Transition plans of the automotive sector: driving transition or losing traction?

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"We will promote domestic production to avoid strategic dependencies, especially for battery production. We will stick to our agreed emissions targets, but with a pragmatic and flexible approach. Our mutual aim is a sustainable, competitive, and innovative car industry in Europe that benefits our citizens, our economy, and our environment."[1]

Ursula Von der Leyen

Europe's automotive sector stands at the crossroads of a profound structural transformation. Central to the European Green Deal, the shift from internal combustion engines to electric drivetrains, backed by EU and national funding, is reshaping industrial models, supply chains, and energy systems. Simultaneously, mobility itself is evolving, through digitalisation, automation, shared usage schemes, and intermodal transport ecosystems. Both trends are posing a genuine strategic challenge for Europe's and climate related transition and industrial leadership, and social cohesion.

Indeed, the sector is a powerhouse: it supports approximately 13.8 million jobs, around 6.1% of total EU employment, and represents 8.5% of manufacturing employment[2]. It is also the EU's largest private-sector contributor to R&D, investing over €59 billion in 2021[3], while maintaining a €96 billion trade surplus in 2022, largely driven by exports to China, the United States, and the UK[4].

But these foundations are increasingly unstable. China now produces over 30 million vehicles annually, accounting for over 32% of global output up from just 3.5% in 2000[5]. At the same time, European manufacturers are losing ground. France posted a €24 billion automotive trade deficit in 2023, reversing decades of surplus[6]. Germany and Italy are also witnessing a decline in global market share, as rising foreign competitors with lower cost structures and active industrial policies consolidate power.

In addition, strategic asymmetries are visible in the electric vehicle value chain. China controls over 60% of global battery production capacity, dominates rare earth processing, and operates a vertically integrated, state-backed EV ecosystem. This "state-backed EV ecosystem" refers to a coordinated model where government policies, subsidies, and state-owned enterprises support the entire value chain from raw material extraction to battery and vehicle manufacturing. Europe's fragmented industrial base and market-led transition model make it vulnerable to strategic dependencies and supply disruptions.

In response, the European Commission launched a structured dialogue with industry in March 2025, presenting a comprehensive action plan.[7] This includes boosting battery manufacturing, deploying CO_2 credit banking (manufacturers have the possibility to manage their fleet-wide CO_2 emissions targets over multiple years, notably banking CO_2 emissions below the target for future use and later compensating when exceeding their targets), and increasing investment in industrial resilience.

1. Ursula von der Leyen, speech at the Automotive Strategic Dialogue, Brussels, 5 March 2025, quoted in European Commission, "Europe's Automotive Industry", https://single-market-economy.ec.europa.eu/sectors/automotive-industry_en
2. Eurofound, "Employment in the EU's Automotive Sector", May 2025, https://www.eurofound.europa.eu/en/resources/article/2025/employment-eus-automotive-secto
3. CEA, Pocket Guide 2022–2023, https://www.acea.auto/files/ACEA_Pocket_Guide_2022-2023.pdf
4. EU–Japan Centre for Industrial Cooperation, "EU Automotive Trade Data 2022", March 2024, https://cdnw8.eu- japan.eu/sites/default/files/publications/docs/2024-03-policy-eujapan-automotive-environmental.pdf
5. MarkLines via CEIC, "Automotive Production in China by Year", https://www.marklines.com/en/statistics/flash_prod/automotive-production-in-china-by-month-2024
6. BNP Paribas Economic Research, "France: Trade Deficit", February 2025, https://economic-research.bnpparibas.com/html/en-US/France-trade-deficit-down-current-account-nearly-balance-2/6/2025%2C51253
7. European Commission, "Launch of Strategic Dialogue on the Future of the EU Automotive Industry", March 2025, https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1170

However, ambition must be matched by realism: between 130,000 and 300,000 jobs could be lost in Germany alone by 2040 due to electrification and automation[8]. National strategies vary widely, and EU coordination remains limited. Without a common framework and stronger financial instruments, the transition risks deepening regional inequality and eroding political support.

Financial constraints are intensifying. In addition to the investments required for catching up with Chinese EV competitors, meeting Fit for 55 goals and aligning with EU taxonomy and CSRD frameworks could require over €250 billion in investment in Germany by 2027[9], amid rising interest rates and stricter ESG conditions. Smaller suppliers, in particular, struggle to access sustainable finance, constrained by regulatory fragmentation and unclear definitions of transition-compatible activities.

In this context, and considering the latest developments in the EU legal framework, this article undertakes a comparative analysis of the transition plans published by Renault and Volkswagen, two of Europe's leading automotive manufacturers, and contrasts them with that of Toyota, as a representative case of a major non-European actor. This comparison seeks to highlight commonalities and divergences in how these companies structure their decarbonisation and industrial transformation plans, as disclosed under the enhanced transparency requirements introduced by the European Union in early 2025.

The objective is to better understand the strategic orientations of the automotive sector in the face of decarbonisation imperatives, while assessing the extent to which these transition pathways can be implemented without difficulties, including for employment.

Before delving into the analysis of these three transition plans, it is necessary to first contextualise the current role and structural challenges of the automotive industry in Europe.

1. An important EU economic sector under strain: the role and the situation of the Automotive industry in Europe

Long regarded as a strategic backbone of the European economy, the automotive industry now faces profound disruption. It has been an industrial powerhouse, a source of technological innovation, and a leading export engine. Yet it is increasingly strained by regulatory acceleration, global competition, geopolitical fragmentation, and supply-chain realignment, all occurring amid growing financial uncertainty.

1.1 A strategic sector of continental scale

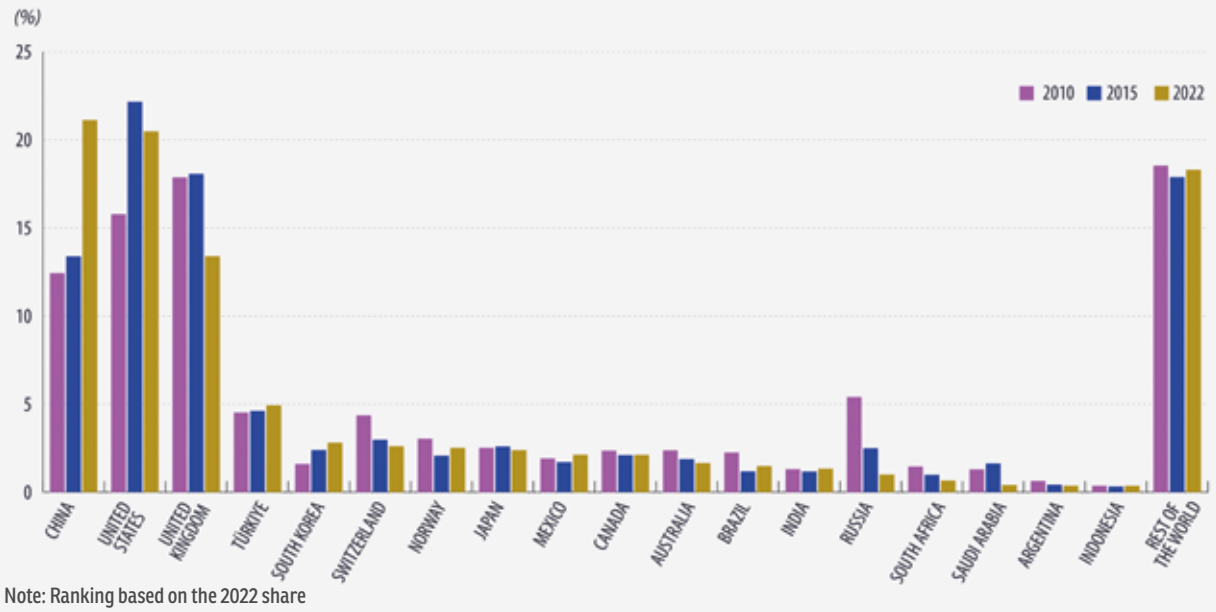
The automotive sector accounts for a significant share of Europe's industrial output, with a dense network of Tier 1 and Tier 2 suppliers spread across nearly all Member States. It directly employs over 1.7 million workers in the EU, including nearly 780,000 in Germany, and supports millions more through logistics, maintenance, and parts services[10]. Automotive exports remain a rare European trade surplus, with net exports exceeding €135 billion in 2023, mainly to China, the U.S., and the UK[11].

