



Intelligence Briefing.

TCO and CO₂ in Poland:
alternative and diesel
trucks in 2025

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Introduction

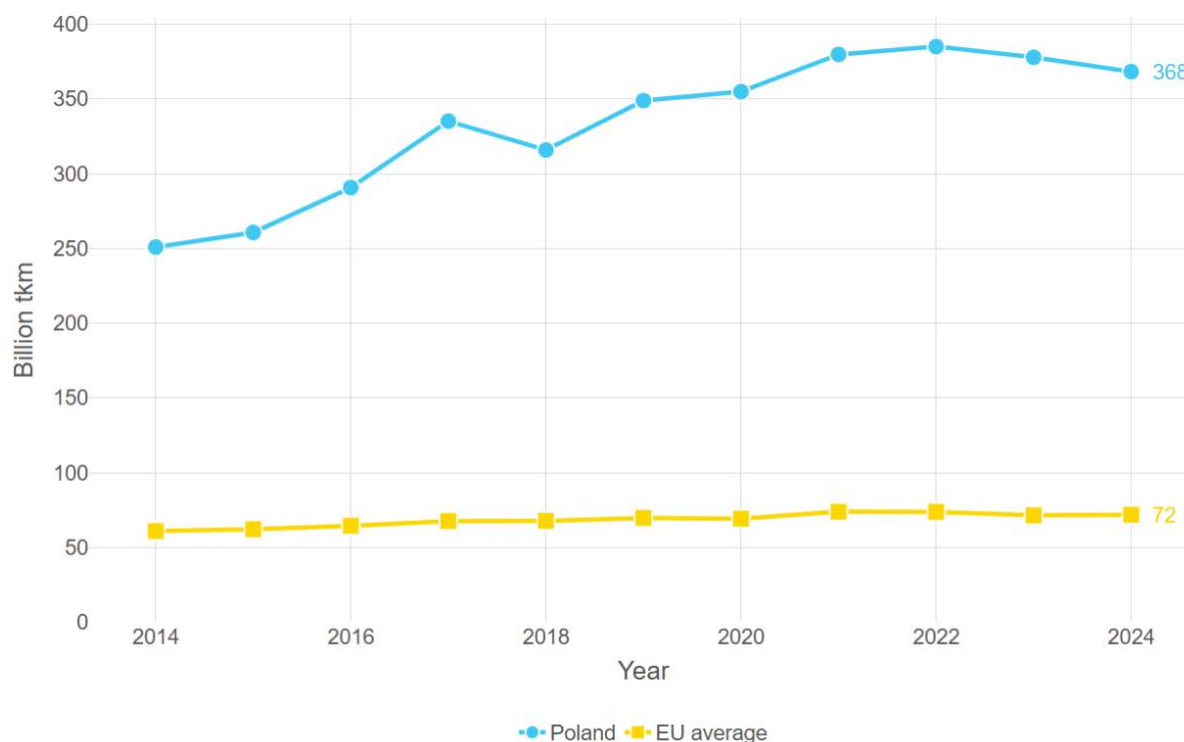
The road freight sector is widely recognised for its operational efficiency, offering fast, reliable, and cost-effective solutions to its customers, including shippers and freight forwarders. In today's evolving economic and regulatory landscape, there are both opportunities and challenges in managing and optimising these costs. While inflation continues to exert pressure on margins, environmental policies are steering the sector towards net-zero emission targets. Achieving sustainable operations that are also financially viable requires a careful strategic balance. The total cost of ownership (TCO) serves as a valuable tool in this context, offering a holistic view of the financial performance of freight operations. However, to fully align with environmental goals and benefit from regulatory developments, it is equally important to integrate CO₂ emissions into strategic planning.

Alternative powertrains are steadily gaining traction across Europe, offering fleet operators a growing array of options to reduce carbon emissions. While diesel remains the predominant fuel powering Europe's heavy-duty fleet, alternative solutions such as compressed natural gas (CNG) and liquefied natural gas (LNG), hydrotreated vegetable oil (HVO), electric, and hydrogen present promising opportunities to enhance long-term operational sustainability. These technologies provide significant potential for reducing CO₂ emissions. However, the adoption may vary depending on an operator's bargaining power and the availability of national incentives or subsidies.

