
Market Challenges and their Impact on the Polish International Road Freight Transport Sector

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Andrzej S. Grzelakowski¹

Abstract:

Purpose: The main objective of the research is identifying the key market driven challenges facing currently the EU road freight sector, as well as, assessing their impact on Polish road freight haulers, in both economic and financial aspects, as well as regulatory ones with respect to its decarbonizing.

Design/Methodology/Approach: To conduct this data-driven research, the following methods were applied: critical literature analysis, data mining and analysis, factor analysis, market analysis and comparative analysis.

Findings: The Polish road freight transport companies play key role in both domestic and international freight transport market, generating at the same time significant amount of GHG. Being under the restrictive regulatory measures aimed at transforming it towards zero emission, they strive to achieve the EC targets in the scheduled time through the accelerated development of electromobility. However, such a path towards decarbonization is associated with huge upfront costs, they need to bear. Capital-weak Polish road freight transport companies, characterized by low profitability and operating in highly competitive, atomized polypoly-type EU market, are not able, however, to carry out the necessary replacement of the vehicle fleet driven by combustion engines by green electric trucks without sufficiently high financial state support. Due to the long lasting market disruptions caused by the ongoing war in Ukraine, temporary abolition of permits for Ukrainian carriers, reconfiguration of supply chains and many macroeconomic reasons that affected severely road freight sector, without significant public financial support, there majority of SMEs will go bankrupt. The road transport market will progressing towards consolidation and oligopolization.

Practical Implications: The current fast-track implementation of the EU road transport decarbonization strategy, focused almost exclusively on achieving ecological goals, should be revised. It needs not only to be extended in time, but also much more strongly than before, take into account the economic and social aspects resulting from its implementation. Otherwise, it may cause serious economic effects for all parties involved in the road transport chains and the EU economy.

Originality/Value: Without bridging the gap between the currently overemphasized environmental dimension and the economic and social ones of the sustainable mobility strategy, it will not be possible to proceed smoothly towards decarbonizing the EU road freight transport. This is the only way to avoid excessive costs and social losses accompanying this type of deep structural change.

¹Gdynia Maritime University, Faculty of Management & Quality Science, Gdynia, Poland, ORCID ID: 0000-0001-7190-6115, e-mail: a.grzelakowski@wzpj.umg.edu.pl

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1. Introduction

Polish companies performance for road freight transport in tonne-kilometres (tkm) in 2004, when Poland joined the EU, was only ca. 30% of German companies. However, in 2018, both values became equal, and in subsequent years, Polish companies surpassed German carriers and became the leader in the EU market since that time. The market share of Polish road haulers in total EU freight transport performance in tkm has increased by as much as 10.4% since 2011, and now stands at about 20% (TLP-SpotData, 2024).

However, the share of Polish road companies in international transport carried out in the EU road transport market, i.e., between member states as well as in cross-trade and cabotage amounted to ca. 33% in 2023 (ZMPD, 2024). With such a high share of Polish road freight carriers in the EU international road transport market, they are among the absolute leaders, ahead of Spain, Lithuania, Romania and Germany with shares of 11.9, 6.9, 5.7 and 4.8, respectively.

The leading position of Polish road freight carriers in the EU market is the result of their high cost competitiveness combined with high quality of services provided and rare ability to adapt to the highly volatile, shock-prone international road transport market in Europe. (TLP-SpotData, 2024).

However, as highly qualified providers of transport services, operating in the most competitive in the EU transport market, Polish road freight transport companies need to have not only a lofty adaptability to dynamic market fluctuations, but also have to properly explore their numerous logistics and operational advantages, such as above-average flexibility and mobility.

Only the appropriate combination of technical and operational features of this mode of transport with its ability to quickly adapt to the market, creates the possibility of gaining a competitive advantage over other road freight haulers as well as rail and inland waterway transport services' providers in terms of direct access to the shippers. Therefore, their business models, strongly oriented on meeting the requirements of the well developed highly competitive market of this transport sector, should demonstrate at the same time elasticity in terms of its quick adaptability to various kinds of supply chain disruptions. They are currently a

characteristic, almost permanent feature of the EU logistics supply chains functioning, impacting at the same time significantly the road freight transport.