In Italy, the industry involves over 2,200 firms employing 250,000 people, particularly in Northern regions like Piedmont and Emilia-Romagna[12]. Italian firms are deeply integrated into Europe's components ecosystem, especially in powertrain, robotics, and design. However, the prevalence of SMEs increases vulnerability to shocks linked to rising costs or rapid tech change. Italy's declining production since 2010 reflects underinvestment in electrification and platform modernisation[13].

The sector is also Europe's top industrial R&D spender, contributing nearly 30% of total private R&D. German automakers remain leaders in applied research in electrification, AI-assisted mobility, and advanced manufacturing. The sector accounts for 13% of Germany's manufacturing output, confirming its macroeconomic weight[14].

8. ifo Institute, "Labor Demand of Automotive Firms during the Green Transformation", Working Paper (with data through April 2024): https://www.ifo.de/DocDL/cesifo1_wp11160.pdf
9. S&P Global Mobility, "Germany plans to invest over €250 billion in automotive R&D by 2027", AutoTech Insight, April 6, 2023, https://autotechinsight.spglobal.com/news/5270132/germany-plans-to-invest-over-250-billion-in-automotive-r-d-by-2027
10. Eurofound, "Employment in the EU's Automotive Sector", May 2025, https://www.eurofound.europa.eu/en/resources/article/2025/employment-eus-automotive-sector
11. European Commission Single Market, "Automotive Industry Overview", accessed July 2025, https://single-market-economy.ec.europa.eu/sectors/automotive-industry_en
12. iCRIBIS, Osservatorio Automotive 2023, 2023, https://www.contenuti.icribis.com/osservatorio/2023/automotive
13. *Ibid*.
14. ACEA, Pocket Guide 2022–2023, https://www.acea.auto; Bundesministerium für Wirtschaft und Klimaschutz (BMWK), "Automotive Sector Key Facts", 2025.

CHART 1.
Eu automotive industry value added from non-EU final use, by trading partner, 2010, 2015 and 2022



Note: Ranking based on the 2022 share

But this strength is under pressure. Post-Covid-19 production remains below pre-2020 levels, and longstanding cost advantages are being eroded by inflation, energy prices, and labour shortages. Electrification requires major capital outlays and a redefinition of value chains. Fragmented supplier networks, such as in Italy, face heightened risks of industrial dislocation unless supported by targeted public investment and consolidation strategies.

1.2 A global value chain under pressure

The European automotive industry remains deeply enmeshed in global value chains and heavily dependent on external demand. According to Eurostat, in 2022 the EU automotive

industry generated €78.9 billion in domestic value added from non-EU consumers, a 54% increase since 2010, albeit down 7% from the 2015 peak of €84.4 billion. The distribution of this demand is highly concentrated: in 2022, China accounted for 21%, the United States for 20%, and the United Kingdom for 13% of that value added. Chinese demand alone rose from 12% in 2010 to 21% in 2022, overtaking the United States[15].

In absolute terms, EU vehicle exports to non-EU countries contained €196 billions of domestic value added in 2023, while €50.1 billion of value added was captured abroad, reflecting deep backward linkages with non-EU suppliers[16]. Notably, €91.6 billion was the highest-ever recorded domestic value added from non-EU demand in 2023[17].

At the same time, longstanding trading partners like the UK and Russia have declined sharply. The UK's share in non-EU value added dropped from 18.1% in 2010 to 13.5% in 2022, buffeted by Brexit and declining intra-European production[18]. Russia's share plummeted from over 5% to under 1% following sanctions. Meanwhile, secondary markets such as Turkey (rising to 5%) and South Korea (to 2.8%) are expanding, reflecting a modest diversification of export destinations[19] (*see Chart 1*).

The sector's deep dependence extends to upstream inputs. As of 2023, China accounted for over 70% of global cathode and anode chemical production, more than 60% of battery cell capacity, and approximately 80% of rare earth processing[20]. Meanwhile, semiconductor dependence remains high, with 90% of advanced chips produced in Taiwan and South Korea and TSMC alone holding 50% of global output. These dependencies have real costs: disruptions during the 2021–22 chip

15. Eurostat, "Increasing role of China in EU's automotive industry", Eurostat News (December 4 2024), https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20241204-1
16. Eurostat, "Employment and value added using FIGARO data", Statistics Explained, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Employment_and_value_added_using_FIGARO_data_-_view_into_the_automotive_industry
17. Eurostat, "EU domestic value added in non-EU automotive exports reaches €91.6 bn", Eurostat News(July 16 2025), https://www.eunews.it/en/2025/07/16/eurostat-us-is-the-largest-market-for-the-eu-automotive-industry
18. Eurostat, "Increasing role of China in EU's automotive industry", and FIGARO statistics.
19. International Energy Agency, Global EV Outlook 2025, https://www.iea.org/reports/global-ev-outlook-2025/outlook-for-electric-mobility
20. *Ibid*.

crisis resulted in an estimated €100 billion in lost automotive revenues[21].

Despite EU efforts, such as the European Battery Alliance, Critical Raw Materials Act, and Chips Act, to reduce strategic dependencies, Europe still accounts for only around 10–15% of global gigafactory capacity, while China dominates with approximately 87%. OEMs must thus both maintain export markets and build domestic resilience in raw materials, batteries, and semiconductors[22].

1.3 An unevenly distributed transformation

Electrification is reshaping Europe's automotive production fabric. EV drivetrains are mechanically simpler, shifting value creation toward chemistry, thermal management, and software. This transformation threatens the EU's legacy ICE-focused supplier base often SME- dominated. A 2021 European Parliament study estimated that 70% of supplier jobs could be affected between 2030 and 2035. CLEPA suggests 30-40% of suppliers face existential risk unless they pivot to EV components. In 2022, 70% reported declining margins and 40% had deferred investment[23].

