

Impact of the application of Eurovignette on toll savings of European zero-emission trucks

Ricardo, Member of WSP

29 June 2026



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Executive summary



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Main takeaways of the study

1) Implementation of Eurovignette can materially improve the business case for zero-emission trucks (ZETs)

- Under expected implementation pathways (Scenario T1), Eurovignette already creates meaningful operating-cost advantages for ZETs.
- A representative N3, battery electric 5-axle articulated truck would save approximately EUR 11,000 - 23,000 per year in tolling costs compared with an equivalent diesel vehicle.

2) Full toll exemptions provide the strongest incentive for ZET uptake

- If full toll exemptions are applied to ZETs (Scenario T2), annual toll savings increase to EUR 37,000 - 53,000 per year.
- The greatest benefits would occur in high-toll markets such as France.

3) External cost charging can generate significant funding for freight decarbonisation

- CO₂- and air pollution-differentiated charging could generate approximately EUR 1.1bn - 4.3bn annually per country, with CO₂ charges accounting for the largest share.
- These revenues could be reinvested in measures supporting the transition to zero-emission freight.

4) Eurovignette implementation remains highly fragmented across Europe

- France and Spain have transposed the Directive, but operational implementation remains limited, largely due pre-existing concession agreements for toll roads.
- Poland is progressing towards implementation, but key provisions remain under legislative development.
- Germany is the only country analysed that has already implemented a comprehensive system combining CO₂ differentiation, air pollution and noise charging, and full ZET toll exemptions.





Introduction and objectives



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Introduction and objectives

Introduction

The EU is home to one of the largest global trucking industries, representing 7% of the world's road freight activity [[OECD, 2024](#)]. In the EU, over three-quarters of transport-related greenhouse gas (GHG) emissions arise from the road sector [[EEA, 2023](#)]. Within this sector, trucks over 3.5 tonnes account for roughly 20% of the EU road transport CO₂ emissions [[EEA, 2022](#)], despite making up only 2% of the vehicles on European roads [[T&E, 2022](#)]. Decarbonisation of road freight in the EU is a key policy objective, as outlined in the Sustainable and Smart Mobility Strategy (SSMS).

Road tolling is a key lever in Total Cost of Ownership (TCO): TCO is one of the primary determinants of ZETs adoption decisions [[Ricardo - Member of WSP, 2025](#)]. The 2022 revision of the Eurovignette Directive, while not mandating tolls, reshapes how tolls are applied, shifting to distance-based charging and linking toll levels to vehicle CO₂ performance and other external costs charges, such as air pollution and noise. Although the 2022 revision of the Directive anticipated that, by 2026, more than half of Member States would implement CO₂-based tolling, covering around 63% of EU territory [[Ricardo - Member of WSP, 2025](#)], in practice only Germany, Austria,

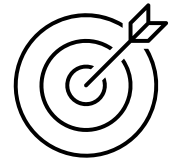
the Czech Republic, Denmark and Hungary have introduced this form of CO₂ - and/or air pollution-differentiated toll.

Under the Eurovignette Directive, Member States may grant temporary exemptions or significant toll reductions for cleaner vehicles; specifically, ZETs must receive at least a 50–75% reduction in tolls compared to conventional trucks. However, this requirement does not apply where a CO₂ charge is applied and is not mandatory where concessions are in place [[EC, 2025](#)]. Under the revised Eurovignette Directive (Directive (EU) 2022/362), as further amended in 2025, Member States are permitted to fully exempt ZETs from road tolls until 30 June 2031, providing a strong economic incentive for fleet decarbonisation.

ECTA seeks to understand how different approaches to implementing the Eurovignette Directive could influence the business case for ZETs and support the transition to cleaner road freight.

Introduction and objectives

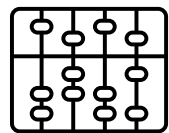
Objectives of the study



- This study assesses the implementation and impacts of road tolling and the revised Eurovignette Directive in four selected Member States (France, Germany, Poland and Spain).



- For each country, it reviews the current road tolling framework and analyses how the revised Eurovignette Directive is being, or expected to be, implemented.



- For each selected Member State, the study also estimates, for the period 2026-2031:
 - The potential annual toll savings from the use of ZETs in long-haul operations under different Eurovignette implementation scenarios
 - The potential annual revenues from CO₂- and air pollution-differentiated tolls under alternative tolling scenarios





Approach and methodology



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Approach and methodology

Key elements of the approach



Current road toll models

Analysis of how each selected country (France, Germany, Poland and Spain) is applying tolls on their road network



Eurovignette Directive implementation

Assessment of how the recent Eurovignette revision has been implemented - or is planned to be implemented - in each selected country



Cost savings for long-haul ZETs

Estimation of annual toll-related cost savings for a standard ZET compared to an equivalent diesel truck under two Eurovignette implementation scenarios in each selected Member State



Revenues from external cost charges

High-level estimation of annual revenues from CO₂ - and air pollution-differentiated tolls under two tolling scenarios in each selected Member State

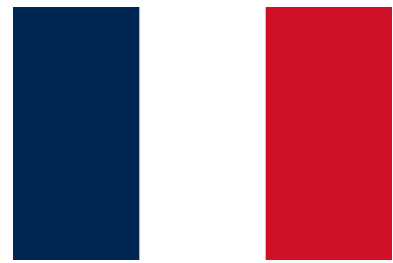


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Approach and methodology

Selected countries for the analysis



France (FR)

- Major EU freight and transit market, with high road freight intensity.
- Extensive use of road tolling and user-charging schemes.
- Advanced policy framework on low-carbon fuels and heavy-duty vehicle decarbonisation.
- Strong experience with fiscal and regulatory incentives affecting freight costs.



Germany (DE)

- Largest freight and trucking market in the EU, with high freight volumes and network density.
- Very advanced in the implementation of Eurovignette Directive.
- Front-runner in zero- and low-emission truck deployment.
- Strong policy interplay between road pricing, climate targets, and freight competitiveness.



Poland (PL)

- One of the largest road-freight markets in the EU, with a strong presence in international haulage.
- Key transit country on major East–West EU freight corridors.
- High exposure of hauliers to distance-based charging abroad, making Eurovignette impacts economically relevant.
- Cost sensitivity and competitiveness of the freight sector are central policy concerns.



Spain (ES)

- Large road-freight-dependent economy, with a high share of domestic and international freight transported by road compared to other modes.
- Very low share of the road network current subject to tolling.
- Tolling is politically and socially sensitive topic, given past debates on road charging and haulier costs.
- Useful case study to assess acceptability and cost impacts in countries with limited tolling.



Understanding different national tolling schemes







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Understanding different national tolling schemes





Key characteristics of current tolling systems

	 France (FR)	 Germany (DE)	 Poland (PL)	 Spain (ES)
Tolling system	Distance-based tolling differentiated by vehicle weight and axle configuration.	Electronic distance-based tolling system applying to HDVs only, with tolls differentiated by CO ₂ emissions, air pollution impact and noise.	Distance-based electronic tolling, with tolls differentiated by vehicle weight/size and EURO class although no specific air pollution-based toll is already implemented).	Distance-based tolling on selected motorway sections, with charges differentiated by vehicle size.
System governance	Private concession model, with 20 operators managing 24 concession contracts.	Publicly operated national tolling system.	Mixed model combining the public e-TOLL system and three private motorway concessions.	Mixed model combining public (SEITT) and private concessions (12 segments).
Network coverage	Approximately 9,300 km of highways are tolled (around 79% of the national highway network), with seven major operators managing 90% of the network.	The national tolling system covers all federal motorways and roads for heavy-duty vehicles, representing approximately 51,000 km of network, with limited exemptions.	The public e-TOLL network covers approximately 5,870 km of roads, while a further 468 km are operated under three private motorway concessions. Together, these tolled sections represent around 30% of Poland's national road network.	Tolling applies to approximately 2,200 km of Spain's high-capacity road network (around 12%). Of this, 710 km are publicly operated by SEITT, with the remainder managed by private concessionaires.



Understanding different national tolling schemes

Key characteristics of current tolling systems

	 France (FR)	 Germany (DE)	 Poland (PL)	 Spain (ES)
Vehicle covered	Covers all vehicle types under five different tariff classes (Class 3 and 4 correspond to HDVs).	Covers all liable goods vehicles above 3.5 tonnes. Zero-emission HDVs are exempt until 30 June 2031, while zero-emission vehicles up to 4.25 tonnes are permanently exempt.	Public e-TOLL roads cover goods vehicles and vehicle combinations above 3.5 tonnes , as well as all buses. Private concession roads apply tolls to all vehicle types.	Both private concessions and SEITT tolls apply to all motorcycles, cars, vans, buses/coaches and trucks in three vehicle classes.
Charging structure	Distance-based tariffs. Tolls vary according to vehicle class (which depends on size and axle configuration). They are set by concession contracts and updated annually under State-regulated formulas.	Distance-based tariffs. Charges comprise infrastructure, air and pollution, noise and CO ₂ components. Tariffs vary by weight, axles, EURO emission and CO₂ class .	Distance-based tariffs. e-TOLL tolls vary according to road class, vehicle weight and EURO emission class . Concession motorway charges are set separately by vehicle and route/section.	Distance-based tariffs. Tolls vary according to vehicle class (which depends on size and axle configuration) with additional differentiation by season, time of day and payment method.
Current toll ranges for HDVs)	0.26 to 0.38 EUR/km ¹	0.14 to 0.52 EUR/km ²	0.08 to 0.20 EUR/km on e-TOLL 0.09 to 1.17 EUR/km on concessions ³	0.20 to 0.22 EUR/km on SEITT 0.11 to 0.50 EUR/km on concessions ⁴

¹Average rates considering the Concessions with the higher coverage: VINCI, APRR and SANEF.

² Tariff structure of German Federal Trunk Road Toll Act (BFStrMG).

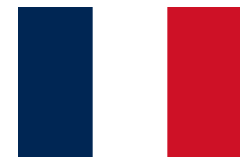
³ Electronic Toll Collection System National Revenue Administration and Autostrada website.

⁴ SEITT and Ministry of Transport and sustainable Mobility.



