THE EU-JAPAN AUTOMOTIVE INDUSTRY IN THE FACE OF ENVIRONMENTAL AND TECHNOLOGICAL DISRUPTION

MINERVA
EU-JAPAN market & policy intelligence

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Executive Summary

The report's objective is to map out all types of cooperation between European and Japanese players in the automotive industry, which stands for both Brussels and Tokyo as a key pillar of both regions' economies. The structure of the report is as follows:

Overview of the EPA chapter on Motor Vehicles and Parts

The report starts with an overview of the Economic Partnership Agreement (EPA), noting its role in enhancing cooperation by aligning regulations, standards, and practices. This alignment helped streamline trade, lower entry barriers, and support a unified market.

Moreover, the report provides a brief overview of trade volumes between the EU and Japan, illustrating the economic vitality of the automotive industry to both regions. Despite the historical competitive stance between European and Japanese automotive players, the current era of environmental and technological upheavals presents similar challenges to both industries.

This backdrop of once-in-a-generation transformation underscores that while competition remains, it does not preclude the possibility of future cooperation, especially considering the massive scale of new investments required to navigate these changes.

Partnerships Between European and Japanese Companies

The report focuses on the dynamic partnerships within the automotive industry, categorizing them into three main areas: collaboration among Original Equipment Manufacturers (OEM), initiatives between automotive suppliers, and third-party projects supported by government investments. It highlights key alliances such as BMW x TOYOTA and the Renault-Nissan-Mitsubishi Alliance, underscoring their role in promoting innovation and technological progress. These collaborations, spanning from fuel cell technology to autonomous driving, signify a unified effort to push the boundaries of electrification, autonomy, and sustainability. Through examining these partnerships, the report illustrates how cooperation among European and Japanese entities drives the automotive sector toward a more advanced and sustainable future, despite the competitive landscape.

EU and GOJ Policies Impacting the Automotive Industry

Finally, the report concludes by examining the environmental and technological legislation set out by the EU and the Japanese government. Initiatives such as the EU's Fit for 55 package and Japan's Green Growth

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Strategy are instrumental in steering the automotive industry towards a future marked by sustainability and advanced technology, aligning with global efforts to reduce carbon emissions and embrace innovative mobility solutions.

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List of Abbreviations

ACEA - European Automobile Manufacturers Association
ADAS – Advanced driver-assistance system
AFIR – Alternative Fuel Infrastructure Regulation
AVERE - European Association for Electromobility
AV – Autonomous Vehicles
CAGR - Compound Annual Growth Rate
CAPR - Climate Action Progress Report
CASE - Connectivity, Automation, Sharing, and Electrification
CBAM - Carbon Border Adjustment Mechanism
CO2 - Carbon Dioxide
COP - Conference of the Parties
DWIH - The German Centre for Research and Innovation
EC – European Commission
EEA – European Environmental Agency
EPA – Economic Partnership Agreement
ETS – Emission Trading System
EU - European Union
EV – Electric Vehicles
FCV – Fuel Cell Vehicles
GHG - Greenhouse Gas
ICE - Internal Combustion Engine
ILO - International Labour Organization
JAMA - Japanese Automobile Manufacturers Association
LCV - Light Commercial Vehicles
METI - Ministry of Economy, Trade and Industry
MFTBC - Mitsubishi Fuso Truck and Bus Corporation
MLIT. - Ministry of Land Infrastructure, Transport and Tourism
MOC - Memorandum of Cooperation
MOU – Memorandum of Understanding
NREL - National Renewable Energy Laboratory
OEM - Original Equipment Manufacturer
R&D - Research & Development
SAE - Society Autonomous Engineers
SDGs - Sustainable Development Goals
TEN-T - Trans-European Transport Network
TMC - Toyota Motor Corporation
TME - Toyota Motor Europe
UN – United Nations
UNECE - United Nations Economic Commission for Europe
WP.29 - World Forum for Harmonization of Vehicle Regulations
WTO – World Trade Organization

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- Batteries Regulation
- The Clean Vehicles Directive
- General Safety Regulation (Autonomous Driving)
- CBAM

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Introduction

Since its foundation in the mid-nineteenth century the automotive industry has wielded transformative influence over the economy, thereby shaping the very fabric of society by enabling transport and connectivity on a global scale.

The industry is arguably one of the driving forces of the world economy. The global automotive manufacturing market was projected[1] to be worth around $2.86 trillion. It also contributes greatly to technological advancements through its massive research and development (R&D) investments. According to Statista[2] global R&D spending on automotive accounted to €145 billion.
In light of its size, the automotive sector has also been a source of employment. Data provided by the International Labour Organization (ILO) [3], global direct employment in the industry was estimated at 14 million workers.

The European Union (EU) and Japan are both global leader in the industry. To our days, the automotive industry continues to be at the hearth respectively of the European and Japanese economies'. Having a look at the numbers helps to grasp the importance of the sector.

According to the European Commission[4] (hereinafter EC) the automotive sector provides direct and indirect jobs to 13.8 million Europeans, representing 6.1% of total EU employment.
The turnover generated by the industry represents over 7% of EU GDP. Moreover, according to ACEA[5], the European Automobile Manufacturers Association, the industry invests more than €59 billion annually in R&D, accounting for 31% of total EU spending.
In 2022[6] 13.1 million motor vehicles were produced in the EU, 15.3% of global vehicle production.

[1] https://www.statista.com/statistics/574151/global-automotive-industry-revenue/

[2] https://www.statista.com/statistics/1102932/global-research-and-development-spending-automotive/

[3] https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/briefingnote/wcms_741343.pdf

[4] (https://single-market-economy.ec.europa.eu/sectors/automotive-industry_en, n.d.)

[5] https://www.acea.auto/figure/rd-shares-of-industrial-sectors-in-european-union/

[6] https://www.acea.auto/figure/key-figures-eu-auto-industry/

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In Japan, the automotive sector accounts[7] for 2,9% of the nation's GDP and 13.9% of manufacturing GDP. Turnover generated by the industry in FY2022 was 5.74 trillion yen[8].
According to the Japanese Automobile Manufacturers Association (JAMA)[9] auto-related employment in Japan totals 5.54 million people, 8.2% of total employment.

The relationship between the European and Japanese players within the automotive industry is characterized by a complex interplay of competition and collaboration that has evolved over several decades. Despite being competitors on the global stage, the EU and Japan have engaged in numerous partnerships, joint research and development (R&D) investments, and acquisitions, reflecting a mutual recognition of the benefits derived from sharing expertise and resources.

The origins of this intricate relationship can be traced back to the post-war era when Japan's automotive industry began to emerge as a significant player on the international scene. Initially, the focus was on rebuilding and modernizing Japan's domestic automotive capabilities, but it wasn't long before Japanese manufacturers looked abroad for opportunities, setting the stage for future interactions with European counterparts.

By the 1980s and 1990s, Japanese automakers had established a significant presence in global markets, including Europe. This expansion sometimes led to tensions, stemming from concerns over market share and employment impacts within European nations. However, these challenges also opened doors for dialogue and cooperation. European and Japanese companies started to recognize the potential for collaboration in facing common challenges such as increasing competition from other regions, the need for technological innovation, and the rising importance of addressing environmental concerns.

This recognition led to various forms of collaboration between EU and Japanese automotive companies. Joint ventures and strategic alliances were formed to develop new technologies, particularly in the areas of safety, fuel efficiency, and, more recently, electric and autonomous vehicles. An example of this collaborative spirit is the engagement in joint R&D projects funded through initiatives like the EU's Horizon 2020 program and Japan's Strategic International Collaborative Research Program (SICORP), focusing on areas such as advanced biofuels and alternative renewable fuels.

[7] https://www.trade.gov/country-commercial-guides/japan-automotive

[8] https://www.statista.com/statistics/1236503/japan-automotive-service-industry-revenue/

[9] https://www.jama.or.jp/english/reports/docs/MIoJ2023_e.pdf

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Acquisitions and strategic investments have also played a role in strengthening EU-Japan automotive ties. European manufacturers have acquired stakes in Japanese companies and vice versa, facilitating the exchange of technology, expertise, and market access. These moves have often been aimed at enhancing the companies' competitive positions in their respective markets and globally.

The relationship between the EU and Japan in the automotive sector has also been influenced by regulatory and trade agreements, aimed at reducing barriers and fostering a more open and fair trade environment. The Economic Partnership Agreement (EPA) between the EU and Japan, which came into effect in February 2019, is a testament to the commitment of both parties to deepen economic ties and promote sustainable development.

According to the latest available data from EUROSTAT, as of 2022, the EU exported a total of €158 billion in vehicles, while imports amounted to €62 billion, resulting in a trade surplus of €96 billion for the EU. Within this trade dynamic, Japan accounts for 4% of the EU's vehicle exports and 12% of its imports. For Japan, the EU represents the third-largest export destination, accounting for 9.3% of its vehicle exports. This data underscores the significant economic interdependence between the EU and Japan in the automotive sector and highlights the ongoing importance of their relationship in shaping the future of global automotive industry.

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1. EPA provisions for Motor Vehicles and Parts

The EU-Japan EPA[10] negotiations were officially launched in March 2013. The agreement was signed in 2018 and entered into force on 1 February 2019. Together, the EU and Japan account[11] for about a quarter of the world's GDP, comprising a free trade area of 640+ million people.

As a consequence of the EPA, all exports of vehicles, their parts and equipment from EU to Japan and vice-versa are duty free, expect leather parts of seats used in vehicles.

The relevant clauses on motor vehicles are to be found in Annex 2-C and Appendix 3-B-1. International standardisation was the relevant achievement. As a result, EU and Japanese vehicles are subject to the same requirements; and owing to the introduction of the international whole vehicle type approved, EU vehicles no longer have to be tested and certified again when exported to Japan.

Additionally, the agreement allows that a limited of hydrogen-fuelled cars that are approved in the EU can be exported to Japan without further modifications.

Here is an overview of the chapter on Motor Vehicles and Parts:

	Passenger Cars	Trucks	Buses	Auto Parts, Etc. (including vehicle bodies)
Japan-EU EPA (in effect as of Feb. 2019)	[10%] To be abolished in 8 years.	Gasoline trucks≥2800cc, Diesel trucks≥2500cc: [22%] Gasoline trucks<2800cc, Diesel trucks<2500cc: [10%] To be abolished in 8 years.	Gasoline buses≥2800cc, Diesel buses≥2500cc: [16%] Gasoline buses<2800cc, Diesel buses<2500cc: [10%] To be abolished in 13 years.	[3-4.5%] Immediately abolished for more than 90% (in value terms).

Source: https://www.jama.or.jp/english/reports/docs/MIoJ2023_e.pdf

Additionally, Brussels and Tokyo wanted to obtain the following:

-The promotion of high levels of safety, environmental protection, and energy efficiency.

- Trade facilitation between the two Parties and access to respective markets through regulatory cooperation, and elimination and prevention of adverse effects of non-tariff measures.

[10] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02018A1227(01)-20220201&from=EN#bm1051level1

[11] https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/japan_en

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- Enhancing the international harmonisation of requirements in the context of the UNECE World Forum for Harmonization of Vehicle Regulations (WP.29), and the mutual recognition type approvals granted in accordance with United Nations (UN) Regulations without requiring any further testing, certification or marketing.
- Achieving convergence of regulatory requirements of the Parties through the application of UN Regulations, UN Global Technical Regulations, and UN Rules.

The Agreement also foresees a strong cooperation between the Parties and obligations to guarantee that the conditions contained in this Agreement can be maintained over time. In this context relevant consultation procedures have been defined.
In November 2019 the EU and Japan established the **Working Group on Motor Vehicles and Parts**. WP.29 serves as a crucial fora for to deepen cooperation on UNECE Regulations and also to discuss automotive related issues.