Moreover, the EU road freight transport market is extremely fragmented. It refers predominantly to the supply side but also to a large extent to the demand side. Such an extremely competitive market structures, i.e., atomized markets of the polipol type as a typical for this transport sector, especially in times of economic recession, falling demand and, consequently, prices for carriers' services, usually seriously affects economically the entire road freight sector.

However, the effects of this are felt most strongly by small and medium-sized (SME) road haulers. They are expressed in form of gradual plunge of their operational rentability, making the costs covering unrealistic in fact (Beguerie, 2024).

If such market challenges timely coincide, however, with serious regulatory challenges, being a result of the legally determined by the EU quick and highly capital-intensive path of the road freight transport decarbonizing, what is now the case, then, there is a risk of an arising a deep economic crisis in the sector. It can entile wide market structural changes in the EU road freight transport along with possible serious economic and social consequences.

These types of challenges and threats, accompanying the current stage of the international road freight transport sector's development and, at the same time, its timely adaptation to the established tough requirements of its decarbonisation, are the subject of research.

The main research problems come down to determining the extent to which the currently existing economic slowdown and extremely unfavourable market conditions for road freight transport carriers, generating serious financial and economic constraints may affect: 1. structural changes of the road freight market, and 2. dynamics of the already implemented decarbonisation process of this sector.

At the same time, research hypotheses were formulated that: 1/ there will be significant changes on the supply side of the market in this sector, manifested in the form of progressive consolidation of carriers and, as a result, oligopolization of the market and 2/ there will be a significant slowdown in the process of adapting carriers, mainly small and medium-sized ones, to the decarbonization goals set by the EU regulator.

2. Literature Review and Methodology

The article, which presents the results of empirical research, required the use of techniques and tools appropriate for this type of conducted research. In order to proper identification and later on in depth analysing and assessing the challenges the

Polish road freight transport companies currently face and further on indicating their impact expressed in terms of economic and financial standing on the companies themselves as well as their ability to further proceed decarbonizing processes in line with the EU regulatory requirements, it was necessary to use, first of all, up-to-date empirical data of Polish international road haulers' associations and statistical data.

In this case, mainly reliable, up-to-date and available sources of Polish industry organizations, branch institutes and research centers which periodically or occasionally analyze road freight transport sector. were explored. In addition, the database has been enriched with information and statistics obtained from analyses of numerous reports, studies, policy statements and position papers developed by institutions such as:

1. EC (European Commission),
2. UN ECE (UN Economic and Social Commission),
3. EIB (European Investment Bank),
4. IRU (International Road Union),
5. ACEA (European Automobile Manufacturers Association),
6. ITF (International Transport Forum) as well as International Road Carriers Associations of the EU countries (e.g., ZMPD in Poland) and many other organizations as well as consulting and research institutes (T. Trans. EU, McKinsey, SpotData, TLP).

Data necessary for conducting analyses were obtained from statistical studies of the EU (Statistical Pocketbook, EU Transport in figures, DG Mobility and Transport) and Eurostat, Statista, as well as digital platforms for professionals, such as EUROACTIV, RailwayPro, Upply, T&E (Transport & Environment), Transporeon GmbH, CargoON, TransportON and Timocon.

Data and information from the websites of road carrier associations were also used. In addition, some data and information were made available thanks to numerous interviews conducted with representatives of road carrier employers' organizations in Poland. Legal acts and sectoral regulations concerning the decarbonization of road freight transport being the subject of the analyses, were taken from the list of legislative actions concerning this transport sector undertaken by EU bodies.

Legal commentaries and opinions regarding the analysed EU's road freight transport policy and proposed regulations, presented in EU Monitor, were also taken into account.

The materials allowed obtaining basic data on all analyzed components, specifying at the same time existed relationships between them. It potentially made possible to examine the impact of the currently seen slowdown of the economic growth in the EU countries as well as ongoing decrease in demand for road freight transport

services connected with many other market distortions affected the road transport sector in Poland and other CEEC countries.