Understanding different national tolling schemes

CO₂-differentiated toll



France (FR)



Germany (DE)



Poland (PL)



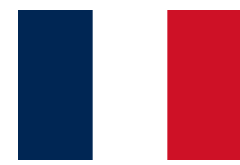
Spain (ES)

	France (FR)	Germany (DE)	Poland (PL)	Spain (ES)
CO ₂ -differentiated tolls in place?	No, not operational yet. CO ₂ -based tolling is included in legislation for new or renewed concession but does not apply to existing concession contracts.	Yes; already operational. CO ₂ -differentiated tolling is applied in combination with EURO class.	No, no yet operational. Poland has not yet completed transposition of the revised Eurovignette Directive.	No, not yet operational. Spain has transposed the legal framework, but CO ₂ differentiation is not applied on existing concession networks.
Expected implementation timeline	No specific timeline identified for existing concessions. According to the Directive, concession contracts signed before March 2022 are not required to apply CO ₂ differentiation until renewal or substantial amendment. The current tolled network in France is therefore exempt as contracts are prior to March 2022 and still in force.	Operational since 1 December 2023 .	Poland shows delayed implementation , as they missed the March 2024 transposition deadline for Eurovignette. CO ₂ -based tolling is planned under the draft law UC74 and currently under legislative process. Public consultation has been launched.	No implementation timeline identified. Private concessions are operated under long-term contracts and are exempt from introducing CO ₂ – differentiated tolls, while the State has chosen not to apply them on public SEITT motorways.
Expected CO ₂ toll ranges for HDVs (2026)	0.08 to 0.16 EUR/km (ICCT, 2026)	0.037 to 0.162 EUR/km (already implemented) BFStrMG	0.00 to 0.10 EUR/km Koben (2025)	0.01 to 0.09 EUR/km (based on administration's sources) La Sexta (2024) , Actualidad Motor (2024)



Understanding different national tolling schemes

Air pollution-differentiated toll



France (FR)



Germany (DE)



Poland (PL)



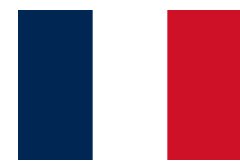
Spain (ES)

	France (FR)	Germany (DE)	Poland (PL)	Spain (ES)
Air pollution-differentiated tolls in place?	No, not implemented on existing concessions. Legal framework was provided as part of the transposition.	Yes, already operational. Rates for this component are calculated based on EURO emission class.	No, not yet operational. Public rates in e-TOLL depend on vehicle EURO class, but no external air pollution-differentiated toll is applied on public nor private tolled segment.	No, not yet planned or operational, although the legal framework for environmental differentiation has been established in the transposition.
Expected implementation timeline	As part of the transposition in 2024, France included an order setting reference values for traffic air pollution-differentiated tolls . (Decree of 9 January 2024) However, existing concession contracts are exempt from applying this charge as they are prior to March 2022.	Operational since 1 January 2023.	Although Poland's UC74 draft law provides the legal framework to introduce this new component into the e-TOLL system, it has not yet entered into force, and it is under parliament proceedings.	No specific implementation timeline has been identified for Spain for this toll component. Current published tariff schedules do not consider EURO emission standards, and they would only be introduced through future new concession contracts.
Expected air pollution toll ranges for HDVs	0.00 to 0.223 EUR/km, although it is unlikely that this will be implemented in the short term	0.011 to 0.187 EUR/km (already implemented)	0.005 to 0.085 EUR/km	0.004 to 0.388 EUR/km ¹ , although it is unlikely that this will be implemented in the short term

¹External-cost estimation including both air and noise pollution charges.

Understanding different national tolling schemes

Noise pollution-differentiated toll



France (FR)



Germany (DE)



Poland (PL)



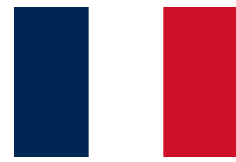
Spain (ES)

	France (FR)	Germany (DE)	Poland (PL)	Spain (ES)
Noise pollution-differentiated tolls in place?	No, not yet planned or implemented.	Yes, already operational. Rates for this component are calculated based on the vehicle weight and axle count.	No, not yet planned or implemented.	No, not yet planned or implemented.
Expected implementation timeline	No timeline identified for noise pollution-tolls implementation in France.	Operational since 1 January 2023.	No timeline identified for noise pollution-tolls implementation in Poland.	No timeline identified for noise pollution-charges implementation in Spain.
Expected noise pollution toll ranges for HDVs	There is currently no evidence that France intends to introduce this toll component.	0.012 to 0.016 EUR/km (already implemented)	There is currently no evidence that Poland intends to introduce this toll component.	There is currently no evidence that Spain intends to introduce this toll component.



Understanding different national tolling schemes

ZET Exemptions



France (FR)



Germany (DE)



Poland (PL)



Spain (ES)

Existing ZET exemptions

No ZET exemption applied to tariffs.
French law allows possible exemptions or reductions for ZETs in concession contracts, but current tariffs on the existing network have not implemented it so far.

Yes. Germany implemented a full toll exemption for zero-emission HDVs as part of the 2023 reform. Under the current scheme, **zero-emission HDVs remain fully exempt from tolls until 30 June 2031**, while zero-emission vehicles up to 4.25 t are permanently exempt.

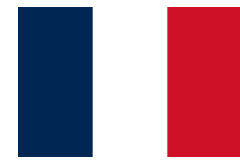
No dedicated operational ZET exemption or reduction identified in the current e-TOLL or private tariff framework. The UC74 draft signals that the strongest incentives would be introduced for vehicles without an external combustion system (mainly electric vehicles), but this is not yet in force.

No. Spanish transposition of the Eurovignette Directive does not consider exemptions for zero-emission vehicles on any of the toll components.



Understanding different national tolling schemes

Status of transposition of the Eurovignette 2022 Revision



France (FR)



Germany (DE)



Poland (PL)



Spain (ES)

2022 Revision of Eurovignette transposition

France has transposed the 2022 Directive into national law. The legal framework was introduced through the Code de la Voirie Routière and secondary legislation, in force since **11 March 2023**.

The 2022 Eurovignette Directive **has been transposed** for the German HGV toll system. The revised Eurovignette rules have been implemented through the Third Act amending toll regulations, which took effect on **1 December 2023**.

Under parliament proceedings. Poland has already implemented a distance-based HGV tolling, but the key 2022 Eurovignette changes are still being prepared through draft bill UC74 and are not yet operational as of June 2026.

Transposed into national law. Spain adopted Royal Decree 205/2025, in force since **20 March 2025**, to transpose Article 1 of Directive (EU) 2022/362 into the Spanish legal framework for toll calculation and application on state toll motorways.

Legal basis – National law key references

- Loi n°2023-171 du 9 mars 2023 (art. 31) and Arrêté du 9 janvier 2024 on CO₂-based modulation and air-pollution surcharge reference values.
- Code de la voirie routière. Article L22-4 (tolling/concession framework) and Articles L119-11 to L119-13 (Eurovignette transposition).

- **Federal Truck Road Toll Act (BFStrMG)**, which defines the vehicles subject to tolls, the federal roads covered by the scheme, and the rules for toll collection and enforcement.
- **Drittes Gesetz zur Änderung maurechtlicher Vorschriften (BGBl. 2023 I Nr. 315**, promulgated 24 Nov 2023), implementing CO₂ differentiation.

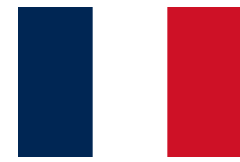
- **Act of 15 April 2021** amending the toll motorways act and other acts (Dz.U. 2021 poz. 1005) for national e-TOLL rollout.
- **Draft bill UC74** to transpose and implement Directive (EU) 2022/362.

- **Ley 37/2015**. Provides the general legal basis for tolling, toll exemptions, state road management and SEITT operation.
- **Real Decreto 205/2025**. Transposes the Eurovignette Directive for toll calculation and application on state toll motorways.



Understanding different national tolling schemes

Status of transposition of Eurovignette 2022 Revision



France (FR)

France already has a mature distance-based concession toll system covering all major vehicle categories, and it has transposed the 2022 Directive into national law. However, operational implementation of CO₂-based tolling, and air pollution-based tolling on the existing motorway concession network is limited because France used the Directive's concession exception for most current contracts. **Full implementation may be delayed due to privately-managed concessions and existing long-term contracts.**



Germany (DE)

Germany is one of the **strongest EU examples** of compliance with the revised Eurovignette for heavy goods vehicles: it has a mature distance-based tolling system, operational CO₂ differentiation since 1 December 2023, embedded air and noise-based tolling, and a strong ZET toll exemption.



Poland (PL)

Poland already meets the core distance-based charging model for heavy duty vehicles and e-TOLL has differentiated rates by EURO class.

However, as of the date of this study, **the revised Directive has not yet been transposed** into national legislation. It still lacks full implementation of the revised Eurovignette requirements on CO₂-based differentiation and the separate air pollution- differentiated toll; these elements remain in draft legislation (UC74).



Spain (ES)

Spain has formally transposed the revised Eurovignette Directive and already uses distance-based tolling where tolls exist, but tolling is limited to a relatively small share of the road network. Environmental differentiation (CO₂ / air-pollution / noise) is not yet generally operational in the published toll schedules. Additionally, Spain may face slower Eurovignette implementation because it is influenced by a policy approach whereby road concessions are allowed to expire, and the corresponding infrastructure is liberalised rather than renewed, **limiting the application of new tolling criteria.**

General comment on compliance with Eurovignette





Toll savings for ZETs under different scenarios



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Scope and approach

Purpose: Estimate annual toll savings for a representative N3 zero-emission truck (*) compared with an equivalent diesel truck between 2026 and 2031 under two Eurovignette implementation scenarios.

- A representative N3 heavy-duty vehicle is considered, reflecting typical long-haul operations in Europe (5-axle articulated truck, EURO VI diesel equivalent).
- Annual mileage assumptions are developed for each selected country, including the share of kilometres travelled on the core TEN-T Core network, which is assumed to represent the network subject to Eurovignette tolling.
- Average toll costs per kilometre are estimated for both zero-emission and diesel vehicle configurations, under two implementation scenarios:
 - **Scenario T1 (expected implementation):** Distance-based tolling aligned with official announcements, legislative proposals and relevant reports, including: CO₂-differentiated tolls (in all countries) and air pollution-differentiated tolls (only where implementation is considered likely in the near term).
 - **Scenario T2 (full ZET exemption):** Full toll exemption for zero-emission trucks (ZETs), with no additional toll reductions applied to diesel vehicles and CO₂ charges for diesel.
- Annual toll costs are calculated by combining mileage assumptions with the relevant toll rates for each vehicle configuration, country and implementation scenario. The difference between diesel and ZET toll costs provides the estimated annual savings.

Assumptions for scenario framing

The following evidence-based assumptions are used to estimate annual vehicle mileage and the share of kilometres travelled on tolled roads:

Country	France	Germany	Poland	Spain	Sources
Average annual mileage per N3 vehicle (km/year)	106,080	127,600	135,200	141,200	Comité National Routier (FR) , Statisches Bundesamt (DE) , Dirección General de Trafico (ES) , CNR and Moreus (PL)
Share of HDV mileage subject to tolling	87.9%	87.9%	87.9%	87.9%	T&E (2021) , CEDR (2023)



Assumptions for scenario framing – Expected implementation

The following evidence-based assumptions were used to estimate average toll rates under **Scenario T1** (expected implementation):

Country	France		Germany		Poland		Spain	
	Diesel	ZET	Diesel	ZET	Diesel	ZET	Diesel	ZET
Average infrastructure base toll rate (EUR/km) for the representative truck	0.37 (APRR , VINCI , SANEF)	0.37 (APRR , VINCI , SANEF)	0.35 (BFStrMG)	- (*)	0.13 (e-TOLL , Autosatrada)	0.13 (e-TOLL , Autosatrada)	0.22 (SEITT , Ministry of Transport)	0.22 (SEITT , Ministry of Transport)
CO ₂ -differentiated toll (EUR/km) for the representative truck (**)	0.16 (ICCT (2026))	-	0.16 (BFStrMG)	-	0.10 (Koben (2025))	-	0.09 La Sexta (2024) , Actualidad Motor (2024)	-
Air pollution-differentiated toll (EUR/km) for the representative truck	Not expected in the short term	-	0.02 (BFStrMG)	-	0.09 (Koben (2025))	-	Not expected in the short term	-
Noise-differentiated toll (EUR/km) for the representative truck	Not expected in the short term	-	0.01 (BFStrMG)	-	Not expected in the short term	-	Not expected in the short term	-

(*) Germany implemented a full road toll exemption for ZET in 2023, exempting all toll components.



