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Powering Clean Mobility

Pathways for the Future of Transport in Romania

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Powering Clean Mobility – Pathways for the Future of Transport in Romania

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About EPG

EPG is an independent, non-profit think tank focused on energy and climate policy in Romania and the European Union. Founded in 2014, EPG operates as a policy research institute primarily financed through competitive grants, philanthropic organisations and, to a limited extent, private sector projects. EPG aims to promote an evidence-based dialogue on how to balance decarbonisation, economic competitiveness and social fairness, engaging decision-makers, industry, and the public.

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Key findings

- The future of transport is closely linked with decarbonisation, which boosts long-term competitiveness by reducing fuel dependence, cutting operational costs, and fostering clean innovation.
- Achieving clean and climate-neutral mobility by 2050 requires a profound transformation of Europe's transport system, guided by EU initiatives such as the Clean Industrial Deal, the Industrial Action Plan for the European Automotive Sector, and the updated Climate Law.
- Romania's updated National Energy and Climate Plan (NECP 2025-2030) aims to align with these objectives, setting clear sectoral targets to advance clean mobility, expand the use of renewable fuels, and develop sustainable infrastructure, while ensuring a gradual and balanced transition towards low-emission transport.
- Despite recent progress, a significant gap persists between Romania's current pace of transport electrification and the modelled decarbonisation trajectories, underscoring the need for stronger and more coherent policy and market interventions.
- This policy paper analyses Romania's NECP 2025-2030 decarbonisation scenarios, both the With Existing Measures (WEM) and With Additional Measures (WAM), in comparison with an EPG simulation, where a more realistic approach to electrification is modelled and highlights the enabling policies required for Romania to meet its EU climate targets.
- The EPG model points to the importance of a balanced energy mix in the mobility sector, combining renewables, hydrogen, and biofuels to achieve a more resource-efficient and EU-aligned pathway to transport decarbonisation. It also reinforces the urgency of widespread adoption of zero-emission vehicles as key drivers of the clean transition.
- Given the strategic importance of the automotive industry to Romania's economy (approx. 13-14% of GDP), policies should steer the transition toward transport electrification in a competitive and socially inclusive way, that boosts local manufacturing.
- This involves tackling structural challenges within the EV sector while broadening access to clean mobility—for example, through social leasing schemes that make electric vehicles more affordable to lower-income households.
- A comprehensive national mobility strategy should integrate stricter efficiency standards, the rapid expansion of EV and charging infrastructure, and the use of renewable fuels to drive decarbonisation across all transport modes.
- In parallel, industrial support, workforce development, and circular-economy initiatives are essential to strengthen Romania's automotive competitiveness and ensure a just and sustainable transition for both industry and consumers.

Mesaje cheie

- Viitorul transportului este strâns legat de decarbonizare, care crește competitivitatea pe termen lung prin reducerea dependenței de combustibili, scăderea costurilor operaționale și promovarea inovației.
- Pentru a atinge obiectivul unei mobilități curate și neutre din punct de vedere climatic până în anul 2050, este necesară o transformare profundă a sistemului european de transport. Această tranziție este susținută de inițiative majore ale Uniunii Europene, precum Pactul pentru o Industrie Curată, Planul de Acțiune Industrială pentru Sectorul Auto European și Legea Climei actualizată.
- În acest context, Planul Național Integrat pentru Energie și Schimbări Climatice (NECP 2025–2030) al României urmărește alinierea la obiectivele europene, stabilind ținte sectoriale pentru promovarea mobilității curate, extinderea utilizării combustibililor regenerabili și dezvoltarea unei infrastructuri durabile. Totodată, planul vizează o tranziție graduală, echilibrată și justă către un sistem de transport curat.
- În pofida progreselor recente, există încă un decalaj semnificativ între ritmul actual al electrificării transporturilor în România și traiectoriile modelate de decarbonizare din NECP 2025–2030, subliniind necesitatea unor politici și intervenții de piață de impact.
- Acest document analizează scenariile de decarbonizare din NECP 2025–2030, atât scenariul cu măsuri existente (WEM), cât și cel cu măsuri suplimentare (WAM), comparativ cu o simulare realizată de EPG, care adoptă o abordare mai realistă privind electrificarea și evidențiază politicile necesare pentru ca România să își atingă obiectivele climatice stabilite la nivelul Uniunii Europene.
- Modelul EPG evidențiază importanța unui mix energetic echilibrat în sectorul mobilității, care să combine sursele regenerabile, hidrogenul și biocombustibilii, și evidențiază importanța adoptării pe scară largă a vehiculelor cu emisii zero, ca factori esențiali ai tranziției către un sistem de transport durabil.
- Având în vedere importanța strategică a industriei auto pentru economia României (aprox. 13-14% din PIB), politicile publice trebuie să stimuleze electrificarea transporturilor într-un mod competitiv și incluziv din punct de vedere social, stimulând producția domestică.
- Aceasta implică abordarea provocărilor structurale din sectorul vehiculelor electrice și accesul la mobilitate curată – de exemplu, prin programe de leasing social care să facă vehiculele electrice mai accesibile pentru gospodăriile cu venituri reduse.
- O strategie națională cuprinzătoare de mobilitate ar trebui să integreze standarde de eficiență, extinderea rapidă a infrastructurii de încărcare a vehiculelor electrice și utilizarea combustibililor regenerabili în toate modurile de transport.
- În paralel, măsurile de sprijin industrial, formare a forței de muncă și inițiativele de economie circulară sunt esențiale pentru consolidarea competitivității industriei auto din România și pentru o tranziție justă și durabilă pentru industrie și consumatori.

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Current transport emissions landscape and climate policy alignment

Transport is a vital engine of the global economy, being closely linked to economic prosperity – businesses moving more goods and people traveling more reflect higher productivity, stronger trade, and greater economic activity. A well-functioning transport system is therefore essential for Europe's competitiveness.

There is a strong overlap between the solutions needed for addressing some of the structural issues of the sector and the objective to lower sectoral emissions. Decarbonising transport can strengthen Europe's long-term competitiveness and prosperity. By reducing reliance on imported fossil fuels, improving air quality, and driving innovation in clean technologies, decarbonisation lowers operational costs, boosts energy security, and positions European industries at the forefront of global clean transition. This ensures that economic growth can continue in a way that is sustainable, resilient, and aligned with future market demands.

In 2024, global greenhouse gas (GHG) emissions exceeded 53.2 gigatonnes of carbon dioxide equivalent[1] ($GtCO_2e$)[2], with the transport sector accounting for approx. 15%[3] of total emissions[4]. In Europe, the sector's contribution was comparatively higher, representing about 19-29% of total GHG emissions[6,5]. A significant share (67-71%)[6]-10 of these emissions is from transport fuel combustion[7], particularly from passenger cars and motorcycles[8], a trend linked to population growth and economic expansion.

In Romania, the transport sector accounts for roughly one-quarter of total GHG emissions[9], making it the leading source of pollution, followed by the manufacturing and power sectors[10]. Road transport is the dominant contributor, responsible for 97% of transport-related emissions[11] in 2023, with 52% being represented by emissions generated by cars, 31% from heavy duty trucks and buses, and 12% from light duty trucks. Also, more than 1% of emissions are coming from rail transport[12]. The trend mirrors the EU data with road transportation, and especially passenger cars being the largest sector to decarbonise.