As a result, there have been worsening at the same time seriously the economic and financial standing predominantly the weakest and most vulnerable to such a crisis SME and slowing down the energy transformation of the Polish road freight transport sector. Moreover, the collected and processed data as well as the obtained information and materials enabled the development of the methodological basis for the implementation of this research project.

In order to properly identify as well as evaluate the effects of imposing rigorous EU regulatory strategy addressed to this transport sector and examine its real impact on the the providers of road transport services as well as the EU freight transport market in medium and long term, a number of classic, both quantitative and qualitative research methods and techniques were used.

The following methods were mainly applied as part of the methodological triangulation formula: critical analysis of literature (CLA), factor analysis (FA), mining of data obtained from many road freight haulers organisations, research and consulting institutes and numerous statistical sources, as well as market (MA) and comparative analysis (CA).

2.1 Polish Road Freight Transport Companies in the European International Road Freight Market: Comparative Analysis of the EU Market Supply Side. I Stage of Research

Road freight transport with ca. 54% market share in performed tonne-kilometres [tkm] within the domestic and intra-EU-27 carriage of goods in 2023, maintains its leading position in the freight transport market (Statista, 2024). It determines to the great extent the smooth operational efficiency and effective development of the European transport and logistics area, while participating at the same time to a large extent in the creation of jobs and generated gross value added (GVA) in EU-27. (Statista, 2024; Eurostat, 2024).

Polish carriers occupy the highest position in international road freight transport in the EU. The achieved volume of goods carried in road transport in tkm by Polish haulers accounted for 20.3% of total road freight transport performance of EU countries in 2023, which ranked Poland in the first place among the EU's countries.

However, in intra EU transport, Poland's share was significantly higher and accounted for one third of the total EU transport performance. It is also worth pointing out that the share of the road freight transport in the total freight transport performance in Poland was as much as 86.6% in 2023, while the average in EU-27 accounted for 78.53% (ZMPD, 2024).

The total transport performance (tkm) of the Polish carriers in international road freight transport since Poland's accession to the EU in 2004, has increased more than fivefold. Basic data on the scope of their transport activity on the EU international road freight market and resource they used are presented in Table 1 for 2023.

Table 1. *Main resources and operational results of the Polish international road freight transport companies in 2023*

Category	1	2	3	4	5	6	7	8
Data	36 120	304 943	45565	410000	245	180	5.13	140 000

Note: 1. Number of trucks 2.5-3.5 t.; 2. Number of heavy goods vehicles (HGV) over 3.5 t. ; 3. Numer of road transport companies in international freight haulage; 4. number of drivers employed; 5. transport performance in billions of tkm; 6. annual market value of transport services performed in billions of PLN; 7. average cost per vehicle kilometer in PLN; 8. average annual mileage of a truck in km.

Source: ZMPD, (2024).

Data analysis shows that Poland currently ranks third in the EU-27 in terms of the number of companies performing international road transport (after Romania and Gemany) as well as third in terms of the number of trucks involved (after Germany and France).

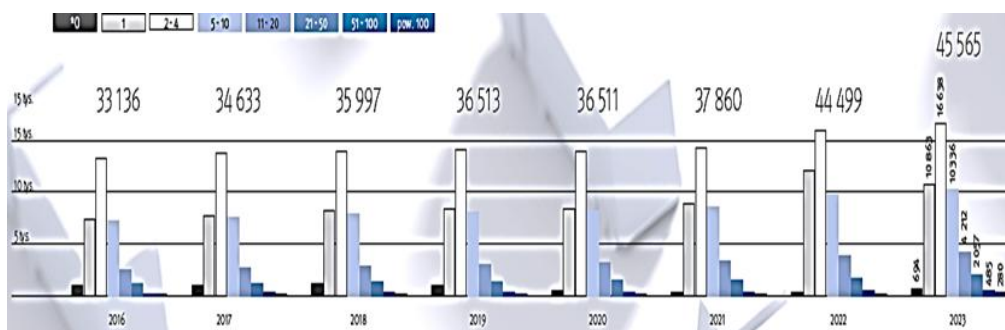
In the EU, there were registered 331,664 road freight haulage companies in 2023, which was an increase of 3.3% compared to 2022. The EU also had a fleet of 2,418,726 authorized vehicles, which was an increase of 5.7% compared to 2022 (Eurostat, 2024). In Poland, these increases in the period 2022-2023 amounted to 16.5% and 13.5%, respectively. The increases also resulted from the licensing obligation for vehicles 2.8-3.5 t dmc.

