, s.d.-a).

Respondents who are not yet using electric trucks were asked whether they are considering purchasing them in the near future. Only six companies indicate that they consider electric trucks as an option in the near future. More than half of the respondents state that they are currently not considering the purchase of electric trucks at all, while 34% remain doubtful. This highlights a sense of hesitation and reluctance within the sector. In the following sections, potential explanations will be explored.

Figure 10: Status electric truck usage

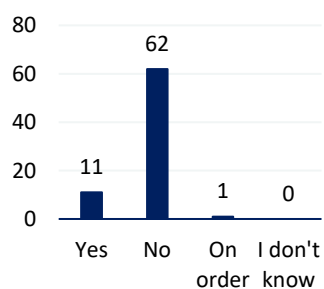


Figure 11: Amount of electric trucks

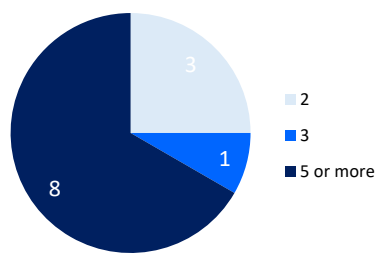
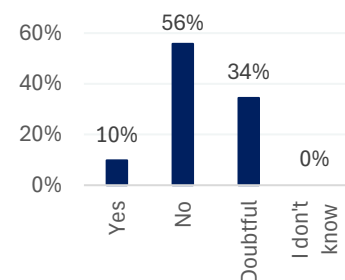


Figure 12: Considering buying BEV



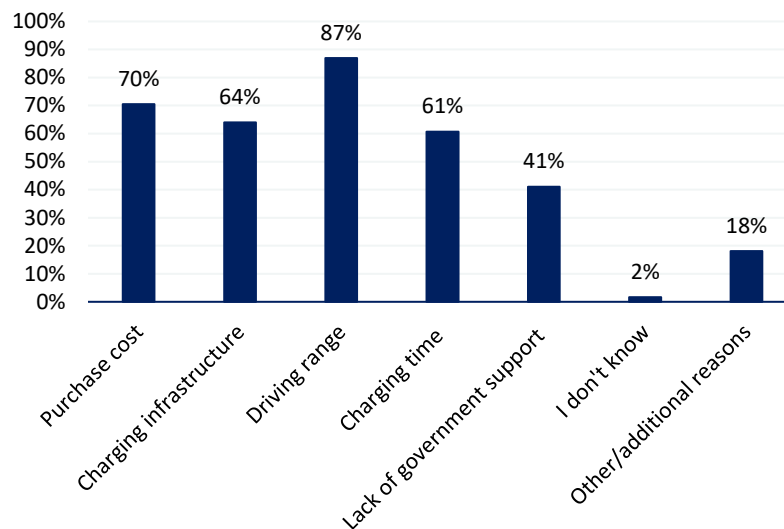
Additionally, a second follow-up question was posed to respondents who have not invested in electric trucks yet, asking them to identify the reasons behind this decision. Multiple answers could be selected.

The most cited barrier, mentioned by 87% of respondents, is the limited driving range of electric trucks. The second most frequently mentioned concern is the high purchase cost, followed by 64% of respondents indicating that the current charging infrastructure is still insufficient. Charging time and lack of government support are also seen as major obstacles.

Beyond these options, several respondents shared additional concerns. These include practical issues such as drivers taking trucks home and uncertainties around charging in such cases, concerns about legislation, residual value, reliability of the technology, payload limitations and limited grid capacity at the company site. Others

noted that their usage intensity does not justify such a large investment, that electric trucks are unsuitable for the specific tasks they perform and an overall lack of trust in the technology was also responded. One respondent even expressed as a reason *'Nothing beats a V8'*.

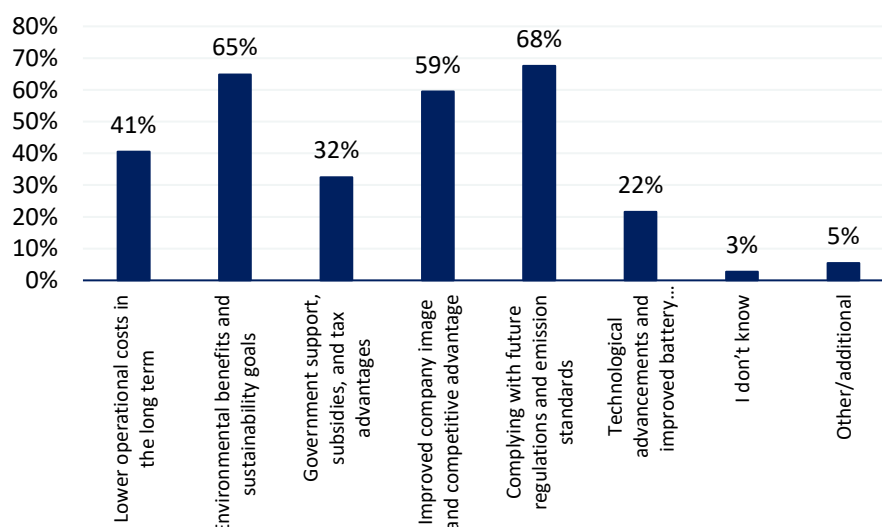
Figure 13: Main reasons discouraging investing in electric trucks



Companies that currently operate electric trucks, are awaiting their arrival or express interest in transitioning to electric heavy-duty vehicles were asked about their main reasons for this decision. Respondents could select again multiple reasons.

The most commonly cited factor was complying with future regulations and emission standards. This was followed by environmental benefits and sustainability goals and improved company image and competitive advantage. Additionally, 41% of respondents indicated that lower operational costs in the long term also play a role in their decision-making process. Nearly one-third mentioned government support, subsidies and tax advantages, while 22% cited technological advancements and improved battery performance as important drivers. Two respondents selected 'other'. One noted that although they are doubtful about a possible implementation, they had not yet considered the reasons behind it, while the other mentioned that their motivation stems from a client request.

Figure 14: Main reasons investing in electric trucks



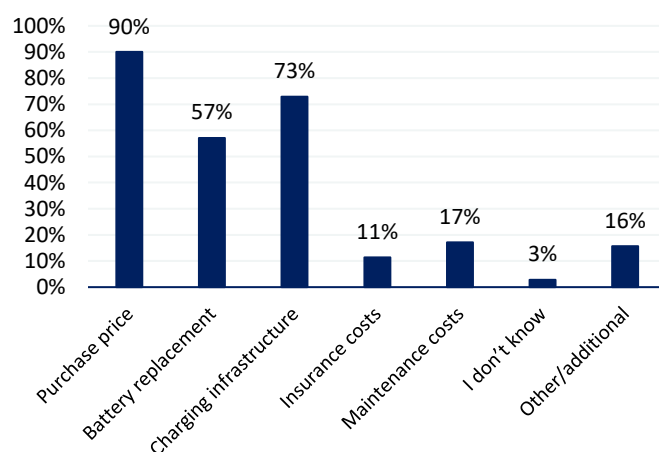
5.2.2.2 Economic considerations

Subsequently, the survey explores several economic aspects associated with the adoption of electric trucks. The first question in this section aims to identify the main cost-related concerns perceived by companies. Respondents were again allowed to select multiple options.