The impact is visible. In May 2025, Northvolt, once hailed as Europe's flagship battery start-up, filed for bankruptcy after failing to scale its operations sustainably despite $15 billion in funding and a $55 billion order book[24]. Germany's Tier 2 and 3 suppliers, despite Industry 4.0 support, often lag in digitalisation and capital access[25].

1.4 Intensified global competition and geoeconomic shifts

While Europe grapples with fragmentation and underinvestment, the U.S. and China are accelerating. Tesla's €5 billion[26] German gigafactory has ramped up battery and drivetrain production, competing on software and efficiency as well as scale.

China's rise is more striking. In April 2025, BYD surpassed Tesla in EU EV registrations (7,231 *vs.* 7,165). Chinese players like BYD, NIO, and Xpeng benefit from integrated supply chains, state support, and large R&D budgets. The share of Chinese-made BEVs in Europe rose from under 1% in 2019 to nearly 8% in 2023, despite new EU tariffs[27].

To bypass the 17.4% tariff, BYD is investing locally starting with a 150,000-unit plant in Turkey (opening 2026), plus projects in Hungary. These moves anchor Chinese firms within Europe and sidestep trade barriers.

CHART 2. ELECTRIC AND HYBRID CAR EXPORT VOLUMES (thousands of cars, 12 mounth moving average)

Chart 2a. Electric vehicles

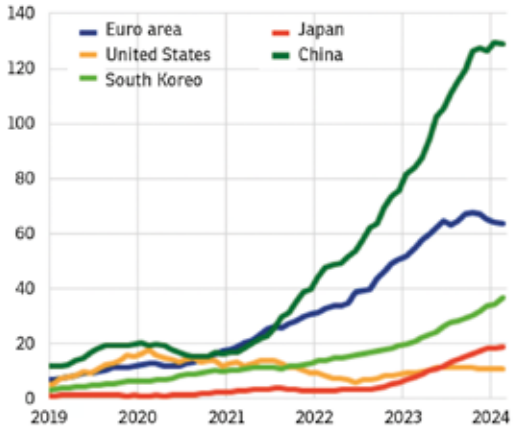
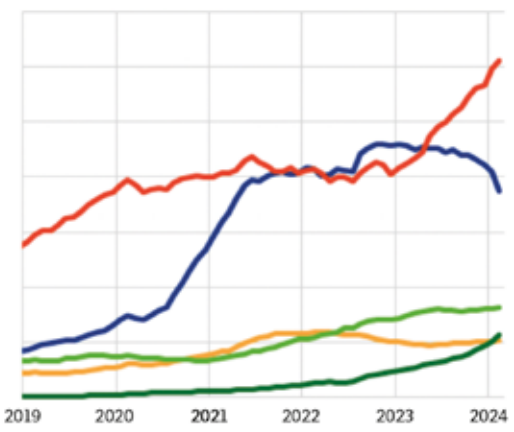


Chart 2b. Hybrid vehicles



Source: Trade Data Monitor and ECB calculations
Notes: Export volumes are expressed as units of exported vehicles. The latest observations are for February 2024

21. Autopromotec. "Chip crisis: 100 billion damage for the automotive industry". https://www.autopromotec.com/en/Chip-crisis-100-billion-damage-for-the-automotive-industry/a775
22. Rouleur Électrique. "CALB investit 2 milliards d'euros au Portugal". https://rouleur-electrique.fr/calb-investit-2-milliards-deuros-au-portugal-pourquoi-ce-geant-chinois-des-batteries-mise-sur-leurope
23. CLEPA, "Grim outlook for European automotive suppliers", press release, 7 months ago, https://www.clepa.eu/insights-updates/press-releases/grim-outlook-for-european-automotive-suppliers-as-lower-volumes-suppress-profitability
24. Richard Milne, "Northvolt Failure Raises Stakes for Europe's Battery Industry", Financial Times, May 22, 2025. https://www.ft.com/content/63b16b6a-e143-4e2c-ac27-5d3f7a89a41f
25. GoAuto. "EV Supplier Job Losses Increase in EU". GoAuto News, January 22, 2025. https://www.goauto.com.au/news/general-news/ev-supplier-job-losses-increase-in-eu/2025-01-22/95513.html?utm_source=
26. Clean Energy Wire. "Tesla Gets Green Light for Berlin Gigafactory, VW to Build New E-Car Plant". Clean Energy Wire, March 7, 2022. https://www.cleanenergywire.org/news/tesla-gets-green-light-berlin-gigafactory-vw-build-new-e-car-plant
27. JATO Dynamics via Reuters, "China's BYD outsells Tesla in Europe for first time, report says", Reuters, May 22, 2025, https://www.reuters.com/business/autos-transportation/chinas-byd-outsells-tesla-europe-first-time-report-says-2025-05-22/

Upstream, China controls over 70% of cathode and anode chemicals, 60% of battery cell capacity, and 90% of rare earth refining. Europe's response, via the Battery Alliance and IPCEIs, remains insufficient to close the gap[28].

2. Transition plans: ambitions and weaknesses

2.1 Case Studies: Volkswagen, Renault and Toyota as a non-European counterpoint

In response to rising regulatory pressure, including the EU's Corporate Sustainability Reporting Directive (CSRD) and the Green Taxonomy as well as mounting investor and societal expectations, major automotive manufacturers have released detailed climate reports in 2024 and 2025. These include standalone climate disclosures, sustainability chapters in annual reports, and decarbonisation roadmaps validated by the Science-Based Targets initiative (SBTi). The aim is twofold: to demonstrate their alignment with the Paris Agreement and to establish credibility for their transition plans in an increasingly carbon-constrained global economy[29].

Volkswagen, Renault, and Toyota each exemplify different strategic approaches to these challenges. Despite their differences, a common reality persists: Scope 3 emissions, particularly from vehicle use (Category 11), remain the dominant source of GHG emissions for all three manufacturers.

More details on the transition plans are presented in Annex 2.

2.1.1 Volkswagen Group

Volkswagen has embraced a fully electrified future as a strategic response to European climate targets and Chinese competition[30]. Its climate roadmap sets clear horizons:

By 2030:
- −60% GHG emissions reduction (Scopes 1 & 2) per vehicle produced (2018 baseline).
- ≥ 60% of new vehicle sales in Europe to be 100% electric.
- All European factories powered by renewable electricity.

By 2035:
- Phase-out of ICE vehicle sales in Europe.

By 2050:
- Net-zero emissions across Scopes 1, 2, and 3.

VW's industrial strategy is anchored in the Modular Electric Drive Matrix (MEB) and future Scalable Systems Platform (SSP), with gigafactory investments across Europe (Salzgitter, Valencia, etc.). Circularity efforts include closed-loop battery recycling and parts remanufacturing. ESG metrics are embedded in executive compensation and €10.5 billion of green bonds have been issued since 2020, aligned with the EU Taxonomy (Activity 3.3).

In 2024, the company reported:
- Scope 1: 3.3 $MtCO_2e$ (vs. 4.0 Mt in 2023).
- Scope 2: 4.2 $MtCO_2e$.
- Scope 3: 408.6 $MtCO_2e$ (down from 429.1 Mt in 2023), 98% of total GHG footprint.