By taking a closer look at the supply side of international road freight transport performed by Polish carriers, it should be noted that since Poland's accession to the EU, the number of international road transport companies has increased fourfold, and the number of trucks almost fivefold. What is particularly important here, when analyzing the supply side of the market, this activity is conducted predominantly by small family businesses.

In 2023, the largest number of Polish companies performing international road transport of goods, i. e. as many as 16,638, had a fleet of between 2 and 4 vehicles. The fewest companies had a fleet of over 100 vehicles (ZMPD, 2024; TLP-SpotData, 2024). Companies with a fleet of 1 to 10 vehicles constitute approx. 80% of all companies and this market supply side segment was dominated by small family businesses, too.

The structure of the supply side of the market for international road freight transport performed by Polish carriers according to the number of vehicles in 2023 is presented in Figure 1.

Figure 1. Number of Polish companies performing international road freight transport by number of vehicles in the period 2016-2023



Source: ZMPD, 2024; GITD, 2024.

Analyzing the entity structure of the supply side of the studied EU market, it should be noted that road transport haulers use their tracks in international carriage of goods on behalf of shippers or logistics service providers, undertaking activities in the market, which structure shows an overwhelming majority of 91% of small or micro enterprises with less than 10 employees (Transporeon, 2024). Such a supply side's structure is, therefore not only typical for Polish road freight transport sector but also for almost all sectors of the EU's countries (IRU, 2024). However, it is particularly noticeable in the CEE countries.

Therefore, a market with such characteristics as the EU road freight transport market, is extremely fragmented. It refers predominantly to the supply side but also to great extent to the demand side, too. Such a characteristic feature like dispersed supply and demand, clearly indicates that this market is a highly competitive one, showing the typical characteristics of an atomized market defined usually as polipol.

Such extremely competitive, polipolistic in its nature market, where the road freight haulers compete not only each other but also the providers of rail transport services, generates significant benefits for both shippers, while reducing their direct and indirect transport cost as well as final consumers of goods transported by road (Grzelakowski, 2025).

However, it places high demands on road carriers in terms of operational and logistical efficiency. They need to work out under competitive market pressure not only a lofty adaptability to dynamically changing market conditions, but also a number of logistic and operational advantages, such as above-average flexibility and mobility.

These factors determine their competitive advantages over rail and inland waterway transport companies in terms of direct access to potential shippers, as well as high

adaptability to various kinds of supply chain disruptions which are a characteristic feature of the current period.

2.2 International Road Freight Transport Market and its Impact on Polish Road Freight Companies: Analytical Approach Stage II

Operating in highly competitive, very dynamic and demanding in logistics terms international market, makes the road freight transport companies very vulnerable, i.e. less resilient to any kind of market disruptions caused usually by economic slump. As a result, especially in times of economic recession, falling demand and, consequently, prices for carriers' services, any market disruptions seriously affect them in economic and financial terms.

This applies primarily to small and medium-sized road haulers, and manifests itself in the form of limitation of their operational rentability, what makes at the same time the possibility of the costs covering very difficult and sometimes it becomes downright unreal.

The conducted market analysis of the international freight road transport market in the EU clearly indicate that this freight transport sector was seriously hit by recession in the recent three years. It was the result of a number of factors that contributed to the deterioration of the financial condition of the Polish road freight transport companies operating on the open EU market.