The Working Group so far met four times since its establishment.
In March 2022 parties engaged in discussions pertaining to their respective automotive markets, focusing on challenges such as post-COVID recovery and supply chain disruptions, particularly the scarcity of semiconductors.
Furthermore, the parties acknowledged the imperative to update Annex 2-C to mirror recent UN regulatory developments and provide heightened legal certainty for automotive manufacturers. Japan expressed willingness to contemplate the inclusion of UN Regulations No 148-163 in Appendix 2-C-1, excluding UNR No 143 due to an absence of market demand. At the behest of the EU, Japan was urged to consider rationalizing conformity of production procedures and accept verification activities conducted by EU authorities.

The last meeting happened in October 2023. The key points covered were the market overview of Japan EU bilateral trade flows and investment in the automotive sector, an update to Annex 2-C to EU-Japan EPA, and finally the Fit for 55 Regulation on carbon dioxide (CO2) emissions for new cars and vans.

They two parties agreed to share market data, with the EU proposing to include car parts statistics in their exchanges. Japan clarified its stance on applying United Nations Regulations (UNR), agreeing to incorporate UNR No. 165-167 into Appendix 2-C-1 of their agreement but not UNR No. 164 due to domestic legal constraints. Both parties plan to update Appendices 2-C-1 and 2-C-2 simultaneously to simplify the amendment process. The EU requested updates on Japan's study of UNR No. 73 and No. 126, and Japan was

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asked to provide written updates on its review of the 433.92 MHz frequency band for vehicle remote keys and tire pressure monitoring systems.

Japan raised concerns about the EU's CO2 emissions regulations, questioning the targets and asking for a review considering technological advancements, including plug-in hybrid technologies. The EU outlined its timeline for reporting and reviewing its emissions regulation impact, considering technological developments. Japan also inquired about the EU's plans for regulating vehicles using carbon-neutral fuels, with the EU noting that the regulation is still under discussion.

Another important forum for cooperation for issues related to the automotive industry is the EU-Japan Industrial Policy Dialogue between the Ministry of Economy, Trade and Industry (METI) and DG GROW. This dialogue addresses key topics related to the automotive sector, including hydrogen, batteries, mobility, and vehicle electrification.

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2. Automotive industry ties between European and Japanese companies

Renault-Nissan-Mitsubishi Alliance

The partnership between Renault and Nissan represents one of the most significant and enduring collaborations between European and Japanese companies in the automotive industry.
The Renault-Nissan partnership began in March 1999, when Renault decided to invest in Nissan, which was struggling financially at the time. Renault bought a 36.8% stake in Nissan, while Nissan in turn took a smaller stake in Renault. This strategic move was more than a mere financial investment; it was a bid to rescue Nissan from near-bankruptcy and to strengthen Renault's global position. Carlos Ghosn, an executive at Renault, was sent to Nissan as Chief Operating Officer and later became CEO, playing a pivotal role in Nissan's turnaround through the implementation of the Nissan Revival Plan.

Under Ghosn's leadership, the Nissan Revival Plan was introduced, which involved drastic restructuring, cost-cutting measures, and a focus on profitability. The plan successfully turned Nissan around from a loss-making entity into one of the most profitable car manufacturers in the world. This success bolstered the alliance and Ghosn's reputation, leading him to be celebrated as a business hero in Japan.

Over the years, the alliance has expanded its scope and scale. In 2010, the partnership went a step further with the creation of the Renault-Nissan Alliance, a unique organizational structure aimed at maximizing operational synergies between the two companies. The alliance has focused on various areas, including R&D, manufacturing, and logistics, to realize cost savings and efficiency gains.

One of the most significant areas of collaboration has been in the development of electric vehicles (EVs). The Nissan Leaf, introduced in 2010, and Renault's range of electric vehicles, like the Zoe, have made the alliance a leader in the electric vehicle market. This has positioned both companies as pioneers in the shift towards more sustainable transportation solutions.

Despite the successes, the alliance has faced its share of challenges. The most notable was the arrest of Carlos Ghosn in November 2018 in Japan on charges of financial misconduct. This event shook the foundation of the alliance, leading to questions about governance, leadership, and the future direction of the partnership. Ghosn's dramatic escape from Japan in December 2019 added further intrigue and complexity to the situation.

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In the aftermath of the Ghosn scandal, both Renault and Nissan have taken steps to strengthen the alliance and ensure its sustainability. New governance structures and operational frameworks have been introduced to enhance collaboration and efficiency. The alliance has also been focusing on new technologies, including autonomous driving and further electrification of their vehicle lineups, to stay competitive in a rapidly evolving automotive landscape.

The Renault-Nissan alliance, despite its ups and downs, continues to be a powerful example of how cross-cultural partnerships can overcome challenges and leverage strengths for mutual benefit. Its history reflects the complexities of global business and the ongoing need for adaptability, innovation, and strong leadership.

Mitsubishi Motors joined the Renault-Nissan Alliance in 2016, expanding the partnership to form what is now often referred to as the Renault-Nissan-Mitsubishi Alliance. This inclusion was marked by Nissan's acquisition of a 34% equity stake in Mitsubishi Motors, making Nissan the largest shareholder and effectively rescuing Mitsubishi Motors from a financial and reputational crisis it was facing due to a fuel economy scandal in Japan.

As of today, the Alliance ranks as the third-largest automotive entity worldwide, with a strategic position to lead as the foremost manufacturer of electric vehicles (EVs). It boasts a global workforce of 375,000.

A notable innovation from the Alliance is the Leader-Follower scheme, where the member with the greatest expertise in a specific area — whether it be platform design, manufacturing processes, powertrain technology, or battery development — leads and shares its knowledge with the others. This approach streamlines development processes, leveraging the collective assets of the Alliance, ensuring that no partner has to begin their innovation journey from zero.

This strategy ensures customer demands are met while fostering the spread of innovative technologies more cost-effectively. For example, Mitsubishi Motors' latest ASX and Colt models incorporate platform technologies from Renault, illustrating the practical benefits of this collaborative approach.

Addressing the urgent call for sustainable mobility, the Alliance has dedicated 10 billion euros to research and development in electrification, supplemented by an additional investment of 23 billion euros. With these funds, the Alliance plans to launch 35 new EV models by 2030, aiming to base nearly 90% of new models on five standardized EV platforms. This strategy is designed to meet diverse global market needs efficiently.

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The Alliance also focuses on the entire vehicle lifecycle, encompassing logistics, after-sales services, charging infrastructure, and battery recycling. Efforts to optimize logistics aim to reduce costs and boost the profitability of retail operations, expand shared outlet networks, and improve resale and after-sales services through a unified European service framework, underlining the Alliance's commitment to sustainability and customer satisfaction across its operations.

BMW X TOYOTA

In 2011, BMW Group and Toyota Motor Corporation (TMC) signed a memorandum of understanding (MOU) for a mid-to-long-term collaboration on next-generation environment-friendly technology. The companies wanted to increase their collaboration particularly in the field of next-generation lithium-ion battery technology. Additionally, Toyota Motor Europe (TME), TMC's European subsidiary, and BMW signed a contract concerning the sale of low CO2 emission diesel-powered vehicles.

In 2012, the alliance broadened as a new joint R&D project was launched, focusing on lithium-air battery technology, commonly known as post-lithium battery technology.

Another key development was the position the companies took on **fuel cell systems.**
BMW Group and TMC decided to jointly develop a foundational fuel-cell vehicle system, covering components like the fuel cell stack, hydrogen tank, motor, and battery. Collaboration would also involve cooperation in assessing hydrogen infrastructure and establishing codes and standards for the wider adoption of fuel cell vehicles.

The Hydrogen Fuel Cell Vehicle (FCV) is a vehicle that uses hydrogen as a fuel source to generate electricity through a chemical reaction that takes place inside of a fuel cell. In these vehicles, hydrogen gas reacts with oxygen from the air in a fuel cell stack, producing electricity, water, and heat as byproducts. Following the generation of electricity, the electric motor that propels the vehicle is powered. Because of its potential for zero-emission transportation and easy refilling, FCVs are seen as a possible alternative to traditional internal combustion engine (ICE) vehicles.

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Market research[12] shows that the global fuel cell market is estimated to grow from USD 3.3bln in 2023 to USD 8.7bln by 2028. Moreover, it is expected to record a compound annual growth rate of 21.7% during the forecast period.

However, there are mounting challenges. Storing and transporting hydrogen poses technical complexities, and hydrogen fuel cells, while efficient, are expensive to manufacture. Infrastructure is also scarce, and the establishment of an extensive refueling network requires substantial investment. Another challenge lies in the energy-intensive process of hydrogen production. Most hydrogen is currently produced through methods like steam methane reforming, which relies on fossil fuels. This process not only contributes to carbon emissions but also diminishes the environmental benefits of using hydrogen as a clean fuel source. Developing more sustainable and energy-efficient methods for hydrogen production is a key challenge for the future of FCVs.

BMW and Toyota have long been proponent of the technology and both founding members of the Hydrogen Council[13].

Toyota started developing hydrogen FCVs in 1992.

In 2014, Toyota introduced its debut model to world markets, the Mirai, a four-door sedan with range of approximately 312 miles (502 km) on a full hydrogen tank.

BMW unveiled[14] the world's first hydrogen 12-cylinder engine in 1989. The Munich-based company then presented the H7 in 2005, however the car used combustion engine to burn the hydrogen.

BMW showcased its first fully FCV, the BMW iX5, at the Munich Motor Show in September 2021. The vehicles was finally marketed in 2023.

The **cooperation agreement** between the German and Japanese manufacturers' revolves around Toyota-made fuel cells, while the overall system design is provided by BMW[15].

In December 2023, **Toyota Motors Europe** declared its intention to establish **Hydrogen Factory Europe**. The Japanese manufacturer expressed its vision, stating that[16] : "it expects Europe to be one of the world's largest

[12] https://www.marketsandmarkets.com/Market-Reports/fuel-cell-market-348.html?gclid=EAIaIQobChMI7rnL47q3_QIVUwGLCh37kwc1EAAYASAAEgKwEfD_BwE

[13] https://hydrogencouncil.com/en/

[14] https://www.bmwgroup-classic.com/en/history/hydrogen.html

[15]

[16] https://newsroom.toyota.eu/toyota-hydrogen-factory-scaling-up-its-european-activities/

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hydrogen fuel cell markets by 2030, with steady acceleration of different mobility and power generation applications. Growing investment and regulatory measures are encouraging development and market growth. These include €45 billion investment from the EC's Green Deal by 2027 and the EU's transport infrastructure fund has awarded 284 million euros – or approximately one third of its budget - for the installation of hydrogen refuelling stations."

Cooperation between European and Japanese companies has also been significant in the H2 Mobility project. H2 MOBILITY Deutschland GmbH & Co. KG is responsible for developing the hydrogen infrastructure across Germany[17], which has arguably been a leader in the deployment of infrastructure. BMW, Honda, Hyundai, Toyota and Volkswagen advise H2 MOBILITY, in their capacity as associated partners.

In 2022 EU and Japan signed[18] a Memorandum of Cooperation on hydrogen, as part of the EU-Japan Green Alliance . As frontrunners in hydrogen technology, the EU and Japan will work together for sustainable and affordable production, trade, transport, storage, distribution and use of renewable and low-carbon hydrogen. The cooperation will help to establish a rules-based and transparent global hydrogen market without distortions to trade and investment. The Memorandum identifies a set of areas in which governments, industrial players, research institutions and local authorities in the EU and Japan will be encouraged to cooperate, such as:

- Policies, regulations, incentives and subsidies, including at the international level to work towards common standards and certification;
- Best practices and lessons learnt in renewable and low-carbon hydrogen research, development, applications and demonstration projects;
- Project development including in the context of multilateral cooperation initiatives, including with a view to supporting other countries around the world;
- Education, upskilling, reskilling and vocational education and training, including via exchanges.