Achieving climate neutrality by 2050 requires a fundamental transformation of the transport sector. The European Union aims to make mobility more sustainable while maintaining connectivity, targeting a 90% reduction in transport-related GHG emissions from 1990 levels by 2050. The European Commission has proposed an amendment to the European Climate

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[1] Joint Research Centre, 2025, World emissions hit record high, but the EU leads trend reversal
[2] Without counting emissions from land use, land-use change, and forestry (LULUCF)
[3] Climate Trace, 2025, Country/Territory Inventory
[4] CO_2e 100yr with emissions total excluding LULUCF
[5] European Environment Agency, 2025, Transport and mobility
[6] Consilium Europa, 2025, Greener transport
[7] Climate Trace, 2025, Inventory by sector in Europe
[8] Destatis, 2025, Road transport: EU-wide carbon dioxide emissions have increased by 23% since 1990
[9] CO_2e 100yr with emissions total excluding LULUCF
[10] Climate Trace, 2025, Inventory by sector in Romania
[11] Eurostat, 2025, Greenhouse gas emissions by source sector
[12] Ibid

Law, aiming to set a more ambitious target of a 90% reduction in GHG emissions by 2040, compared to 1990 levels[13].

Transport is one of the key areas of focus of the European Green Deal (EGD). Following the EGD and the Fit for 55 Package, the European Council has adopted new and revised regulations affecting all transport modes (Table 1), including the revision of the EU Emissions Trading System (ETS) and the introduction of ETS2, the implementation of new CO_2 emission standards for road transport and buildings, and additional measures to promote alternative fuels infrastructure.

In 2025, the EU refined its strategy by linking climate ambition with industrial competitiveness through flagship initiatives such as the Clean Industrial Deal[14] and the Industrial Action Plan for the European automotive sector[15].

Romania's National Energy and Climate Plan (NECP) serves as the central framework for implementing the country's energy and climate objectives. It translates EU-wide targets, stemming from the EGD and key legislative instruments such as the ETS, ESR, RED III into national policies and sectoral pathways, including those for transport decarbonisation, renewable fuels, energy efficiency, and sustainable infrastructure development.

The NECP must ensure alignment with EU objectives by incorporating binding measures and targets for transport by 2030, including increased renewable energy use in transport fuels, expanded charging and refuelling infrastructure, and improved vehicle efficiency standards. The updated 2024's NECP 2025-2030[16] sets Romania's long-term climate ambition to achieve a 96% reduction in net GHG emissions by 2040, and to reach complete climate neutrality by 2050, corresponding to a 105% reduction in net GHG emissions compared to 1990 levels.

For the transport sector, the NECP focuses on curbing emissions growth and promoting low-emission mobility, primarily through the uptake of hybrid and electric vehicles. Given the sector's upward emissions trajectory in recent years, the plan establishes a maximum allowable increase of 40% in transport-related GHG emissions by 2030 relative to 1990 levels, reflecting both the need to accommodate mobility demand and the commitment to a gradual decarbonisation pathway.

[13] European Commission, 2025, A new plan for Europe's sustainable prosperity and competitiveness
[14] European Commission, 2025, Clean Industrial Deal
[15] European Commission, 2025, Industrial Action Plan for the European automotive sector
[16] European Commission, 2024, Integrated National Energy and Climate Plan of Romania 2025-2030 Update

Table 1. The main directives and regulations covering the emissions in the transport sector in the European Union

EU Directive/ EU Regulation	Implications for the transport sector
Directive 2003/87/EC[17] (EU ETS[18])	Establishes a cap-and-trade system covering power, industry, aviation[19] (since 2012) and maritime transport[20] (since 2024) that places a price on CO_2 emissions
Directive 2023/959[21] (EU ETS2)	Creates a new emissions trading system for fuels used in road transport and buildings, targeting fuel suppliers rather than end users, to drive decarbonisation in these sectors, from 2027 onwards
Directive 2023/2413[22] (RED III[23])	Increases binding targets of either at least 29% of renewables share in the final energy consumption in the sector (RES-T[24]), or reduction with 14.5% of GHG emissions intensity by 2030 Supports the deployment of clean hydrogen technologies, with a sub-target to achieve a 1% share of renewable fuels of non-biological origin (RFNBOs) in the energy supplied to the transport sector by 2030
Regulation 2019/631[25]	Establishes fleet-wide CO_2 emission performance standards for new passenger cars and new light commercial vehicles in the EU, progressively tightening toward 2035 Amended Regulation 2023/851[26] sets a 100% emission reduction target from 2035 onwards
Regulation 2019/1242[27]	Establishes CO_2 emission performance standards for new heavy-duty vehicles (trucks/buses), with binding reduction targets from 2025 and beyond

[17] EUR-Lex, 2023, Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003
[18] EU Emissions Trading System (EU ETS)
[19] European Commission, 2025, Reducing emissions from aviation
[20] European Commission, 2025, FAQ – Maritime transport in EU Emissions Trading System (ETS)
[21] EUR-Lex, 2023, Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023
[22] EUR-Lex, 2023, Directive (EU) 2023/2413 of the European Parliament and of the Council
[23] The revised Renewable Energy Directive (RED)
[24] Renewable Energy Sources in the Transport sector (RES-T)
[25] EUR-Lex, 2019, Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019
[26] EUR-Lex, 2023, Regulation (EU) 2023/851 of the European Parliament and of the Council of 19 April 2023
[27] EUR-Lex, 2019, Regulation (EU) 2019/1242 of the European Parliament and of the Council of 20 June 2019

EU Directive/ EU Regulation	Implications for the transport sector
Regulation 2018/842[28] amended by Regulation 2023/857[29] (ESR[30])	Sets binding national[31] targets for GHG emission reduction for each Member State for sectors not covered by the main ETS, incl. domestic transport (i.e., road, non-ETS aviation, non-ETS maritime)
Regulation 2023/1804[32] (AFIR[33])	Requires deployment of publicly accessible recharging and refuelling infrastructure for alternative fuels (i.e., electricity, hydrogen, liquified methane[34]) along the TEN-T[35] network and throughout Member States
Regulation 2024/1679[36] (TEN-T Regulation)	Defines the TEN-T, sets obligations for developing high-quality multimodal infrastructure across road, rail, air and waterways to support decarbonised transport[37]

[28] EUR-Lex, 2018, Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018
[29] EUR-Lex, 2023, Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023
[30] Effort Sharing Regulation (ESR)
[31] European Commission, 2025, Effort sharing 2021-2030: targets and flexibilities
[32] EUR-Lex, 2023, Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023
[33] Alternative Fuels Infrastructure Regulation (AFIR)
[34] European Commission, 2025, Alternative Fuels Infrastructure Regulation
[35] Trans-European Transport Network (TEN-T), a planned network of roads, railways, airports and water infrastructure in the European Union
[36] EUR-Lex, 2024, Regulation (EU) 2024/1679 of the European Parliament and of the Council of 13 June 2024
[37] European Commission, 2025, Trans-European Transport Network

Romania's automotive sector and the transition to sustainable mobility

The automotive industry is a key component of Romania's economy, contributing 13-14% to national GDP in 2024[38] [39]. Romania exported new cars worth ca. 12 billion euros in 2024, while imports of new cars were 3.5 billion euros[40]. In 2024, Romania's automotive industry generated a turnover of approximately EUR 35 billion[41], with the car parts and accessories segment accounting for the largest share of around 70%, and the remainder 30% generated by vehicle producers Dacia and Ford Otosan.