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(**) According to Directive (EU) 2022/362 (Annex IIIc, Table 1), the reference CO₂ external-cost charge for the relevant heavy-duty vehicle category is EUR 0.08 per vehicle-km. Member States applying a CO₂ external-cost charge may increase this amount, subject to the Directive's limits, not exceeding twice the Annex IIIc value (i.e. EUR 0.16 per vehicle-km).

Assumptions for the scenario framing – Full ZET exemption

The following evidence-based assumptions were used to estimate average toll rates under **Scenario T2** (full ZET exemption):

Country	France		Germany		Poland		Spain	
	Diesel	ZET	Diesel	ZET	Diesel	ZET	Diesel	ZET
Average infrastructure base toll rate (EUR/km) for the representative truck	0.37 (APRR , VINCI , SANEF)	-	0.35 (BFStrMG)	-	0.13 (e-TOLL)	-	0.22 (SEITT , Ministry of Transport)	-
CO ₂ -differentiated toll (EUR/km) for the representative truck (**)	0.16 (ICCT (2026))	-	0.16 (BFStrMG)	-	0.10 (Koben (2025))	-	0.09 La Sexta (2024) , Actualidad Motor (2024)	-
Air pollution-differentiated toll (EUR/km) for the representative truck	0.02 (*)	-	0.02 (BFStrMG)	-	0.09 (Koben (2025))	-	0.02 (*)	-
Noise-differentiated toll (EUR/km) for the representative truck	0.01 (*)	-	0.01 (BFStrMG)	-	0.01 (*)	-	0.01 (*)	-

(*) In the absence of country-specific evidence on the expected level of these toll components, the rates currently applied in Germany are assumed.

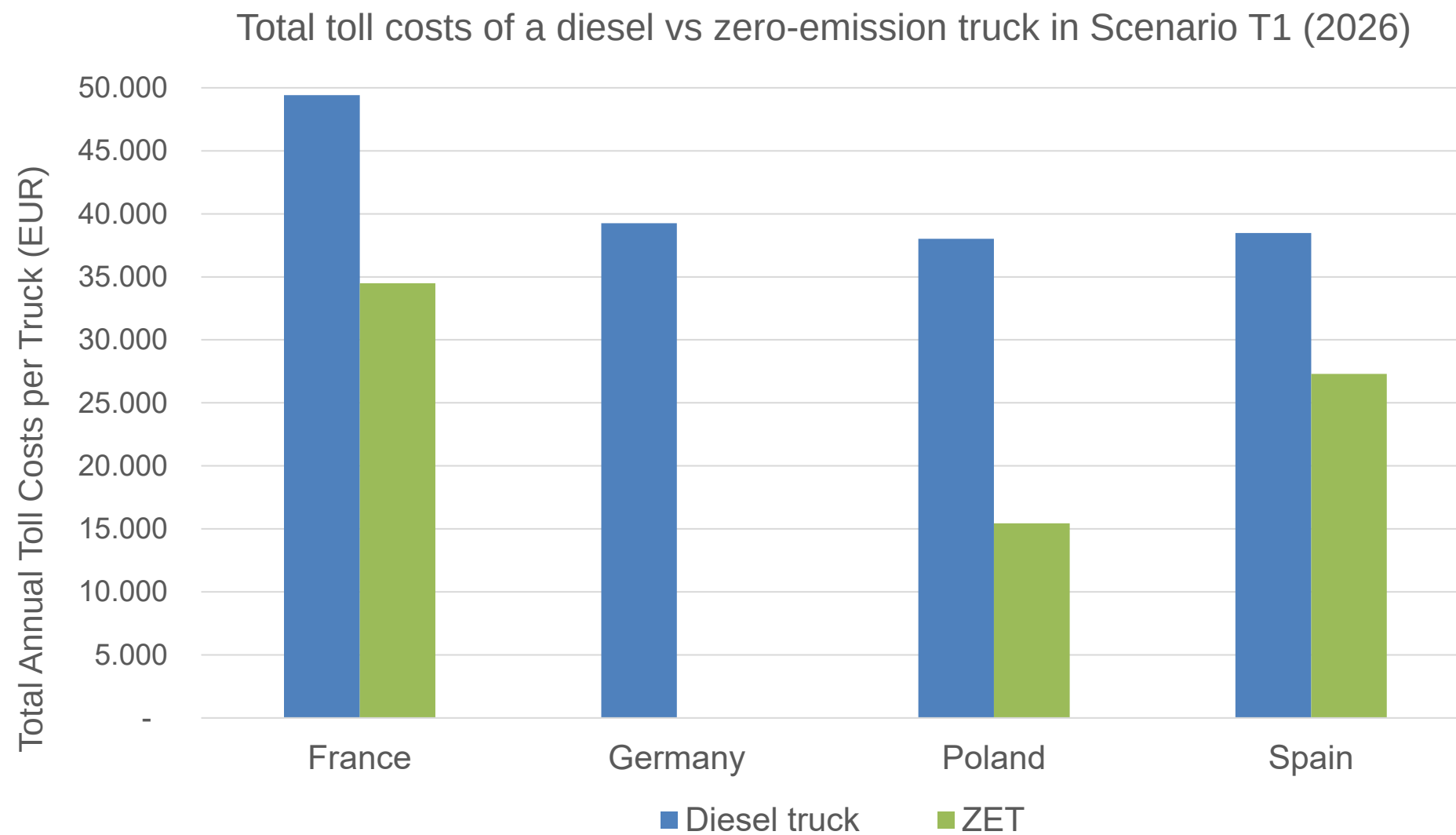
(**) According to Directive (EU) 2022/362 (Annex IIIc, Table 1), the reference CO₂ external-cost charge for the relevant heavy-duty vehicle category is EUR 0.08 per vehicle-km. Member States applying a CO₂ external-cost charge may increase this amount, subject to the Directive's limits, not exceeding twice the Annex IIIc value (i.e. EUR 0.16 per vehicle-km).



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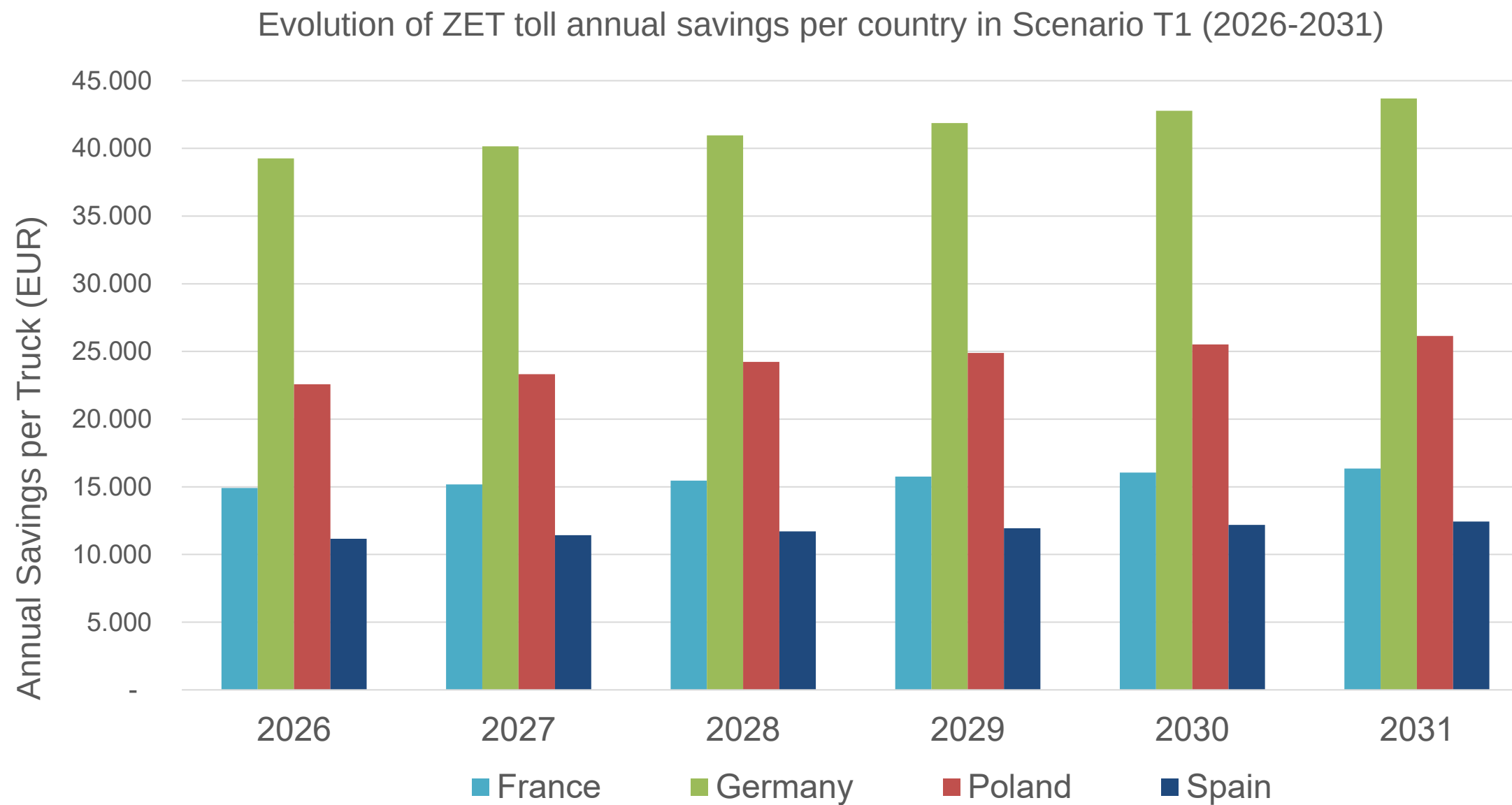
Annual savings by ZET vs diesel (*) (2026) – Scenario T1: Most likely implementation



The results show that ZETs deliver meaningful annual toll cost reductions across all four countries.

- **France** shows the highest toll cost for a diesel truck, at **49,400 EUR/year**, compared with 34,500 EUR/year for a ZET, which would only pay current infrastructure charges. This would result in **EUR 14,900 in savings** each year for a ZET compared to an equivalent Euro VI diesel truck.
- **Germany** stands out because it has already implemented the Eurovignette Directive into its national toll system and applies a 100% cost reduction for zero-emission HDVs until 2031; therefore, the toll cost for an average diesel truck of **39,300 EUR/year** is effectively translated into savings for ZETs.
- Poland offers the lowest annual toll cost for diesel trucks, at **EUR 38,000 per year** but the highest ZET savings outside Germany, which amount to **22,600 EUR/year**. This level of saving is driven by the expectation that Poland will introduce both CO₂- and air pollution-differentiated tolls in a hypothetical implementation scenario.
- **Spain** would show a total toll cost for a diesel truck of **38,500 EUR/year** under the most likely Eurovignette implementation scenario. Due to the high weight of the infrastructure component on the total toll, Spain shows the lowest **annual savings for ZETs (EUR 11,200 per year)** as a result of the implementation of a CO₂ charge.