Kawasaki Heavy Industries x Daimler

A notable collaboration in the advancement of hydrogen-powered motor vehicles involves Kawasaki Heavy Industries and Daimler, both of which are esteemed entities in the automotive realm.

[17] https://h2-mobility.de/wp-content/uploads/2017/09/H2M_PM_H2Live_Crossborder_170925.pdf

[18] file:///Users/mishelreali/Downloads/EU_and_Japan_step_up_cooperation_on_hydrogen%20(1).pdf

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In 2013, Kawasaki embarked on the development of a sophisticated high-pressure hydrogen regulator. This endeavor was undertaken as a collaborative effort with NuCellSys, a subsidiary of Daimler. Leveraging its profound expertise in fluid control technologies alongside NuCellSys's comprehensive understanding of fuel cell systems, Kawasaki achieved a breakthrough by engineering a hydrogen regulator noted for its exceptional reliability and performance.

Despite the innovation, the project faced a regulatory hurdle: the necessity to align with EU Regulation No 79/2009, which sets forth stringent requirements for hydrogen-powered vehicles. To navigate this challenge and ensure compliance, Kawasaki forged a partnership with TÜV SÜD, a leading certification body known for its rigorous testing and validation services.

This collaborative venture culminated in the integration of Kawasaki's high-pressure hydrogen regulator into Daimler's pioneering fuel cell vehicle, the Mercedes-Benz GLC F-CELL. This marked a significant milestone, as it represented Daimler's first foray into the realm of fuel cell vehicles, thereby reinforcing the viability and potential of hydrogen as a sustainable fuel source for the automotive industry.

VOLVO x ISUZU

In 2019, the Volvo Group and Isuzu Motors signed a non-binding Memorandum of Understanding (MOU) to form a strategic alliance. The primary goal was to transfer ownership of UD Trucks from Volvo Group to Isuzu Motors, aiming to leverage the increased volumes and complementary strengths of both companies. This move sought to harmonize their geographical presence and product lines, enhancing their cooperative potential.

By 2020, the agreement was finalized, resulting in Isuzu Motors acquiring UD Trucks for JPY 243 billion. The acquisition aimed to foster a technology partnership, focusing on leveraging each company's expertise in both current and emerging technologies to support investment in leading-edge technology. The partnership plans included:

- Joint development by Isuzu Motors and UD Trucks of platforms for medium to heavy-duty trucks, primarily for Asian markets, incorporating Volvo Group technology.

- Collaboration on new technologies such as autonomous driving, connectivity, and electric vehicles.

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The alliance also aims to explore further collaboration opportunities within the commercial vehicle industry, focusing on urban logistics solutions. This initiative is part of a broader strategy to address the automotive industry's shift towards the CASE paradigm — Connectivity, Automation, Sharing, and Electrification.

In alignment with a common trend in the automotive industry, Isuzu Motors acknowledged the exponential R&D investment costs needed for new technologies. The company views its partnership with Volvo Group, which is at the forefront of next-generation automotive technologies, as a strategic initiative. This collaboration is intended to provide Isuzu Motors with access to advanced technologies, thereby reinforcing its standing in an increasingly competitive and evolving industry landscape.

Daimler Truck AG (Germany) × Mitsubishi Fuso Truck Bus× Hino Motors (TOYOTA motor group)

In 2003, Daimler AG acquired a significant 43% share in Mitsubishi Fuso as part of the separation of the Truck & Bus Division from Mitsubishi Motor Corporation. Mitsubishi Fuso Truck and Bus Corporation (MFTBC) is a leading manufacturer of commercial vehicles in Japan, offering an extensive range of trucks and buses engineered to meet a variety of operational needs.

Since 2011, Daimler has held a dominant stake of approximately 90% in Mitsubishi Fuso, underscoring a strong commitment to the brand and its global presence. FUSO's manufacturing footprint spans across strategic locations: trucks are produced in Kawasaki, Japan, Oragadam near Chennai, India, and Tramagal, Portugal, while its buses are manufactured in Toyama, Japan. Beyond these manufacturing hubs, FUSO extends its global reach through 16 local assembly plants, employing a knock-down assembly process that allows for local manufacturing efficiencies and market responsiveness.

In May 2023, Daimler Truck, MFTBC, Hino Motors, and Toyota made a joint announcement about an agreement to merge Hino Motors and MFTBC. This move is aimed at speeding up the development of technologies related to Connectivity, Automation, Sharing, and Electrification (CASE) within the automotive sector.

The agreement places Hino and MFTBC as equals, highlighting a shared goal to work together in developing, supplying, and manufacturing commercial vehicles. The main aim here is to make the merged company a strong competitor in the commercial vehicle market and to achieve carbon neutrality in transportation.

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Additionally, Daimler Truck and Toyota have committed to supporting this new company by working together on hydrogen technology. This is expected to make the company more competitive. The CEO of Daimler Truck highlighted how commercial vehicles play a critical role in achieving sustainable transport, and he also noted that this merger should help stabilize jobs and promote growth in the automotive sector, not just in Japan but across Asia.

Stellantis x Toyota

The partnership initially started in 2012 between the PSA Group and Toyota, aiming to strengthening their position in the light commercial vehicles (LCV) segment.
By 2019, the collaboration had already yielded significant results with the introduction of a new compact-size LCV, manufactured at PSA's plant in Vigo, Spain.

In 2021, the automotive industry witnessed the creation of a new global powerhouse through the merger of two prominent players: PSA Group and Fiat Chrysler Automobiles (FCA). This landmark merger gave rise to Stellantis. PSA Group, with its roots in France, was renowned for its strong portfolio of brands including Peugeot, Citroën, DS, Opel, and Vauxhall. FCA, on the other hand, brought together a diverse array of iconic automotive brands such as Fiat, Chrysler, Jeep, Dodge, Ram, and Alfa Romeo, with a heritage that spans Italy, the United States, and beyond. The merger was not just a consolidation of brands but a fusion of rich histories and innovative technologies from both sides of the Atlantic. The strategic decision to merge was driven by several factors, key among them being the need to pool resources for the development of new technologies, including electric and autonomous vehicles. The automotive industry is at a pivotal moment, facing challenges such as stringent emissions regulations, the shift towards electrification, and the advent of smart, connected vehicles.

The strategic partnership with Toyota continues. The partnership entered a new phase in 2022 with the agreement to produce a large-size commercial van, this time expanding the offering to include a battery electric version. This expansion was a clear indication of both companies' commitment to innovation and sustainability, aligning with the global automotive industry's shift towards electrification.
Stellantis' role in providing the latest large-size commercial van to Toyota Motor Europe (TME) for marketing in Europe underlines the strategic importance of this collaboration. Scheduled for production in Stellantis' plants in Gliwice, Poland, and Atessa, Italy, this new vehicle segment is anticipated to make its debut in mid-

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2024. It represents TME's strategic entry into the large-size van market, a sector that demands high levels of reliability, efficiency, and adaptability to meet the diverse needs of commercial users.

Mazda x Iberdrola

In 2020, Mazda took a significant step towards enhancing its commitment to electric mobility by forging a strategic collaboration with Iberdrola, a frontrunner in the clean energy sector known for its extensive clean energy grids and storage solutions. This partnership is poised to facilitate the provision of charging points for electric vehicles (EVs), along with related services, underscoring Mazda's dedication to fostering sustainable mobility solutions.

The Hiroshima-based company has been a longstanding advocate for sustainable development, a commitment that was formalized with the unveiling of its "Sustainable Zoom-Zoom" vision in 2007. This ambitious initiative laid out Mazda's environmental goals, aiming for a substantial reduction in carbon dioxide emissions. Specifically, Mazda set its sights on cutting CO2 emissions to an average of 50% below the levels of 2010 by the year 2030, with a further goal to achieve a 90% reduction by 2050. This strategic alignment with Iberdrola marks a pivotal advancement in Mazda's journey towards achieving these environmental milestones, showcasing the automotive manufacturer's proactive approach to integrating sustainability into its core operations.

Japanese Production Facilities in Europe

Based on the 2019 report from the Japanese Automobile Manufacturers Association (JAMA), Japanese automotive manufacturers have made a significant impact on the European Union (including the United Kingdom, which at the time was still a Member State) through their local production, employment, and research and development activities.

As of 2018, JAMA member companies operated a total of 14 production plants and 16 R&D facilities across the European Union. These facilities collectively produced 1.35 million vehicles, of which 280,416 were exported worldwide. Furthermore, these operations directly or indirectly employed 172,757 individuals and made substantial purchases of European-made auto parts, totaling €15.14 billion. The engagement of Japanese automakers in Europe reflects their commitment to fostering innovation and sustainable mobility solutions within the region.

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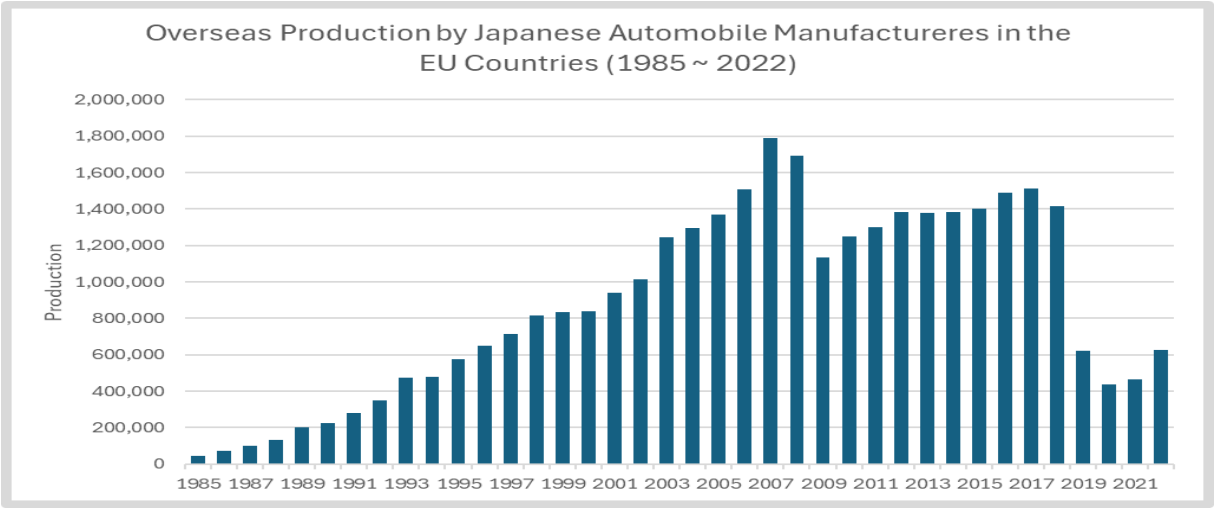
This engagement has been part of a broader effort to adapt to and shape the automotive industry's future, with significant investments in electric and fuel cell vehicles, energy supply, and artificial intelligence, in collaboration with various stakeholders in Europe. The presence of Japanese automakers in Europe is not only a testament to their global strategy but also highlights the strong economic ties and technological exchange between Europe and Japan, contributing positively to the European automotive landscape and its transition towards greener and more sustainable mobility options.

As of 2022, Japanese automotive manufacturers produced 625,566 vehicles, demonstrating ongoing growth and adaptation to the European market's evolving demands and regulatory environment



2.1 B2B Dynamics in the automotive supplier sector

Denso x Infineon Technologies

In 2019, Denso, a leading global manufacturer of automotive components, invested in Infineon Technologies AG, a producer of semiconductor products for vehicles. This investment is aimed at merging Infineon's state-of-the-art semiconductor technologies with Denso's in-vehicle technology expertise. The collaboration is particularly focused on accelerating innovation in mobility solutions, with a keen emphasis on autonomous driving technology.