While recent reductions in Scope 1 emissions and a modest decline in Scope 3 suggest that Volkswagen is broadly on track to meet its 2030 climate targets, the company's ability to achieve its long-term net-zero ambition will ultimately depend on accelerating fleet electrification and tackling the dominant share of Scope 3 emissions.

2.1.2 Renault Group[31]

Renault pursues a more modular approach, leveraging affordability and a rapid transformation of its product mix. Its transition plan is structured around the target of 100% electric passenger car sales in Europe by 2030. This target was published in 2022 and remains officially unchanged despite the take-off of the BEV market, slower in 2024 and in the beginning of 2025 than expected.

The company's climate roadmap combines upstream and downstream levers. On the industrial side, it emphasises energy efficiency (with ISO 14001-certified sites), factory digitalisation, and optimisation of the energy mix. Downstream, Renault adopts a robust methodology for Scope 3 vehicle-use emissions, based on a 200,000 km life-cycle assumption and a 20% correction factor over type-approved emissions. This approach enhances transparency and reinforces the credibility of the company's climate metrics. Circularity is also a strategic pillar:

28. European Commission, Joint Research Centre. Critical Raw Materials for Strategic Technologies and Sectors in the EU: A Foresight Study. Luxembourg: Publications Office of the European Union, 2020. https://doi.org/10.2760/808352
29. Volkswagen AG, Sustainability Report 2024, https://uploads.vw-mms.de/system/production/documents/cws/002/931/file_en/953dcbb8e57270df70ca288218092dba4721fd63/Y_2024_e.pdf
30. *Ibid*.
31. Renault Group, Rapport Climat 2024, https://assets.renaultgroup.com/uploads/2025/03/RENAULT_Rapport_climat_2024_FR_1920x1080pix_V5_MEL.pdf

Renault integrates ecodesign into all vehicle projects and aims to reach 33% recycled content by 2030, up from 30% in 2024[32].

Targets are SBTi-validated (WB2C scenario) and fully aligned with the CSRD and ESRS E1–E5.

The recent evolution is the following:

- –60% reduction in Scopes 1 & 2 (2012 base year).
- –27.5% reduction in Scope 3 Category 11 (vehicle use, 2019 base year).
- Energy consumption per vehicle dropped from 2.28 to 1.61 MWh between 2019 and 2024.
- Scope 1 & 2 emissions fell from 1.43 $MtCO_2e$ in 2019 to 715 $ktCO_2e$ in 2024.

The group's transition plan is underpinned by clear performance indicators, science-based validation, and embedded sustainability practices.

However, it is worth noting that Renault did not publish standalone climate reports in 2022 or 2023; the last comprehensive disclosure prior to 2024 dates back to 2019. This three-year gap may raise concerns about the continuity of reporting and the ability of stakeholders to monitor progress during a critical decade for the automotive sector's decarbonisation.

2.1.3 Toyota

Toyota offers a non-European perspective. Toyota's decarbonisation strategy reflects Japan's national transition frameworks, including the Green Growth Strategy and Ministry of Economy, Trade and Industry's (METI) sectoral roadmaps, which promote a technology-neutral, phased approach. As a result, Toyota's climate targets vary by region and vehicle type, with hybrid vehicles playing a transitional role in key markets. This explains the differentiated Scope 3 targets for passenger cars and trucks, and the company's emphasis on long-term net-zero goals rather than short-term BEV dominance. Long criticised for its slow BEV uptake, the company leverages its hybrid strength while planning for long-term net-zero goals. It conducts climate scenario analysis (TCFD, SBTi) and applies internal carbon pricing[33].

The targets are the following:

- Scope 1 & 2: –68% reduction by 2035 (from 2019), carbon neutrality in production by 2035.
- Scope 3 Category 11:
  –33.3% reduction (passenger cars) by 2030
  –11.6% reduction (trucks) by 2030
  ≥50% reduction by 2035, net-zero by 2050.

Emissions trend and most recent figures:

- Scope 1: 2,94 $MtCO_2e$ (2019) → 2,37 Mt (2021) → 2,48 Mt (2024).
- Scope 2: 3,90 $MtCO_2e$ (2019) → 2,87 Mt (2021) → 2,61 Mt (2024).
- Scope 3 total: 581,2 $MtCO_2e$ (2022) → 587,5 Mt (2023), of which 436,3 Mt for Category 11.

The slight increase in Scope 3 emissions in 2023 mainly reflects higher sales volumes and a slower-than-expected shift in the product mix toward zero-emission vehicles, particularly in markets with strong demand for hybrids and internal combustion engine models. Scope 3 data for 2019 is not disclosed in recent reports due to changes in the calculation methodology and the organisational boundary introduced after 2021, making historical figures non-comparable Toyota's "Six Environmental Challenges" include zero-carbon manufacturing, vehicle circularity, biodiversity, and water usage reduction. Toyota's recycling ecosystems span five continents and its Battery 3R (Reduce, Reuse, Recycle) program is expanding.

Indicator	Volkswagen Group	Renault Group	Toyota Motor Group
Scope 1 emissions (2024)	3.3 $MtCO_2e$	0.715 $MtCO_2e$	2.48 $MtCO_2e$
Scope 2 emissions (2024)	4.2 $MtCO_2e$	Not separately disclosed	2.61 $MtCO_2e$
Scope 3 emissions (2024)	408.6 $MtCO_2e$	108.1 $MtCO_2e$ (2024 total GHG-Scope 1/2)	587.5 $MtCO_2e$ (2023)
Scope 3 breakdown (Cat. 11)	Dominated by Cat. 11 (passenger use phase)	Mainly Cat. 11, but not fully broken down	436.3 $MtCO_2e$ (Cat. 11 only)
% Scope 3 share of total GHG	98%	≈95%	≈95%

Refer to Annex 2 for methodological notes

32. Renault Group DEU 2024.https://assets.renaultgroup.com/uploads/2025/04/Renault DEU 2024.pdf
33. Toyota Motor Corporation, Sustainability Data Book 2025, https://global.toyota/pages/global_toyota/sustainability/report/sdb/sdb25_en.pdf

Indicator	Volkswagen Group	Renault Group	Toyota Motor Group
Scope 1 & 2 target 2030	-60% per vehicle (*vs* 2018)	-62.5% combined (*vs* 2019), Scope 1=2012	-68% by 2035 (*vs* 2019)
Scope 3 Cat. 11 target 2030	-30% by 2030 (*vs* 2018)	-27.5% by 2030 (*vs* 2019)	-33.3% for cars, -11.6% for trucks (*vs* 2019)
Net zero target	2050	2040-2050	2050
BEV share target in EU	≥60% by 2030, 100% by 2035	100% by 2030	Not specified (hybrid focus)
Recycled material target (2030)	Not disclosed	33% in new vehicles	Battery 3R program expanding
Circular economy initiatives	Battery recycling (Salzgitter), reuse of raw materials	Certified REP for end-of-life	Battery 3R + global end-of-life systems
SBTI validation	Yes (WB2C)	Yes (WB2C)	Yes (1.5°C Scope 1/2; WB2C Scope 3)
Green finance	€10.5 bn green bonds since 2020	Not reported	Not disclosed
Governance & reporting	CSRD/TCFD aligned; DCI; ESG KPIs in exec pay	CSRD implementation in progress	Internal carbon pricing; TCFD; scenario-based analysis

All data refer to the most recent available year (2023 or 2024). Scope 3 emissions primarily refer to Category 11: Use of Sold Products. Targets and figures have been extracted from official reports validated by the SBTi or reported under CSRD/TCFD.