Evolution of annual savings by ZET vs diesel (*) – Scenario T1: Most likely implementation



The evolution of annual savings of ZETs compared to diesel trucks over the 2026-2031 period shows a steady increase across all countries.

- In **France**, this hypothetical implementation scenario would reach savings of **EUR 16,300 in 2031**.
- **Germany** leads in terms of ZET savings, as the full diesel toll cost is translated into savings under the current full exemption. Annual savings reach **EUR 43,700 in 2031**. Since Germany has announced that the full toll exemption for ZETs will remain in place until 2031, the savings profile would be expected to change after this point according to the policy framework in place. Post-2031 treatment remains uncertain and subject to future EU and German policy decisions.
- In **Poland**, this hypothetical implementation scenario would offer the highest savings for zero-emission trucks among the countries without a full toll exemption, reaching **EUR 26,100 in 2031**.
- **Spain** would present the lowest savings potential for ZETs, reaching **EUR 12,400 in 2031**.

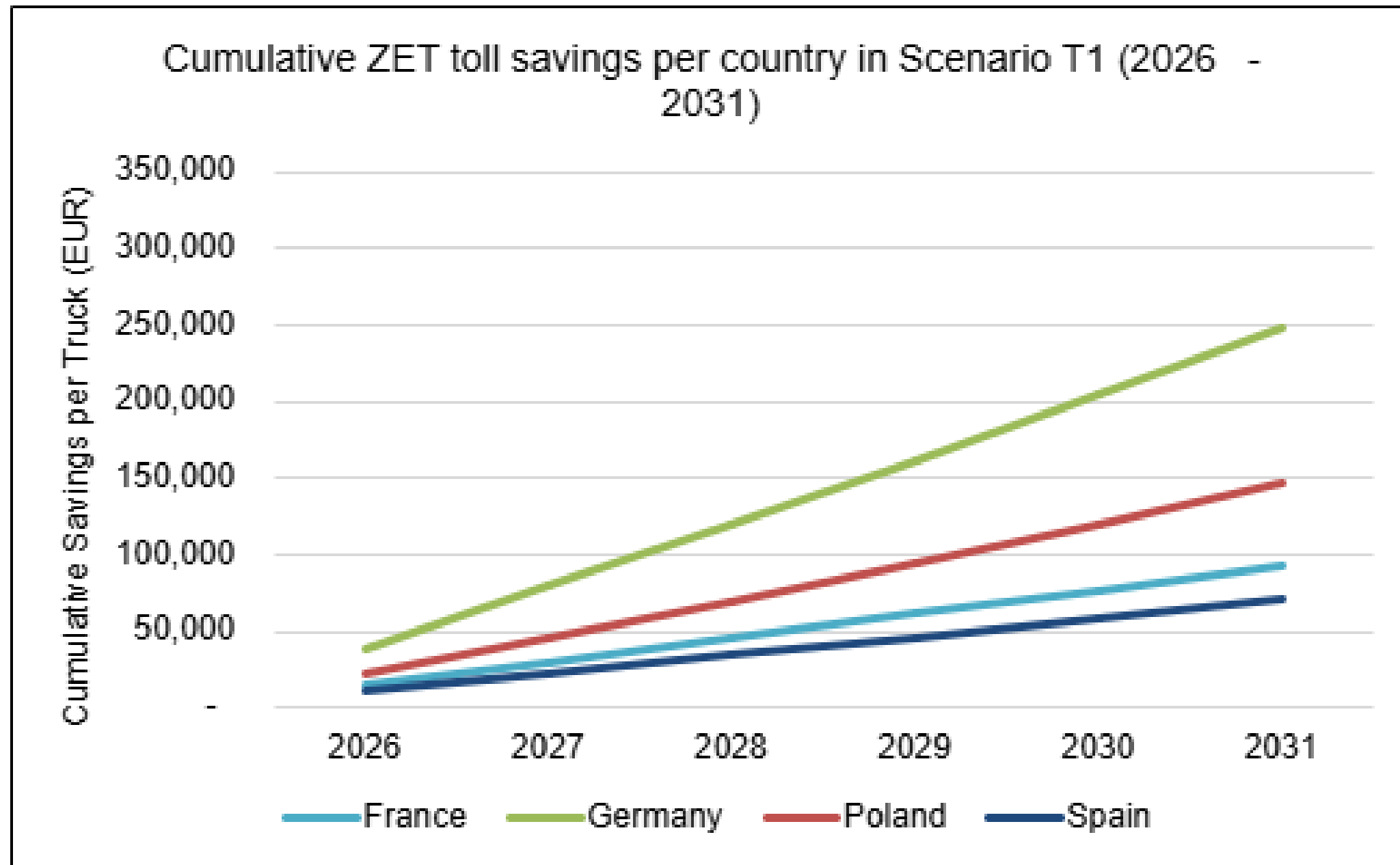


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(*): A representative N3 diesel truck with a standard axle configuration (e.g. 5-axle articulated truck), EURO VI class, and its equivalent BET were selected for the comparison.

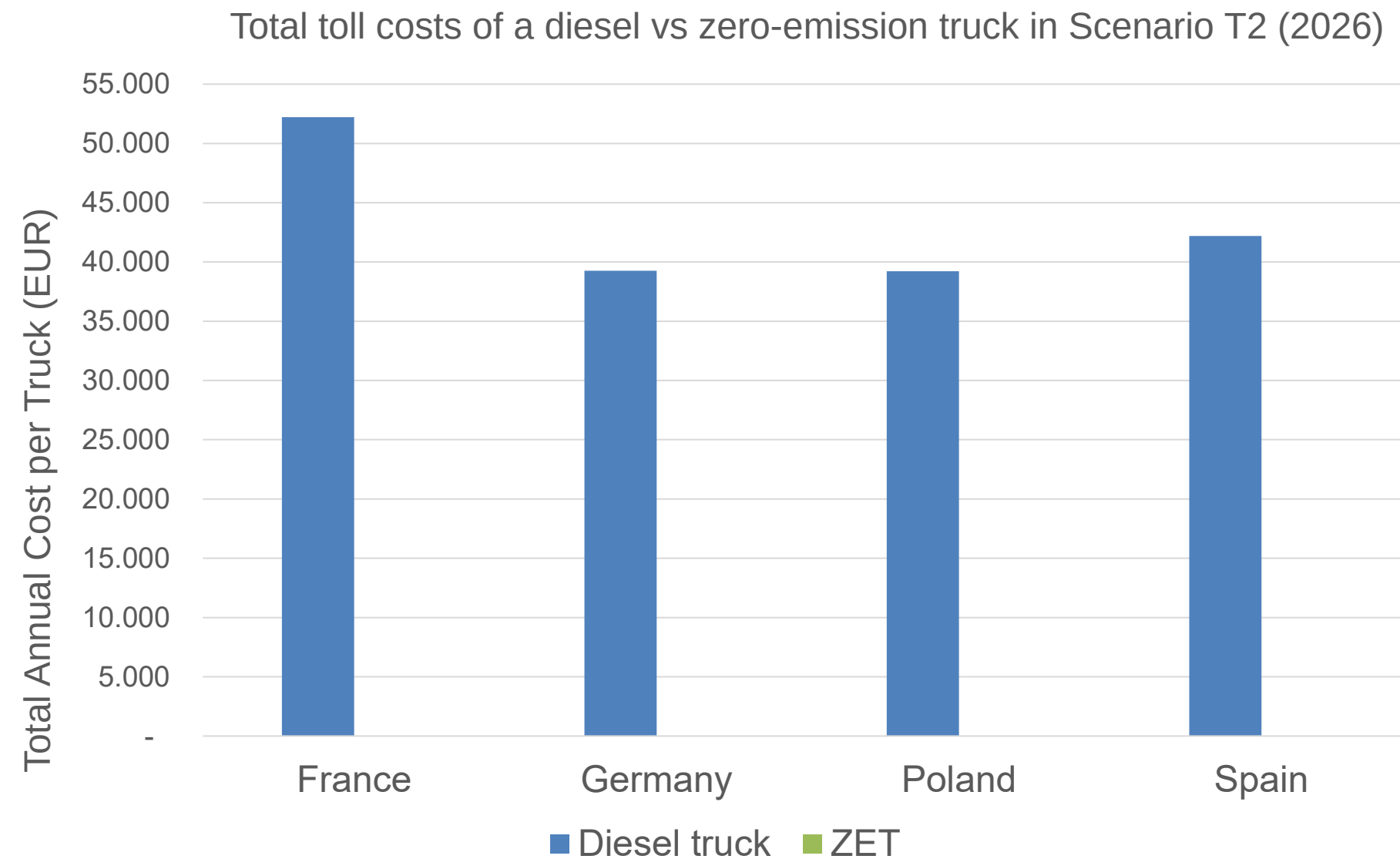
Cumulative savings by ZET vs diesel (*) – Scenario T1: Most likely implementation



- In **France**, this hypothetical implementation scenario would reach a **cumulative total saving of around EUR 93,700 per ZET** over the 2026-2031 period.
- **Germany** leads in terms of ZET savings, with a **cumulative figure of around EUR 248,800 per ZET** over the period studied.
- In **Poland**, the hypothetical implementation scenario would lead to a **total saving of around EUR 146,700 per ZET** over the 2026-2031 period.
- In **Spain**, the hypothetical implementation scenario would generate around **EUR 70,800 in total savings per ZET** over this 6-year period.



Annual savings by ZET vs diesel (2026) – Scenario T2: Full toll exemption for ZETs (German model)