A striking 90% of participating companies indicate that the purchase price is a major financial concern. This is unsurprising, given the significant price gap between electric and diesel trucks (Luman, 2024). The second most cited concern is the current charging infrastructure, which - again - aligns with expectations considering the limited availability of charging facilities in Belgium (Volvo, 2024; European Commission, 2025). Additionally, more than half of the respondents mention the cost of battery replacement as a key concern. Maintenance and insurance costs are seen as concerns by 17% and 11% of respondents.

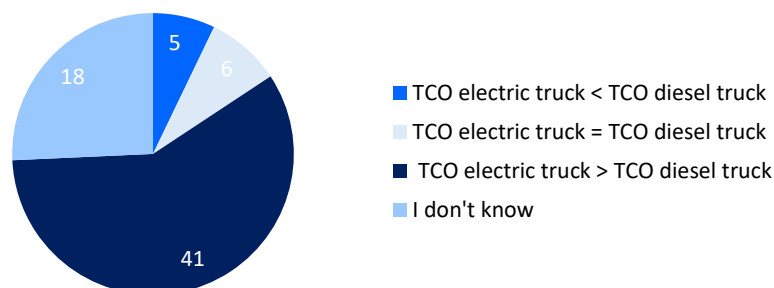
Beyond the listed options, eleven respondents also mention other specific cost-related concerns. These include issues such as limited driving range, difficulties in performing standard operations, uncertainty about residual value, safety risks in case of accidents and charging costs. Some express worries about battery autonomy, increased complexity in planning due to limited range, higher tire costs and reduced power or load capacity. Finally, the uncertainty around the lifespan of electric trucks and the fast pace of technological evolution, which can make vehicles obsolete quickly, are also mentioned as concerns.

Figure 15: Main cost concerns regarding electric trucks



A large portion of this research focuses on examining and comparing the TCO of electric trucks. Accordingly, one of the survey questions specifically addresses how respondents perceive the TCO of an electric truck to that of a diesel truck. The results show that a large majority - 41 respondents - believe that the TCO of an electric truck is higher than that of a traditional one. Only five respondents expect the TCO of an electric truck to be lower, while six believe they are equal. Additionally, eighteen participants indicate that they do not know.

Figure 16: Perceptions TCO electric truck vs. TCO diesel truck

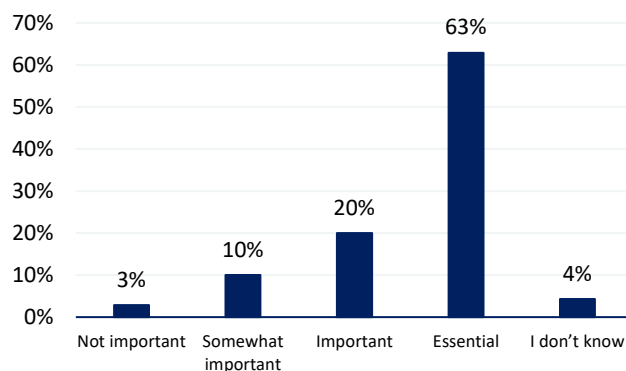


The survey also investigates how important government support and fiscal incentives are in the decision to adopt electric trucks. The findings indicate that for 63% of the companies, such support is essential. Another 20% of the respondents consider it important, while 10% view it as somewhat important. Only two companies state that government support does not influence their decision-making process.

A follow-up question was posed to those who indicated that government support plays a role, asking which additional support measures or policy initiatives could encourage their company to purchase (more) electric trucks. The responses reveal a strong desire for more financial aid, including subsidies for both vehicle purchases and charging infrastructure. Several respondents point out the need for improvements to the electricity grid and the development of more extensive and reliable charging infrastructure across the country. Others refer to the importance of policy stability and predictability, arguing that uncertainty about the future of current financial advantages limits their willingness to invest. A number of participants also stress that electric trucks should become more cost competitive, particularly in terms of TCO, in order to be a viable alternative to diesel trucks.

Additionally, concerns were raised about the practicality and technical capabilities of current electric trucks, such as their limited range, charging time, vehicle weight and overall suitability for certain types of transport activities. For some companies, the lack of profitability without charging customers a premium remains a barrier.

Figure 17: Importance of government support and tax incentives for transition to electric fleet



The final question related to the economic aspects of electric trucks explored whether companies are willing to pay a premium for an electric truck compared to a diesel variant. 21 companies indicated they are willing to pay more if long-term cost savings can be achieved. 35 respondents stated that their willingness depends on the size of the price difference, while thirteen companies expressed no willingness to pay a premium.

Those who indicated they are open to paying a premium were asked which percentage they would be willing to pay more. Fourteen percent of companies reported a willingness to pay less than 5% more. 32% of respondents, is open for a premium of 5-10%, while eighteen companies reported they would accept a price increase of 11-20%. Notably, 18% of the surveyed companies are even willing to pay over 20% more for BEV.

Figure 18: Willing to pay a premium

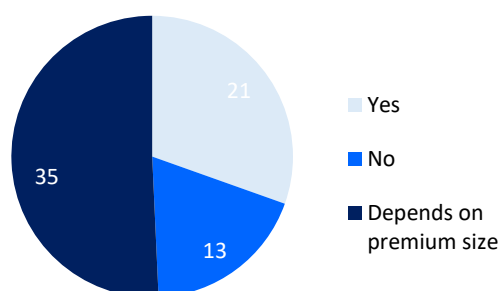
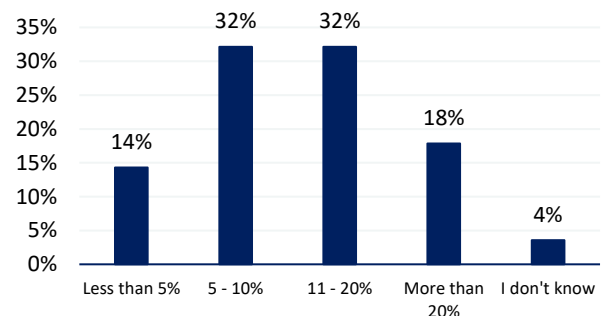


Figure 19: Percentage of premium willing to pay

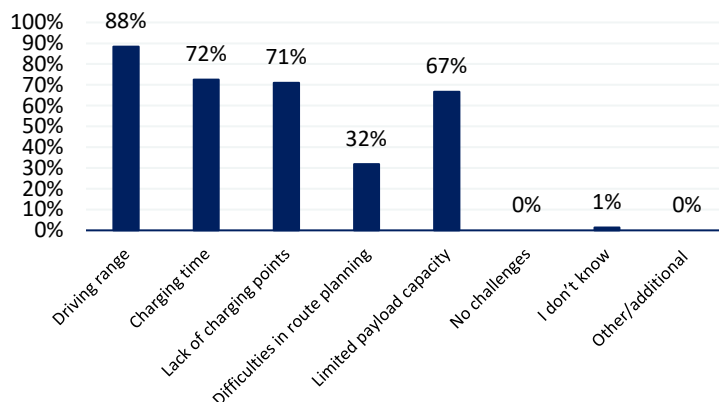


5.2.2.3 Operational and infrastructural considerations

The next section of the survey focuses on operational and infrastructural concerns related to the (potential) use of electric trucks. Respondents were asked to indicate the main practical challenges they associate with electric truck usage, with the possibility to select multiple options.