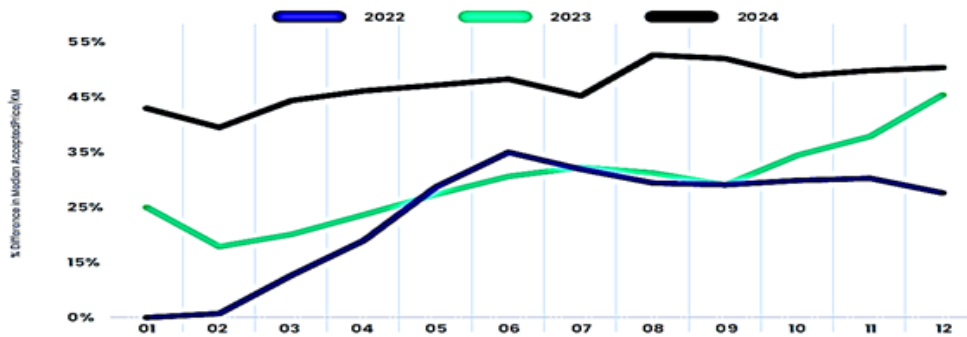
Their sources were in the commodity markets, money markets and labor markets, accumulating in the period under review, i.e., in 2022-2024. The main reason was the slowdown or even a significant recession in the economies of the largest EU's countries such as Germany, France and many CEE's countries (Kerriou, 2024). The economic downturn was reflected by the PMI developed for the economies of the affected countries.

As a result of that, the road freight transport companies in Poland, and above all, overwhelming majority of small or micro enterprises with less than 10 employees as most vulnerable to any market distortions caused by economic slump have been particularly hard hit by the notably weakened demand (Beguerie, 2025).

Significant fluctuations and decreases in demand for the services of road freight transport carriers were reflected, although sometimes with a significant delay, in spot rates. The changes in the level of the spot rates are shown in the Figure 2.

Low level of spot freight rates in the years 2023-2024, which definitely prevail in terms of the scope of their application in relation to contract rates in international transport carried out by micro and SME involved in freight road haulage, significantly reduced not only the level of revenues, but also diminished to a great deal their already low profitability.

Figure 2. Changes in spot freight rates in Europe in 2022-2024 (% YoY)



Source: (T)Trans.eu, 2024; CARGO(ON), 2025.

The Upply Road Freight Rate Index for Europe (URFRIE), which stands at 122.4 points in the third quarter of 2024 on the spot market, fell in fact by 4.4 points compared to the previous quarter and by 6.1 points year-on-year. Meanwhile, the road freight rate index on the contract market remained stable quarter-on-quarter at 127.2, but fell by 2.2 points year-on-year (Beguerie, 2025; Kerriou, 2025).

This trends were the result of high dynamics of demand reduction, i.e. a decrease in the number of transport offers being a result of a falling freight volume in relation to the offered transport capacity by the road haulers.

As far as the currently existed relation between the spot rates and contract rates quoted in the European road freight transport market is concerned, clearly presents the URFRIE (Figure 3). Such index is determined according to a set formula that takes into account data from the Timocon freight exchange as well as IRU and the Upply platform (Ti x Upply x IRU European road freight rates index).

The index include the price estimates which are based on actual transactions (Kerriou, 2025). Therefore, they may be subject to revisions as new data are incorporated into the Upply database.

Figure 3 clearly shows that road freight transport prices, both on the contract and the spot markets in Europe decreased a quarter-on-quarter in the first quarter of 2025. At that time the Upply spot road freight rate index decreased by 3.8 points quarter-on-quarter to 134.1 points, as did the contract index, which lost 2.3 points to 131.1.

However, year-on-year, the trend remains bullish: the Spot index gained 1.6 points and the contractual index 0.4 points. According to estimates by the Timocon freight exchange, supply will exceed demand throughout 2025, which will result in lower volumes, reducing at the same time the pressure on road freight rates, as cost growth in the road transport sector has also slightly slowed. Consequently, a weak stabilization of freight rates may be expected.

Visible symptoms of a slowdown and then recession in the EU road freight market had a strong impact on the Polish carriers. In 2023, compared to the previous year, a decrease in volume by 1.0% and in transport performance in tkm by 3.7% in carriage of goods in national transport was noted. It was partially a result of the unfair competition from Ukrainian carriers who, by quoting low transport rates, performed cabotage transport in Poland, which is inconsistent with the EU-Ukraine agreement concluded in 2023.

In turn, in international transport a decrease in tonnes by 0.9% and in transport performance by 0.8% was recorded. In comparison with 2022, the share of international transport in total transport remained at a similar level 21.4% for tonnes and increased from 63.6% up to 64.3% for tkm (Eurostat, 2024).