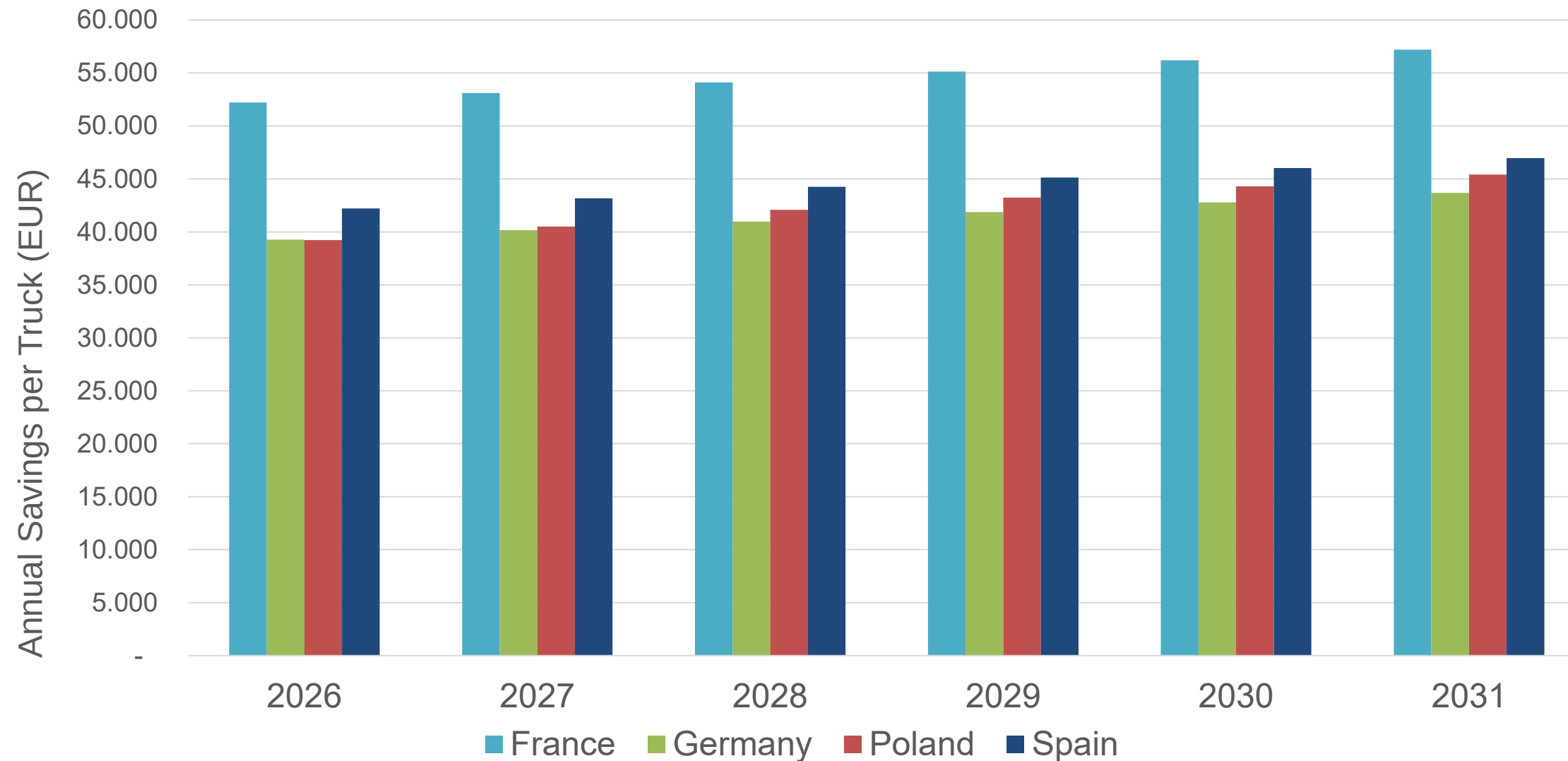
Under a hypothetical scenario of full toll exemption for zero-emission HDVs in 2026, ZETs would not incur in any toll cost in every country considered in this study, **mirroring the situation currently observed in Germany**. As a result, annual savings for ZETs in this scenario are the equivalent to the full toll cost paid by a diesel truck. Additionally, costs for diesel trucks are slightly higher compared to those considered in Scenario 1, due to the inclusion of air and noise pollution tolls, in addition to the CO₂-emissions component.

- **France** would record the highest annual toll cost for diesel trucks, reaching **EUR 52,200 per year per truck**, since this country applies the highest tolls per km.
- **Germany** shows the same result as in Scenario 1, as it is already implementing all components in their toll tariff structure and applying the exemption for ZETs. The annual toll cost for a diesel truck in Germany reaches **EUR 39,300 per year**.
- The result for **Poland** would be very similar to Germany's, where the annual toll cost for a diesel truck amounts to **EUR 37,200 per year** and presents the lowest total cost of all four countries.
- **Spain** would record an annual toll cost of approximately **EUR 42,200 per year** for a diesel truck.



Evolution of annual savings by ZET vs diesel – Scenario T2: Full toll exemption for ZETs (German model)

Evolution of ZET Toll Annual Savings per Country in Scenario 2 (2026-2031)

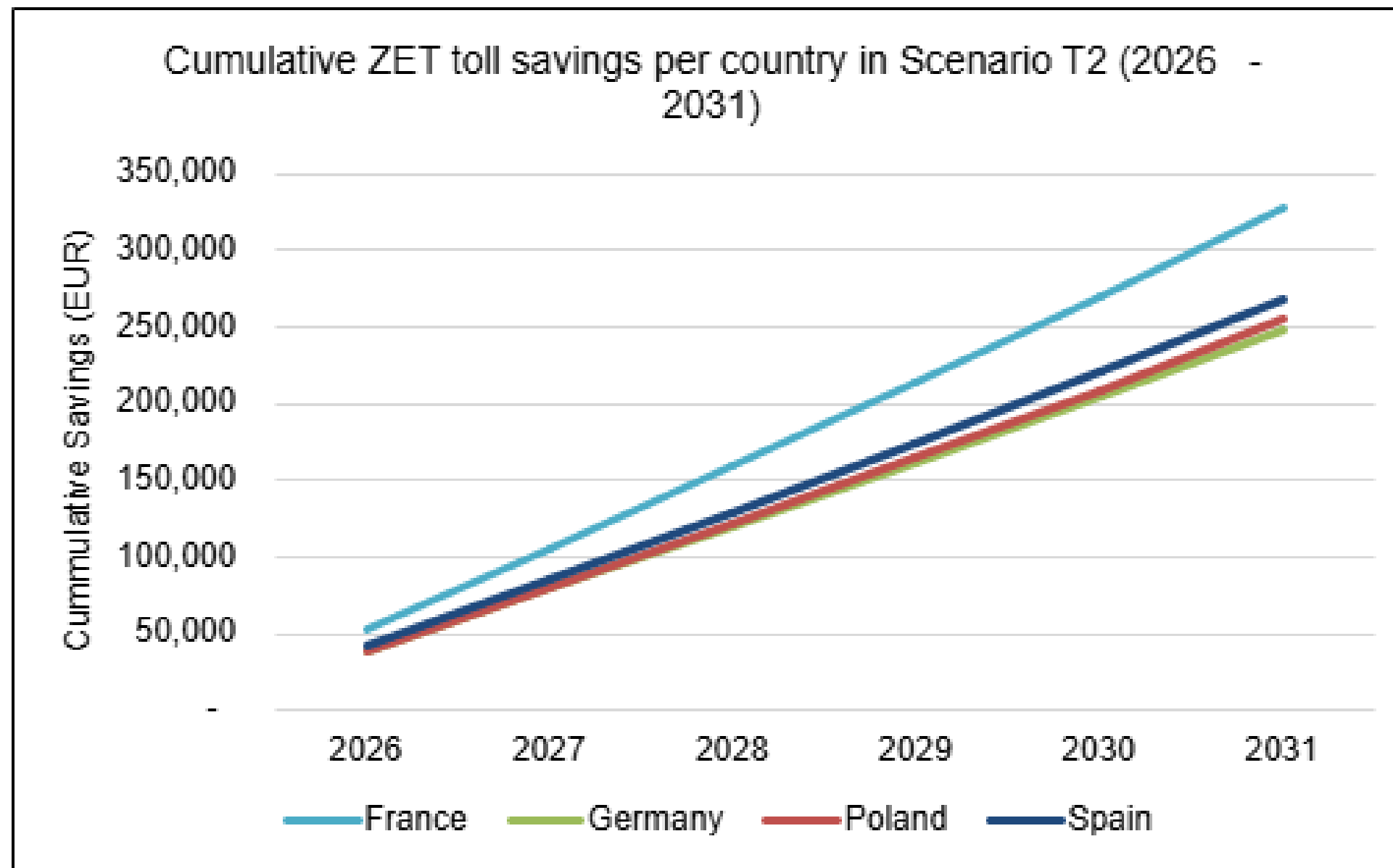


The evolution of annual savings of ZETs compared to diesel trucks under the full exemption scenario shows values slightly higher than in Scenario T1, as diesel truck tariffs include infrastructure, CO₂, air and noise pollution charges.

- **France** would stand out as the country with the highest savings for ZETs, as diesel trucks currently face the highest annual cost. Savings would reach **EUR 57,200** in **2031**, amounting to around **EUR 328,000** over the **6-year period**.
- Because **Germany** has already implemented the proposed tolls and the ZET exemption, the results for this scenario are the same as in the previous one. Annual savings for ZETs reach **EUR 43,700** in **2031**, with a **cumulative figure of approximately EUR 248,800**.
- **Poland** would offer limited savings for ZETs, just slightly above Germany, with ZETs saving **EUR 45,400** in **2031** and accumulating around **EUR 254,800** since **2026**.
- **Spain** would show the second highest saving potential for ZETs, reaching **EUR 47,000** in **2031** and a total of around **EUR 267,700** saved over the whole period.



Cumulative savings by ZET vs diesel – Scenario T2: Full toll exemption for ZETs (German model)



- In **France**, cumulative savings would amount to around **EUR 328,000 per ZET** over the 6-year period.
- Since **Germany** has already implemented the proposed tolls and the ZET exemption, the results for this scenario are the same as in the previous one. Annual savings for ZETs reach a **cumulative figure of approximately EUR 248,800 per ZET** over the 2026-2031 period.
- In **Poland**, fleet operators would accumulate around **EUR 254,800 per ZET**.
- In **Spain**, fleet operators would reach a total of around **EUR 267,700 saved per ZET** over the whole period.



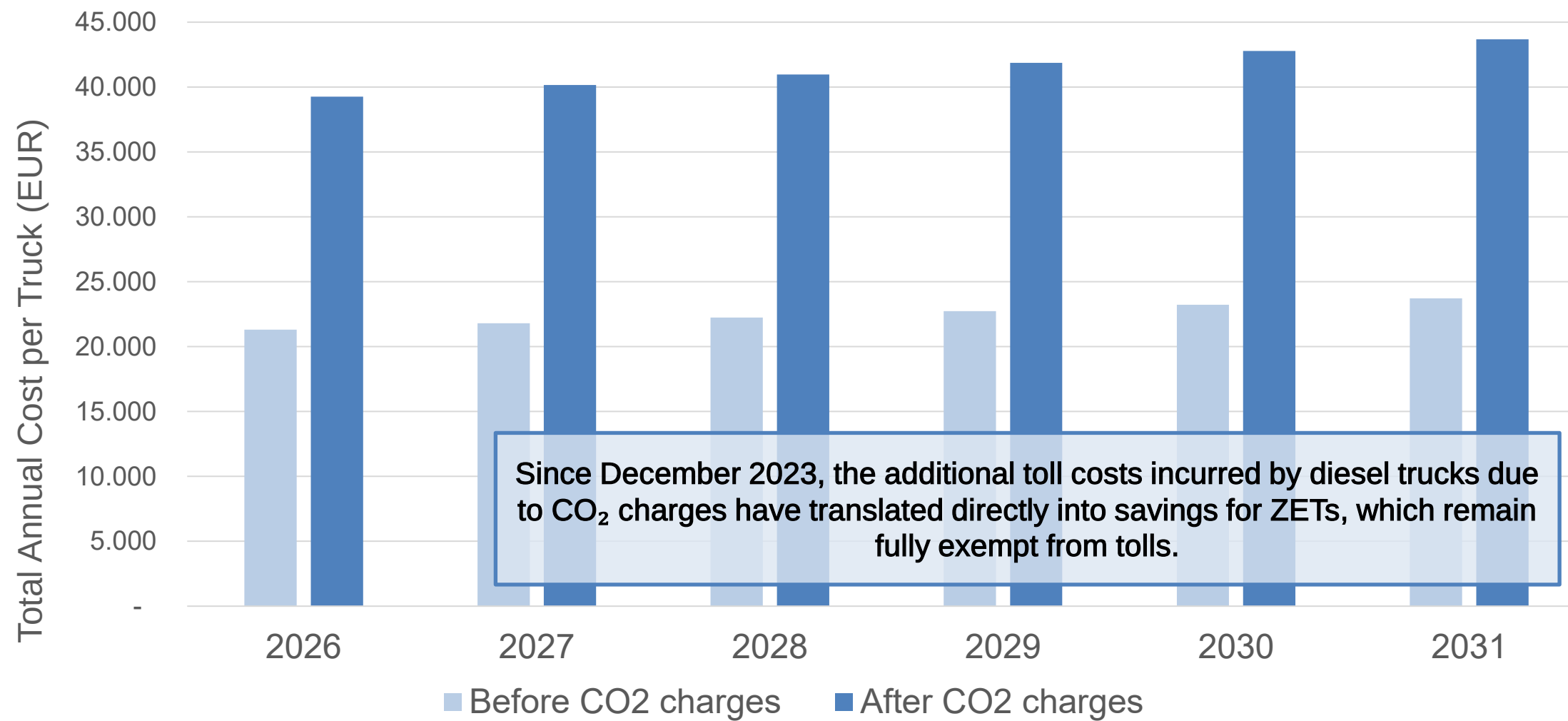
Case study of Germany: estimation of savings after CO₂-differentiated toll implementation (December 2023)

As Germany implemented the full Eurovignette requirements in December 2023 and introduced CO₂-differentiated charges into its national toll tariffs, this study includes an additional analysis of annual costs for diesel trucks since the introduction of this component.