The results reveal that 88% of participating companies consider the current driving range to be a major challenge. Charging time, the lack of charging infrastructure and limited payload capacity are also seen as large operational barriers by the majority of respondents. Additionally, nearly one third of the companies report that electric driving complicates their route planning. None of the respondents indicated that electric trucks pose no practical challenges for their operations.

Figure 20: Practical challenges (future) use of electric fleet



The remaining three questions within this theme focused on infrastructure related aspects. First, companies were asked whether they currently have their own charging infrastructure for trucks. Twelve companies report having installed such infrastructure, while ten have plans to do so. The majority, 47 respondents, indicate that they do not have any charging infrastructure or plans to install them anytime soon.

In addition, respondents were asked to assess the availability and reliability of public charging points for electric trucks in Belgium, including regular stations that are adequate in terms of space and capacity. A total of 36 respondents rated the current situation in Belgium as poor, while six considered it average and only two found it good. It is worth noting, however, that these two positive responses came from companies that do not yet operate electric trucks. Moreover, 38% of the surveyed companies stated they do not know.

The final infrastructure-related question asked whether companies had already encountered grid capacity issues or other electricity related limitations when preparing for a potential transition to an electric fleet. Eleven companies reported having faced such problems, while another eleven indicated they had not encountered any issues so far. A large number of respondents - 39 in total - reported that they had no plans yet when it comes to installing charging infrastructure and eight companies answered they did not know.

Figure 21: Private charging infrastructure

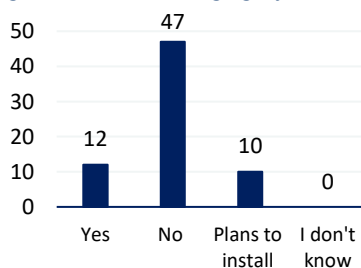


Figure 22: Availability and reliability public truck charging stations Belgium

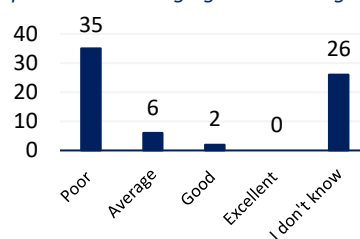
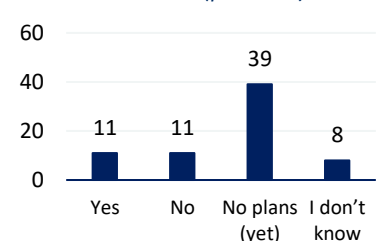


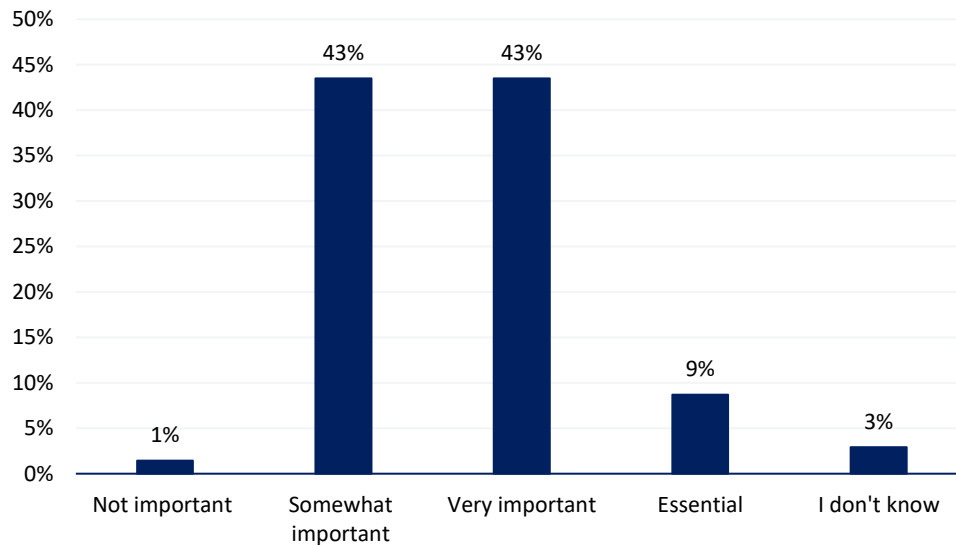
Figure 23: Grid capacity issues in relation to (potential) transition



5.2.2.4 Environmental and strategic considerations

The final theme addressed in the survey focused on the environmental and strategic aspects of electric trucks. One of the questions explored the role of sustainability in fleet decision-making. Results show that for 43% of the participating companies sustainability plays a somewhat important role, while another 43% considers it very important. For 9% of the respondents, sustainability is essential in shaping their decisions. Two companies indicated they don't know and one company stated that sustainability is not an important factor in their fleet decision-making choice.

Figure 24: Importance sustainability in decision-making regarding vehicle fleet



Respondents were also asked whether they believe electric trucks offer a competitive advantage within their sector. The majority - 43 companies - do not perceive such an advantage. Sixteen companies believe they do, while ten were unsure.

In addition, the survey explored whether there is customer demand for zero-emission transport. 34 companies reported that this is not currently the case, and one company was uncertain. However, nineteen companies indicated that customers sometimes request zero-emission transport and fifteen companies confirmed that they do receive such requests.

Figure 25: Competitive advantage electric truck

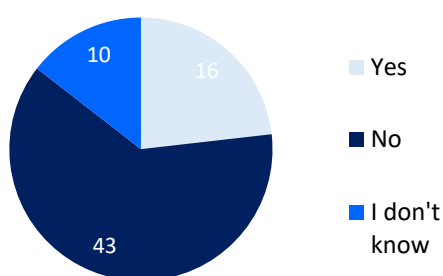
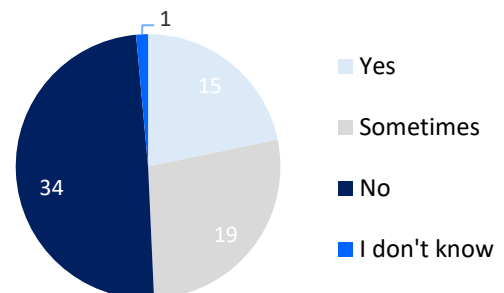


Figure 26: Demand for zero-emission transport



5.2.2.5 Additional insights

The final question invited respondents to share any additional comments or insights. A commonly mentioned concern was that customers often expect sustainable transport without being willing to share the extra cost. Multiple respondents also emphasized that the current purchase and infrastructure costs are still too high.

Practical limitations were also highlighted, such as the infeasibility of installing charging stations at every delivery site and the challenges posed by specific transport operations, particularly in construction or long-haul freight. Some mentioned skepticism about the environmental benefits, pointing to issues like second-life emissions abroad and the sourcing and disposal of battery materials. Others referred to the need for policy changes, especially regarding vehicle weight. Lastly, the safety of electric trucks when an accident happens was also questioned.