In terms of employment, the automotive industry plays a central role in Romania's manufacturing base. It accounts for 15% of total direct manufacturing employment, one of the highest shares in the EU, placing Romania second among EU member states in 2023[42] compared to the EU average of 8%. The industry directly employs over 220,000 people[43].

The transition to electric mobility presents significant structural challenges for the automotive sector. Battery electric vehicles (BEVs) are considerably more energy-efficient than internal combustion engine (ICE) vehicles, with an energy conversion efficiency of around 80-90%,[44] and produce about 73% fewer life-cycle GHG emissions than equivalent fossil fuel-powered vehicles[45]. Romania is a major producer of automotive components, with supply chains closely tied to ICE vehicle production. Consequently, the shift to BEVs will require substantial adjustments across the supply network to maintain industrial competitiveness and safeguard employment.

In 2024, the average emissions of new vehicles in Romania reached 123.8 gCO_2/km, a 4.3% increase compared to 2023, while the EU-wide average was 108 gCO_2/km[46]. This divergence highlights the ongoing reliance on internal combustion engine vehicles in Romania and underscores the need for strengthened policies and incentives to accelerate the adoption of low- and zero-emission vehicles, complementing industrial transition efforts and aligning with EU climate objectives (RED III).

[38] KPMG, 2024, KPMG survey highlights auto industry in time of transition
[39] Oeconomus, 2025, The end of the Romanian miracle? – The impact of the automotive crisis on Romanian foreign trade and labour
[40] Economedia, 2025, APIA contrazice datele prezentate de ING Bank România: Industria auto românească performează
[41] SeeNext, 2025, Automotive industry in Southeast Europe, page 24
[42] ACEA, 2025, The Automotive Industry Pocket Guide 2025/2026, page 11
[43] SeeNext, 2025, Automotive industry in Southeast Europe, page 24
[44] Togun et al, 2025, Development and comparative analysis between battery electric vehicles (BEV) and fuel cell electric vehicles (FCEV)
[45] Including vehicle manufacturing
[46] ACEA, 2025, The automobile industry. Pocket Guide 2025/2026, page 64

Pathways to a climate-neutral and resilient transport sector in Romania by 2050

Achieving decarbonisation by 2050 demands robust, evidence-based planning and clear strategic pathways. Romania has yet to define a comprehensive strategy to reach climate neutrality in alignment with the European Union's objective of net-zero GHG emissions by 2050. In this context, the 2024 NECP sets specific requirements for the transport sector to 2030, but do not fully capture all EU-level requirements and ambitions.

In this policy paper, the scenarios developed for Romania's NECP 2025-2030, namely the With Existing Measures (WEM) and With Additional Measures (WAM) scenarios are compared with the EPG scenario model. The comparison focuses on projected decarbonisation outcomes, with particular emphasis on the transport sector. The EPG scenario offers a more comprehensive alignment with EU targets, including the NECP targets, highlighting the need for further policy support in the sector.

The EPG scenario was modelled using the 2050 Pathways Explorer, a comprehensive simulation tool developed by CLIMACT and subsequently calibrated and adapted to the Romanian context by EPG. It covers all sectors contributing to GHG emissions and energy use. Data on Romania's transport sector were sourced from JRC IDEES Data Base, Eurostat, the National Institute of Statistics.

The Pathways Explorer enables dynamic visualisation of national climate transition pathways, allowing for the comparison of alternative trajectories towards net-zero GHG emissions. The tool supports evidence-based policy analysis by evaluating the potential impact of key input factors on the decarbonisation process. The EPG scenario assumes that current growth trends in Romania will converge with the EU average, projecting a continued growth in transport demand with passenger transport increasing by 10%, aviation by 16%, and freight activity by 11% by 2030 compared to 2021 levels.

Exploring simulation outcomes based on NECP and EPG scenarios

Looking ahead to 2030, the simulation results reveal that among the three scenarios, the EPG scenario delivers more impact towards decarbonisation. While the WAM scenario projects a 6% reduction in total GHG emissions compared to the WEM scenario, the EPG model achieves a markedly higher 10% reduction as compared to the WAM scenario (Figure 1). From a sectoral perspective, energy-related emissions remain broadly consistent across all three scenarios. However, under the EPG pathway, emissions are projected to fall more sharply by 14% in transport, 14% in industry, 16% in agriculture and 23% in buildings, relative to WAM levels. This indicates that the EPG model not only supports a stronger overall emissions reduction but also drives more balanced progress across key emitting sectors.

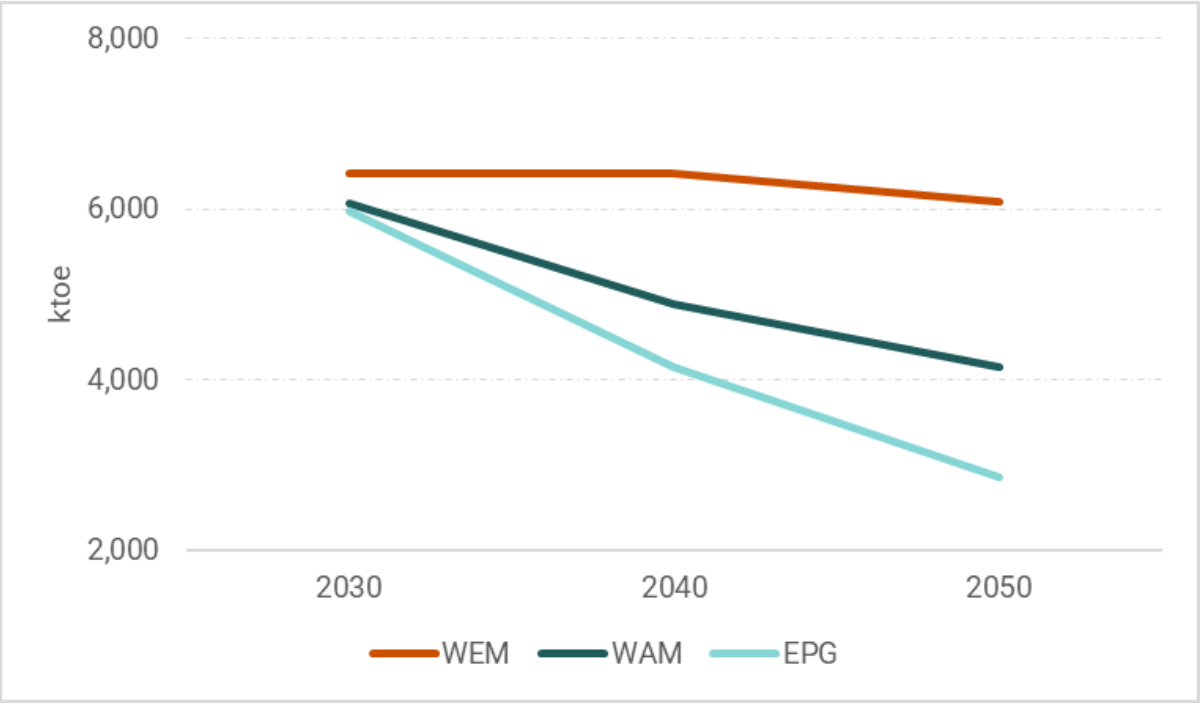
Figure 1: Total and sectoral GHG emissions in 2030

In terms of total transport emissions in Romania, both the EPG and WAM scenarios are projected to align with the climate neutrality target by 2050 (Figure 1). By contrast, under the WEM scenario, emissions show only a marginal decline of about 5% between 2030 and 2050, reflecting limited impact. In the WAM and EPG scenarios, however, enhanced decarbonisation measures lead to a progressively wider gap in GHG intensity over time. Although the differences among the three scenarios remain relatively modest in 2030, they widen significantly by 2050, with total emission reductions reaching up to 84-85% in the more ambitious pathways. This divergence underscores the need for additional policy and investment efforts to accelerate emission reductions and ensure Romania meets its national and EU net-zero objectives.