Toll tariff structure in Germany for a representative diesel truck (*)		
Toll component	Before CO ₂ – differentiated toll implementation (EUR/km)	After CO ₂ – differentiated toll implementation (EUR/km)
Infrastructure rate	0.16	0.16
Air pollution rate	0.02	0.02
Noise pollution rate	0.01	0.01
CO ₂ rate	0.00	0.16
Total toll	0.19	0.35

Case study of Germany: estimation of savings after CO₂-differentiated toll implementation (December 2023)

Evolution of annual toll costs for a diesel truck before and after CO₂ charge implementation in Germany (2026-2031)



The introduction of Germany’s CO₂-differentiated toll has materially increased diesel truck toll costs. For an N3 EURO VI diesel truck, the CO₂ charge equals the infrastructure charge (EUR 0.16/km), almost doubling the toll rate compared with the previous tariff structure.

Under pre-CO₂ tariffs, annual toll costs would have increased from EUR 21,300 in 2026 to EUR 23,700 in 2031, resulting in a cumulative cost of **EUR 135,000** over 2026–2031. The addition of the CO₂ charge generates **EUR 113,700** in cumulative extra costs (or foregone savings) over the same period, highlighting the significant cost impact of CO₂-based tolling on diesel operations.



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Estimation of revenues from CO₂- and air pollution-differentiated tolls



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Scope and approach

Purpose: Estimate annual revenues generated from CO₂- and air pollution-differentiated tolls applied to heavy-duty vehicles under different Eurovignette implementation scenarios.

- Traffic activity is derived from the [Fraunhofer synthetic freight flow dataset](#), representing freight movements across the European road network.
- Traffic flows are adjusted to represent movements on the TEN-T Core Network (*), which is assumed to represent the most likely scope of harmonised Eurovignette implementation. Revenue estimates assume charging across the full TEN-T core network.
- Traffic activity is segmented by vehicle weight and emissions class to reflect the composition of the national truck fleet in each country.
- Applicable CO₂ and air pollution toll rates (EUR/km) are assigned to each vehicle category under two tolling scenarios.
 - **Scenario R1 (higher charging scenario):** CO₂ charge aligned with the German CO₂ toll component (approximately EUR 200/tCO₂) and higher air pollution charges based on the German framework. No noise charge is included.
 - **Scenario R2 (lower charging scenario):** CO₂ charge set at 50% of the German CO₂ toll component (approximately EUR 100/tCO₂) and air pollution charges set at 50% of the corresponding German level. No noise charge is included.

Where country-specific expected CO₂ and air pollution charges were available, these values were applied instead of the generic scenario assumptions.
- Annual revenues are estimated by combining traffic volumes with the relevant CO₂ and air pollution tolls rates and aggregating revenues across all vehicle categories.

(*): Although Germany currently applies truck tolls across a larger motorway network than the Core TEN-T corridors alone, the analysis has been consistently based on the Core TEN-T network for all countries, including Germany, to ensure methodological alignment and facilitate cross-country comparability. This approach is additionally supported by the fact that heavy-duty vehicle kilometres travelled (vkm) are highly concentrated along major freight corridors, which largely overlap with the Core TEN-T network.



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Assumptions for scenario framing

The following CO₂ and air pollution charge ranges are used to estimate revenues under each scenario. Values vary by vehicle weight and emissions class (*):

Country	France		Germany		Poland		Spain	
Scenario R1	Diesel	ZET	Diesel	ZET	Diesel	ZET	Diesel	ZET
CO ₂ -differentiated toll (EUR/km)	Ranging from 0.04 to 0.16	-	Ranging from 0.04 to 0.16	-	Ranging from 0.02 to 0.10	-	Ranging from 0.02 to 0.09	-
Air pollution-differentiated toll (EUR/km)	Ranging from 0.01 to 0.19	-	Ranging from 0.01 to 0.19	-	Ranging from 0.01 to 0.09	-	Ranging from 0.01 to 0.19	-

Country	France		Germany		Poland		Spain	
Scenario R2	Diesel	ZET	Diesel	ZET	Diesel	ZET	Diesel	ZET
CO ₂ -differentiated toll (EUR/km)	Ranging from 0.02 to 0.08	-	Ranging from 0.02 to 0.08	-	Ranging from 0.01 to 0.05	-	Ranging from 0.01 to 0.05	-
Air pollution-differentiated toll (EUR/km)	Ranging from 0.01 to 0.09	-	Ranging from 0.01 to 0.09	-	Ranging from 0.01 to 0.05	-	Ranging from 0.01 to 0.09	-

(*): rounded to two decimal points

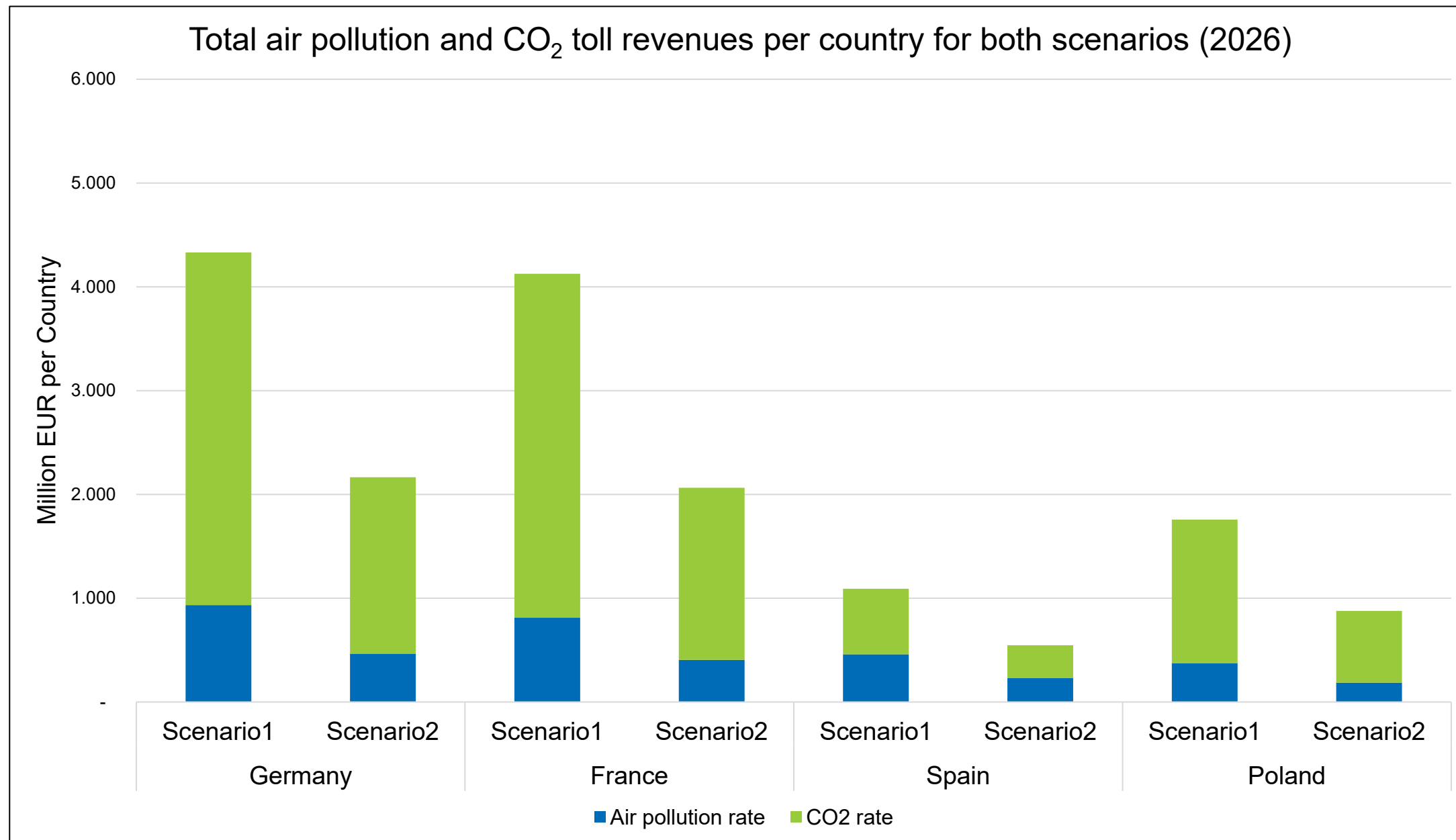
Additional assumptions for estimation of revenues

Expected share of BET in the fleet for each year. Based on our analysis of [ICCT study \(2025\)](#):

	2025	2026	2027	2028	2029	2030	2031
France	0.8%	1.2%	2.0%	3.2%	5.0%	7.1%	11.0%
Germany	0.9%	1.3%	2.2%	3.4%	5.4%	7.7%	12.0%
Poland	0.4%	0.7%	1.1%	1.8%	2.8%	4.0%	6.2%
Spain	0.5%	0.7%	1.1%	1.8%	2.9%	4.1%	6.3%



Revenues from CO₂- and air pollution-differentiated toll (year 2026)