The following TCO-CO₂ analysis uncovers key economic insights related to the financial viability of different vehicle technologies within the evolving EU regulatory framework over the next six years. Drawing on its industry expertise, IRU has developed and validated its assumptions in close collaboration with its members. This analysis incorporates future-oriented parameters, including the upcoming Emissions Trading System 2 (ETS2), to provide a representative view of what the future may hold for economically sustainable fleet

Figure 3. Polish fleet activity exceeds all other EU countries, recording 368 billion tkm in 2024

Poland versus EU average road freight volumes over time



Source: Eurostat (road_go_ta_tott) extracted on 2025-11-03

For a more detailed breakdown of EU road freight volumes and future trends, consult the Intelligence Briefing titled **Breakdown of the latest road freight volumes**, which also provides a forecast to 2030.

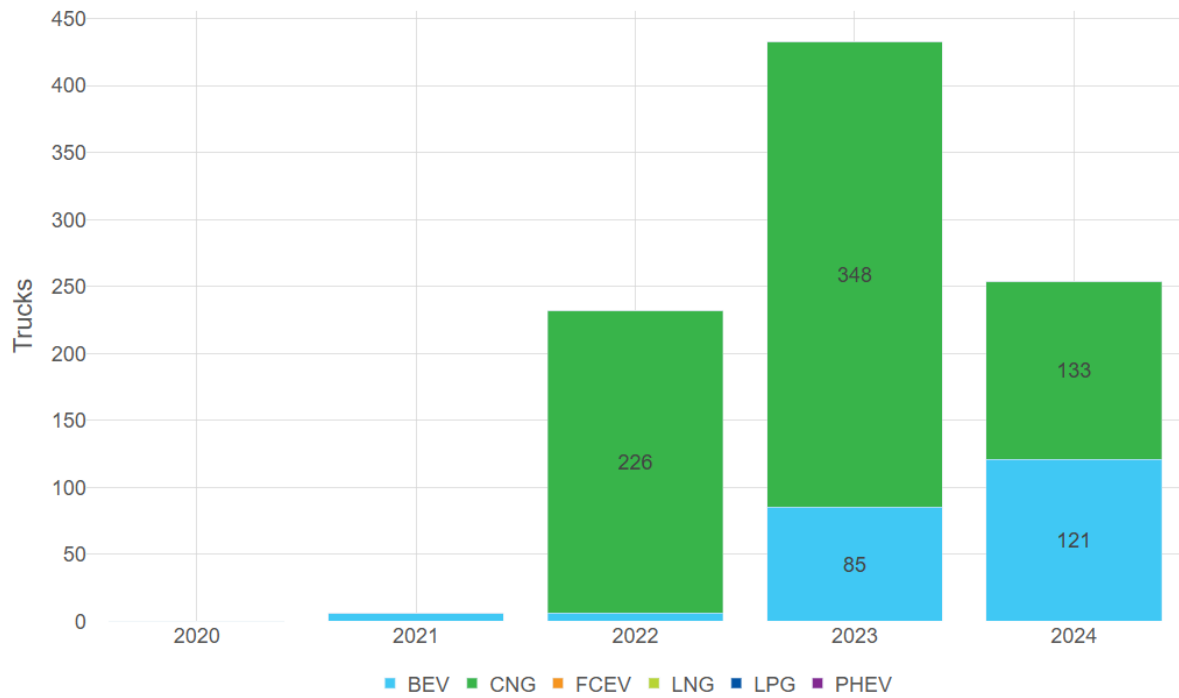
1.2 Truck fleet

Over the past decade, the EU fleet has consistently grown, reaching 5.8 million trucks in 2024. New trucks are added every year, while older trucks are generally sold to non-EU countries, or find new niche applications, such as local distribution in small communities.

Poland has the largest fleet, with 959,000 trucks accounting for 17% of the total number of trucks in the EU. Germany and Italy come second with 750,000 trucks, closely followed by Spain and France.