6 Discussion

In this section, a discussion of the results is provided. This will be accomplished by providing answers to the hypotheses, sub-research questions and the overall research question based on the results obtained in the previous section.

6.1 Hypotheses

Based on the TCO analysis, hypothesis 1, namely that the total cost of ownership of electric trucks is lower than that of diesel trucks over a five to ten year period, is only partially supported. Across most scenarios and years, the TCO of a BEV remains higher than that of a traditional diesel truck. In 2020, diesel trucks had a much higher TCO than electric trucks. Even in 2025, the TCO of an electric truck in Brussels and Wallonia remains above that of diesel. However, a notable exception occurs in Flanders, where small and medium enterprises using electric trucks experience a lower TCO than diesel, suggesting that regional policies or incentives may influence cost competitiveness. By 2030, electric trucks have a lower total cost of ownership for all types of enterprises and regions in Belgium compared to traditional diesel trucks.

This result suggests that while electric trucks are not overall cost-effective in Belgium yet, they become more competitive compared to diesel counterparts. The role of regional subsidies and the size of the company appear to be two decisive factors.

Hypothesis 2, which supposes that the limited charging infrastructure is the primary structural barrier preventing companies from transitioning to electric trucks in Belgium can be rejected. Figure 13 indicates that the primary reason companies currently hold back from investing in electric trucks is the limited driving range. The second most cited barrier is the high purchase price. The current state of the charging infrastructure ranks third place, suggesting that while infrastructure is indeed a barrier, it is not the main hurdle.

Based on hypothesis 2 it can be concluded that Belgian companies are more concerned with the limited driving range and high purchase costs, than with charging infrastructure limitations. This suggests that technological development and financial support may currently be more effective than infrastructure expansion.

The third and final hypothesis explores the role of government support in the adoption of electric trucks. The hypothesis, that states that government involvement is essential in the adoption process, can be accepted. This is supported, first, by the results shown in Figure 17 where 63% of the surveyed companies indicate that government support is crucial in their decision, with an additional 20% describing such support as important. Furthermore the TCO analysis validates this hypothesis. In 2025, the TCO for electric trucks operated by SMEs in

Flanders is lower than that of diesel trucks, largely due to the higher subsidies received by SMEs compared to large enterprises. In contrast, in Brussels and Wallonia - where no subsidies were available - the TCO for electric trucks remained higher than for diesel trucks, further highlighting the influence of government support.

The result of hypothesis 3 underscores the important role of government support for transitioning to electric trucks. Without government support many companies appear unwilling or unable to invest in electric trucks. Therefore it would be a good idea if the government decides to opt for a subsidy that is not region and company size specific. The latter confirms that financial incentives from the government, such as purchase subsidies, are essential for accelerating the transition to an electric fleet. Government support is necessary to bridge the gap between the high initial investment costs and the long-term operational savings.

6.2 Research questions

Sub-research question 1 examines how the TCO of an electric truck differs from the TCO of a diesel variant. It can be concluded that the TCO of an electric truck differs notably from that of a diesel truck across various components. While electric trucks have a higher purchase price, this cost is offset over time by longer depreciation periods, lower maintenance costs, lower toll costs and in Flanders subsidies. Overall, while electric trucks require a higher upfront investment, their operational savings improve their financial competitiveness, especially as purchase prices decline and charging infrastructure improves.

The analysis confirms that the high purchase costs remains a major barrier for most companies. Longer depreciation periods, lower maintenance costs, lower toll costs and subsidies are indispensable to make electric and diesel trucks competitive.

The second sub-research question explores which factors facilitate or hinder the transition to electric trucks for Belgian companies. Companies highlighted that subsidies for both vehicle purchase and charging infrastructure could facilitate the transition. Additionally, many believe that eliminating road charges would encourage further adoption. On the other hand, several key barriers were identified, including the limited driving range of electric trucks, high purchase cost, insufficient charging infrastructure, charging time, limited payload capacity, difficulties in route planning and a lack of government support.

It can be concluded that there are several factors that facilitate the transition to electric trucks, but that most companies still see more barriers than advantages when implementing electric trucks. The majority of the companies still face a lot of financial and operational concerns – such as high initial investment, limited driving range and limited payload capacity - which hinders the transition process.

Sub-research question 3 investigates how well-prepared the current charging infrastructure is and what investments are needed to support the transition to electric trucks in Belgium. Currently, the infrastructure is insufficient, most companies do not have their own charging facilities and public charging stations for trucks are largely viewed as poorly available and unreliable. Although around 30 public charging hubs are planned, regional disparities and limited grid capacity lead to challenges. Significant investments in both charging stations and electricity grid upgrades are essential to develop a reliable and futureproof charging network.

Based on sub-research question 3 it can be decided that for a broad roll-out of electric trucks large infrastructure investments are needed. The government does not only need to invest in charging infrastructure but also in grid upgrades to facilitate the electrification process of trucks in Belgium.

The fourth and last sub-research question examines which government measures or subsidies could accelerate the adoption process of BEVs. The most impactful incentives would include a more extensive purchase subsidy, that is not limited to two vehicles per company. Additionally, exempting zero-emission trucks from road charges,

offering subsidies for the installation of charging infrastructure and reducing electricity costs were frequently mentioned as necessary government support measures. For these incentives to be effective, it was also suggested that it is important that the government clearly communicated how long the benefits will remain available.

The results of sub-research question 4 show that government measures are necessary for the adoption process of electric trucks in Belgium. However, it is important that the possible support initiatives will be communicated clearly to the companies. Uncertainty about how long subsidies or exemptions will remain in effect creates hesitation among companies to invest in electric trucks.

The goal of this study was to answer the research question: *What is the economic feasibility of an electric heavy-duty fleet in Belgium, and which challenges are faced during this transition?*. The economic feasibility of transitioning to an electric heavy-duty fleet in Belgium is currently still limited. This is primarily due to high upfront investment costs, insufficient charging infrastructure and uncertainties around long term-government support. While companies recognize the long-term benefits, such as compliance with environmental regulations, lower operational costs and an improved company image, the transition is hindered by the high purchase price, limited driving range and limited payload capacity. Moreover, the charging infrastructure in Belgium remains largely inadequate, both in terms of capacity and distribution, resulting in major investments that are needed. Government measures such as lower electricity costs, exemptions from road charges and more financial support for the purchase of electric trucks and charging installations are seen as critical to make the transition economically feasible. It can be concluded that although many companies recognize the potential of a transition, they still remain cautious given the current circumstances and conditions.

7 General conclusion

This research explored the economic feasibility and challenges of transitioning to an electric heavy-duty fleet in Belgium. To assess whether electric trucks are a viable alternative to diesel trucks both a total cost of ownership analysis and a survey were performed.

The quantitative analysis shows that the economic competitiveness of an electric truck strongly depends on the timing of the transition, the company size and the region. In 2020 diesel trucks were the most cost-efficient. By 2025, there was a small shift observable, for SMEs in Flanders electric trucks present a lower TCO than a diesel counterpart. For large companies in Flanders and both SMEs and large companies in Brussels and Wallonia this shift did not happen in 2025, resulting in diesel trucks remaining more economically attractive for these types of enterprises. Looking ahead as for the future, towards 2030, the analysis reveals an economic advantage for electric trucks across all company sizes and regions in Belgium, primarily due to declining purchasing prices for electric trucks, an increase in the price of a diesel truck and rising diesel prices.