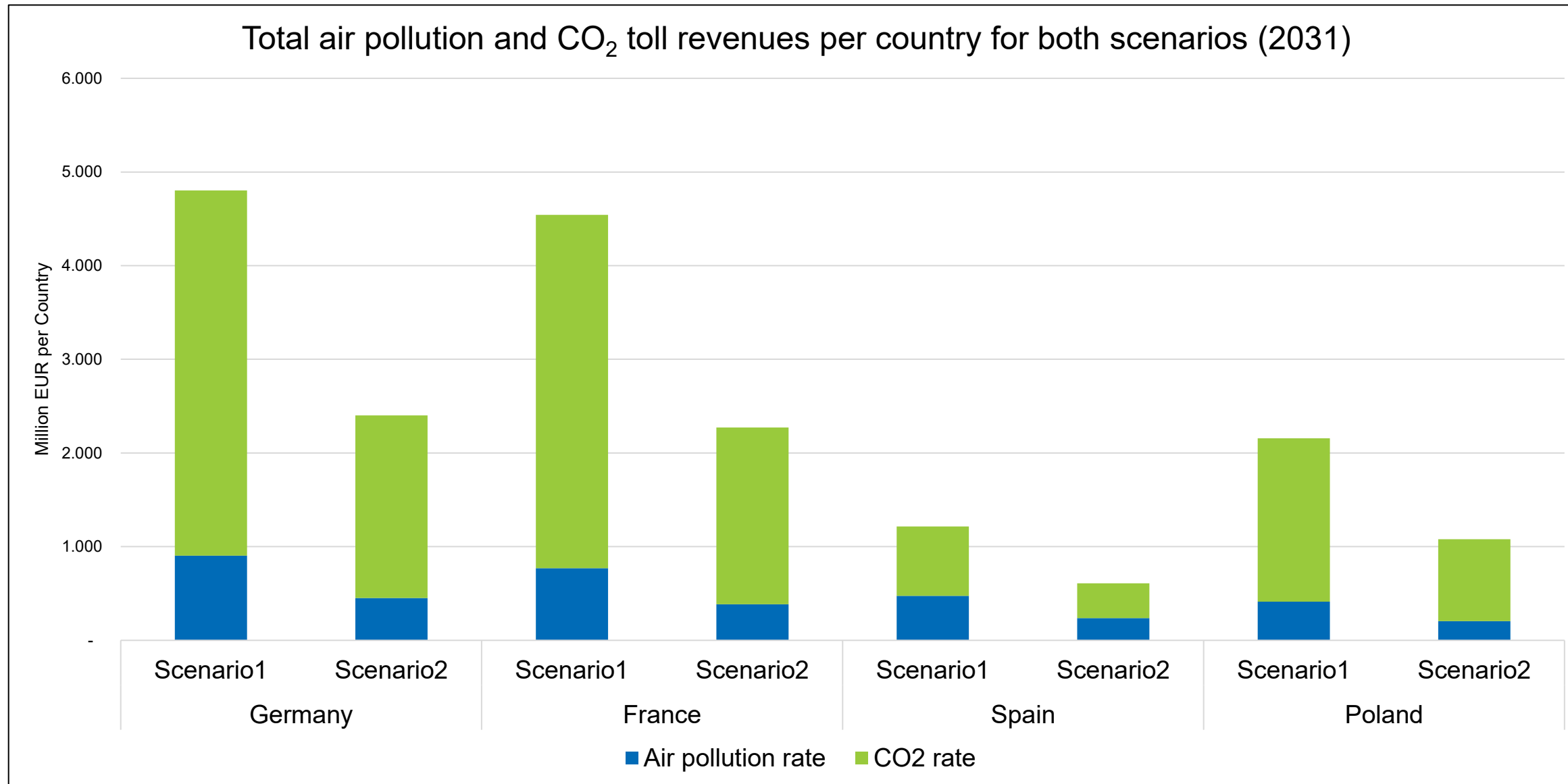


The results show that most of the revenue is associated with CO₂ charges, as this rate is considerably higher than for air pollution.

- **Germany** records the highest CO₂ and air pollution revenues, which translate into the highest annual revenue of all four countries studied. With 78% of the revenues associated with CO₂ charges, total revenue amounts to **EUR 4.3 billion** under Scenario R1 and **EUR 2.2 billion** under Scenario R2.
- **France** would present a total revenue of **EUR 4.1 billion** in 2026 under the higher carbon cost estimation, of which only 20% comes from air pollution charges. This proportion is maintained in Scenario R2, where the total revenue amounts to **EUR 2.1 billion**.
- **Spain** would record the lowest revenue of all four countries, because of its smaller tolled network. With 29% of the revenue derived from air pollution charges, Spain would generate **EUR 1.1 billion** and **EUR 550 million** in 2026 for each of the environmental cost assumptions.
- **Poland** would attribute just 21% of its revenue to air pollution charges. Under a higher carbon price assumption, the estimated annual revenue would amount to **EUR 1.8 billion**, falling to **EUR 900 million** under the second scenario.



Revenues from CO₂- and air pollution-differentiated toll (year 2031)



The results show that expected revenue in 2031 is slightly higher than in 2026.

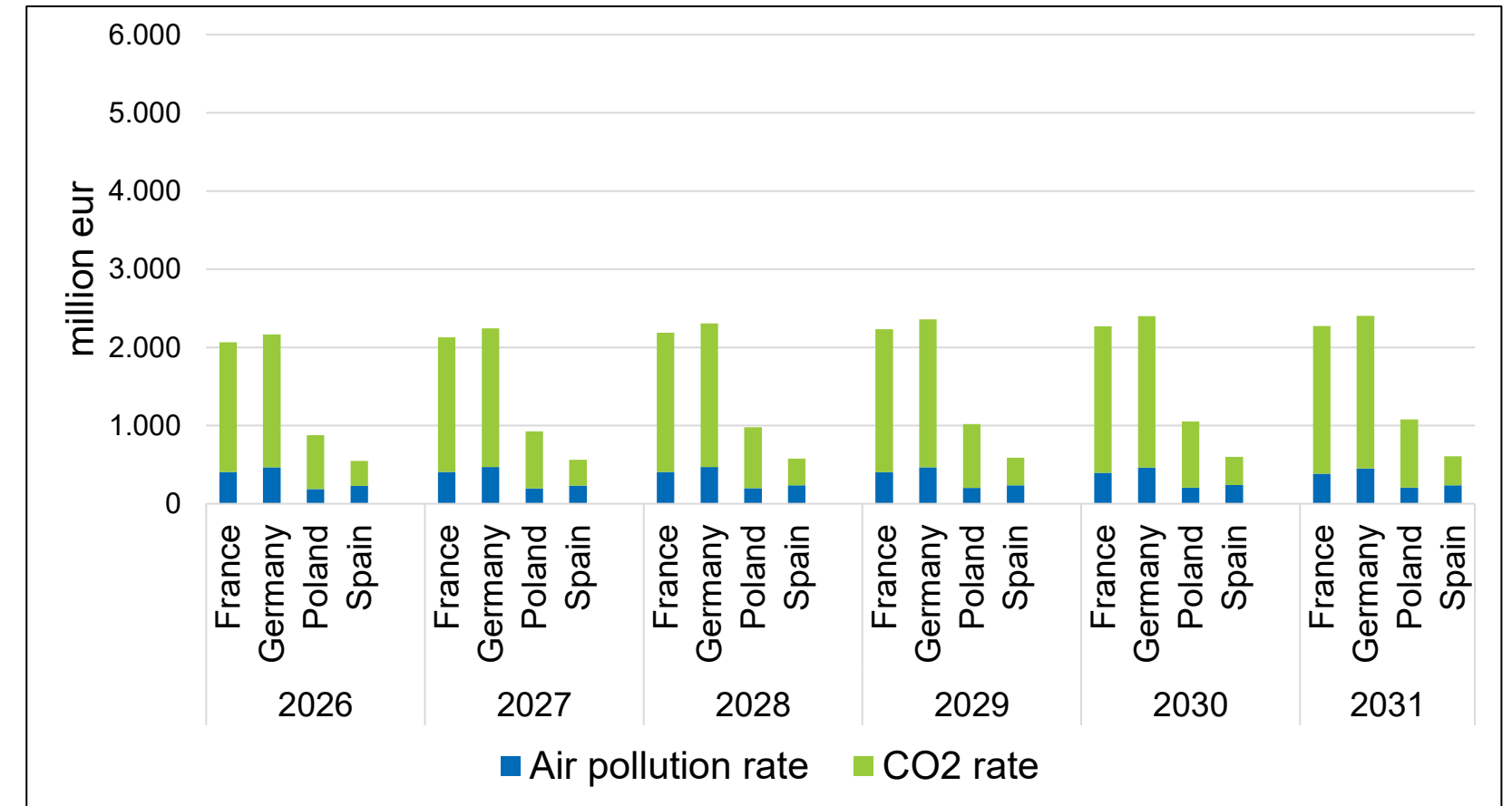
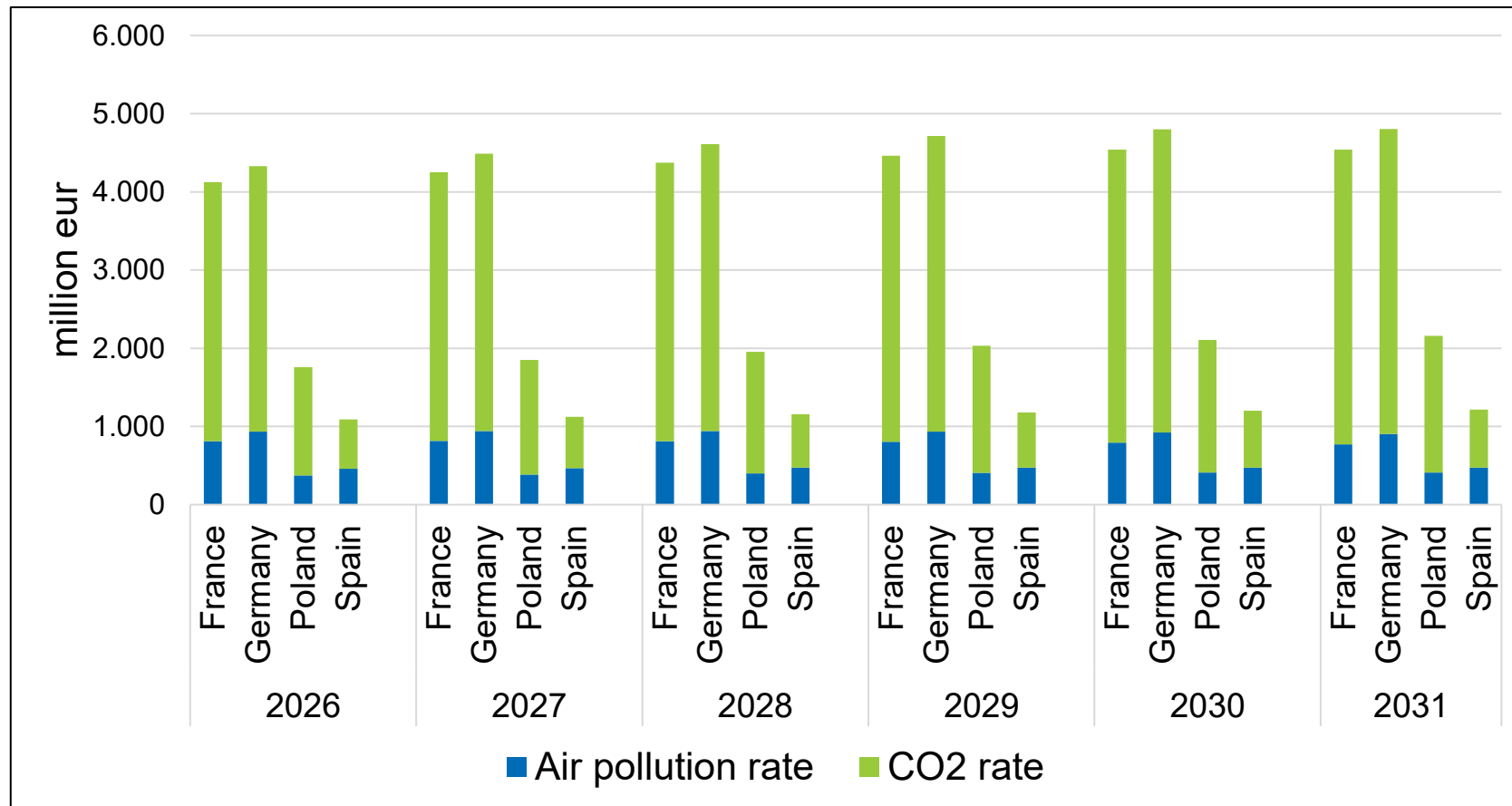
- **Germany** remains the largest revenue contributor among the countries analysed. CO₂ charges now account for 81% of the total revenue, which amounts to **EUR 4.8 billion** under Scenario R1 and **EUR 2.4 billion** under Scenario R2.
- **France** would reach **EUR 4.5 billion** in total revenue under Scenario R1, with air pollution charges representing only 17% of the total, down from 20% in 2026. Under the second scenario, revenue is reduced to **EUR 2.3 billion**.
- In 2031, **Spain** continues to generate the lowest revenue of the four countries, as it has a smaller share of kilometres covered by the toll scheme. Total revenue would reach **EUR 1.2 billion** under Scenario R1 and **EUR 600 million** under Scenario R2, with air pollution charges accounting for 26% of the total, the highest of all four countries under study.
- **Poland** would see its 2031 revenue increase to **EUR 2.2 billion** under the higher carbon and air pollution costs assumption, while Scenario R2 results in **EUR 1.1 billion**. Air pollution charges would represent 19% of total revenue, broadly in line with the 2026 result.