According to surveys conducted by ZMPD among carriers and analyses by experts from this transport sector, the main causes of the current crisis, which has severely affected Polish international road freight carriers, include: a significant collapse in demand for transport services as a result of the cooling of the European economy, an increase in energy prices, rising labour costs and costs resulting from the implementation of solutions aimed at decarbonisation, as well as inflation and the relatively strong exchange rate of the PLN against the euro.

As a result of the accumulation of all these various reasons, the current strategies of the Polish road carriers based on searching for new alternative transport routes that could guarantee higher profitability, i.e. by turning to other EU's road freight markets. However, it have not brought the intended results. On the contrary, such short-term tactical behavior has sparked fierce competition which impacted on transport spot prices in 2023-2024 (Beguerie, 2024; TLP-SpotData, 2024).

This usually resulted in increased operating costs and reduced profitability of conducted transport performance. The average operating costs structure and level of profitability of the Polish international road freight transport companies are presented in Tables 2 and 3.

Table 2. Average costs per 1 vehicle-kilometer, average transport rates and average net margin (PLN/km) of the Polish freight road companies loperating on international EU routes in 2021-2023.

Year	Average freight rate	Average cost	Average net margin
2021	5.13	4.93	0.20
2022	5.32	4.98	0.34
2023	5.29	5.13	0.16

Source: ZMPD, 2024,

The data presented in Table 2. indicate that in 2023 the operating costs of Polish international freight road carriers increased significantly and at the same time the transport freight rates decreased highly compared to the previous year. As a result,

there was a significant reduction in the level of their profitability. The net margin dropped more than a half. The structure of the operating costs of the Polish road freight transport companies committed in European international relations in 2023 is presented in Table 3.

Table 3. *The structure of the operating costs of the Polish road freight transport companies carrying goods in European relations in 2023 (share in total costs in %).*

Year 2023	1	2	3	4	5	6	7	8
Share in %	34.3	4.9	4.1	3.3	31,0	3.1	11.7	7.0

Note: I/ 1. Fuels and consumables, 2. Repair services, repairs and tires, 3. Amortisation and depreciation, 4. Other capital costs (leasing, credit), 5. Drivers' remuneration and delegations and social insurance of foreign employees, 6. Transport insurance and transport tax, 7. Road tolls, 8. Other costs of the company's transport activities. II/ The following tax components were added to items 1 and 6, 7 and 8: income tax (CIT, PIT), VAT, excise tax on fuel, fuel fee, tax on vehicles, environmental fee (emission) and property tax (including parking).

Source: ZMPD, 2024.

Based on the analyses carried out, it can be concluded that road transport haulers are actually the market price takers with marginal revenues (MR) which do not always cover the level of marginal costs incurred (MC). Relatively low barriers to entry into the market and a homogeneous product (high substitutability) limit the possibilities of maintaining financial surplus in the long term (Ragon and Rodriquez, 2022; Schröder *at al.*, 2023). As a result, their financial resources and, consequently, investments potential is currently very limited.

The particularly visible effect of this, is the deterioration of the economic situation in road transport, which is mainly noticed in the data on insolvencies, which consist of restructuring and bankruptcy proceedings. In the years 2022-2024, a significant increase in the number of restructuring proceedings in transport can be observed - from 87 in 2021 to as many as 493 in 2024. At the same time, the number of bankruptcies of companies in the industry from 28 in 2020 during the pandemic crisis, stabilized at 12 in the years 2023-2024.

However, in Poland bankruptcies are an increasingly less common form of solving the problem of excessive debt, because this procedure most often involves liquidation of the company. The legal changes that have been made have allowed companies to reduce debts without liquidating their business, i.e., facilitating debt restructuring, and recently the number of such proceedings has been gradually increasing. The increase is also due to greater protection of debtors.