Denso x Tom Tom

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In the same year, Denso expanded its ventures into autonomous driving technology by partnering with TomTom, a Dutch company renowned for its location technology. This partnership centers around the development of a software platform crucial for the operation of autonomous vehicles (AVs).

Denso x PiNTeam

In 2019, Denso secured a 49% equity stake in PiNTeam Holding GmbH, a German startup acclaimed for its innovative in-vehicle embedded software technologies. This strategic investment by Denso aims to fast-track the development of software that controls in-vehicle electronic control units (ECUs), a critical component in modern vehicles that are increasingly reliant on advanced technological systems.

Denso Ten x Cinemo

Denso Ten and Cinemo signed a strategic collaboration agreement to revolutionize automotive entertainment and connectivity. This partnership aims to elevate the in-car entertainment experience by offering advanced audio and video playback, seamless smartphone integration, and superior connectivity features.

NTT Docomo x Valeo

NTT Docomo, Japan's premier mobile operator, form a partnership with Valeo, a French automotive supplier. The objective of this collaboration is to jointly develop services for connected cars and mobility, combining Valeo's expertise in on-board equipment with Docomo's telecommunications services. This partnership is set to explore next-generation mobility services in the 5G/V2X era, digital services for cars using smartphones, and improved controls for on-board equipment, marking a significant step towards integrating telecommunication technologies with automotive innovation.

Piolax x ARaymond SCS

Piolax, a Japanese manufacturer specializing in automotive springs and industrial-use fasteners, formed a business alliance with ARaymond SCS, a French manufacturer also specialized in fasteners, back in 2001. This alliance highlights the ongoing collaboration between Japanese and European companies in the automotive components sector.

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Horiba x FuelCon AG

Horiba, Ltd., a Japanese multinational company known for its manufacturing and supply of instruments and systems for various industries including automotive test systems, completed the acquisition of FuelCon AG in 2019. FuelCon AG, based in Germany, is a leading supplier in the fields of engine, driveline, brake, and emissions test systems, showcasing Horiba's commitment to expanding its capabilities in automotive testing.

Volkswagen x Sankyotateyama

Sankyotateyama signed a partnership with Volkswagen for the ongoing development of the MEB modular system for electric vehicle (EV) manufacturing. This includes extrusion, additional processing, and surface treatment, with STEP-G supplying Volkswagen with the finished parts produced using a fully automated production line.

Sekisui Plastics x Proseat

Sekisui Plastics acquired the Proseat Group, which is a leading automotive component supplier. Established in 1999, Proseat emerged as a collaborative effort between Recticel and Canadian partner Woodbridge Foam Corporation. Its primary focus is catering to Tier 1 and OEM (original equipment manufacturer) car manufacturers by supplying molded seat pads, headrests, and armrests made of polyurethane. The Proseat Group comprises eight entities spread across six European countries (Germany, Czech Republic, France, Poland, Spain, and the United Kingdom). Positioned as Europe's largest independent automotive parts manufacturer, Proseat specializes in seat-use cushion material, trim components like headrests and armrests, and foamed molding for European automobile companies.

Hitachi x IAV

Hitachi and IAV entered into a cooperation agreement focused on developing innovations in the field of autonomous driving. IAV, a leading provider of engineering services to the automotive industry, brings over 30 years of experience in developing innovative concepts and technologies for future vehicles, complementing Hitachi's efforts in autonomous driving development.

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Renesas Electronics x Hella Aglaia

Renesas Electronics Corporation, a leading Japanese semiconductor manufacturer, partnered with Hella Aglaia, a German-based company specializing in computer vision solutions for advanced driver assistance systems (ADAS). Their collaboration, initiated in 2017, aims to produce an open and scalable front camera solution for ADAS and automated driving, highlighting the synergy between semiconductor technology and computer vision expertise.

Asahi Kasei x Senseair AB

Asahi Kasei Corporation is a Japanese multinational conglomerate that operates in various sectors, including chemicals, housing, healthcare, and electronics. Operating also in the automotive industry, in 2016 it signed an agreement with SenseAir, a leading global prodvider of air and gas sensing technology. In 2016, AKM signed a joint development agreement with Senseair, which has a 25-year track record in the field of NDIR CO_2 sensor modules. The two companies have collaboratively worked on the development of new CO_2 sensors by combining Senseair's optical path design technology and manufacturing know-how for gas sensors with AKM's small, high-quality IR light emitting elements and detectors.
In 2018, Asahi Kasei acquired[19] the shares of the Swedish-based company.

Nidec Corporation x Groupe PSA (now Stellantis)

Nidec Corporation is a Japanese company known for specializing in the manufacturing of electric motors and related products. Nidec produces a wide range of motors used in various applications, including automotive, appliances, industrial equipment, and more. It signed a joint venture agreement with then Groupe PSA (now Stellantis) to design, manufacture and sell motors for electric & hybrid vehicles.

Alpha Group x SPPP

ALPHA group is a Japanese automotive Tier 1 supplier, historical actor of locks systems in general. In particular one of the group iconic well-known product, is the individual locker bearing ALPHA logo. A few years ago it

[19] https://www.asahi-kasei.com/news/2017/e180201.html

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acquired SPPP, a company specialized in painting of plastic materials. The Slovakian-based company addresses niche market as well as large OEM serial production.

Kasai x Röchling Automotive

In 2019, the Japanese automotive supplier Kasai Kogyo Corporation expanded its european footprint by acquiring the Röchling Automotive plant, located in Wolfsburg-Hattorf, Germany. Röchling Automotive, known for its production of high-quality automotive interior parts such as doors and side panels, became a part of Kasai, including its entire operations and workforce.

Sumitomo Electric Industries x Sinterwerke Group

Sumitomo Electric Industries (SEI), a Japanese leader in automotive supplies manufacturing, in 2018 acquired for 71 million the operations of the Sinterwerke Group (SWG), a company specializing in the production of high-density sinter parts for the automotive industry. This move was part of SEI's strategy to expand its market reach into Europe, leveraging SWG's expertise and customer base.

Rohm x ST micro electronics

ROHM Semiconductor and STMicroelectronics have joined forces to advance the development of silicon carbide (SiC) power devices. SiC technology is superior to traditional silicon in efficiency and power density, making it highly suitable for automotive, industrial, and consumer electronics applications. This collaboration merges both companies' semiconductor expertise to accelerate the production of high-performance SiC solutions, catering to the growing demand for more efficient electronic devices.

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2.2 Collaboration on third-party projects

German-Japanese Research Cooperation in Automated and Connected Driving (VIVID)

VIVID[20] is a project promoted by the German Centre for Research and Innovation (DWIH), which serves as a platform to promote collaboration between German and Japanese research organisation and companies.

This project establishes a collaborative platform uniting leading German and Japanese research organizations and companies in the pursuit of advancing automated and connected driving technologies. Notable participants include industry giants such as Mercedes-Benz AG, Toyota Motor Co., Honda Motor Co., Nissan Motor Co., among others.

The primary objective of VIVID is to catalyze research cooperation in automated and connected driving. It aims to develop and refine test methodologies, thereby facilitating a rich exchange of knowledge and technical expertise through cooperative R&D efforts. Central to VIVID's mission is addressing the crucial question of how the safety of connected and automated driving functions can be thoroughly tested, evaluated, and ensured.

Automated Vehicles (AVs) promise a transformative impact on the transportation sector, with potential benefits extending to environmental sustainability. Research indicates that the widespread adoption of AVs could significantly reduce greenhouse gas emissions, with projections suggesting a decrease of up to 34% in total transportation emissions by 2050. Further, a study by the National Renewable Energy Laboratory (NREL) suggests that AVs could realize energy savings of up to 18% by 2050.
One of the key ways AVs contribute to emission reduction is through enhanced fuel efficiency. Equipped with sophisticated sensors and algorithms, AVs can adopt smarter driving patterns, eliminating the common human errors of sudden acceleration and unnecessary braking. This not only conserves energy but also leads to a marked reduction in overall fuel consumption and, consequently, lower carbon emissions.

Beyond environmental benefits, AVs hold the potential to address several societal challenges. Greenwald and Kornhauser (2019) highlight AVs' capacity to mitigate issues such as the 1.3 million annual global accident fatalities, the vast amounts of time spent driving with low seat occupancy, vehicles being idle 96% of the time,

[20] https://www.dwih-tokyo.org/en/2022/12/15/vivid/

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and driving-related stress. Additionally, AVs present new commercial opportunities and synergies with public transport services, enriching societal value.

The Society of Automotive Engineers (SAE)[21] has identified six levels of driving automation, ranging from Level 0 (no automation) to Level 5 (full autonomy), delineating the progression from manual driving experiences to fully autonomous vehicles capable of operating without human intervention under all conditions. This spectrum of automation underscores the technological evolution and the intricate work required to ensure that AVs are safe, efficient, and integrated into the broader transportation ecosystem.

Horizon 2020 – SICORP

The EU and Japan have long been cooperating on advancing scientific and technological research; the two parties signed the Science and Technology Cooperation Agreement in 2009, which entered into force in 2011. A recent investment which is particularly relevant for the automotive industry is a joint investment of 10,7 million in advanced biofuels and alternative renewable fuels. This investment comprises three projects, with €9.5 million sourced from Horizon 2020—the EU's flagship research and innovation programme for the years 2014-2020—and an additional €1.2 million contributed by Japan's Strategic International Collaborative Research Program (SICORP).

The funded projects include:

LAURELIN, aimed at advancing renewable methanol production for use in heavy-duty road transport. This project will explore innovative catalyst systems and CO2 hydrogenation technologies, including Magnetic Induction, Non-Thermal Plasma Induction, and Microwave technologies. A joint grant of €4.9 million supports the collaboration between eight European and two Japanese organizations.

4AirCRAFT, addressing the critical demand for low or net-zero emission aviation fuels. The project seeks to develop pioneering catalysts for converting CO2 directly into liquid aviation fuels, integrating three key reactions within a single reactor. A consortium comprising seven European and one Japanese organization, with the addition of one Brazilian organization, is funded with a €2.6 million grant.

[21] https://www.sae.org/standards/content/j3016_202104/

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ORACLE, focusing on producing renewable ammonia from nitrogen and H2O for use as shipping fuel. It will explore various catalysis processes for ammonia synthesis, including electro-catalytic, plasma-aided electro-catalytic, and electrified thermal catalysis, to facilitate on-site ammonia production. A consortium of six European and two Japanese organizations has been awarded a €3.2 million grant.

H2 Mobility

The H2 Mobility Project is an initiative focused on promoting the development and deployment of hydrogen infrastructure for fuel cell vehicles. It aims to establish a network of hydrogen refueling stations, making hydrogen more accessible to support the growth of the FCV market. The project involves collaboration among various stakeholders, including government entities, industry partners, and research organizations, working together to address challenges and advance the adoption of hydrogen as a clean energy source for transportation.

The partners involved in the H2 Mobility Project include various companies and organizations from the automotive, energy, and technology sectors. Some notable partners include automakers like BMW, Daimler, and Volkswagen.
Three Japanese companies joined the project as associated partners: Nissan, Toyota and Honda.

In 2022 TME signed[22] a MOU with Air Liquide and Caetano Bus with the aim of developing integrated hydrogen solutions.