Revenues from CO₂- and air pollution-differentiated toll (2026-2031)

Scenario R1

Scenario R2



In France and Germany, stronger ZET uptake and higher external-cost charges would moderate revenue growth over time, particularly from air pollution-differentiated tolls. As cleaner vehicles replace older, more polluting trucks, fewer HDVs are subject to the highest air pollution charges. In contrast, Poland and Spain would show a more consistent increase in revenues, as slower ZET adoption keeps a larger share of higher-emitting vehicles on the road, sustaining growth in both CO₂- and air pollution-related revenues.



Revenue per country at different assumptions of % TEN-T core network covered by tolls, in billions (2026)

% TEN-T core network covered by tolls (assumption)	25%		50%		75%	
	R1	R2	R1	R2	R1	R2
France	1,03	0,53	2,05	1,05	3,08	1,58
Germany	1,08	0,55	2,15	1,10	3,23	1,65
Poland	0,45	0,23	0,90	0,45	1,35	0,68
Spain	0,28	0,15	0,55	0,30	0,83	0,45

In the previous pages, the estimation of revenues was done assuming a toll coverage on the core TEN-T network of 100% as part of the implementation. In this graph, revenues are shown based on different assumed levels of tolled network. The analysis indicates that countries such as Spain, where only a limited share of the road network is subject to tolling, may be underutilising a significant revenue-generation mechanism that could help finance the decarbonisation of the transport sector.





Conclusions and policy recommendations



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Conclusions (I)

Progress on the implementation of Eurovignette

- **Distance-based tolling** is already established in the analysis of all examined countries, providing a strong foundation for the implementation of the revised Eurovignette Directive, as this charging scheme better reflects road use and externalities compared to time-based charging.
- Eurovignette implementation remains uneven across countries. **Germany is the most advanced case**, having implemented CO₂ differentiation, air pollution and noise charges, as well as a full toll exemption for zero-emission HDVs until 2031. This creates a strong financial incentive for ZET adoption.
- France and Spain demonstrate that **legal transposition alone does not guarantee implementation in practice**. Both face additional challenges linked to concession-based toll networks, particularly in France, where the motorway network is almost entirely operated under long-term concession contracts.
- In Spain, tolling applies only to a **limited share of the road network** and currently does not differentiate according to CO₂ emissions. Tolling remains a sensitive policy issue and the Ministry of Transport confirmed in May 2024 that compliance with the Eurovignette Directive will be achieved without introducing new tolls or modifying the existing system. Without a robust Eurovignette implementation, Spain may face a policy gap in incentivising BET adoption, requiring the deployment of complementary measures such as purchase grants or tax incentives
- Poland represents an intermediate case. It already operates a distance-based HDV tolling system with EURO-class differentiation, but key provisions of the revised Directive have not yet been implemented. **Transposition remains under parliamentary review** and is expected to introduce both CO₂- and air pollution-differentiated tolls.



Conclusions (II)

Toll savings for ZETs under different scenarios

- **Eurovignette implementation can significantly improve the cost competitiveness of ZETs.** Under the most likely implementation pathway (Scenario T1), annual toll savings for a representative N3 5-axle battery-electric truck range between EUR 11,000 and EUR 23,000, depending on national implementation choices. Germany provides the strongest incentive through its existing exemption policy, while Poland offers the highest savings among countries without a full exemption.
- **Full toll exemptions represent the most effective mechanism for accelerating ZET adoption in the short to medium term.** As these exemptions are scheduled to expire after 2031, CO₂-based road charges will become increasingly important in maintaining the business case for fleet decarbonisation. Under this scenario (T2), annual toll savings increase to between EUR 37,000 and EUR 53,000 per ZET. High-toll countries such as France offer the greatest potential benefits from exemption policies, while Germany already reflects this approach in practice.
- The Germany-specific analysis illustrates the impact of CO₂-differentiated tolling. Following the introduction of CO₂ charges in December 2023, **toll costs for diesel trucks nearly doubled**, significantly strengthening the economic advantage of zero-emission vehicles.



Conclusions (III)

Estimation of government revenues from CO₂ and air pollution charges

- **External-cost tolling can generate significant revenues across all countries analysed**, particularly under CO₂ and air pollution charging assumptions (Scenario R1). Across all countries, the majority of revenues are generated by CO₂-differentiated tolls, reflecting the higher level of this component relative to air pollution charges. **Germany records the highest annual revenues** due to the wider coverage of its tolled network, **while Spain generates the lowest revenues** because of its more limited tolled network and lower expected charges. Between 2026 and 2031, revenues increase across all countries, mainly driven by inflation adjustments, with annual revenues ranging from approximately EUR 1.2 billion in Spain to EUR 4.8 billion in Germany in 2031 under Scenario R1.
- **Over the 2026-2031 period, CO₂- and air pollution revenues continue to increase, but the pace of growth becomes increasingly influenced by changes in fleet composition.** In France and Germany, where ZET uptake is stronger and external-cost charges are higher, the gradual shift towards cleaner vehicles gradually **moderates revenue growth, particularly for the air pollution component.** This is because fewer older, more polluting vehicles remain in the fleet and therefore fewer HDVs pay the highest environmental charges. By contrast, **Poland and Spain show a steadier upward trend, as slower ZET uptake means that a larger share of polluting trucks remains in the fleet for longer** (see page 35), leading CO₂-and air pollution-related revenues to keep increasing. Nevertheless, cumulative revenues remain highest in Germany and France, reaching EUR 27.8 billion and EUR 26.3 billion respectively under Scenario R1, compared with EUR 11.9 billion in Poland and EUR 10.3 billion in Spain. These revenues create a significant opportunity to support freight decarbonisation through targeted reinvestment measures.



Policy recommendations (I)

- **Promote full toll exemptions for ZETs as the preferred policy to strengthen the financial incentive for uptake.** The analysis shows that full toll exemptions are the most powerful measure to improve ZET competitiveness. Annual savings for a representative 5-axle battery-electric truck increase from EUR 11,000– EUR23,000/year under the most likely implementation scenario (T1) to EUR 37,000–EUR 53,000/year under a full exemption (T2). This is highly relevant in a sector dominated by SMEs, where between 80–90% of EU road freight transport companies operate with fewer than 10 vehicles, according to Eurostat.
- **Accelerate the rollout of CO₂-based tolling across all Member States.** Germany's experience demonstrates the effectiveness of CO₂ differentiation. The introduction of a EUR 0.16/km CO₂ charge in December 2023 (for a representative 5-axle truck) increased diesel truck toll rates in roughly 85% and strengthened the business case for ZET adoption.
- **Address concession-network barriers to implementation.** Legal transposition alone is insufficient when toll roads are managed through long-term and fragmented concession contracts. This is particularly important in France, where approximately 9,000 km of motorway infrastructure is operated through concession contracts and currently remains outside the Eurovignette's scope. Governments should work with Concessionaires to ensure that Eurovignette incentives can be applied consistently across networks.
- **Ring-fence CO₂- and air pollution-differentiated toll revenues for freight decarbonisation.** Under the study assumptions, annual revenues from external charges range from EUR 1.1 billion to EUR 4.3 billion per country. Governments should dedicate a significant share of these revenues to measures supporting the transition to zero-emission trucks, such as ZET purchase and leasing support schemes, fleet renewal programmes for SMEs and small hauliers and grid upgrades along major freight corridors. CO₂-based road charges could also serve as a mechanism to fund transport infrastructure maintenance, partially offsetting the revenue shortfall associated with toll exemptions for ZETs.



Policy recommendations (II)

- **Prioritise CO₂ charging as the primary funding lever while maintaining air-pollution differentiation.** Across all countries, around 70–80% of total revenues originate from the CO₂ component, making it the most effective instrument for both decarbonisation and revenue generation. Air-pollution charges should nevertheless be maintained to accelerate the retirement of older, high-emitting vehicles and deliver local air-quality benefits





Country snapshot comparison



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Country snapshot comparison

Country	France	Germany	Poland	Spain
Tolling model	Distance-based	Distance-based	Distance-based	Distance-based
Scheme operator	Private concessions	Public model	Mixed model, primarily public	Mixed model, primarily concessions
Km of TEN-T Core network	~ 5,500 km ¹	6,364 km	3,811 km	5,944 km
Current toll rates: average for a representative diesel truck	0.37 EUR/km	0.35 EUR/km	0.13 EUR/km	0.22 EUR/km
(Expected) toll rates for CO ₂ component	0.16 EUR/km	0.16 EUR/km	0.10 EUR/km	0.09 EUR/km
(Expected) toll rates for air pollution component	Not expected in short term	0.02 EUR/km	0.09 EUR/km	Not expected in short term
Toll savings for ZET under Scenario T1 – Expected implementation	EUR 14,900	EUR 39,300	EUR 22,600	EUR 11,200
Toll savings for ZET under Scenario T2 – Full exemption	EUR 52,200	EUR 39,300	EUR 37,200	EUR 42,200
Government revenue estimation 2026 – Scenario R1	EUR 4,1 billion	EUR 4,3 billion	EUR 1,8 billion	EUR 1,1 billion
Government revenue estimation 2026 – Scenario R2	EUR 2,1 billion	EUR 2,2 billion	EUR 0.9 billion	EUR 0.6 billion





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