Figure 2: Total GHG transport emissions in 2030, 2040 and 2050

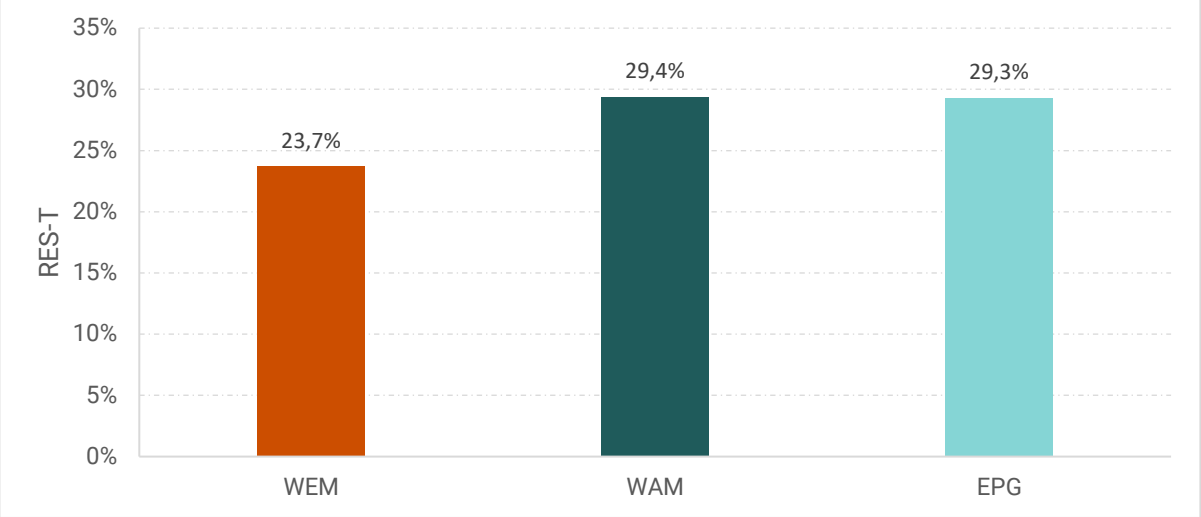
Similarly, looking at the energy consumption in the transport sector, differences among the three scenarios remain limited in 2030, but diverge significantly by 2050 (Figure 2). Under the WEM scenario, total energy demand remains above 6 Mtoe throughout 2030-2050, reflecting a continuation of current trends. In contrast, the WAM scenario projects a 32% reduction in transport energy consumption by 2050, reaching around 4 Mtoe, while the EPG scenario achieves a deeper 53% decrease, falling just below 3 Mtoe.

Figure 3: Total energy consumption in transport in 2030, 2040 and 2050



In addition, a key indicator of the efficiency of the transition is the share of renewable energy sources in transport energy consumption (RES-T). The WEM scenario is projected to reach a 24% RES share by 2030, while both WAM and EPG attain higher levels of around 29%, underscoring the importance of accelerated renewable deployment to align with EU transport decarbonisation objectives (Figure 3).

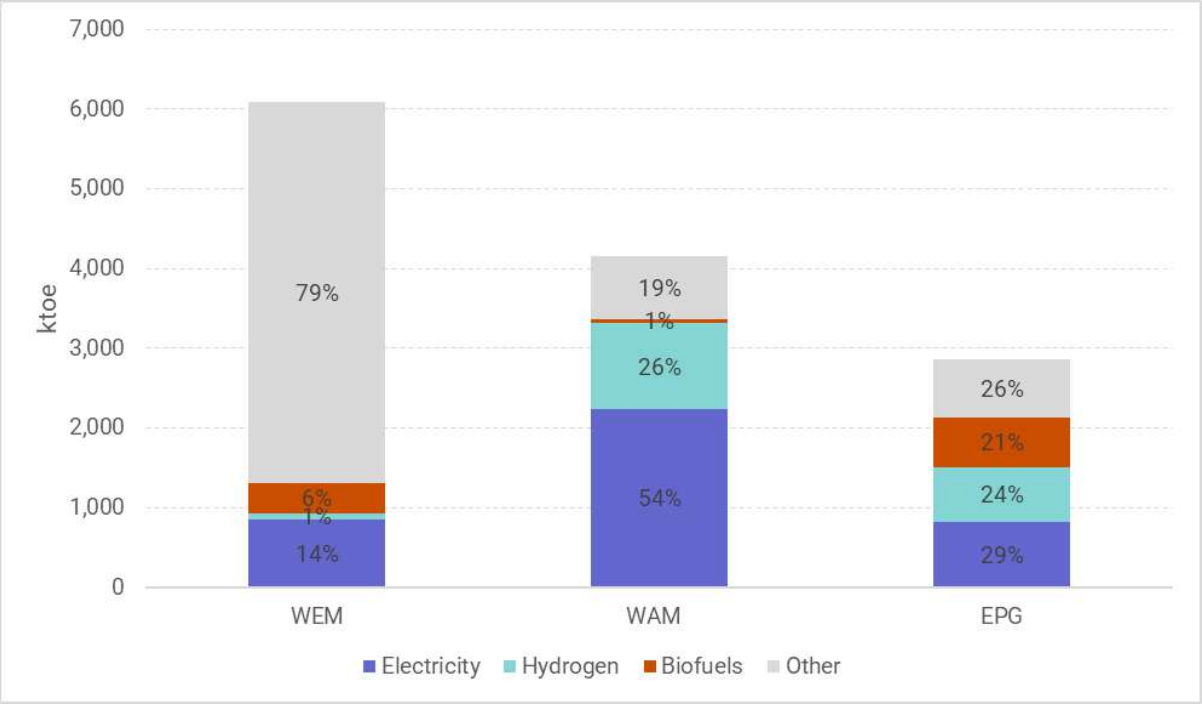
Figure 4: RES-T value in 2030 by scenario



Looking ahead to 2050, the electricity and fuel mix in the transport sector varies significantly across the three scenarios (Figure 4). Under the WEM (business-as-usual) scenario, hydrogen use remains marginal (1%), biofuel uptake modest (6%), and renewable electricity reaches only 14%, indicating limited progress toward energy diversification. In the WAM scenario, there is a strong shift toward electrification, with renewable electricity accounting for 54% of total transport energy use, alongside a major increase in hydrogen adoption (26%), while biofuels remain minimal (1%).