[22] https://newsroom.toyota.eu/toyota-air-liquide-and-caetanobus-join-forces-to-accelerate-the-development-of-hydrogen-mobility-in-europe/

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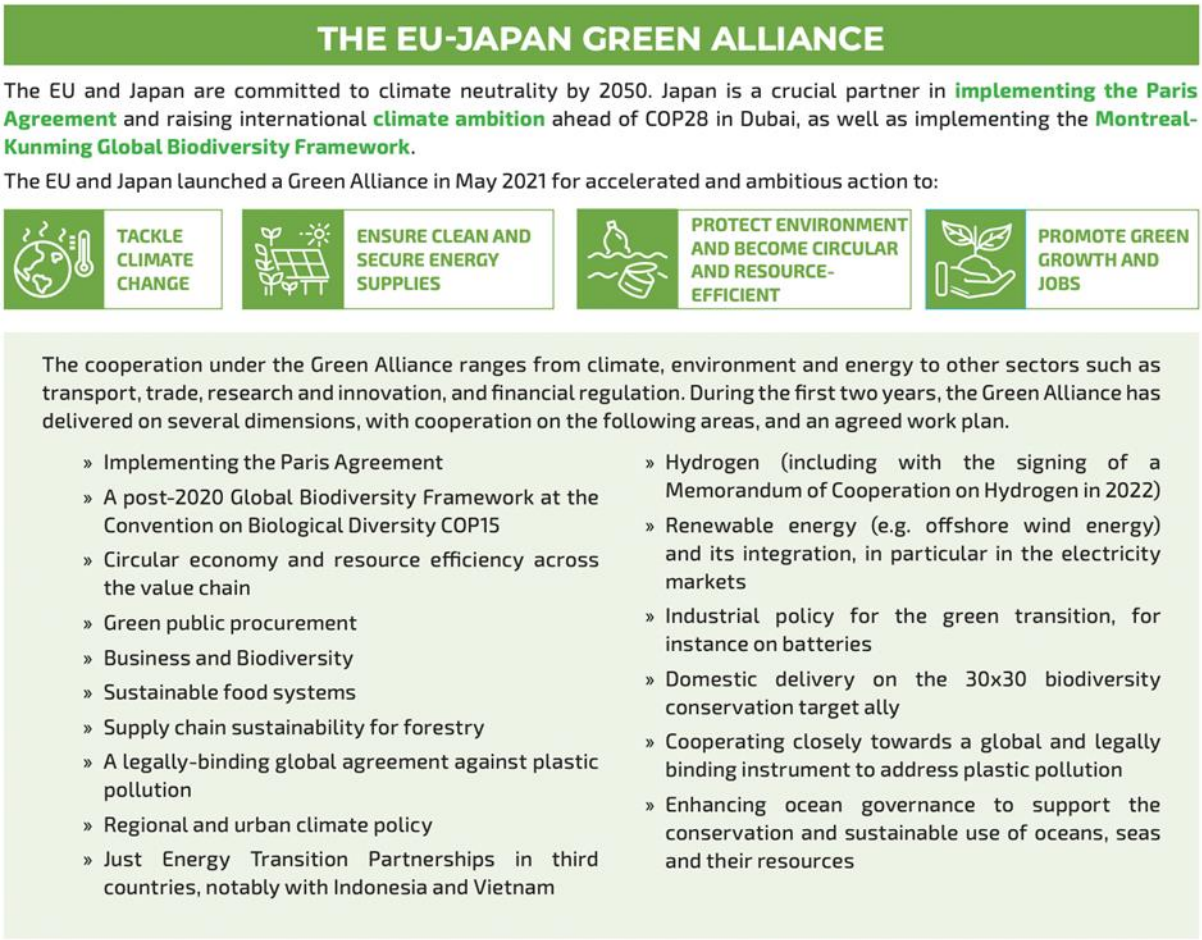
3. The impact of the Green Transition on the Automotive Industry

The EU and Japan are both leaders in terms of the fight against climate change. Policies have been rolled out in both Brussels and Tokyo to slash emissions and the stated goal is to become carbon neutral by 2050. At the EU-Japan Summit in May 2021, the EU and Japan launched a Green Alliance. In the Summit declaration both sides also highlighted the need for:" strengthening their regulatory cooperation, so as to spur the global momentum for the uptake of innovative environmental solutions, sustainable products and safe and sustainable low - carbon technologies of key importance, in order to accelerate the transition to circular and climate neutral economies and to promote those standards globally."



High levels of emissions have long been associated with the automotive industry.

Research shows that the transport sector significantly contributes to global CO2 emissions, comprising 16.2% of global emissions in 2016 (Ritchie and Roser, 2020). Specifically, within the transport sector, road transport stands out as the leading source of CO2 emissions, responsible for 74.5% of the emissions generated in the

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sector in 2018 (Ritchie, 2020).

In 2023, approximately 25% of the EU's total GHG emissions stem from the transport sector. Among transportation modes, road vehicles contribute significantly, making up 71% of the total emissions.

Comparatively, as of 2021, the transport sector in Japan accounted for 17.4% of the country's overall emissions.

3.1 EU policies impacting the automotive industry

Cutting GHG emissions has long been a priority in the EU. In 2008 EU leaders agreed that by 2020 the EU would slash GHG emissions by 20% from 1990 levels. A goal that was achieved three years ahead of schedule. In 2014 the objective was raised at cutting down emissions by at least 40% by 2030.

In December 2019, the EC introduced the European en Deal, a landmark set of policy initiatives designed to achieve a 55% reduction in GHG emissions by 2030 and establish Europe as the first climate-neutral continent by 2050. As an interim milestone, the EC, in February 2024, the EC disclosed its climate target for 2040, aspiring to slash GHG emissions by 90% compared to 1990 levels.

The EC publishes a yearly Climate Action Progress Report (CAPR). As of 2023, these are the latest EU GHG net emissions, targets and aggregated Member States' projections.

Figure 2.a

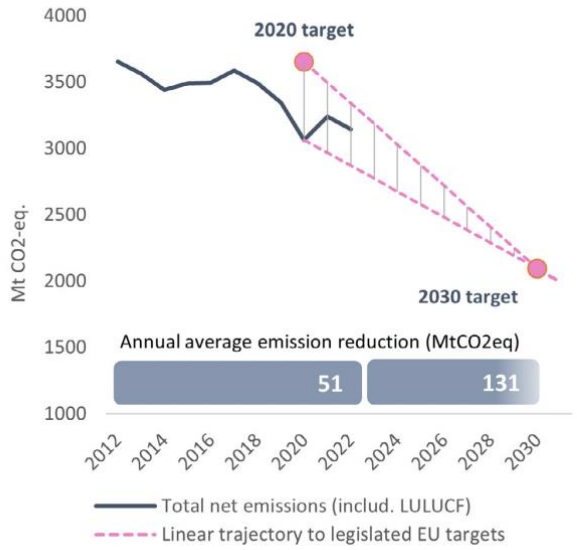
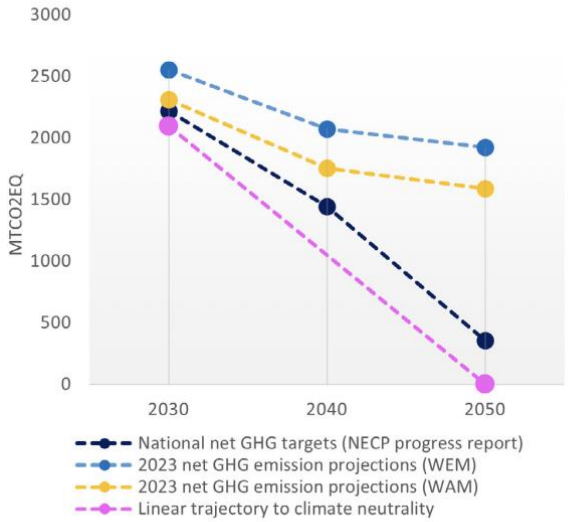


Figure 2.b



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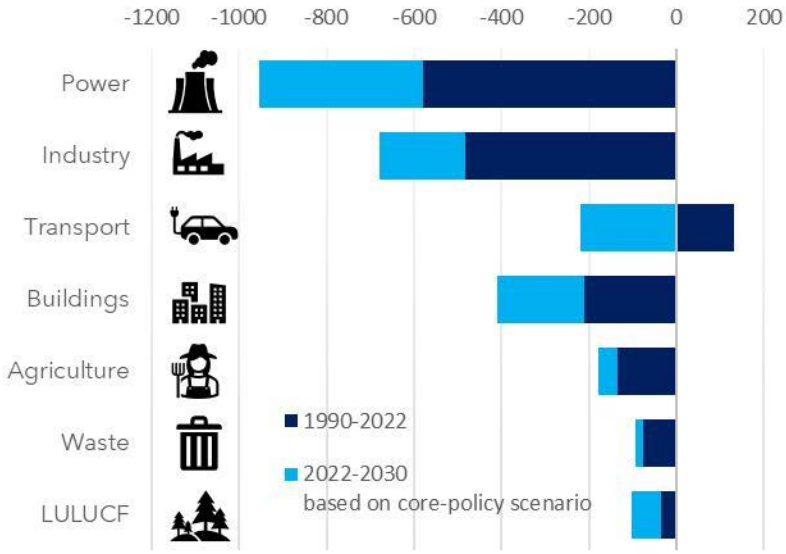
However, there is one sector where the fight to slash GHG emissions appears to be challenging. According to a study of the European Environment Agency (EEA) transport is the only economic sector which experienced an increase in GHG emissions in the past three decades.



Source: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0653

Data from Eurostat and the EEA highlight that between 1990 and 2019 GHG emissions in the EU though fuel combustion increased 23,8%, equivalent of 160 million tonnes of CO2 (values do not include international aviation and navigation/shipping).

The biggest increase happened in the years 1990-2007, then there was a decrease through 2013 mainly due to the effects of the global financial crisis. 2020 saw a drop in emissions, as the COVID-19 pandemic swiftly impacted the transport sector. 2021 then saw a rebound of 8,6% compared to the year before. Additionally, in the latest thirty years fuel combustion level per inhabitant rose 16,1% in 2019 compared to 1990.