Toyota follows a slower, hybrid-focused pathway shaped by Japan's state-backed sectoral transition plans, which integrate industrial policy and private finance. The main divergence lies in Europe's regulatory framework but remaining market-led and BEV-centric model versus Japan's phased, technology-neutral approach.

3. Up to know Volkswagen and Renault are on track but there are challenges ahead

Volkswagen and Renault have demonstrated tangible progress in their transition performance over the past year. But while European carmakers now publish increasingly detailed, SBTi-validated climate roadmaps, several structural tensions, often absent from the official transition plans, threaten the credibility and effective implementation of their decarbonisation strategies.

First, the industrial legacy of internal combustion engines (ICE) remains deeply entrenched.
Despite targets for full electrification in Europe by 2030–2035, ICE and hybrid models continue to dominate global portfolios, particularly in markets like Latin America, India, and Southeast Asia. Toyota, for instance, plans to reach carbon neutrality only by 2050, relying heavily on hybrids and low-carbon fuels. Volkswagen continues to produce ICE vehicles outside Europe well into the next decade[34]. These conflicting product lines raise doubts about global alignment with Paris objectives and open the door to regulatory arbitrage and delay tactics.

Second, the cost of transformation remains a key constraint. Carmakers face tens of billions in capital expenditure for battery production, software development, and circularity infrastructure. According to DNV, the world must redirect over $2 trillion annually to staywithin the 1.5°C carbon budget[35]. Yet, the OECD and ESCP warn of capital misallocation in the sector, as investments still flow into fossil-fuel-compatible platforms or offset-based decarbonisation rather than genuine emissions reductions[36]. The financial exposure of legacy suppliers, particularly Tier 2 and Tier 3 SMEs, adds further vulnerability, with risk of deindustrialisation in ICE-heavy regions such as Eastern France, Saxony, and Northern Italy.

Third, ESG contradictions persist across supply chains. Automakers often rely on carbon offsets to claim progress toward net-zero, despite mounting criticism of the lack of nence, transparency, or additionality of such mechanisms[37]. Besides, there are still major gaps in circular design: despite pledges for battery reuse and recycling, the current share of recycled raw materials in battery production remains under 10%, and end-of-life

34. Toyota Motor Corporation, Sustainability Report 2024 ; Volkswagen AG, Sustainability Report 2024.
35. DNV, Financing the Energy Transition, Energy Transition Outlook 2024.
36. OECD, How the Green and Digital Transitions Are Reshaping the Automotive Ecosystem, 2023; ESCP, Key Future Challenges in Turbulent Times, 2024 https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/03/how-the-green-and-digital-transitions-are-reshaping-the-automotive-ecosystem_c10d29a2/f1874cab-en.pdf
37. Transport & Environment, Greenwashing Briefing https://www.transportenvironment.org/uploads/files/Greenwashing-report.pdf

traceability for components is often incomplete. Renault and Volkswagen report recycled content targets, but enforcement across suppliers and markets varies widely.

Finally, raw material dependency exacerbates strategic and ethical concerns. As the IEA and Transport & Environment (NGOS specialized in transport) note, over 70% of the world's cathode/anode chemicals and 90% of rare earths are processed in China[38]. This poses geopolitical risks, particularly as the EU introduces due diligence requirements on environmental and human rights grounds.[39] Supply chains remain exposed to water stress inlithium-rich regions, human rights violations in Congolese cobalt mining, and deforestation linked to nickel extraction in Indonesia[40].

4. Weaknesses of the transition plans

Despite real progress and increasingly detailed, SBTi-validated climate roadmaps, both Volkswagen and Renault face structural weaknesses in their transition strategies. These can be grouped into three core areas: regulatory alignment (Green Deal), financing challenges, and the evolving relationship with civil society actors.

4.1 Green Deal

Volkswagen and Renault have structured their decarbonisation strategies to align with major EU regulatory frameworks such as Fit for 55, the Corporate Sustainability Reporting Directive (CSRD), the EU Taxonomy, and the European Sustainability Reporting Standards (ESRS)[41]. Both companies have set clear targets for 2030 and 2050, integrated Scope 3 emissions into their climate roadmaps, and begun aligning capital expenditure with Taxonomy-compliant activities (*e.g.* VW's €10.5 Bn in Green bonds aligned with Activity 3.3)[42].

However, the rapidly evolving and increasingly dense regulatory landscape presents serious implementation challenges. The complexity of CSRD/ESRS reporting, the technical screening criteria of the EU Taxonomy, and the 2035 internal combustion engine (ICE) phase-out all require not just compliance but deep operational transformation. These obligations particularly strain smaller suppliers in the OEM (Original Equipment Manufacturer) ecosystem, which both Renault and Volkswagen rely on[43]. Transition plans rarely address how these suppliers will adapt, revealing a major blind spot in value chain resilience[44].

Furthermore, there is little acknowledgment within transition plans of regulatory fragmentation or political volatility. The EU's 2035 target faces growing resistance[45], and Member State-level differences in incentives and infrastructure rollout risk creating a fragmented transition landscape. These factors are insufficiently integrated into scenario planning or risk assessments disclosed by OEMs[46].

4.2 Finance

Volkswagen has announced €180 billion in investments linked to its transition through 2027. Renault has not disclosed a comparable overall investment figure. However, in 2023, more than 20% of its CapEx was dedicated to "low-carbon technologies".

These transition plans depend on sustained access to capital markets, including Green bonds, and favourable financing conditions, including public support, for example for megafactories of batteries.

Yet rising interest rates, inflation, and macroeconomic uncertainty could threaten this model.

Suppliers, particularly Tier 2 and Tier 3, report reduced ability to invest in decarbonisation, and the transition plans of OEMs often fail to account for how these actors will access transition finance. This omission could amplify structural asymmetries and result in uneven decarbonisation across the value chain[47].