On the other hand, the impact of the recession can be seen by comparing the number of insolvencies in road transport to the total number of insolvencies. This share is systematically growing. In the case of restructurings alone, in 2020 it amounted to 6%, in 2021 – 5%, in 2022 8%, in 2023 – 10%, and in 2024 already 13%. Thus, the share of the road transport sector in the number of restructuring proceedings is nine

times higher than its share in GDP. The financial difficulties in road freight transport are also indicated by the growing number of suspensions of road transport, which increased from 63 in 2021 to 107 in 2022, 208 in 2023 and as much as 349 in 2024 (TLP-SpotData, 2024; (T)Trans.eu, 2024).

Therefore, their current level of readiness to meet the restrictive requirements of the energy transformation and to bear, in particular the high uptake costs of purchasing new electric vehicles meeting the EC targets concerning zero-emissions, are very limited (T&E, 2023).

3. The Path Towards Green Transformation: Research Results and Discussion

The EU package Fit for 55, adopted in 2021, established a new wider and more accelerated greening procedure of the transport sector, supporting the EGD and SSMS by several detailed regulations (EP, 2022; EC, 2020). According to its adopted goals, the percentage of greenhouse gas reduction by 2030 should be 55% and by 2035, combustion vehicles are to disappear from the market, being replaced primarily by electric trucks.

According to it, the average CO₂ emissions of HDVs would have to decrease by 45% from 2030, by 65% from 2035, and by 90% from 2040 onwards, compared to 2019 levels (Antolini, 2024). Thanks to this, the EU transport sector is planned to achieve zero emissions in 2050. Another important regulatory challenge for the EU road freight transport is the s.c. ETS 2 system (EU, 2023). The ETS2 for road transport is a new extension of the EU's emissions trading system, covering the road transport and construction sectors from 2027.

Bearing in mind that at the beginning of 2025 more than 94% of all HDVs in the EU have fossil fuel powered propulsion, the scope of the challenges that need to be overcome both on the EU and road freight companies level to achieve the transition target and put into practice a necessary fleet of ZETs is vast.

Meanwhile, the progress achieved in the decarbonisation of the EU road freight transport sector over the last few years is not impressive and does not provide a chance to achieve the regulatory objectives set for the future. In the EU the absolute majority of HDVs in annual sales in their core vehicle segments were diesel powered in 2023.

Share of vehicles powered by electric, hybrid or alternative energy (natural gas) in the total number of newly purchased HDVs (i.e., vehicles with GVW of 16 tonnes and more) registrations amounted to: 8% in France, 3% in Germany, 2% in Italy and only 1,1% in Poland in 2023 (ACEA, 2024). On average at the EU level it was only 3%. Meanwhile, the estimated share of these low and zero emission trucks' sales and thus their share in the total fleet of the EU road hauliers' fleet should be in 2025

– 7%, 2030 – 28%, 2035 – 49% and in 2040 – 78% (McKinsey, 2024 b; 2023, Beguerie, 2024). Achieving such indicators is necessary to meet CO₂ emission reduction targets.

In 2024, a total of 7,516 electric trucks were registered in the EU. In Poland, on the other hand, the number of electric trucks in the N3 category (over 12 tons) was only 105. In this respect, Poland ranked only 13th in Europe. In May 2025, 240 electric trucks with a GVW of over 3.5 tons were registered in Poland.

Over the last 12 months, the market has grown by 69.0%. During the first 4 months of this year, the fleet increased by only 33 units, which means a 10 percent decrease compared to the same period in 2024 (ACEA, 2025). In the N2 vehicle category, there were 132 vehicles, which means that over the last 12 months the fleet increased by 88.6% (SAMAR, 2025). In the segment with N3 homologation, 108 vehicles were registered, 50.0% more than a year earlier (SAMAR, 2025). The electrification percentage of heavy transport in Poland is therefore only 0.03% (May 2025).

Figure 5. Number of electric trucks in use in Poland in the N2 and N3 categories in the period April 2024 – May 2025



Source: SAMAR, 2025.

The obtained research results clearly indicate that Poland is only at the very beginning of the development of electromobility in this transport sector. There are still many barriers to the speeding up the decarbonization of the Polish road freight transport.

In addition to the already indicated economic limitations resulting from the ongoing market disturbances and the resulting critical financial condition of micro, small and medium-sized transport companies, there are also serious limitations resulting from the underdevelopment of vehicle charging infrastructure and access to public funds that make it possible to compensate to a certain extent the difference between the at least twice as high costs of purchasing an electric truck in relation to a diesel-powered one (ACEA, 2025; Kerriou, 2025).