Figure 11. BEV adoption is gaining more traction in Poland, approximately on par with CNG registrations in 2024

Evolution of alternative fuel truck registrations in Poland



Source: EAFO

2.3 Truck usage during their first life

IRU's TCO methodology (see Appendix A) is based on vehicles' usage during their first life. As a general approach, it is considered that:

- Articulated T2S3 vehicles conduct long-haul operations
- Rigid R2 trucks conduct regional operations

Both are considered to conduct national transport only (i.e. Polish trucks working in Poland). The following two sections define the first life characteristics and usages for both regional and long-haul operations, which are essential assumptions for the TCO analysis.

2.3.1 First life characteristics

A vehicle's first life is the period between its purchase and its resale by the first owner. Its characteristics are its duration, annual mileage, and the number of operational days per year.

Table 1. Life duration and operational days during the first year by vehicle type in Poland

	First-life duration	Operational days first year
T2S3	6 years	272 days
R2	6 years	257 days

Source: IRU estimates

It is considered that the first owner operates the vehicle the most during its first year, followed by a decreasing annual mileage over time. A constant yearly mileage may be a reasonable proxy of vehicle usage, but it does not account for the effect of inflation and other cost increases, nor for the operational range of an electric vehicle, which will depend less on public charging over the years.

The IRU Green Compact has created a mileage projection line for trucks based on first life duration, nationality, and the number of operational days. The values below are then used as assumptions for IRU's TCO calculations.

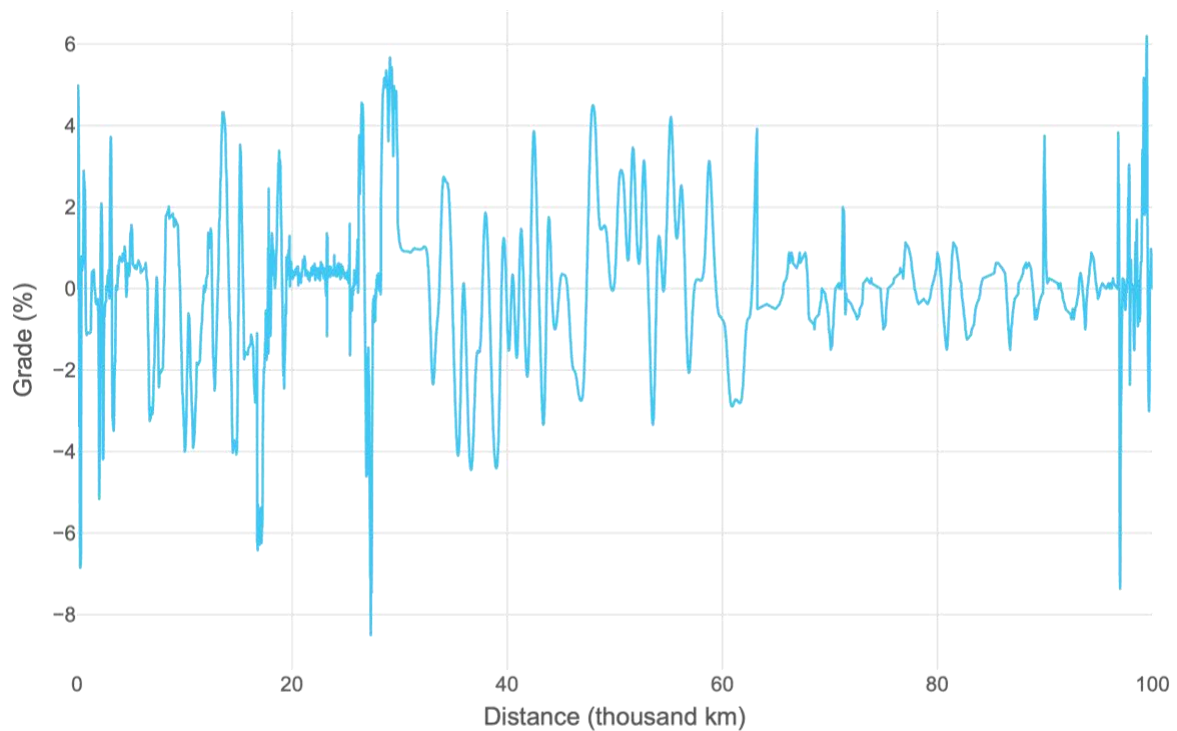
Table 2. Yearly mileages by vehicle type for general cargo in Poland