By contrast, the EPG scenario presents a more balanced and gradual transition, with 29% renewable electricity, a comparable hydrogen share (24%), and a notable contribution from biofuel blends (21%). This configuration results in a lower overall electricity demand compared to the other scenarios, suggesting a more resource-efficient and adaptive pathway for Romania's transport decarbonisation, one that balances technological feasibility, infrastructure needs, and fuel diversification.

Figure 5: Total energy consumption in transport in 2050 by type



Across the scenarios, projected vehicle fleet composition reveals distinct adoption trajectories for battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). By 2030, the EPG scenario assumes a slightly higher uptake of BEVs compared to both WAM and WEM (Figure 6), reflecting a stronger but still pragmatic transition toward full electrification. In contrast, PHEV adoption in the EPG and WAM scenarios is comparable, whereas the WEM scenario projects nearly twice as many PHEVs as the other scenarios in 2030. It should be noted, however, that hybrid vehicles could not be modelled within the EPG scenario, which may partially explain differences in early adoption patterns.

Building on this foundation, the EPG scenario outlines a steady and sustained growth trajectory, indicative of an ambitious yet feasible transition pathway. Between 2030 and 2040, BEVs under EPG are projected to grow at a compound annual growth rate (CAGR) of 12%, closely aligned with the 13% projected under WAM and notably higher than the 8% under WEM. The growth in the EPG and WAM scenarios reflect continued momentum driven by declining technology costs, supportive policies, and increasing consumer uptake.

From 2040 to 2050, BEV expansion naturally moderates as market saturation approaches, with EPG and WEM recording a 3% and 4% CAGR respectively, compared to the WAM scenario's continued 7% growth. This deceleration under EPG reflects a more credible long-term stabilization of the market once the early growth momentum tapers off, consistent with historical diffusion patterns for emerging technologies.

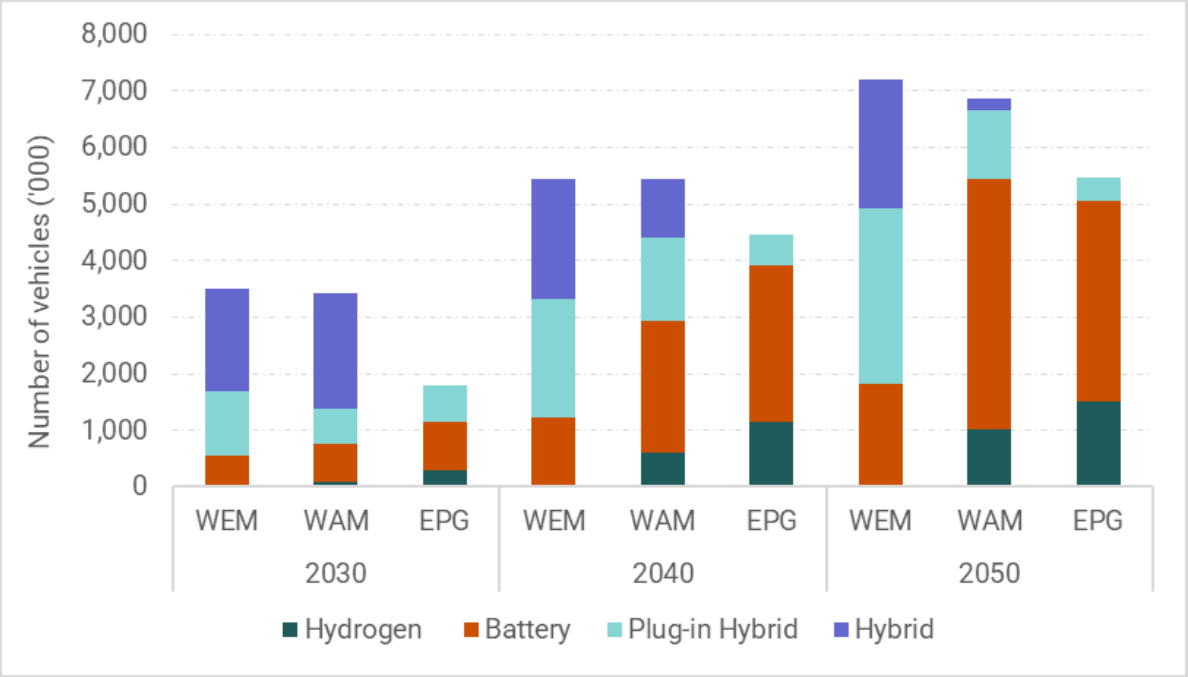
The PHEV outlook further underscores the differing scenario dynamics. Between 2030 and 2040, the WEM scenario anticipates strong PHEV growth at 6% CAGR, with WAM even higher at 9%, while the EPG trajectory records a modest 2% decline. In the subsequent decade (2040-2050), PHEV adoption under WEM continues to rise at 4% CAGR, while both WAM and EPG show declining trends of -2% and -3% respectively. This contraction, particularly under the

EPG scenario, is consistent with an accelerated move toward full electrification as charging infrastructure expands and BEV affordability improves.

In terms of hydrogen vehicle adoption, no uptake is projected under the WEM scenario. The EPG scenario presents the highest initial baseline, with an estimated 0.28 million hydrogen vehicles by 2030, compared to 0.08 million projected under WAM. However, between 2030 and 2040, the WAM scenario anticipates more rapid expansion, with a compound annual growth rate (CAGR) of 22%, relative to 15% under EPG. From 2040 to 2050, growth moderates across both pathways, with WAM and EPG recording 5% and 3% CAGR respectively.

Overall, the EPG scenario captures strong early growth in BEVs followed by gradual market stabilization, a measured decline in PHEV reliance, and steady yet ambitious progress in hydrogen vehicle deployment. Designed to align with the EU's decarbonisation and transport electrification targets, the EPG pathway assumes the implementation of targeted policy measures to enable its outcomes. It balances ambition with feasibility for achieving long-term emissions reduction and advancing the transition toward a fully decarbonised vehicle fleet.

Figure 6: Projected alternative fuel and electric vehicle fleet composition in each scenario by 2030, 2040 and 2050



Projected vehicle fleet composition and market implications

Under the EPG scenario, the 2030 vehicle fleet composition is expected to include around 0.87 million BEVs, 0.29 million fuel-cell electric vehicles (hydrogen vehicles), and 0.65 million PHEVs. This structure reflects a balanced transition pathway that combines electrification with the gradual introduction of hydrogen technologies. Nevertheless, when compared to current market realities, the gap between Romania's actual pace of electrification and these modelled trajectories remains substantial, highlighting the need for stronger policy and market interventions.

In 2024, approximately 150,000 new cars were registered in Romania, marking a modest 4% increase over 2023[47]. Of these, 9,765 were fully electric (a 32% decrease year-on-year), while 58,470 were hybrids (up 35% from previous year)[48]. The total stock of electric vehicles reached around 54,500 units by the end of 2024[49], highlighting the early stage of EV market development.

To reach the targeted 0.87 million electric vehicles by 2030, annual sales would need to average around 136,000 new BEVs per year, nearly equivalent to the total number of new cars registered nationwide in 2024. This illustrates the scale of the effort required to align market growth with national decarbonisation targets.

At the same time, Romania's ageing vehicle stock presents both a challenge and an opportunity for accelerating the transition. The country has the third-oldest car fleet in the European Union, with an average national car fleet age of 15.4 years, well above the EU average of 12.5 years as of 202350. This structural reality highlights the urgency of comprehensive fleet renewal and the promotion of low- and zero-emission vehicles to modernise the transport system.