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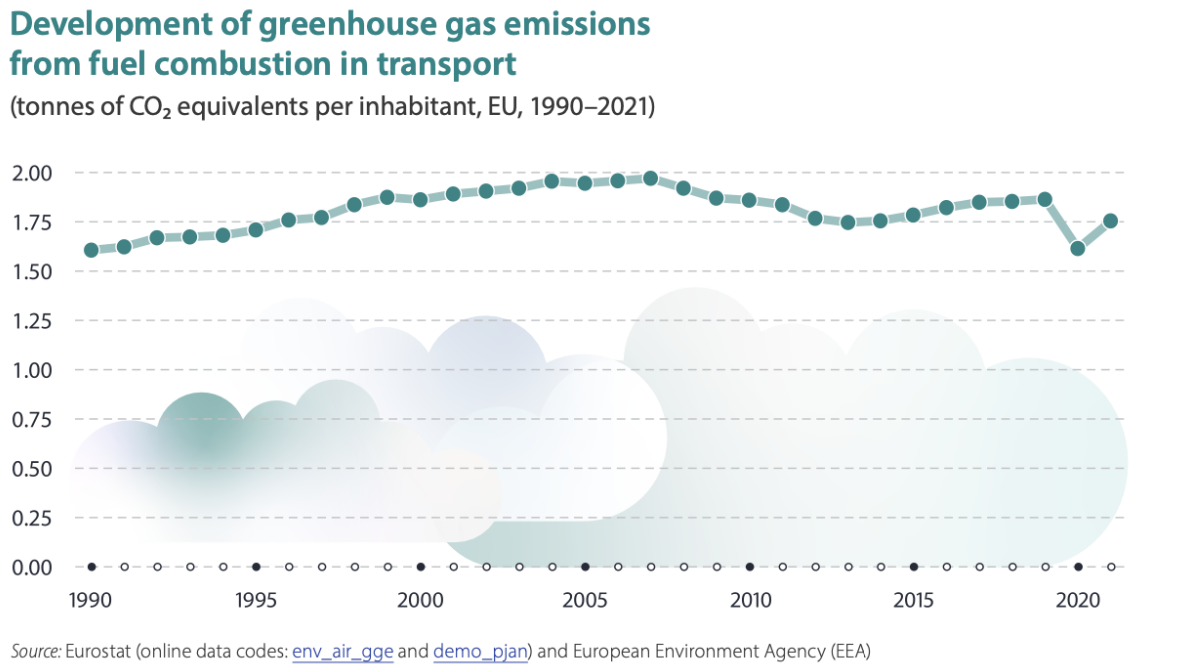
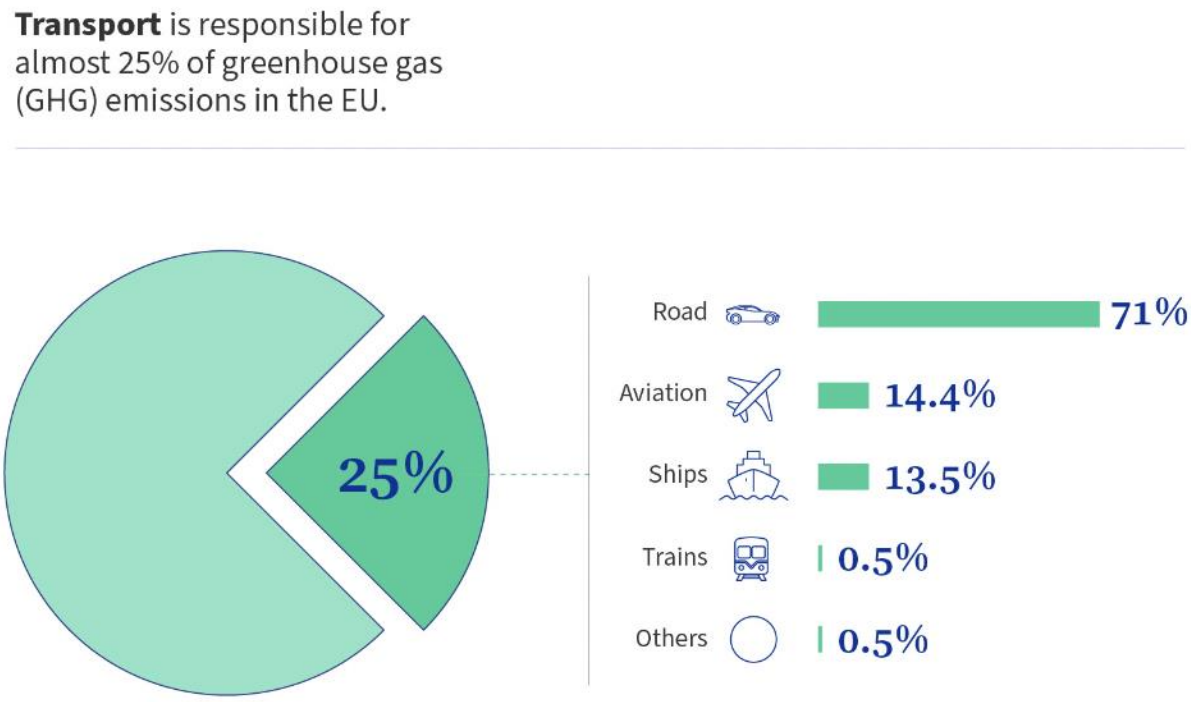


As of 2024, transport accounts for around 25% of the EU's total GHG emissions.



Source: https://www.consilium.europa.eu/media/63407/afir_sn02272_update-2023.jpg

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Regulation on CO2 emission limits for new cars and vans

A crucial measure of the Fit for 55 package, it is regarded as one of the most impactful regulations.
It sets the following targets:

- **55%** CO2 emission reductions for new cars and **50%** for new vans **from 2030 to 2034** compared to 2021 levels
- **100%** CO2 emission reductions for both new cars and vans **from 2035**

Additionally, a regulatory incentive mechanism for zero- and low-emission vehicles (ZLEV) will be put in place from 2025 until the end of 2029. If a manufacturer meets certain benchmarks for the sales of zero- and low-emission vehicles it can be rewarded with less strict CO@ targets. Benchmark set at 25% for cars and 17% for vans.

Other important provisions are included, such as:

- gradually reducing the cap of emission credits that manufacturers can receive for **eco-innovations** that verifiably reduce CO2 emissions on the road, to maximum 4g/km per year from 2030 until the end of 2034 (currently set at 7g/km per year)
- a common EU methodology, to be developed by the Commission by 2025, for **assessing the full life cycle of CO2 emissions** of cars and vans placed on the EU market, as well as for the fuels and energy consumed by these vehicles

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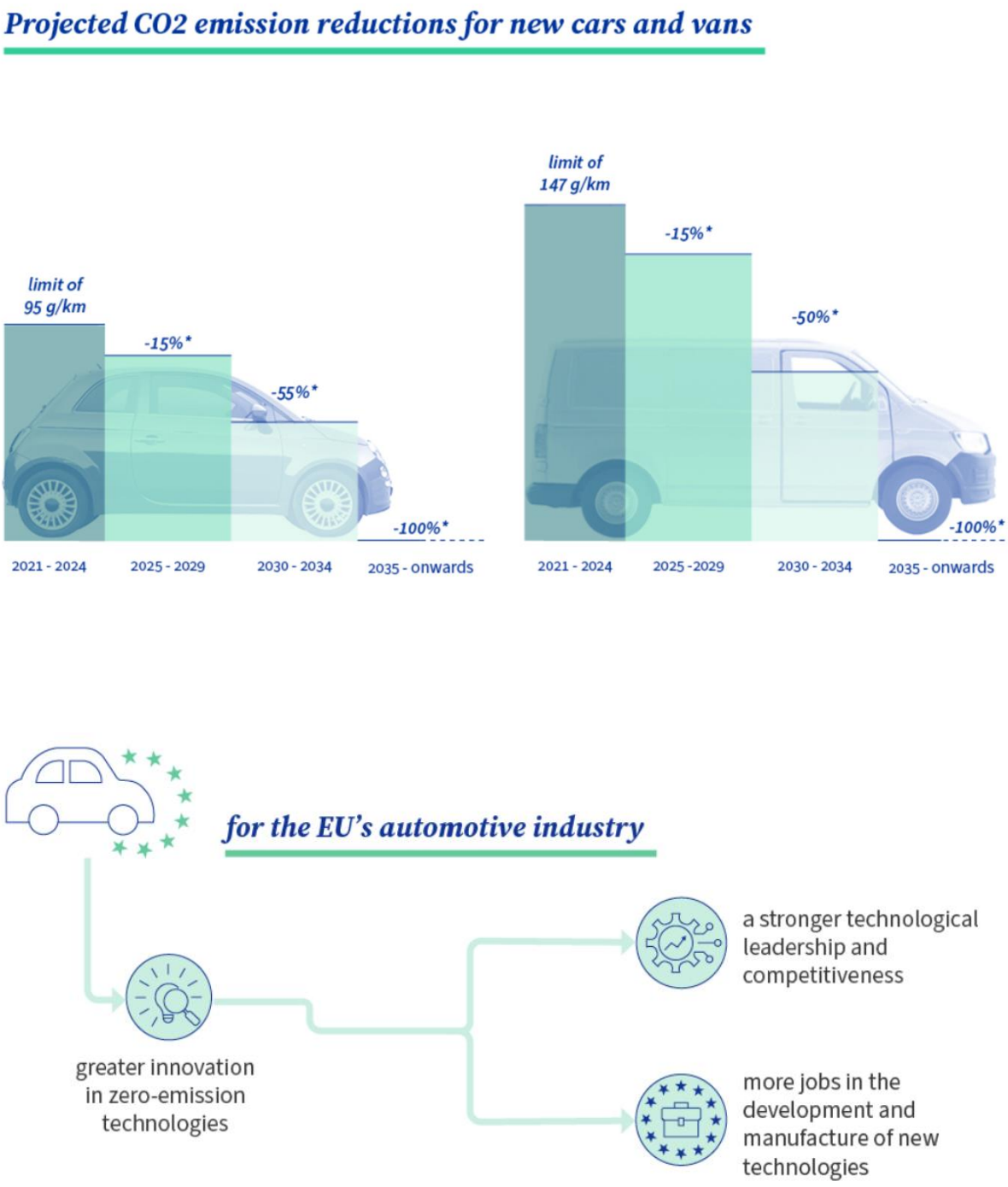

Source: https://www.consilium.europa.eu/en/infographics/fit-for-55-emissions-cars-and-vans/

Alternative Fuels Infrastracture Regulation (AFIR)

This comprehensive package is designed to facilitate the EU's endeavor to diminish its net GHG emissions by a minimum of 55% by 2030 in comparison to 1990 levels, with the overarching objective of attaining climate

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neutrality by 2050. On June 2, 2022, the Transport Council achieved a preliminary consensus regarding the proposal. Following subsequent deliberations with the European Parliament, the two principal legislative bodies arrived at a provisional consensus concerning the regulation on March 28, 2023.

The regulation text outlines specific goals that must be achieved in 2025 and 2030:

- from 2025 onwards, fast recharging stations of at least 150kW for cars and vans need to be installed every 60 km along the EU's main transport corridors, the so-called 'Trans-European Transport Network' (TEN-T)
- recharging stations for heavy-duty vehicles with a minimum output of 350kW need to be deployed every 60 km along the TEN-T core network, and every 100 km on the larger TEN-T comprehensive network from 2025 onwards, with complete network coverage by 2030
- hydrogen refuelling stations serving both cars and lorries must be deployed from 2030 onwards in all urban nodes and every 200 km along the TEN-T core network
- users of electric or hydrogen-fuelled vehicles must be able to pay easily at recharging or refuelling points with payment cards or contactless devices and without a need for a subscription and in full price transparency
- operators of recharging or refuelling points must provide consumers full information through electronic means on the availability, waiting time or price at different stations

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What will change?

passenger cars and trucks **below 3.5 tonnes**

trucks **above 3.5 tonnes**

Road transport

Recharging stations:

→ at least every 60 km on main roads (core TEN-T network)

by the end of 2025

by the end of 2030

→ every year, the total power output provided through recharging stations grows with the number of registered cars

→ at least two recharging points in each safe and secure parking area (end of 2027) and four by the end of 2030

→ recharging stations also in urban nodes

60 km

Derogations for roads with low traffic

Hydrogen refuelling stations:

→ at least every 200 km on main roads (end of 2030)

→ at least one refuelling station in every urban node

→ every refuelling station will have a designed capacity to provide 1 tonne of hydrogen per day, at 700 bar

200 km

Liquefied methane refuelling points:

→ at least along main roads to allow vehicles using methane to circulate throughout the EU

New infrastructure will have to:

→ allow ad-hoc charging

→ accept electronic payments

→ clearly inform users about pricing options

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The importance of infrastructure

Building public infrastructure such as electric charging stations and hydrogen fuelling stations will encourage consumers to shift from ICE vehicles. Range anxiety, defined as the worry of running out of battery power before reaching destination, has been and continues to be one of the main concerns for potential customers. Investments in public infrastructure injects confidence and is therefore crucial for the green transition.