38. EA, The Role of Critical Minerals in Clean Energy Transitions, 2021; https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions
39. European Commission, Corporate Sustainability Due Diligence Directive (CSDDD), 2024, https://commission.europa.eu/business-economy-euro/doing-business-eu/sustainability-due-diligence-responsible-business/corporate-sustainability-due-diligence_en#:~:text=This%20Directive%20establishes%20a%20corporate,those%20of%20their%20business%20partners
40. Wappelhorst, Sandra, and Marcus Ferdinand. "Electrifying the Auto Industry: Why the EU's Industrial Policy Must Go beyond 'Value Chains'." Global Environmental Change 84 (2024): 102841. https://doi.org/10.1016/j.gloenvcha.2024.102841
41. European Commission, "Fit for 55: EU reaches new milestone to make all new cars and vans zero-emission by 2035," March 28, 2023, https://climate.ec.europa.eu/news-your-voice/news/fit-55-eu-reaches-new-milestone-make-all-new-cars-and-vans-zero-emission-2035-2023-03-28_en
42. Volkswagen Financial Services, Green Finance Framework, September 2024, https://www.vwfs.com/content/dam/bluelabel/valid/www-vwfs-com/investor-relations/vwfs-ag/green-finance-framework/20240910_VWFSAG_GFF.pdf
43. CLEPA, "EU Taxonomy Threatens Investments in Europe's Automotive Supply Industry," December 7, 2022, https://clepa.eu/mediaroom/eu-taxonomy-threatens-investments-in-europes-automotive-supply-industry/
44. European Central Bank, Guide on Climate-Related and Environmental Risks, November 2020, https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.202011finalguideonclimate-relatedandenvironmentalrisks~58213f6564.en.pdf
45. Reuters, "EU Countries Approve 2035 Phase-Out of CO_2-Emitting Cars," March 28, 2023, https://www.reuters.com/business/autos-transportation/eu-countries-poised-approve-2035-phaseout-co2-emitting-cars-2023-03-28/
46. European Central Bank, Climate Stress Test Report, July 8, 2022, https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.climate_stress_test_report.20220708~2e3cc0999f.en.pdf
47. Lazard. Global Automotive Supplier Study: Average Industry Profit Margin Drops to Just 4.7%. Munich, May 5, 2025. Press Release. https://www.lazard.com/news-announcements/global-automotive-supplier-study-average-industry-profit-margin-drops-to-just-47

Moreover, while OEMs like Volkswagen benefit from Green bond issuance, many transition plans do not address potential future financing risks, such as shifts in investor sentiment, the tightening of ESG (Environmental, Social and Governance) criteria, or exposure to transition risk in credit portfolios. Renault's multi-year reporting gap (no standalone transition reports between 2019 and 2024) further undermines transparency for investors[48].

4.3 NGOS : increasingly critical

Initially aligned with electrification goals, NGOs (Non-Governmental Organisations) have grown increasingly critical of the automotive sector's transition strategies. Leading organisations such as Transport & Environment (T&E) and Verkehrsclub Deutschland (VCD)now point to a disconnect between OEM public commitments and implementation[49].

While both Renault and Volkswagen disclose extensive decarbonisation plans, these are often too technical and inaccessible for independent scrutiny. NGOs criticise the lack of comparability in year-on-year data, the variability in Scope 3 methodologies, and the absence of clear, traceable progress indicators. Moreover, some transition plans omit references to just transition frameworks, labour issues in the battery supply chain, or citizen engagement mechanisms[50].

A further criticism concerns the accessibility of transition documentation to the wider public.

Many transition plans exceed 100 pages, are written in highly technical language, and include fragmented reporting structures, making them difficult to read and engage with outside of expert circles. This lack of clarity undermines public scrutiny and weakens civil society's ability to hold OEMs accountable.

T&E and others also stress the need to uphold the 2035 ICE ban without political dilution. The ambiguity of industry lobbying, where OEMs publicly endorse targets while resisting stricter implementation measures, undermines credibility[51]. Transition plans often fail to clarify the companies' policy positions, raising further concerns about greenwashing and regulatory capture[52].

Conclusion

In theory, transition plans are meant to clarify each manufacturer's climate commitments, financial pathways, and implementation strategies. They provide key information on targets, means, and progress indicators, and are designed to inform stakeholders and facilitate public debate.

Transition plans from Renault and Volkswagen offer useful insights into targets and tools for decarbonisation, but they are incomplete and do not provide operational clarity on how the Green Deal will be implemented on the ground. Moreover, their long, technical, and poorly accessible format limits their impact outside expert circles.

Despite regulatory intentions, these plans are not yet effective instruments for public accountability or policy coordination. To play a meaningful role by 2026, they must become clearer, more comparable, and better integrated into Green Deal implementation and democratic debate.

Greater simplicity, transparency, and public visibility will be essential if transition plans are to regain relevance and contribute meaningfully to Europe's decarbonisation agenda.

48. BloombergNEF. 2023. "Battery Prices Down 14% This Year, Says BloombergNEF". PV Magazine USA, December 1, 2023. https://pv-magazine-usa.com/2023/12/01/battery-prices-down-14-this-year-says-bloombergnef
49. Transport & Environment. Don't Be Fooled by the Car Industry's "Complain Then Comply" Strategy, February 27, 2025. https://www.transportenvironment.org/articles/dont-be-fooled-by-the-car-industrys-complain-then-comply-strategy
50. European Commission. Monitoring Capital Flows to Sustainable Investment, April 2024. https://finance.ec.europa.eu/system/files/2024-04/240404-sf-platform-report-monitoring-capital-flows_en.pdf
51. Politico Europe. "German Auto Lobby Proposal Sparks Renewed Debate on EU Combustion Engine Ban", June 6, 2025. https://www.politico.eu/article/german-auto-lobby-proposal-sparks-renewed-debate-eu-combustion-engine-ban/
52. Reuters. "EU Gives Automakers 'Breathing Space' on CO_2 Emission Targets", March 3, 2025. https://www.reuters.com/business/autos-transportation/eu-propose-giving-automakers-three-years-meet-co2-emission-targets-2025-03-03/

Annex 1: Glossary of Terms and Acronyms

1. Key Acronyms

- **BEV (Battery Electric Vehicle):** A fully electric vehicle powered exclusively by batteries, with no internal combustion engine.
- **CSDDD (Corporate Sustainability Due Diligence Directive):** An EU directive requiring large companies to identify, prevent, and mitigate adverse impacts on human rights and the environment across their value chains.
- **CSRD (Corporate Sustainability Reporting Directive):** A regulation mandating large EU companies and listed SMEs to disclose comprehensive sustainability-related information, including climate risks and transition strategies.
- **ESRS (European Sustainability Reporting Standards):** Technical standards under the CSRD detailing how companies must report on environmental, social, and governance (ESG) matters.
- **EU Taxonomy:** A classification system that defines environmentally sustainable economic activities, used to guide investment decisions and corporate disclosures.
- **ESG (Environmental, Social, and Governance):** A set of non-financial performance indicators used by investors and regulators to assess the sustainability and societal impact of companies.
- **ICE (Internal Combustion Engine):** A traditional engine type that burns fuel (*e.g.*, petrol or diesel) to power vehicles.
- **IPCEI (Important Projects of Common European Interest):** EU-supported initiatives that allow for state aid to strategic, cross-border industrial projects (*e.g.*, batteries, hydrogen).
- **OEM (Original Equipment Manufacturer):** A company that designs and manufactures vehicles or major components, often selling under its own brand (*e.g.*, Volkswagen, Renault).
- **SBTi (Science-Based Targets initiative):** A global standard-setting body that validates corporate emission reduction targets in line with the Paris Agreement.
- **TCFD (Task Force on Climate-related Financial Disclosures):** An international framework for disclosing climate-related financial risks and opportunities.
- **VERRA / Gold Standard:** Certification bodies that verify carbon offset projects to ensure they meet certain criteria for environmental integrity and additionality.