Recommended pathways and measures under the EPG scenario

Under the EPG scenario, the decarbonisation of passenger transport focuses upon vehicle efficiency, electrification, and the progressive phase-out of conventional technologies. This transition supports the gradual electrification of the passenger transport sector while maintaining flexibility in vehicle operation during the decarbonisation phase. The scenario defines specific targets to be achieved by 2030, consistent with the trajectory toward climate neutrality by 2050:

- **The energy efficiency of new internal combustion engine (ICE)** passenger vehicles is projected to increase by 16% in 2030 compared to 2021 levels.
- **The share of zero-emission vehicles (ZEVs)** is expected to increase linearly from 8% in 2021 to 46% by 2030 for passenger car new sales, while for buses, the share of ZEVs in new registrations is expected to rise from 5% in 2021 to 43% by 2030. Achieving these market shares is essential to meet the EU emission targets of 49.5 g CO_2/km for passenger cars[51] and light commercial vehicles, and 90.6 g CO_2/km for vans by 2030.
- **The expansion of plug-in hybrid electric vehicles (PHEVs) adoption** will serve as an important transitional technology in reducing fleet emissions. The share of PHEVs in new passenger car sales is projected to increase from 4.5% in 2021 to 51% by 2030, while for buses, the share is expected to grow from 2% in 2021 to 50% by 2030.

For the decarbonisation of freight transport, the EPG scenario relies on a combination of technological innovation, energy efficiency improvements, and a gradual shift toward low-

[47] Romania Journal, 2025, The Romanian auto market up in 2024, yet new full electric cars down by 32%
[48] Ibid
[49] Energynomics, 2025, Romania's EV fleet continued to grow in 2024, reaching about 54,500 cars
[50] Energynomics, 2025, PwC: Subsidy cut led to a drop in Romanian EV sales of over 30%
[51] Climate Action, 2025, Light-duty vehicles

and zero-emission vehicle technologies. These measures are essential for achieving the EU and national emission reduction targets, including 45% reduction in CO_2 emissions from heavy-duty vehicles (HDVs) by 2030[52] and the broader renewable energy share (RES-T) objectives in transport:

- **The energy efficiency of new freight vehicles** is projected to increase by 11% relative to current performance levels, due to technological advances, while the utilisation rate is expected to increase by 15%, indicating a more intensive and efficient use of the existing fleet.
- **Accelerate uptake of ZEVs** with the share of new heavy-duty vehicle (HDV) sales ought to increase to 42% by 2030, while for light-duty vehicles (LDVs), the share should be rising from 8% in 2021 to 46% by 2030.
- **The share of PHEVs in new HDV sales** is projected to increase from 2% in 2021 to 50% by 2030, while for LDVs, the share is expected to grow from 4.5% in 2021 to 51% by 2030.
- **Increased use of alternative and renewable fuels** by 2030, with 10% of fossil fuel use in road transport (including passenger vehicles) and aviation should be replaced by advanced biofuels and renewable fuels of non-biological origin.

Trends in electric vehicle uptake

Global adoption of EVs has continued to accelerate, and growth is expected to persist across all major markets, yet regional dynamics remain uneven. In 2024, China accounted for the largest share of global EV sales, with approx. 50% of all new vehicles sold being electric, of which 28% were BEVs, 15% PHEVs[53], and 6% extended-range electric vehicles (EREVs)[54]. In comparison, Europe accounted for one-fifth of global vehicle sales in 2024, with 14% being BEVs and 7% PHEVs, while the United States represented about 10% of sales (8% BEVs and 2% PHEVs).

Across the 27 EU Member States, new car registrations in 2024 increased slightly by 0.8%[55], reaching approximately 10.6 million units. However, the uptake of electric vehicles (EVs) shows notable variation among countries. In Romania, EVs accounted for 11% of total new car registrations in 2024[56], down from 13% in 2023 and well below the EU average. This decline largely reflects the halving and delayed implementation of incentives under the RABLA Plus program, underscoring the critical role of consistent policy support and financial incentives in driving the adoption of low- and zero-emission vehicles.

In the broader context of road transport, Europe's market dynamics for alternatively powered vehicles reveal mixed progress. In 2024, the market share of alternatively powered trucks remained relatively stable at approximately 5%[57], indicating a modest uptake. Conversely, the

[52] European Comission, 2024, Questions and Answers: Revised CO2 emission standards for Heavy-Duty Vehicles
[53] Mckinsey, 2025, New twists in the electric-vehicle transition: A consumer perspective
[54] Only market where EREVs available at scale
[55] ACEA, 2025, New car registrations: +0.8% in 2024; battery-electric 13.6% market share
[56] Nemes, 2025, Recent challenges have slowed e-mobility growth in Romania, but the long-term prospects remain encouraging
[57] ACEA, 2025, The automobile industry. Pocket Guide 2025/2026, page 35-36

market share for new bus sales saw a significant increase, nearly doubling over the past four years. This growth reflects a broader trend where Europe, the world's second-largest market for electric buses[58], has witnessed remarkable progress with nearly half (49%) of all new EU city buses registered in 2024 being zero-emission[59]. The surge was driven by the rapid uptake of fuel cell buses (3%) alongside the dominance of battery-electric models (46%). Romania broadly follows this trajectory, with battery-electric buses accounting for 82% of new city bus registrations and hybrids around 10%, although fuel cell buses have yet to be introduced.

Status of charging infrastructure deployment

Across the European Union, the rollout of EV charging infrastructure continues to advance, though notable disparities among Member States remain. In 2024, the EU recorded a 35% year-on-year increase in public charging points, surpassing one million units[60]. Further expansion is anticipated under the AFIR, which requires the deployment of fast-charging stations of at least 150 kW for cars and vans every 60 km along the TEN-T core network by 2025 and fast recharging stations of at least 350 kW for electric trucks and other heavy-duty electric vehicles by 2030[61].

However, charging infrastructure remains unevenly distributed, with 61% of all EU public charging points concentrated in the Netherlands, Germany, and France[62]. Achieving the EU target of 3.5 million public chargers by 2030 will require installing about 2.6 million additional units within five years, hence an average of 520,000 per year, compared to just 153,000 added in 2023.

In Romania, the national charging network expanded to over 4,500 publicly accessible points by the end of 2024, marking a 33% annual increase supported by private sector investment and financing under the National Recovery and Resilience Plan (NRRP)[63]. Under the NRRP, Romania targets the installation of at least 22,400 public charging points by 2026[64]. However, with only around 20% of this target achieved by end-2024, the pace of infrastructure deployment must accelerate significantly, underpinned by continued investment and coordinated policy implementation to align with national and EU decarbonisation objectives.