The EAST-E project, which focuses on recharging infrastructure deployment in the Central and Eastern European (CEE) region, conducted a study that supports this hypothesis. The research reveals a growing consumer interest in EVs when potential buyers are made aware of the presence of extensive charging networks. Once informed about infrastructure accessibility, the proportion of positive responses climbed from 45% to 64% in Slovakia and from 25% to 48% in Czechia. https://impact.economist.com/sustainability/project/the-rev-index/ev-charging-deployment/

Patrik Krizansky, vice-president of the European Association for Electromobility (AVERE), warns of the risk of a "two-speed Europe" in the deployment of EV and infrastracture: " this two-speed Europe [between West and East, and North and South] must be avoided because it could prevent the achievement of EU emissions targets. As reported by ACEA, the five EU countries with the lowest number of chargers per 100km (penetration of between 0.2 and 0.5) are in the CEE and southern European regions. There is a clear contrast to the most built-up five (penetration of between 6.1 and 47.5), with the Netherlands, Luxembourg, Germany, Portugal, and Austria at the top of the ladder. A country's GDP per capita undoubtedly impacts the speed of the green transition. Moreover, as the prices of older ICE cars sink due to their environmental and financial burden, the CEE region is clearly becoming the graveyard of second-hand vehicles from the West." https://impact.economist.com/sustainability/project/the-rev-index/ev-charging-deployment/

EURO 7

The Euro 7 regulation is part of the EC's Sustainable and Smart Mobility Strategy and the 2021 Zero-Pollution Action Plan. It establishes rules for the exhaust gas emissions of road vehicles and for other types of emissions such as tyre abrasion and brake particle emissions. Additionally, it includes rules to improve EV battery durability.

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It has been debated for a long time and was source of controversy. In the end the agreement maintains previous existing Euro 6 exhaust emission limits for cars and vans.

Batteries Regulation

The global demand for batteries is on a rapid ascent, projected to increase 14-fold by 2030, with the EU expected to contribute to 17% of this surge, primarily fueled by the electrification of transportation.

Under the Batteries Directive, EU-level regulations have governed batteries and waste batteries since 2006. However, in December 2020, prompted by evolving socioeconomic conditions, technological advancements, market dynamics, and the expanding array of battery applications, the Commission proposed revisions to this Directive.

Initiated in 2017, the European Battery Alliance endeavors to cultivate innovation, sustainability, and global competitiveness within Europe's battery value chain. Its overarching goal is to secure a reliable supply of batteries essential for decarbonizing both the transportation and energy sectors.

A pivotal component of this strategy is the forthcoming Batteries Regulation, which aims to ensure that future batteries boast a reduced carbon footprint, contain minimal harmful substances, rely less on raw materials from non-EU sources, and undergo comprehensive collection, reuse, and recycling processes within Europe. This regulatory framework aligns with the overarching objective of transitioning towards a circular economy.

The Clean Vehicles Directive

The Clean Vehicles Directive objective is to increase the share of low and zero emission vehicles in contracts tendered by public authorities. It requires public authorities from the EU27 to purchase and promote the use of vehicles running on electricity, natural gas and hydrogen. The use of conventional diesel and petrol vehicles therefore should be dismissed.
The idea behind the policy is that widespread usage of public authorities will further enhance market stimulus and therefore greater affordability.

The directive is expected to expedite the widespread adoption of clean and energy-efficient road transport, especially in the bus sector, where public procurement constitutes over 70% of the market. The increased

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sales are projected to bring down costs through economies of scale, leading to a gradual enhancement in the energy and environmental performance of the entire vehicle fleet.

General Safety Regulation (Autonomous Driving)

The regulation establishes the legal framework for the approval of driverless and automated vehicles in the EU.

The Commission adopted technical legislation for fully driverless vehicles (level 4 of automation, e.g. urban shuttles or robotaxis), the first international rules of their kind. The technical rules set out via a delegated and implementing act establish a comprehensive assessment of the safety and maturity of the fully automated vehicles before they go onto the EU market. The rules will cover testing procedures, cybersecurity requirements, data recording rules, as well as safety performance monitoring and incident reporting requirements for manufacturers of fully driverless vehicles.

For automated vehicles replacing the driver on motorways (level 3 automation), EU legislation aligns with the UN, referring to the new UN level rules on level 3 automation.

CBAM

The EU's Carbon Border Adjustment Mechanism (CBAM) is the EU's tool to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries.

By confirming that a price has been paid for the embedded carbon emissions generated in the production of certain goods imported into the EU, the CBAM will ensure the carbon price of imports is equivalent to the carbon price of domestic production, and that the EU's climate objectives are not undermined. The CBAM is designed to be compatible with World Trade Organization(WTO) rules.

CBAM will apply in its definitive regime from 2026, while the current transitional phase lasts between 2023 and 2026. This gradual introduction of the CBAM is aligned with the phase-out of the allocation of free allowances under the EU Emissions Trading System (ETS) to support the decarbonisation of EU industry.

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3.2 GOJ policies impacting the automotive industry

Since 1990, the Japanese government has navigated a challenging path to curtail GHG emissions, culminating in ambitious targets to achieve carbon neutrality by 2050 and a substantial 46% reduction by 2030.

In 1990, Japan launched the Plan on Actions for Prevention of Global Warming. This initiative underscored Japan's recognition of its role as a key climate player on the international stage, leveraging the nation's economic and technological prowess to support developing countries. It was during this period that Japan committed to restraining the overall CO2 emissions below the 1990 levels by the year 2000, anticipating advancements in technology and the adoption of new renewable energy sources like hydrogen.

Japan significantly bolstered its global standing when it hosted the Conference of the Parties (COP3) in Kyoto in the December of 1997. This marked a crucial turning point for Japan's stance on environmental issues.

In 2015, Japan, as a signatory to the Paris Agreement and a proponent of Sustainable Development Goals (SDGs), unveiled the Long-term Prospect of Energy Demand and Supply just two months before officially endorsing the accord. This initiative aligns with the "3E+S" principle, a framework crucial for a future carbon-neutral society, encompassing Energy Security, Economic Efficiency, Environment, and Safety.

The announcement in 2020 of Japan's commitment to achieve carbon neutrality by 2050 represented a watershed moment. This ambitious goal signifies a paradigm shift in the nation's approach to combating climate change. Simultaneously, the interim target of a 46% reduction in GHG emissions by 2030 demonstrates a determined effort to accelerate progress in the next decade.

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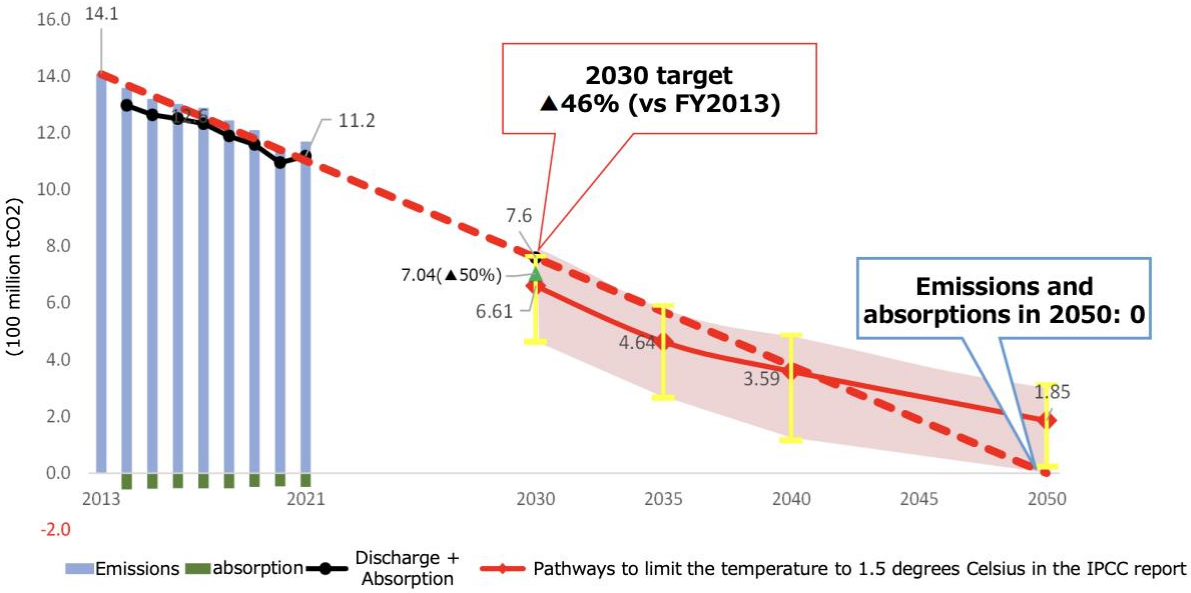
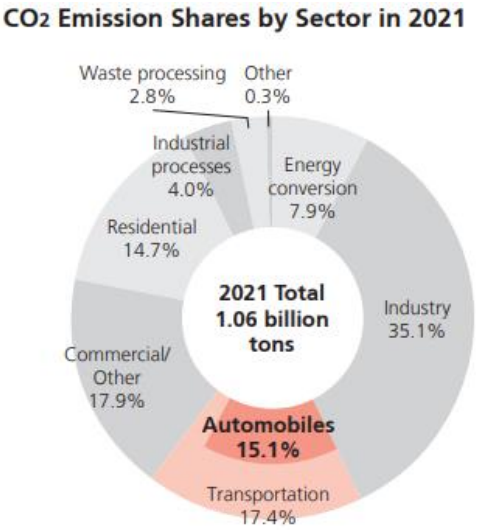


Source:https://www.meti.go.jp/policy/energy_environment/global_warming/transition/pathways_to_green_transformation_eng.pdf

In 2021, Japan emitted 1.06 billion tons of CO2, with the transportation sector contributing nearly 17%. Despite a slight increase from the previous year, CO2 emissions in Japan's transport sector have generally decreased since their peak in 2001. This decline is primarily attributed to enhanced fuel efficiency in passenger cars and improved efficiency in goods distribution. The automotive industry intends to persistently advance CO2 emission reduction in road transport by enhancing vehicle fuel efficiency and increasing the availability of next-generation vehicles in the market.



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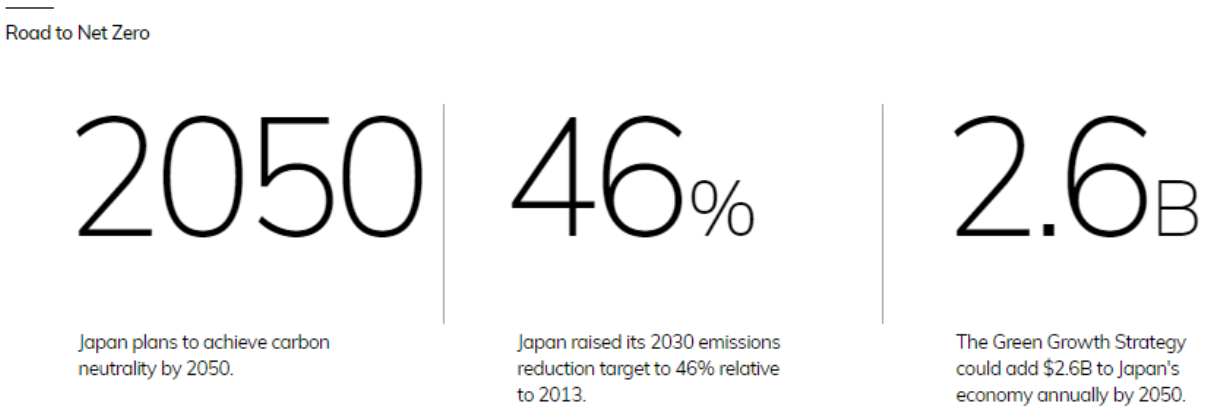
In a resolute commitment to tackle climate change and foster sustainable development, Japan unveiled its ambitious Green Growth Strategy—a comprehensive set of industrial policies designed to establish a harmonious and virtuous cycle between the economy and the environment. This forward-thinking strategy represents a pivotal step toward achieving the nation's goal of carbon neutrality by 2050.