The qualitative findings from the survey complement the results from the cost-analysis and the literature review. Although most companies still operate diesel trucks in Belgium, early adopters in electric trucks often invest in multiple vehicles. The majority of electric truck owners already have five or more of these types of vehicles. The main obstacles identified with an electric truck include a high investment cost, insufficient charging infrastructure in Belgium, long charging times, limited driving range and a lack of government support. The latter is made very clear in the number of sales of electric trucks in Belgium in 2024, where only one sale was registered in Wallonia and all other 76 in Flanders. This is due to the fact that in Flanders there is a purchase subsidy for electric trucks and in Wallonia there is currently not.

Government support plays a crucial role in the transition process of electric trucks. Many respondents stressed the need for higher subsidies, both for vehicle acquisitions and for charging infrastructure installations. Furthermore, investments in a reliable and widely spread network of truck-specific charging stations are essential for accelerating the transition to electric heavy-duty vehicles.

In conclusion, electric trucks have the potential to become both economically competitive and environmentally sustainable, when renewable energy is used, but government support will be necessary. With the right support mechanism, electric trucks can play a crucial role in decarbonizing the transport sector to meet the climate targets.

7.1 Limitations

This type of research comes with certain limitations, making it essential to identify potential risks at the beginning of the analysis process to mitigate their impact where possible.

First, there are limitations regarding data availability (Danielis et al., 2025). Since this research focuses on financial figures such as purchase prices and cost components, it is important to acknowledge that not all companies, institutions or manufacturers are fully transparent about this information online.

Second, a low survey response rate could affect the representativeness of the findings (Wagh, 2025). To ensure a reliable dataset, it is crucial that at least 50 Belgian companies complete the questionnaire. By reaching out to an extensive network of 500 Belgian companies, nearly 70 complete responses were collected. Only the energy and water sector were not represented in this survey.

Third, this research is subject to fluctuations, leading to potential uncertainty (IEA, 2024). Energy prices and purchase prices can change rapidly, potentially impacting the accuracy of cost calculations. As a result, the findings must be interpreted within the context of these dynamic market conditions. Moreover, it is important to consider the rapid technological advancements in electric truck development, which are likely to lead to improvements in charging times and driving range.

7.2 Suggestions for further research

The first suggestion for future research is to investigate the actual sustainability of electric trucks. Although these vehicles are widely promoted as a key solution for the future due to their zero-emission operation, their production process is not environmentally neutral (Carlan, 2025). Moreover, if the electricity used to power these trucks is not generated from renewable sources, they still rely on fossil fuels.

Another potential area for further research is the conversion of diesel trucks into battery-electric vehicles (VLAIO, 2025a). This approach offers an alternative path to fleet electrification by transforming existing polluting vehicles into cleaner ones. In Flanders, companies can receive financial support for this process, with subsidies covering up to 50% of the conversion cost for SMEs and 30% for large enterprises.

Further research could also focus on the safety aspects of electric trucks. One concern relates to the increased risk of fire during charging, particularly with fast charging systems (Feys et al., 2024). A second concern is related to the safety of electric trucks when a collision happens. In the survey conducted for this study, several respondents expressed concerns about the safety of electric trucks in the event of a collision, specifically due to the fire hazard posed by the battery systems.

Finally, it could be examined how charging times can be optimally aligned with driving and rest periods, and whether dedicated software solutions could be developed to support this integration.

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Appendices

Appendix 1: Electric truck models in Belgium

Belgium's truck market features a diverse range of manufacturers, each contributing to a competitive landscape (Yvens, 2024). Overall, DAF Trucks leads as the most popular brand, followed by Volvo Trucks and Mercedes-Benz, which secure strong positions in the top three. MAN and Scania occupy fourth and fifth places, while Iveco, Renault Trucks, and Ford Trucks complete the top eight.

While the electric truck market in Belgium is gradually growing, sales volumes for smaller brands remain very limited (Yvens, 2024; Dejaeger, 2024). In 2023, Maxus sold three electric trucks in Belgium, while Sany and Tatra each registered only one heavy-duty vehicle sale. Due to these minimal sales and the relatively low recognition of these brands in Belgium, this analysis focuses on the top eight manufacturers - DAF, Mercedes-Benz, Volvo, MAN, Scania, Iveco, Renault, and Ford - who collectively dominate the market and drive the adoption of electric models.

All manufacturers offering battery-electric trucks collectively provide a total of 100 different models (Scania EV Academy, 2023). Below is an analysis provided, highlighting the key differences among the eight most sold brands in Belgium between 2022 and 2028 (Yvens, 2024; Scania EV Academy, 2023).

DAF TRUCKS

Between 2022 and 2028, DAF offers six types of electric trucks (Scania EV Academy, 2023). The majority of these models are box trucks, with one being a tractor truck. All six models are powered by a BEV powertrain. Depending on the battery pack and motor, the trucks have a range of at least 200 km and up to a maximum of 500 km. All models feature Lithium Iron Phosphate (LFP) batteries and are charged via 150 or 350 kW DC fast charging.

Electric trucks either use LFP batteries or Nickel Manganese Cobalt, abbreviated as NMC, batteries (Schneider et al., 2023; Scania EV Academy, 2023). DAF's models utilize LFP batteries, which are primarily suitable for short-distance transport and volume-constrained operations. Additionally, LFP batteries are often considered safer, more cost-effective and more sustainable than NMC batteries (Paco, s.d.; Schneider et al., 2023). In contrast, NMC batteries are more appropriate for longer distances – between 350 and 600 km – and for weight constrained transport.

A key factor in choosing the appropriate model for electric trucks is the nature of the transport (DAF, 2024). On the one hand the DAF CB Electric is well-suited for urban goods distribution, on the other hand the DAF XF Electric is the best option for regional or national transport. If the buyer is looking for a versatile truck with a range of up to 500 km, the DAF XD Electric would be the most suitable choice.

VOLVO TRUCKS

Volvo offers fourteen different types of electric trucks (Scania EV Academy, 2023). Similar to DAF, the majority of Volvo's models are box trucks and all are powered by BEV powertrains. However, unlike DAF, Volvo exclusively uses NMC batteries. Additionally, while DAF only provides DC fast charging, Volvo offers both DC and AC charging options for its electric trucks.

A noteworthy characteristic of all Volvo's electric models is their range, which is limited to a maximum of 300 km (Scania EV Academy, 2023). For a truck, this range is relatively short, which may limit its suitability for long-haul operations but could be more appropriate for urban or regional deliveries where shorter distances are typical.

Despite the Volvo FH Electric having a range of only 300 kilometers, the truck is still recommended for transport and operations within urban areas due to its comfort, power and quiet operation (AB Volvo, 2024). Charging this truck with alternating current (AC) will take almost ten hours, while, charging with direct current (DC) will reduce the full charging time to two or three hours. Moreover, in 2024 this model of truck was elected as International Truck of the Year (ITOTY, 2024).