Costs barriers towards EV widespread adoption

Besides charging infrastructure limitations, the high upfront cost of EV purchase remains a critical barrier to the widespread adoption. For instance, the median price EU consumers are willing to pay for a new or used BEV is approx. EUR 20,000[65], closely aligned with the EU's

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[58] IEA, 2025, Trends in heavy-duty electric vehicles
[59] Molliere, 2025, Half of new EU city buses were zero-emission in 2024
[60] IEA, 2025, Global EV Outlook 2025: Electric vehicle charging
[61] Nationale Leitstelle, 2025, Charging infrastructure in the EU context
[62] EIT, 2025, Boosting electric vehicles charging infrastructure network in Europe
[63] Nemes, 2025, Recent challenges have slowed e-mobility growth in Romania, but the long-term prospects remain encouraging
[64] Comache, 2025, Stațiile de încărcare pentru electrice: mai multe, dar tot insuficiente. Ținta PNRR devine greu de atins
[65] European Alternative Fuels Observatory, 2024, Consumer Monitor 2023, page 7

2023 median disposable income (19,955 PPS[66]). In contrast, maintaining current production cost structures and profit margins requires a minimum retail price of around EUR 45,000 for EU-manufactured BEVs[67]. This raises doubts about the feasibility of faster adoption without additional support, and this gap is felt even more strongly in Romania, where median disposable income (11,084 PPS in 2023) remains significantly below the EU average.

The market penetration of battery-electric vehicles (BEVs) remains closely aligned with GDP per capita, indicating that adoption is strongest where purchasing power is higher and financial incentives are well developed. This underscores that the transition to electric mobility is fundamentally influenced by issues of access and affordability[68]. Monetary and fiscal incentives continue to serve as key policy instruments supporting Europe's shift toward BEVs. Nonetheless, projected battery cost reductions of 28% by 2027 vs. 2025 levels[69] could surpass the declines achieved in the previous three years, potentially enabling further decreases in BEV prices and supporting renewed market momentum.

Despite substantial industry investment and model diversification, BEV market penetration remains geographically heterogeneous across the EU. The BEV-ICE price premium escalated from 30% in April 2025 to over 40% by June 2025, attributable to the phased implementation of revised EU regulatory frameworks over a three-year transition period[70]. This regulatory adjustment has deferred an est. 2 million planned BEV between 2025 and 2027, temporarily constraining near-term adoption trajectories[71].

Policy instruments supporting the electrification of transport

Across Europe, a wide range of policy instruments and fiscal measures are employed to accelerate the electrification of the transport sector and discourage the continued use of ICE vehicles. These measures typically include a combination of financial incentives, tax benefits, and regulatory restrictions, all aimed at promoting the adoption of EVs and the expansion of charging infrastructure.

Key mechanisms include:

- **Tax incentives** for the acquisition and ownership of EVs[72], such as reduced registration fees, exemptions from ownership and pollution taxes for company cars[73], toll exemption for zero emission trucks[74] and favourable benefit-in-kind (BIK)[75] treatment[76] for corporate fleets[77].

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[66] Eurostat, 2024, Key figures on European living conditions, page 10
[67] Egenhofer et al, 2025, Navigating the EV transition: barriers and tools for shifting Europe to low-carbon mobility, page 31
[68] ACEA, 2025, Demand incentives matter
[69] T&E, 2025, EV progress report: Which EU carmakers are on track for 2025-27 targets?
[70] Ibid
[71] Ibid
[72] ACEA, 2025, Tax benefits and incentives
[73] European Commission, 2025, Decarbonise Corporate Fleets
[74] European Alternative Fuels Observatory, 2025, EU backs extended toll exemption for zero emission trucks
[75] BIK or 'company car tax' refers to taxes payable by employees for private use of a company car
[76] EY, 2024, Benefit in kind for company cars in 2024
[77] ICCT20, 2025, Belgium's tax incentives drive electric vehicles in corporate fleets

- **Financial incentives** for EV purchase and infrastructure development[78], including direct purchase subsidies, grants for charging stations, and low-interest financing or leasing schemes (e.g., social leasing[79]).
- **Regulatory and fiscal disincentives** for high-emission vehicles, such as restricted-access zones for non-electric vehicles[80] and higher taxation for vehicles with high CO_2 emissions[81].

In addition to direct financial measures, several non-monetary incentives are used to further encourage EV uptake. These include free or discounted public charging[82], access to priority lanes (e.g., special lanes[83]), and preferential parking availability[84] for EVs.

Romania supports transport electrification through several policy instruments, though the framework has faced recent instability. The main incentive is the Rabla Plus program offering €7,500 subsidies for new BEVs or hydrogen fuel cell vehicles, €3,000 for new plug-in hybrid vehicles, and €2,400 for hybrids, applicable to vehicles when scrapping old cars[85]. The amount of the subsidies has varied in value in the recent years, yet it was one of the main drivers of electrification in the country.

Apart from that, BEVs benefit from complete exemption from registration and annual car taxes in Romania, while for PHEV, there is a reduced tax established by the local council (for instance, in Bucharest, there is 95% reduction in car tax)[86], with no differentiation based on vehicle value or its environmental impact. Some localities also offer free or discounted public charging, access to priority lanes or parking benefits[87] for EVs. The government also provides refunds up to €2,500 for small charging stations and up to €30,000 for larger ones[88].

Social leasing model to enable EV access to lower-income segments

Expanding EV adoption in Romania requires measures that ensure affordability and social inclusion, particularly for low- and middle-income households. A social leasing model, financed through revenues from the forthcoming ETS2 could serve as an effective mechanism to support equitable access to clean mobility. Under such a scheme, a portion of ETS2 revenues could be allocated to subsidise EV leasing contracts with a capped monthly rate or a fixed subsidy (e.g., €5,000 per vehicle)[89]. This approach would allow lower-income

[78] ACEA, 2025, Tax benefits and incentives
[79] T&E, 2025, Social leasing: how low-price EVs can help transport vulnerable drivers
[80] Clean Cities, 2024, Low-Emission Zones: the Essential Guide, page 5
[81] Meireles, 2021, The Effectiveness of Environmental Taxes in Reducing CO2 Emissions in Passenger Vehicles: The Case of Mediterranean Countries
[82] Electra, 2025, Free EV charging stations 2025: our complete guide
[83] Josten, 2023, What are the advantages of electric vehicles in cities?
[84] EVmarket, 2025, Parcare gratuită în București pentru mașini electrice și hibride în 2025
[85] Ministry of Environment, Waters and Forests, 2025, Rabla auto 2025 – Ghidul de finanțare trimis la Monitorul Oficial
[86] Autovit, 2025, Impozit auto 2025 – ghid complet: cum se calculează, unde îl achiți
[87] Despre energie, 2025, Cât te costă întreținerea unei mașini electrice față de una pe benzină?
[88] European Alternative Fuels Observatory, 2025, Incentives and Legislation in Romania
[89] T&E, 2025, Social leasing: how low-price EVs can help transport vulnerable drivers

households, including those in smaller cities and rural areas, to switch from older, high-polluting vehicles to zero-emission models without prohibitive upfront costs.

By expanding access to affordable EVs, social leasing schemes can stimulate demand while providing the automotive industry with predictable market volumes to scale up production of affordable, EU-made vehicles. Such initiatives drawing on Social Climate Fund (SCF) resources, ETS2 revenues, or unspent Recovery and Resilience Facility allocations could follow successful models piloted in other Member States[90].

The French social leasing programme in 2024 offers a relevant example: it effectively targeted low-income and mobility-dependent groups, with 40% of beneficiaries belonging to the lowest income quartiles, many of whom were younger than the average BEV buyer[91]. This demonstrates that carefully designed schemes, built around income level, commuting needs, and vehicle use patterns, can expand equitable access to clean mobility while anchoring industrial demand.