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
T2S3	150,000	148,000	146,000	145,000	143,000	141,000
R2	103,000	102,000	100,000	99,000	98,000	97,000

Source: IRU estimates

Figure 18. Altitude profile of regional delivery vehicles

Altitude profile of regional delivery vehicles



Source: VECTO tool

2.3.3 Empty trips

Empty trips account for around 34% of operations conducted by the Polish fleet, which is higher than the EU average of 23%. This proportion has remained relatively stable over the past decade, which indicates there are some opportunities to improve route planning and logistics. According to the [IRU Intelligence Briefing on the size and economic landscape of the EU road transport sector](#), the added value generated by Polish freight companies is currently below the EU average. This may limit the resources available for investing in modernisation and logistics optimisation.

It is worth noting that according to the [IRU Green Compact Survey Report 2025](#), reducing empty miles remains the most widely implemented efficiency measure among transport operators globally, enhancing both CO₂ performance per load and overall TCO.

3.3 Fuel and energy

The cost of energy is a critical component of TCO. This report uses the [IRU live fuel price service](#) and [Intelligence Briefing on fuel and tolling trends](#) to determine it. TCO calculations assume recoverable taxes are claimed back.

Table 6. Average yearly fuel prices in Poland in 2025 (excluding recoverable taxes)

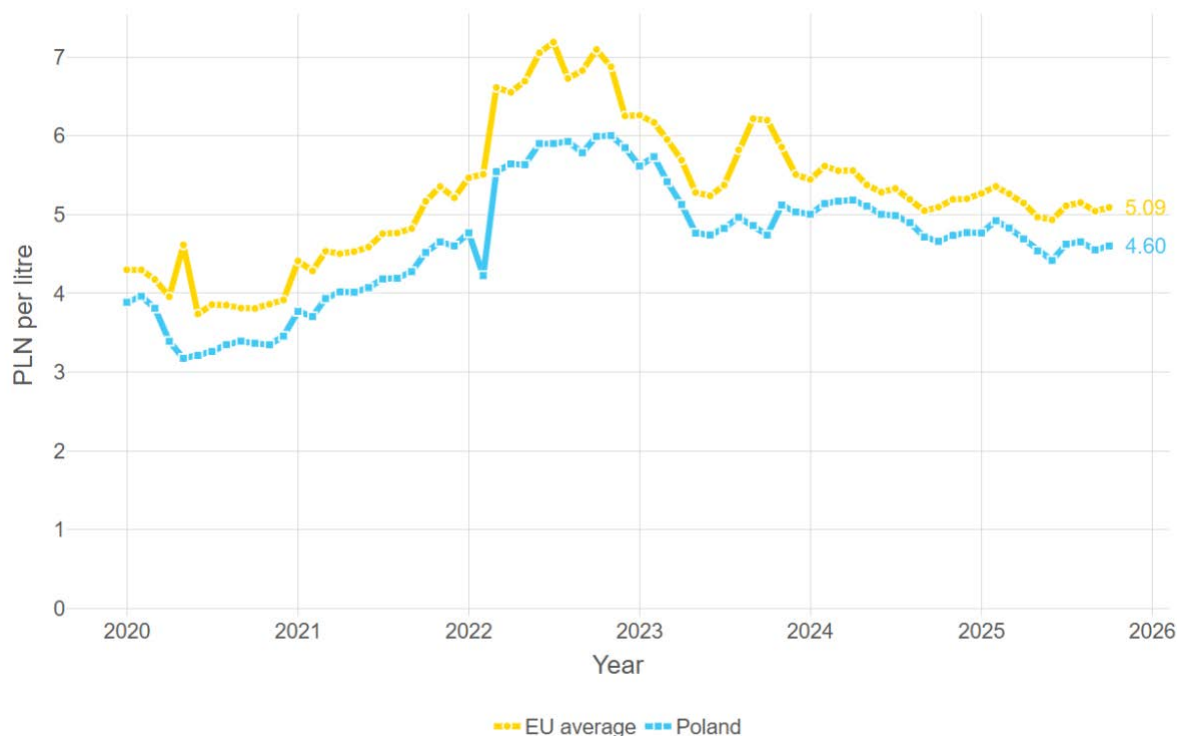
Diesel	AdBlue	HVO	CNG	LNG	Electricity (depot)	Electricity (public)	Hydrogen
zł 5.0/L	zł 2.9/L	zł 5.5/L	zł 5.1/kg	zł 3.6/kg	zł 0.9/kWh	zł 1.8/kWh	zł 56.9/kg