MERCEDES-BENZ

The third best-selling truck brand in Belgium offers seven different electric models during the period 2022-2028 (Yvens, 2024; Scania EV Academy, 2023). Similar to DAF and Volvo, the majority of these trucks are box trucks that are fully powered by batteries. The two models with the longest range, namely 500 km, are equipped with LFP batteries, while the other five models have a more limited range and feature NMC batteries. The range of the remaining models varies, with ranges up to 220 km, 300 km and 400 km. The charging system is the same across all seven models, namely DC charging.

Among all electric models from Mercedes-Benz, the eActros is the best choice in urban areas for heavy distribution transport (Daimler Truck AG, 2024). The average charging time for this model depends on several external factors, such as the outside temperature and the charging capacity of the charging station. Furthermore, this model is also equipped with various assistance systems, such as fire detection and alarm systems, to ensure the safety of both the driver and other road users.

MAN

MAN offers three different electric vehicle models: the MAN eTGX, MAN eTGS and MAN eTGL (MAN België, 2024). Depending on the needs of the customer, the truck configuration and cabin can be customized for its specific purpose. When the driving and rest times of drivers are optimally utilized for charging, daily ranges between 600 and 800 kilometers are achievable with the eTGX and eTGS models. The eTGL, on the other hand, is a more practical variant with an average daily range of up to 235 kilometers. The sales of this model will start in April 2025.

SCANIA

SCANIA also offers a range of electric truck models, suitable for both urban distribution and long-distance transport (SCANIA, 2024a; SCANIA, 2024c). When total charging time and driving range are decisive factors in choosing between brands, SCANIA emerges as a great option. This is due to the brand's advanced battery systems, which provide a range between 350 and 600 kilometers when fully charged. These NMC batteries can be charged to 100% in less than 90 minutes when using DC fast chargers (SCANIA, 2024c; Scania EV Academy, 2023). Combined with SCANIA's performance, this ensures high operational efficiency for businesses. Additionally, SCANIA offers both box trucks and tractor units in electric variants, with cabins that can be adapted to meet customer needs.

IVECO

The electric truck from Iveco is a result of a collaboration between two brands, Iveco and Nikola (Transport en Milieu, 2023). In Europe, this truck features the Iveco logo on the grille, while Nikola exclusively serves the American market. The truck has a range of 500 kilometers and can be charged to 80% in 90 minutes. The Iveco HD BEV has a payload capacity of 24.7 tons in Europe.

RENAULT TRUCKS

Renault also offers several electric truck models (Renault Trucks, 2024a). One electric model has a range of a bit above 300 kilometers, while the other models feature a range of 500 kilometers or more. An important consideration is that achieving the full 500-kilometer range with these models requires an extra recharge, which takes an hour at a DC charging station. Additionally, the electric Renault model which is capable of driving up to 560 kilometers has a limited payload capacity of 8.75 tons. Therefore, although it is possible to cover long distances, the truck is less suitable for transporting large or heavy loads.

FORD TRUCKS

In 2022, Ford Trucks announced that the company would completely cease the sale of combustion engine trucks by 2040 (Yvens, 2022). Additionally, they presented at the same moment their electric truck that entered production in 2024, which is designed specifically for waste collection and has a range of 300 kilometers.

Ford trucks has yet to introduce its first battery-electric truck to the Belgian market (Roosens, 2023). The Turkish manufacturer began producing in 2024 and aims to scale up to mass production by 2025. The electric trucks will first undergo a test phase in Turkey before being introduced to the Belgian market.

Appendix 2: Inflation

The inflation figures for Belgium over the period 2015 to 2024 were published by the *Federale Overheidsdienst Economie* (FOD) and the projected inflation rates for 2025, 2026 and 2027 were provided by the National Bank of Belgium (FOD Economie, 2025; NBB, 2024). As no official forecasts have been published for the years 2028 to 2030, an average of the preceding years' inflation rates was used as an estimate for this period.

Table 19: Inflation figures Belgium

INFLATION	
2015	0,6%
2016	1,8%
2017	2,2%
2018	2,3%
2019	1,2%
2020	0,4%
2021	3,2%
2022	10,3%
2023	2,3%
2024	4,3%
2025	2,9%
2026	1,3%
2027	1,7%
2028	2,7%
2029	2,7%
2030	2,7%

Source: Own processing based on FOD Economie (2025) and NBB (2024)

Appendix 3: Survey economic feasibility and challenges of electric trucks in Belgium

Dear participant,

Thank you for taking part in this research on electric trucks in Belgium. Through this survey, I aim to gain insight into the economic feasibility of electric trucks in Belgium. The focus will be on the current charging infrastructure, as well as the benefits, costs, and challenges associated with the transition to an electric truck fleet. This survey targets both companies that are already using electric trucks and those that have not yet adopted them.

Completing this survey will only take a few minutes of your time. At the top of the screen, a red progress bar indicates how many questions you have completed. Participation is entirely voluntary, and all responses will be treated with strict confidentiality and anonymity, solely for research purposes.

Please carefully read the information below in accordance with GDPR guidelines and indicate whether you agree to participate:

- I am aware that I am participating in a study on the economic feasibility and challenges of electric trucks in Belgium.
- My participation involves no risks, and I may stop the survey at any time.
- The results of the study will be used for academic purposes and may be published.
- The survey is completely anonymous: my name or company details will not be mentioned anywhere.
- If I have any questions, I can contact Alix Bens via: alix.bens@student.uantwerpen.be

You are asked to participate in a study conducted by Alix Bens under the supervision of Professor R. Aronietis (Faculty of Business and Economics). The aim of the study is to determine the economic feasibility of electric trucks. Under no circumstances will the collected data be passed on to third parties. If you wish to view, limit, change or delete your personal data, you can contact the student and/or supervisor.

I have read and understood the information above. I agree to participate. (→ 79 respondents)

- Yes → 78 respondents
- No (end of survey) → 1 respondent

Questions related to company information:

Question 1: Does your fleet include at least one truck? (→ 76 respondents)

- Yes → 74 respondents
- No (end of survey) → 2 respondents

Question 2: In which sector is your company active? Please select all answers that apply. (→ 74 respondents)

- Logistics and transportation → 56 respondents
- Construction and infrastructure → 17 respondents
- Retail and wholesale trade → 3 respondents
- Manufacturing → 5 respondents
- Waste management and recycling → 5 respondents
- Agriculture, horticulture, forestry and livestock → 5 respondents
- Chemicals, metals, oil and gas → 3 respondents

- Food and beverage industry → 8 respondents
- Energy and water → 0 respondents
- I don't know → 0 respondents
- Other (please clarify your answer) → 1 respondent
 - o Repair service

Question 3: How many employees does your company currently employ? Please include both permanent staff and temporary agency workers. (→ 74 respondents)

- Fewer than 10 → 22 respondents
- 10 – 49 → 27 respondents
- 50 – 100 → 4 respondents
- 101 – 199 → 6 respondents
- 200 – 499 → 7 respondents
- 500 or more → 8 respondents
- I don't know → 0 respondents

Question 4: How many trucks counts your fleet? (→ 74 respondents)