Similarly, Germany has announced a €3 billion targeted support programme from the national Climate & Transformation Fund and the EU SCF to help low- and middle-income households acquire zero-emission cars through direct grants or social leasing options (e.g., €99 per month over three years)[92] aimed specifically at boosting uptake among groups most sensitive to price. In essence, well-designed social leasing frameworks can deliver a dual benefit: advancing social inclusion in the EV transition and strengthening Europe's clean-mobility manufacturing base, if policies are well-designed to ensure that.

Towards a self-sustaining EV sector: production, skills, and circularity

Romania faces several challenges across the EV value chain that must be addressed to build and sustain a competitive sector. At the upstream level, EV production remains highly dependent on imported critical raw materials[93] such as lithium, cobalt, graphite, magnesium[94] etc., that are primarily sourced from China[95], exposing the sector to price volatility and supply security risks[96]. Battery cell manufacturing capacity is still limited, with only one operational plant[97] near Bucharest[98] and a few additional projects under consideration, whose implementation remains uncertain amid economic fluctuations[99]. The domestic supplier base for advanced EV components is underdeveloped, leading to continued reliance on imports and longer production lead times.

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[90] T&E, 2025, Affordable EV platform: how the EU can bring social leasing to scale - T&E note
[91] Wappelhorst, 2025, Two recent successes with "social leasing" programs for zero-emission vehicles
[92] European Alternative Fuels Observatory, 2025, Germany plans targeted EV subsidies for low-and middle-income households
[93] Fastmarkets, 2024, Battery raw materials outlook 2025: Robust and rebalancing market
[94] Financial Times, 2024, Europe restarts magnesium mining to counter reliance on China
[95] EIA, 2025, China dominates global trade of battery minerals
[96] China Global South Project, 2025, China's Critical Minerals Lead Widens as Rivals Struggle to Keep Pace
[97] Potter, 2024, Where are the Gigafactories for batteries in Europe?
[98] Prime Batteries, 2025, EV Battery
[99] Fabian, 2025, Are Romania's battery manufacturing ambitions in danger?

The Critical Raw Materials Act (CRMA) establishes targets for the European Union to strengthen supply chain resilience by 2030: at least 10% of the annual consumption of strategic raw materials should be extracted within the EU, 40% should be processed domestically, and 25% should be sourced from recycling[100]. Given its endowment of critical natural resources, Romania is well placed to attract investment in the extraction, processing, and recycling of critical materials, thereby supporting both national industrial growth and the EU's strategic autonomy. Currently, three mineral mining projects in Romania have been identified under the CRMA framework, focusing primarily on the extraction of graphite, copper, and magnesium[101].

In the downstream segment, Romania faces a pronounced shortage of EV-specific engineers and technicians across R&D, battery assembly, and high-voltage maintenance. This reflects a broader skills mismatch between workforce qualifications and the evolving demands of the green and digital transition. Over 40% of automotive workshops report severe difficulties in recruiting qualified personnel[102], with even fewer specialists trained for electric vehicle repair. This shortage contributes to higher post-warranty maintenance costs, extended service times, and uneven coverage across the country, factors that could erode consumer confidence and slow EV adoption long-term.

In addition, Romania's limited domestic research and development capacity in battery cell chemistry and vehicle software constrains its ability to move up the EV value chain. The high upfront investment requirements and perceived policy and market risks further discourage large-scale battery and EV manufacturing projects. Market dynamics also pose challenges. Price sensitivity among consumers and the prevalence of low-cost imports, particularly from China, have weakened the competitiveness of local and European producers.

Recent reports indicate that one in four EVs sold in Europe in 2024 are likely manufactured or assembled in China[103], reflecting that affordability and availability often outweigh the importance of origin for many buyers. However, there is growing awareness of potential disadvantages, including concerns over quality standards[104], security[105] and long-term reliability. The debate on emerging preference for vehicles produced in Europe or with higher local content has also raised questions about whether public subsidies, financed by taxpayers, should continue to support the purchase of non-European, particularly Chinese-made, EVs[106].

In response, policy measures should prioritize strengthening the European EV ecosystem. This includes introducing procurement preferences for vehicles and components with higher local or EU content, alongside targeted fleet electrification programs and carefully calibrated subsidy designs that reward domestic value creation rather than price alone. Equally

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[100] European Commission, 2025, Commission selects 47 Strategic Projects to secure and diversify access to raw materials in the EU
[101] Ernst, 2025, Three mineral mining projects in Romania under EU's Critical Raw Material Act
[102] Actmedia, 2025, Cars: Employers: Shortage of skilled workers, a major challenge for car workshops in Romania
[103] Poliscanova, 2024, A smart industrial policy to fast-charge Europe's electric vehicles revolution
[104] Lancefield, 2025, Surge of Chinese EVs in UK sparks privacy concerns among older consumers – poll
[105] Enache, 2025, Costul ascuns al succesului mașinilor electrice din China
[106] Profit, 2024, Cum a votat România la tarife pentru mașinile electrice din China

important is the establishment of EU-aligned technical standards, the expansion of certified testing laboratories, and accelerated permitting processes for battery manufacturing plants and charging infrastructure. To ensure long-term sustainability, Romania should also invest in battery recycling facilities, to create incentives for closed-loop supply chains, encouraging reuse and recovery of critical materials while reducing dependence on external suppliers.

Policy Recommendations

- **Introduce stricter efficiency standards for new internal combustion engine vehicles** to achieve a minimum 16% improvement by 2030 compared to 2021 levels, while implementing performance-based fiscal measures that tie subsidies and taxes to vehicle metrics including fuel efficiency, usage patterns, and carbon footprint to accelerate the transition toward cleaner conventional technologies.
- **Develop a comprehensive charging infrastructure strategy** that prioritizes both the quantity and quality of charging networks, ensures equitable availability in underserved and economically disadvantaged regions, and establishes public-private partnerships to rapidly scale deployment across passenger and freight transport corridors, reducing range anxiety and total cost of ownership barriers to zero-emission vehicle adoption.
- **Accelerate the integration of advanced biofuels and renewable fuels of non-biological origin** to replace 10% of fossil fuel consumption in road transport and aviation by 2030, supported by blending mandates, supply chain development incentives, and certification schemes that ensure sustainability criteria are met while providing a complementary decarbonisation pathway alongside vehicle electrification.
- **Implement regulatory frameworks and fiscal incentives to accelerate zero-emission vehicle market penetration**, targeting 46% of new passenger car and light-duty vehicle sales and 42% of heavy-duty vehicle sales by 2030, through mechanisms such as social leasing schemes that improve EV affordability for low- and middle-income households, corporate benefit programs that incentivize fleet electrification, and progressive taxation systems that reduce the cost gap between battery electric vehicles and conventional alternatives.
- **Establish an integrated EV maintenance ecosystem** by implementing battery traceability systems and mandating warranties on core components, developing vocational training programs to address workforce shortages in battery diagnostics, high-voltage maintenance, and emergency response, and creating mandatory recycling frameworks with clear collection standards to recover critical materials, reduce replacement costs, and ensure transparent pricing for consumers.
- **Assess support measures to strengthen Romania's automotive competitiveness** through production subsidies, R&D funding, and preferential taxation for domestic or EU-manufactured EVs, while enabling development of cost-competitive zero-emission vehicles, efficient ICE technologies, and extended-range electric vehicles (EREVs) to diversify the national portfolio.

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