2. Greenhouse Gas (GHG) Emissions – Scope Definitions

- **Scope 1:** Direct GHG emissions from owned or controlled sources (e.g., emissions from company-operated factories or vehicles).
- **Scope 2:** Indirect GHG emissions from the generation of purchased electricity, steam, heating, or cooling consumed by the company.
- **Scope 3:** All other indirect emissions in a company's value chain. This includes:

- *Category 11 – Use of sold products:* Emissions from consumers using vehicles throughout their lifecycle (typically the largest share for automakers).
- Other categories: include upstream raw material extraction, logistics, end-of-life treatment, etc.

3. Core Concepts

- **Circularity / Circular Economy:** An economic model aimed at minimising waste and maximising resource efficiency through reuse, remanufacturing, recycling, and product design.
- **Green Bonds:** Debt instruments used to raise funds specifically for climate or environmental projects, often aligned with the EU Taxonomy.
- **Transition Finance:** Financial flows supporting the decarbonisation of high-emission sectors, helping companies shift toward more sustainable models.
- **Carbon Offsets:** Emission reduction credits purchased to compensate for a company's own emissions, often through forest protection, renewable energy, or methane capture projects. These are increasingly scrutinised for transparency and additionality.
- **Just Transition:** A policy principle ensuring that the shift to a low-carbon economy is fair and inclusive, particularly for workers and regions dependent on fossil-fuel-based industries.
- **Strategic Autonomy:** The EU's goal of reducing reliance on third countries (notably China) for critical inputs like batteries, rare earths, or semiconductors.
- **Greenwashing:** Misleading claims about a company's environmental performance or sustainability actions, often criticised by NGOs and investors.

Annex 2: Methodological Notes: GHG Emissions 2024 (Scopes 1, 2, 3)

1. Renault Scope 2 emissions not separately disclosed

Renault does not disclose Scope 2 emissions separately in its 2024 reporting. Only a combined figure for Scopes 1 & 2 is provided (0.715 $MtCO_2e$), without a breakdown by market-based or location-based methods.

2. Scope 3 differences in methodology

- Volkswagen reports emissions across 13 of the 15 GHG Protocol categories. Category 11 (*use of sold products*) represents ~98% of its total Scope 3 emissions.
- Toyota reports 587.5 $MtCO_2e$ for Scope 3 in 2023, of which 436.3 Mt (≈74%) comes from Category 11.
- Renault reports Scope 3 emissions only for Category 11, using a methodology based on a 200,000 km lifetime assumption and a 20% correction factor over type-approved emissions.

3. Year alignment

- Volkswagen and Renault: Scope 3 data reported for 2024
- Toyota: most recent Scope 3 data available is for 2023

4. Data rounding and reporting scope

- All emissions are reported in million tonnes of CO_2 equivalent ($MtCO_2e$).
- Reporting boundaries (consolidation scope, included subsidiaries, etc.) may vary between companies.
- Inter-company comparisons, especially for Scope 3, must be approached with caution due to differences in coverage and methodologies.

5. Legend – Climate Targets Comparison Table (2030/2050)

- **Net-zero target:** Target year by which the company aims to reach carbon neutrality across Scopes 1, 2, and 3.
- **Scope 1 emissions (2024):** Direct GHG emissions from company-owned and controlled resources (e.g. fuel combustion, process emissions).
- **Scope 2 emissions (2024):** Indirect GHG emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the company. If not separately reported (e.g. Renault), it may be embedded in the Scope 1+2 figure.
- **Scope 3 emissions (2023–2024):** All other indirect emissions occurring in the value chain (both upstream and downstream). Often dominated by Category 11: use of sold products.
- **% Scope 3 share of total GHG:** Share of Scope 3 emissions in total reported GHG emissions. Typically 95–98% in the automotive sector due to vehicle use.
- **Scope 3 target (use phase):** Targeted reduction in emissions from Category 11 (use of sold products), expressed relative to a base year. Scope and methodology vary by manufacturer.
- **BEV share target in EU:** Company's targeted share of battery electric vehicles (BEVs) in new passenger car sales in the EU by a specific year.
- **Recycled material target (2030):** Targeted proportion of recycled content in vehicles produced by 2030.
- **SBTi validated targets:** Validation of climate targets by the Science-Based Targets initiative (SBTi), with temperature alignment indicated (*e.g.* "1.5°C", "well-below 2°C").
- **Circular economy initiatives:** Notable corporate initiatives to improve material circularity, including battery recycling, reuse of components, and end-of-life management.
- **Green finance:** Reported use of sustainable finance instruments (*e.g.* green bonds), and alignment with the EU Taxonomy where applicable.
- **Governance & reporting:** Integration of ESG criteria in corporate governance, executive compensation, and alignment with disclosure frameworks (*e.g.* CSRD, TCFD, internal carbon pricing).

Bibliography

- BloombergNEF. "Battery Prices Down 14% This Year, Says BloombergNEF". PV Magazine USA, December 1, 2023. https://pv-magazine-usa.com/2023/12/01/battery-prices-down-14-this-year-says-bloombergnef
- Bundesministerium für Wirtschaft und Klimaschutz (BMWK). Automotive Sector Key Facts. 2025. CEA. Pocket Guide 2022–2023. https://www.acea.auto/files/ACEA_Pocket_Guide_2022-2023.pdf
- Clean Energy Wire. "Tesla Gets Green Light for Berlin Gigafactory, VW to Build New E-Car Plant". Clean Energy Wire, March 7, 2022. https://www.cleanenergywire.org/news/tesla-gets-green-light-berlin-gigafactory-vw-build-new-e- car-plant
- CLEPA. "EU Taxonomy Threatens Investments in Europe's Automotive Supply Industry". Press Release, December 7, 2022. https://clepa.eu/mediaroom/eu-taxonomy-threatens-investments-in-europes-automotive-supply- industry/
- CLEPA. "Grim Outlook for European Automotive Suppliers". Press Release, 7 months ago. https://www.clepa.eu/insights-updates/press-releases/grim-outlook-for-european-automotive-su ppliers-as-lower-volumes-suppress-profitability
- DNV. Financing the Energy Transition. Energy Transition Outlook 2024.
- EA (International Energy Agency). The Role of Critical Minerals in Clean Energy Transitions. 2021. https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions
- European Automobile Manufacturers' Association (ACEA). Pocket Guide 2022–2023. https://www.acea.auto
- European Central Bank. Guide on Climate-Related and Environmental Risks. November 2020. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.202011finalguideonclimate-relatedandenvironmentalrisks~58213f6564.en.pdf
- European Central Bank. Climate Stress Test Report. July 8, 2022. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.climate_stress_test_report.20220708~2e3cc0999f.en.pdf
- European Commission. "Automotive Industry Overview". Accessed July 2025. https://single-market-economy.ec.europa.eu/sectors/automotive-industry_en
- European Commission. "Fit for 55: EU Reaches New Milestone to Make All New Cars and Vans Zero-Emission by 2035". Press Release, March 28, 2023. https://climate.ec.europa.eu/news-your-voice/news/fit-55-eu-reaches-new-milestone-make-all-new-cars-and-vans-zero-emission-2035-2023-03-28_en
- European Commission. "Launch of Strategic Dialogue on the Future of the EU Automotive Industry." March 2025. https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1170.
- European Commission. Corporate Sustainability Due Diligence Directive (CSDDD). 2024. https://commission.europa.eu/business-economy-euro/doing-business-eu/sustainability-due-dilig ence-responsible-business/corporate-sustainability-due-diligence_en.
- European Commission. Monitoring Capital Flows to Sustainable Investment. April 2024. https://finance.ec.europa.eu/system/files/2024-04/240404-sf-platform-report-monitoring-capital- flows_en.pdf.
- European Commission, Joint Research Centre. Critical Raw Materials for Strategic Technologies and Sectors in the EU: A Foresight Study. Luxembourg: Publications Office of the European Union, 2020. https://doi.org/10.2760/808352.
- Eurofound. "Employment in the EU's Automotive Sector". May 2025. https://www.eurofound.europa.eu/en/resources/article/2025/employment-eus-automotive-sector
- Eurostat. "Employment and Value Added Using FIGARO Data". Statistics Explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Employment_and_value_added_using_FIGARO_data_-_view_into_the_automotive_industry