- Fewer than 5 → 16 respondents
- 5 - 10 → 15 respondents
- 11 - 20 → 15 respondents
- 21 - 50 → 12 respondents
- More than 50 → 16 respondents
- I don't know → 0 respondents

Question 5: What is the average distance covered per truck per year in your company? (→ 74 respondents)

- Less than 50,000 km → 11 respondents
- 50,000 – 100,000 km → 38 respondents
- 100,001 – 150,000 km → 20 respondents
- More than 150,000 km → 5 respondents
- I don't know → 0 respondents

Questions related to the current fleet and electrification status

Question 6: Is your company currently using electric trucks? (→ 74 respondents)

- Yes → 11 respondents
- No → 62 respondents
- In order → 1 respondents
- I don't know → 0 respondents

Question 7a (if question 6 was 'yes'): How many electric trucks does your company currently operate? (→ 12 respondents)

- 1 → 0 respondents
- 2 → 2 respondents
- 3 → 1 respondent
- 4 → 0 respondents

- 5 or more → 9 respondents
- I don't know → 0 respondents

Question 7a (if question 6 was 'no'): What are the main reasons your company has (so far) not purchased an electric truck? Please select all that apply. (→ 61 respondents)

- Purchase cost → 43 respondents
- Charging infrastructure → 39 respondents
- Driving range → 53 respondents
- Charging time → 37 respondents
- Lack of governmental support → 25 respondents
- I don't know → 1 respondent
- Other/additional reasons (please specify) → 11 respondents
 - o At *company name*, the problem is that each driver takes their truck home. I wouldn't know how to solve that
 - o Complexity of the various factors mentioned above, combined with the use of truck-mounted cranes
 - o Legislation
 - o Resale value and reliability
 - o Current electrical connection is not powerful enough (125A) and cannot be upgraded
 - o Usage is not intensive enough to justify such an investment
 - o There is currently no support from our customers to help cover the extra cost of the truck. There is no demand from them.
 - o Limited payload capacity due to battery weight
 - o Payload capacity
 - o Nothing beats a V8
 - o A general disbelief in the technology

Question 7b (if question 6 was 'no'): Is your company considering purchasing electric trucks in the near future? (→ 61 respondents)

- Yes → 6 respondents
- No → 34 respondents
- Doubtful → 21 respondents
- I don't know → 0 respondents

Question 8 (If question 6 was 'yes' or 'in order' or if question 7b was 'yes' or 'doubtful'): What are the main reasons for your company to implement electric trucks (in the future)? Please select all answers that apply. (→ 37 respondents)

- Lower operational costs in the long term → 15 respondents
- Environmental benefits and sustainability goals → 24 respondents
- Government support, subsidies and tax advantages → 12 respondents
- Improved company image and competitive advantage → 22 respondents
- Complying with future regulations and emission standards → 25 respondents
- Technological advancements and improved battery performance → 8 respondents
- I don't know → 1 respondent
- Other/additional (please clarify) → 2 respondents
 - o Not thinking about yet
 - o Customer demand

Questions related to economic considerations

Question 9: What are the main cost concerns for your company regarding electric trucks? Please select all answers that apply. (→ 70 respondents)

- Purchase price → 63 respondents
- Battery replacement → 40 respondents
- Charging infrastructure → 51 respondents
- Insurance costs → 8 respondents
- Maintenance costs → 12 respondents
- I don't know → 2 respondents
- Other/additional (please clarify) → 11 respondents
 - o Low driving range
 - o Carrying out our standard service in general
 - o Residual value of the vehicle
 - o Safety in case of an accident
 - o External charging costs and mixing with own production through solar panels/battery packs, etc.
 - o Battery autonomy
 - o Not applicable
 - o Extra costs in planning because we will have to plan completely differently considering the truck's driving range
 - o Tire costs
 - o Weight, strength for driving different types of builds, e.g., a container system
 - o Lifespan is still a question mark. Also, the continuous developments mean that devices become outdated quickly and less competitive.

Question 10: How does the total cost of ownership (TCO) of electric trucks compare to that of diesel trucks according to your experience or perception? TCO refers to all costs over the entire lifecycle of the truck (not just the purchase price). (→ 70 respondents)

- TCO of an electric truck is lower than that of a diesel truck → 5 respondents
- TCO of an electric truck is equal to that of a diesel truck → 6 respondents
- The TCO of an electric truck is higher than that of a diesel truck → 41 respondents
- I don't know → 18 respondents

Question 11: How important are government subsidies or tax incentives for your company to transition to electric trucks? (→ 70 respondents)

- Not important → 2 respondents
- Somewhat important → 7 respondents
- Important → 14 respondents
- Essential → 44 respondents
- I don't know → 3 respondents

Question 11b (If question 11 was 'somewhat important', 'important' or 'essential'): What (additional) support measures or policy initiatives would encourage your company to purchase (more) electric trucks?

- Open question (→ 33 respondents)
 - o --> They must be competitive without support
 - o --> Subsidies and government support for the development of better technology

- --> Charging infrastructure and additional purchase subsidies
- --> Create a stable electricity grid capable of charging trucks year-round. Invest in more truck charging stations
- --> Tax benefits / No road charges / Subsidy on purchase price
- --> Guaranteed ability to charge at a normal price / Plenty of charging points in every town
- --> ?
- --> 200% tax deduction for charging infrastructure, like previously applied to passenger cars. This would ease pressure on cash flow
- --> Sufficient charging infrastructure
- The TCO must be lower for EV trucks compared to diesel trucks
- Government contribution to the operating costs of electric trucks
- As before: purchase subsidies make the financial case much more feasible
- Subsidy
- Subsidies
- Subsidies for charging infrastructure
- Discount on electricity bill
- Abolish road charges
- No road charges
- Premium
- Allow zero-emission trucks to operate free of road charges. Also, significantly lower electricity grid costs
- Certainty
- Increase the 44-ton weight limit to, for example, 46 tons for zero-emission vehicles
- Subsidy/contribution for installing charging infrastructure / Fast-track procedures with utility companies to set up infrastructure (we've been waiting over 6 months for a response from Fluvijs on our request for a high-voltage cabin) / Clarity on how long current limited incentives will last
- Subsidies for electric truck purchases - not limited to two per company / Well-equipped, affordable charging points for trucks
- Currently not interested in electric vehicles at all
- In the TCO, driving costs are a key factor, so road charges for BEV trucks must be drastically reduced
- The range is too short for us to consider buying an electric truck
- Support in infrastructure
- Extra tonnage
- Improved cost position compared to B7 thermal
- The current purchase price of an electric vehicle is about 3x that of a diesel. On a 7-year lease, the vehicle is never profitable unless we charge extra to our customers. The purchase price should align with that of a diesel
- Expansion of the charging station network in Belgium and Europe / Lower purchase price of an E-truck
- Goh, I think they haven't progressed far enough yet

Question 12: Is your company willing to pay a premium for electric trucks if long-term savings can be demonstrated? (→ 69 respondents)

- Yes → 21 respondents
- No → 13 respondents
- Depends on the size of the premium → 35 respondents
- I don't know → 0 respondents

Question 12b (if question 12 was 'yes' or 'depends on the size of the premium'): Is your company willing to pay a premium for electric trucks if long-term savings can be demonstrated? (→ 56 respondents)