Source: IRU estimates

Until 2021, diesel prices remained under PLN 5.00 per litre (without VAT), before surging to a historic peak of nearly PLN 7.19 per litre due to the war in Ukraine and the post-COVID economic rebound. Since then, prices have gradually declined, with some volatility, stabilising between PLN 4.92-4.42 per litre in Poland, which is below the average EU price. These recent stable results may potentially lead to a more predictable freight market.

Figure 24. Diesel prices in Poland have recently stabilised at PLN 4.60 per litre, below the EU average

Price of diesel in Poland (without VAT)



Source: xavvy

4.

IRU carbon emission factor assumptions

Carbon emission factor (CEF) is used to derive the total amount of CO₂ emitted based on energy consumption. The CEF values used in this report follow a well-to-wheel approach, meaning it includes the production stage (i.e. it incorporates the CO₂ emitted during the production process of the energy). Each fuel or energy has a CEF which may vary depending on its source, production and distribution process.

The table below summarises the CEF of electricity, hydrogen, diesel and alternative fuels in Poland in 2026. Please note the CEF values are reported in different units to reflect the respective energy sources.

Table 9. CEF for Poland in 2026

	CEF in 2026 Poland
Electricity	554 gCO ₂ /kWh
H ₂	11.40 kgCO ₂ /kg
Diesel	3.35 kgCO ₂ /L
HVO ¹	0.36 kgCO ₂ /L
CNG	3.33 kgCO ₂ /kg
LNG	3.58 kgCO ₂ /kg
AdBlue	0.30 kgCO ₂ /L

¹CEF values exclude HVO sourced from Indirect Land Use Change (ILUC)

4.1 Electricity

In Poland, a sizeable proportion of electricity is generated from coal (56%). Wind is the second source of energy (15%) and is likely to progress with the country's substantial investments in offshore wind farms in the Baltic Sea, it is closely followed by natural gas (12%).⁹ Poland's heavy reliance on coal makes its electricity one of the highest carbon emitters in the EU. In 2024, Poland's electricity CEF was estimated at 612 gCO₂ per kWh¹⁰.

⁹ <https://www.iea.org/countries/poland/electricity>

¹⁰ <https://ourworldindata.org/grapher/carbon-intensity-electricity>

Figure 38. For any payload, FCEVs result in more costs per tonne-kilometre

TCO by powertrain for 15-tonne payload in Poland (long-haul)