For eHGV, the use of high-power direct current (DC) fast chargers is recommended. Typical charging capacities for these vehicles are 50-150 kW for N2 and 150-350 kW for N3 trucks. The latest data from the "AFIR Counter" show that Poland is still far from achieving the objectives of the EU AFIR regulation.

Fulfilment of the requirements for charging zones along the TEN-T network is currently only 13%, while the implementation of obligations for heavy vehicles remains at 0%.(McKinsey, 2024 a; PSNM, 2024)

Equally important to the development of charging infrastructure for eHDV is the introduction of comprehensive support instruments, such as increased subsidies for the purchase of ZETs, tax relief and programs dedicated especially to SMEs. To achieve a real reduction in emissions, Poland must also significantly increase the share of renewable energy sources in the domestic energy mix or start investing in other alternative fuels. This kind of legal and economic actions, although undertaken with a delay, are gradually being implemented.

Thus, in 2025, support programs with a total budget of over EUR 950 million were launched for the construction and expansion of publicly available charging stations for HDV and the development of the electricity network (PSNM, 2025). They constitute a significant step towards the transformation of the freight road transport and strengthening its market position in the EU.

In addition, a third support programme worth approx. EUR 450 ml is currently being launched in the form of support for the purchase or leasing of zero-emission vehicles (ZET) of categories N2 and N3. This third pillar of the accessible support programme assumes that in the case of the purchase of eHDV vehicles, the subsidy may amount to a maximum of: 30% of eligible costs for large enterprises, 50% for MSE enterprises and 60% for small enterprises.

However, the total amount of support may not exceed EUR 95 thousand for category N2 vehicles or EUR 182 thousand for category N3 (PSNM, 2025). For the leasing option, the support may not be higher than the amount of the initial leasing fee.

The next two years will show whether such actions will bring the intended effects, leading to a significant leap in the implementation of decarbonisation goals in the Polish international road transport sector. This depends to a large extent on the activity of the national regulator, which should also support carriers with reliefs in the reduction of road tolls for eHDVs and other forms of support.

Regulator's activity should aim to reduce the operating costs of such vehicles, which may be a significant incentive for carriers to replace currently used, technically outdated HDVs aged at average of 15 years and having high operating costs and as well as significant negative impact on the environment with ZET.

4. Conclusions

The Polish freight road transport, characterised by absolute dominant share of SMEs in the overall number of companies operating currently in the international European market, has encountered numerous market driven economic hurdles and barriers

which lead to significant cost increases and net profit margins erosion. The lack of capital and, at the same time, a very limited access to credits and loans by gradually increasing financial indebtedness, has already caused the suspension of operating activities and the growing threat of insolvency and bankruptcies of many of Polish international freight road haulers.

Moreover, for most of them, the gradual loss of competitiveness and, consequently, of their market advantages, appears as another potential effect of market disturbances. Nowadays, there are the main challenges they face as a leaders in the EU market.

In in such circumstances, meeting the very ambitious EU's regulatory challenge regarding the energy transformation of this sector becomes particularly difficult for this transport sector and especially micro as well as SMEs. On the one hand, due to their poor economic and financial condition, the market adoption of ZEVs has been considerable hampered, if not impossible.

On the other, the still existed significant cost differential between a diesel HDV and an electric one, despite potential access to fairly limited state subsidies, additionally is slowing down the energy transformation process in this transport sector.

The conducted research clearly indicates that the process of transformation of the Polish freight road transport towards zero emission is very complex and difficult to implement within the time period specified by the EU regulator. In fact, there are many challenges in the process of its electrification, from technological, through financial, to infrastructural. It is also burdened not only with numerous serious micro but also profound macroeconomic and social challenges as well as risks related to the possible rapid consolidation of the freight road market segment towards its oligopolization along with the loss of many jobs in this transport sector.

As a result, complex, coordinated actions will be needed by the government, industry and transport operators and eventually developing by the national regulator mid term strategy making the road transport sector transition towards zero-emissions effective and widespread.

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