- Less than 5% → 8 respondents
- 5 - 10% → 18 respondents
- 11 - 20% → 18 respondents
- More than 20% → 10 respondents
- I don't know → 2 respondents

Questions related to operational and infrastructure considerations

Question 13: What are the biggest practical challenges for your company in the (future) use of electric trucks? Please select all answers that apply. (→ 69 respondents)

- Driving range → 61 respondents
- Charging time → 50 respondents
- Lack of charging points/stations → 49 respondents
- Difficulties in route planning → 22 respondents
- Limited payload capacity (tonnage/weight of the load) → 46 respondents
- No challenges → 0 respondents
- I don't know → 1 respondent
- Other/additional (please clarify) → 0 respondents

Question 14: Does your company have its own (private) infrastructure for charging a truck? (→ 69 respondents)

- Yes → 12 respondents
- No → 47 respondents
- There are plans to install this → 10 respondents
- I don't know → 0 respondents

Question 15: How do you assess the availability and reliability of public charging locations for trucks in Belgium, including regular charging points that are suitable in terms of space and capacity for charging a truck? (→ 69 respondents)

- Poor → 35 respondents
- Average → 6 respondents
- Good → 2 respondents
- Excellent → 0 respondents
- I don't know → 26 respondents

Question 16: Has your company already encountered grid capacity issues or other electricity supply limitations in relation to a (potential) transition to an electric fleet? (→ 69 respondents)

- Yes, we encountered this during the (preparation for the) transition → 11 respondents
- No, we have not experienced any problems during the (preparation for the) transition → 11 respondents
- We do not (yet) have plans to develop electric infrastructure → 39 respondents
- I don't know → 8 respondents

Questions related to environmental and strategic considerations

Question 17: How important is sustainability in your company's decision-making regarding its vehicle fleet? (→ 69 respondents)

- Not important → 1 respondent
- Somewhat important → 30 respondents
- Very important → 30 respondents
- Essential → 6 respondents
- I don't know → 2 respondents

Question 18: Do you believe that using electric trucks offers a competitive advantage within your sector?

- Yes → 16 respondents
- No → 43 respondents
- I don't know → 10 respondents

Question 19: Is there pressure from customers to deliver with zero emissions, for example because they want to project a sustainable image to their own customers or stakeholders? (→ 69 respondents)

- Yes → 15 respondents
- Sometimes → 19 respondents
- No → 34 respondents
- I don't know → 1 respondent

Question 20: Do you have any additional comments or insights regarding this research?

- Open question (→ 23 respondents)
 - o Most customers do not want to pay an extra fee for these electric applications. They want to showcase a green footprint but shift the burden entirely to the transport sector. If it's not profitable without subsidies, it is doomed to fail anyway.
 - o Here in Belgium, we cannot bring emissions to zero. Our discarded vehicles continue their life elsewhere.
 - o /
 - o At this moment, customers must be willing to co-finance zero-emission transport. An electric truck and its charging station are currently too expensive for small transporters to purchase. However, we are making quick progress in terms of price, range and number of charging points.
 - o I don't think we can run every truck electrically. Either there must be a charging point at every loading and unloading site, which is impossible if you deliver to, for example, private homes or construction sites.
 - o There is still a major evolution coming in battery technology
 - o No
 - o No
 - o It's surprising how little focus there is on where the raw materials for battery production will continue to come from. And what about their dismantling after end-of-life? What about the catastrophic consequences of, say, a pile-up involving electric trucks?
 - o No. We have trucks operating on construction sites, which drive intensively from A to B with heavy loads. We currently see no opportunity with what is available on the market.
 - o No
 - o Hopefully hydrogen is the future if we really have to switch.
 - o No
 - o It's still not ready at all. As long as that doesn't change, I'll keep driving diesel

- If the government allows us to produce our own electricity through wind turbines or other sources (solar panels aren't enough), and if we can store this energy in batteries to charge trucks overnight — with proper government support — then I'd consider switching to electric
- Regulations regarding weight and length must urgently be adapted so that we can do the same work with an electric truck as we can with a diesel truck.
- Electric trucks are not the large-scale solution and are not feasible with current charging stations and batteries — there's just too much volume on the road. Some sectors might be able to adapt, but pure transport is tough, I fear. Drivers often sleep in the truck, are bound by company opening hours for loading/unloading, face tachograph pressure, and try to plan around traffic every day. If our drivers also have to find a charging point, it becomes very difficult to deliver freight to the customer on time.
- There is a big difference in transport types: city delivery or regional transport can't be compared to international transport. With a range of 600+ km, investing in BEV trucks for international transport becomes interesting. The axle load of the tractor becomes an issue, which is less of a problem with rigid trucks. Europe should play a role here as well.
- No
- No
- No
- The extra purchase cost we're willing to pay for an E-truck depends on the total savings we could realize. In TCO, an E-truck is currently break-even for us because we only do overnight home base charging, and we charge using green energy from our own wind turbines (and solar panels via battery storage, so it can be charged overnight)
- No

This was the end of the survey. Thank you for your time and valuable contribution. Please click the red arrow below one last time to submit your responses.

If you would like to receive the results of this survey, you can leave your email address below.

For further questions or clarification, feel free to contact: alix.bens@student.uantwerpen.be

Kind regards,

Alix Bens

Master's student TEW – Transport & Logistics



**Universiteit
Antwerpen**

Verklaring op woord van eer

Ik verklaar dat ik deze aan de Faculteit BE ingediende masterproef zelfstandig en zonder hulp van andere dan de vermelde bronnen heb gemaakt.

Ik bevestig dat de direct en indirect overgenomen informatie, stellingen en figuren uit andere bronnen als zodanig aangegeven zijn in overeenstemming met de richtlijnen over plagiaat in de masterproefbrochure.

Ik bevestig dat dit werk origineel is, aan geen andere onderwijsinstelling werd aangeboden en nog niet werd gepubliceerd.

Ik ben mij bewust van de implicaties van fraude zoals beschreven in artikel 15 van het onderwijs- en examenreglement van de Universiteit Antwerpen. (www.uantwerpen.be/oer)

Datum 19 Mei 2025

Naam Alix Bens

Handtekening Alix Bens

Bevestiging van het volgen van de regelgeving m.b.t. de AVG (Algemene Verordening Gegevensbescherming)

Hierbij bevestig ik, ondergetekende Bens Alix

dat ik de richtlijnen m.b.t. de AVG in mijn onderzoek heb gevolgd en dat ik mijn respondenten hiervan ook op de hoogte heb gebracht.

Ik heb de respondenten gewezen op de wijze van verwerking van de verzamelde gegevens en de mogelijke risico's verbonden aan het onderzoek. Ik heb expliciet de vraag gesteld naar hun akkoord voor de wijze van verwerking van de gegevens. Tevens bevestig ik dat de respondenten toestemming hebben gegeven om aan de studie deel te nemen en zich akkoord verklaard hebben met de wijze van verwerking van de gegevens.

Datum: 19 mei 2025

Handtekening student: Alix Bens

Contactgegevens: Alix Bens (alix.bens@student.uantwerpen.be)