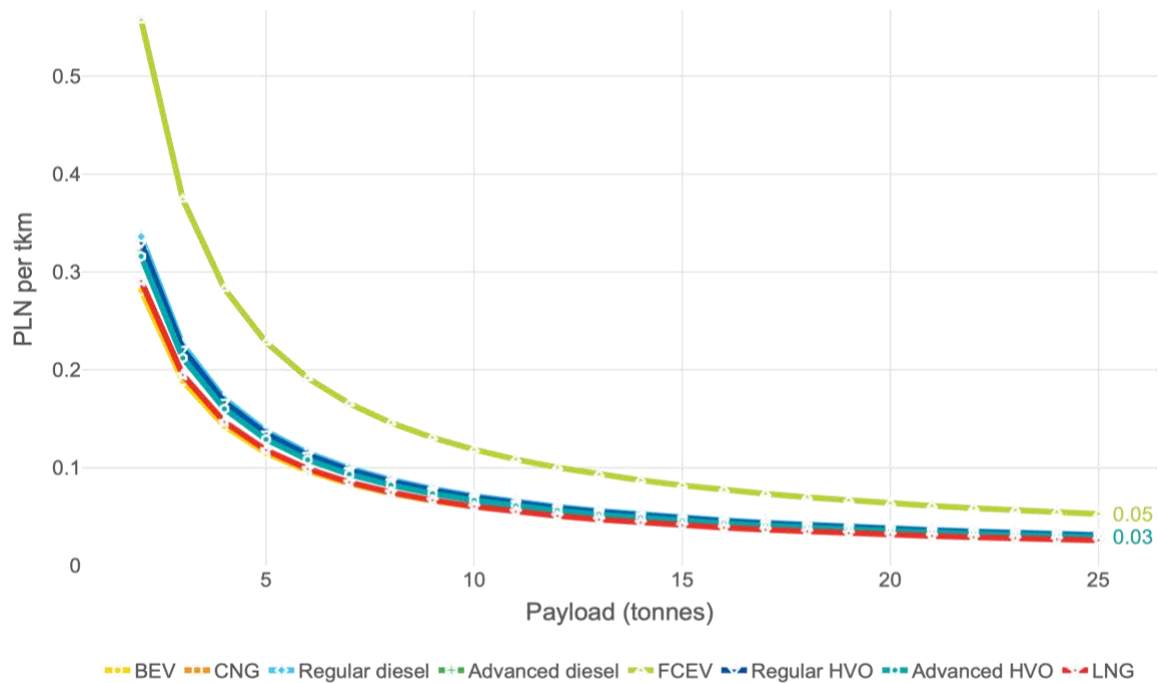
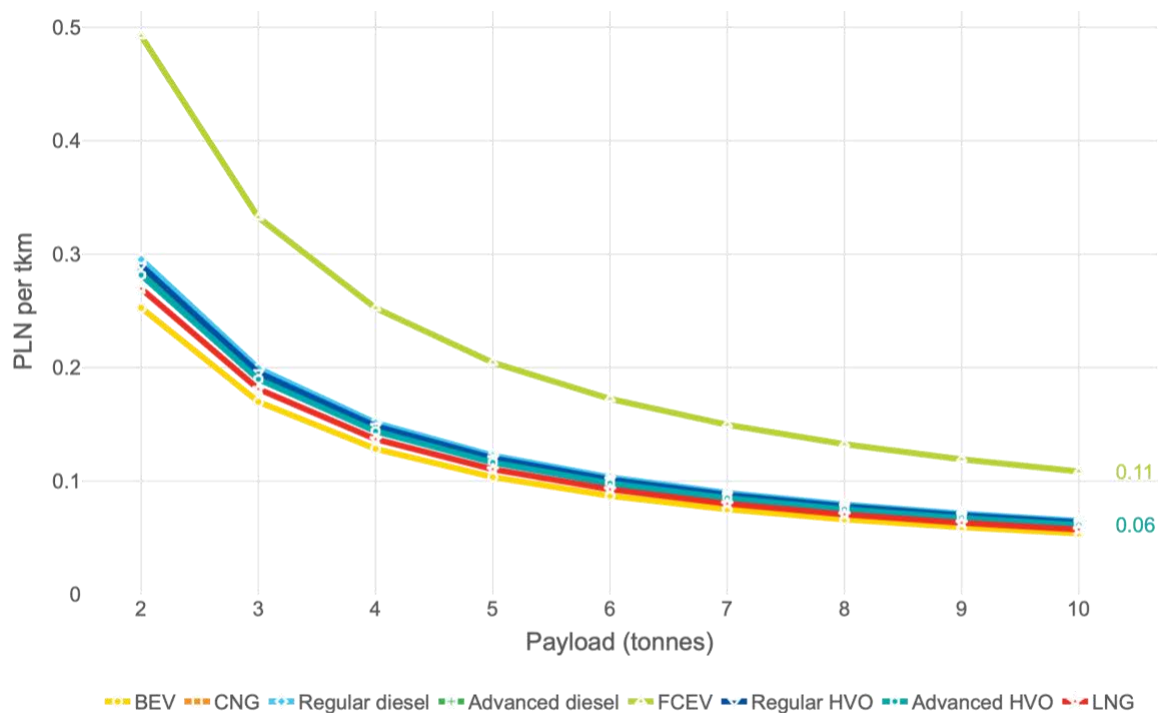


Figure 39. Like CO₂ reduction, payload optimisation also significantly reduces TCO per tonne-kilometre

TCO by powertrain for 8-tonne payload in Poland (regional)



Source: IRU estimates

Further adjustments can be made to improve the cost-efficiency of an operation by leveraging revisiting existing set-ups.



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