- Eurostat. "EU Domestic Value Added in Non-EU Automotive Exports Reaches €91.6 bn". Eurostat News, July 16, 2025. https://www.eunews.it/en/2025/07/16/eurostat-us-is-the-largest-market-for-the-eu-automotive-industry
- Eurostat. "Increasing Role of China in EU's Automotive Industry". Eurostat News, December 4, 2024. https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20241204-1
- GoAuto. "EV Supplier Job Losses Increase in EU". GoAuto News, January 22, 2025. https://www.goauto.com.au/news/general-news/ev-supplier-job-losses-increase-in-eu/2025-01-22/95513.html
- Investing.com. "Renault Aims to Generate over €10 Billion in Revenue by 2025". April 2025. https://www.ainvest.com/news/renault-strategic-resilience-leadership-continuity-ev-ambition-buy-45-2506/
- iCRIBIS. Osservatorio Automotive 2023. https://www.contenuti.icribis.com/osservatorio/2023/automotive
- Ifo Institute. "Labor Demand of Automotive Firms during the Green Transformation". Working Paper, 2024. https://www.ifo.de/DocDL/cesifo1_wp11160.pdf
- International Energy Agency. Global EV Outlook 2025. https://www.iea.org/reports/global-ev-outlook-2025/outlook-for-electric-mobility
- JATO Dynamics via Reuters. "China's BYD Outsells Tesla in Europe for First Time". Reuters, May 22, 2025. https://www.reuters.com/business/autos-transportation/chinas-byd-outsells-tesla-europe-first-ti me-report-says-2025-05-22/
- Lazard. Global Automotive Supplier Study: Average Industry Profit Margin Drops to Just 4.7%. May 5, 2025. https://www.lazard.com/news-announcements/global-automotive-supplier-study-average-indust ry-profit-margin-drops-to-just-47/
- MarkLines via CEIC. "Automotive Production in China by Year". https://www.marklines.com/en/statistics/flash_prod/automotive-production-in-china-by-month-2 024
- Milne, Richard. "Northvolt Failure Raises Stakes for Europe's Battery Industry". Financial Times, May 22, 2025. https://www.ft.com/content/63b16b6a-e143-4e2c-ac27-5d3f7a89a41f
- NatWest. "Electric Vehicles: Slowing Market Likely to Accelerate Again". NatWest Insights, March 2025. https://www.natwest.com/corporates/insights/sustainability/electric-vehicles-slowing-market-like ly-to-accelerate-again.html
- OECD. How the Green and Digital Transitions Are Reshaping the Automotive Ecosystem. 2023.https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/03/how-the-green-and-digital-transitions-are-reshaping-the-automotive-ecosystem_c10d29a2/f1874cab-en.pdf
- Politico Europe. "German Auto Lobby Proposal Sparks Renewed Debate on EU Combustion Engine Ban". Politico, June 6, 2025. https://www.politico.eu/article/german-auto-lobby-proposal-sparks-renewed-debate-eu-combusti on-engine-ban/
- Renault Group. Rapport Climat 2024. https://assets.renaultgroup.com/uploads/2025/03/RENAULT_Rapport_climat_2024_FR_1920x108 0pix_V5_MEL.pdf
- Renault Group. Renault DEU 2024. https://assets.renaultgroup.com/uploads/2025/04/Renault_DEU_2024.pdf
- Reuters. "Volkswagen Plans to Invest 180 Billion Euros over Five Years in Areas Including Battery Production". Reuters, March 14, 2023. https://www.reuters.com/business/autos-transportation/volkswagen-invest-180-bln-euros-five-y ear-plan-2023-03-14
- Reuters. "EU Gives Automakers 'Breathing Space' on CO2 Emission Targets". March 3, 2025. https://www.reuters.com/business/autos-transportation/eu-propose-giving-automakers-three-years-meet-co2-emission-targets-2025-03-03/
- Reuters. "EU Says It Sticks to Zero-Emission Car Path to 2035". March 5, 2025. https://www.reuters.com/business/autos-transportation/eu-sticks-2035-zero-emissions-target-new-cars-2025-03-05/.

- Rouleur Électrique. "CALB Investit 2 Milliards d'Euros au Portugal". https://rouleur-electrique.fr/calb-investit-2-milliards-deuros-au-portugal-pourquoi-ce-geant-chinois-des-batteries-mise-sur-leurope
- S&P Global Mobility. "Germany Plans to Invest over €250 Billion in Automotive R&D by 2027". AutoTech Insight, April 6, 2023. https://autotechinsight.spglobal.com/news/5270132/germany-plans-to-invest-over-250-billion-in -automotive-r-d-by-2027
- Toyota Motor Corporation. Sustainability Report 2024. https://global.toyota/pages/global_toyota/sustainability/report/sdb/sdb24_en.pdf
- Toyota Motor Corporation. Sustainability Data Book 2025. https://global.toyota/pages/global_toyota/sustainability/report/sdb/sdb25_en.pdf
- Transport & Environment. Greenwashing Briefing. https://www.transportenvironment.org/uploads/files/Greenwashing-report.pdf
- Transport & Environment. "Don't Be Fooled by the Car Industry's 'Complain Then Comply' Strategy". February 27, 2025. https://www.transportenvironment.org/articles/dont-be-fooled-by-the-car-industrys-complain-th en-comply-strategy
- Ursula von der Leyen. Speech at the Automotive Strategic Dialogue. Brussels, March 5, 2025. Cited in European Commission, "Europe's Automotive Industry". https://single-market-economy.ec.europa.eu/sectors/automotive-industry_en
- Volkswagen AG. Sustainability Report 2024. https://uploads.vw-mms.de/system/production/documents/cws/002/931/file_en/953dcbb8e5727 0df70ca288218092dba4721fd63/Y_2024_e.pdf
- Volkswagen Financial Services. Green Finance Framework. September 2024. https://www.vwfs.com/content/dam/bluelabel/valid/www-vwfs-com/investor-relations/vwfs-ag/green-finance-framework/20240910_VWFSAG_GFF.pdf
- Wappelhorst, Sandra, and Marcus Ferdinand. "Electrifying the Auto Industry: Why the EU's Industrial Policy Must Go beyond 'Value Chains'". Global Environmental Change 84 (2024): 102841. https://doi.org/10.1016/j.gloenvcha.2024.102841