The Green Growth Strategy, launched in December 2020, outlines a dynamic approach that leverages innovative technologies, fosters eco-friendly industries, and promotes sustainable practices across various sectors. The overarching objective is to stimulate economic growth while simultaneously reducing environmental impacts, thereby creating a positive feedback loop where environmental sustainability drives economic prosperity and vice versa.

The Green Growth Strategy embodies Japan's commitment to marrying economic prosperity with environmental responsibility. By prioritizing sustainability and investing in cutting-edge technologies, Japan endeavours to lead the way in achieving both carbon neutrality and a vibrant, green economy. However, the successful implementation of these policies will require concerted efforts, cooperation from industry stakeholders, and continued public support to realize the vision of a greener and more sustainable future.

The strategy sets goals in 14 fields, identifies current challenges and formulates the basis for action plans including budgets, taxes, regulatory reforms, standardisation and international collaboration. The strategy is expected to trigger an annual growth of 90 trillion yen (€700 million) by 2030 and 190 trillion yen (€1.5 billion) by 2050 (European Cluster Collaboration Platform).



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An overview of the Green Growth Strategy. Source: https://sponsored.bloomberg.com/article/jco/charting-the-path-to-net-zero-with-japanese-innovations

Point 5 of the Green Growth focuses specifically on the automotive industry. METI outlines the following policy objectives. The main future efforts consists of:

-Setting electrification targets.

For passenger vehicles, electrified vehicles will account for 100% of new vehicle sales by 2035. – As for commercial vehicles, aiming for electrified vehicles accounting for 20-30% of new light vehicles sales by 2030 and electrified vehicles and decarbonized fuel vehicles accounting for 100% by 2040. For heavy vehicles, aiming for an advanced introduction of 5,000 vehicles in the 2020s and setting a target for 2040 electrified vehicle penetration by 2030.

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-Setting storage battery targets.

Increasing the domestic production capacity for in-vehicle batteries to 100GWh as early as possible by 2030.

– Aiming to achieve a cumulative installation of approximately 24GWh for the total of home-use and business/industrial-use storage batteries by 2030.

Additionally, METI highlights the importance of setting charging and refuelling infrastructure targets:

- Achieving the comparable level of convenience as gasoline vehicles by 2030 by installing 150,000 charging stations, including 30,000 quick chargers for public use.

– Installing approx. 1,000 hydrogen stations in optimal locations by 2030.

Implementing a package of measures to promote electrification is also deemed necessary.

– Examples: Utilization of fuel efficiency regulations, promotion of electrification of public and company vehicles, support for introduction and promotion of replacement, promotion of largescale investment in storage batteries, etc., expansion of introduction of charging and refuelling infrastructure, strengthening of supply chains and value chains, consideration of visualization of CO2 emissions throughout the life cycle of storage batteries, unification of regulations related to the Road Transport Vehicle Act and the High Pressure Gas Safety Act for fuel cell vehicles, etc.

Climate Transition Bonds

Recognizing the need for economic growth, competitive industries, and adherence to global decarbonization goals, the Japanese Ministry of Finance (MOF) has committed to investing 15 billion yen in green investments over the next decade. This investment aligns with the GX Promotion Strategy, aiming for carbon neutrality by 2050 and a 46% reduction in emissions by 2030, in accordance with the Paris Agreement.

The focus is on sectors that can both reduce emissions and bolster economic and industrial strength. These sectors face challenges in attracting private investment; to mitigate these risks, the government's investment will cover subsidies, equity investments, and debt guarantees, enhancing the predictability for private enterprises.

The strategy includes 14 "Future Actions" for decarbonization, supporting both public and private efforts to stabilize energy supply. These actions form the criteria for climate transition bonds, with funds earmarked for six green categories.

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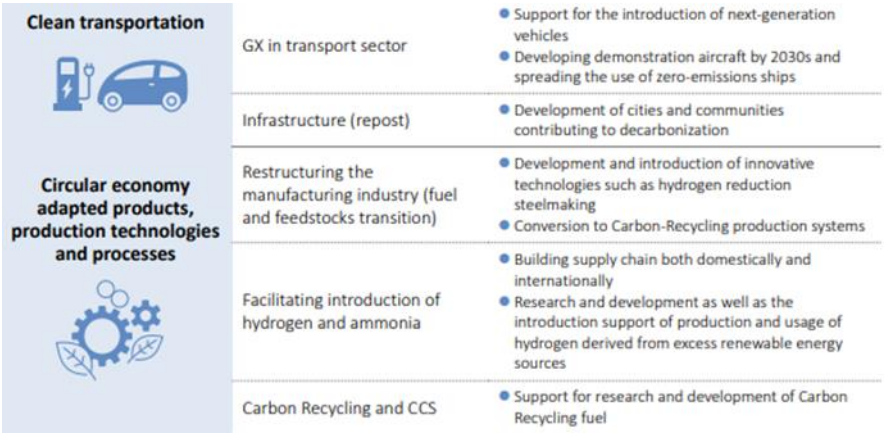
The automotive industry is a primary beneficiary, especially in energy efficiency improvements through investments in battery manufacturing and component technologies. These advancements are crucial for enhancing electric vehicle (EV) range and addressing consumer concerns, thereby boosting EV adoption.

The "Clean Transportation" category directly targets the automotive sector by supporting the adoption of advanced vehicles and promoting decarbonization in vehicle production. Investments are encouraged in low-carbon energy sources like hydrogen and ammonia, and in developing green supply chains globally. Japan's ambitious targets for hydrogen and ammonia underscore the importance of efficient supply chains in cutting CO2 emissions.



GX in transport sector	• Support for the introduction of next-generation vehicles • Developing demonstration aircraft by 2030s and spreading the use of zero-emissions ships
Infrastructure (repost)	• Development of cities and communities contributing to decarbonization
Restructuring the manufacturing industry (fuel and feedstocks transition)	• Development and introduction of innovative technologies such as hydrogen reduction steelmaking • Conversion to Carbon-Recycling production systems
Facilitating introduction of hydrogen and ammonia	• Building supply chain both domestically and internationally • Research and development as well as the introduction support of production and usage of hydrogen derived from excess renewable energy sources
Carbon Recycling and CCS	• Support for research and development of Carbon Recycling fuel

Furthermore, this initiative backs the purchase of EVs, fuel cell vehicles, plug-in hybrids, and other eco-friendly vehicles, promoting sustainable practices within the automotive industry. This comprehensive approach aims to significantly reduce carbon emissions by supporting the transition to greener vehicles and cleaner manufacturing processes.

Guidelines for Promoting the Development of EV Charging Infrastructure

METI in June 2023 launched a “Study Group for Promoting the Development of EV Charging Infrastructure” to confront with relevant stakeholders. The key points outlined by the guidelines are the following:

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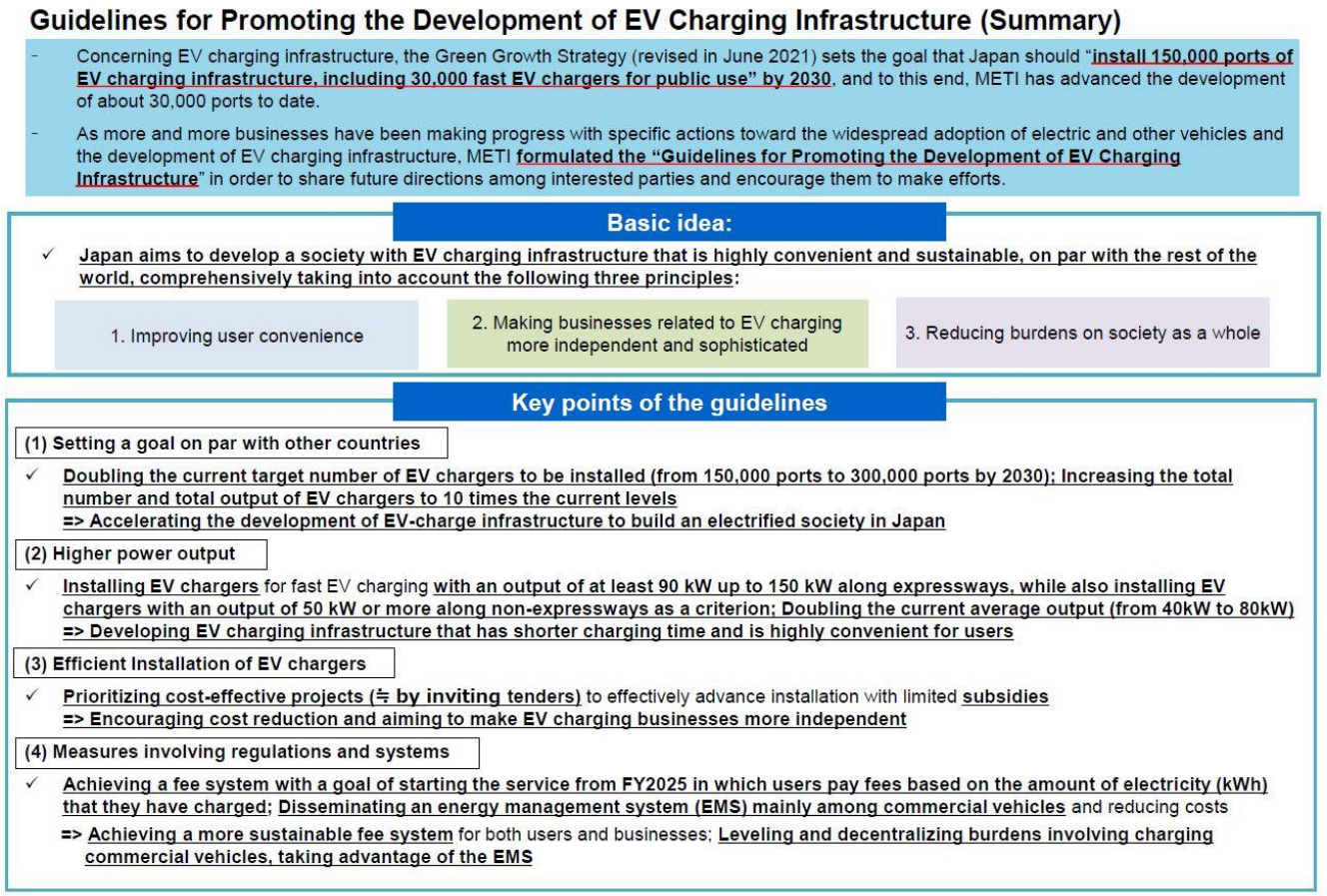

Subsidies for Promoting the Introduction of Clean Energy Vehicles and Infrastructure (update)

The FY2021 Supplementary Budget Draft approved by the Cabinet on November 26 established subsidies for the purchase of EVs, plug-in hybrid vehicles, and fuel cell vehicles, as well as subsidies for the development of charging and hydrogen fueling infrastructure.

Maximum amount of subsidy ・EV (excluding light motor vehicles): Maximum 650,000 yen ・Electric light motor vehicles: Maximum 450,000 yen ・Plug-in hybrid vehicles: Maximum 450,000 yen ・Fuel cell vehicles: Maximum 2,300,000 yen ・Ultra compact mobility: Fixed amount of 250,000 yen (individuals), fixed amount of 350,000 yen (service use)

In December 2023, the Japanese Government devised a sectoral investment strategy encompassing 16 diverse sectors, among them the automobile industry. This strategy acknowledges that achieving Green

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Transformation involves more than simply advancing EV production. It emphasizes the incorporation of advanced technology, user security, sustainability throughout the entire lifecycle, and the creation of a market conducive to their simultaneous growth.

In alignment with the investment strategy, METI has incorporated a new provision into the initial 2023 budget plan. This provision outlines additional subsidies amounting to 1,291 billion yen, aimed at fostering the adoption of Clean Energy Vehicles. These subsidies will be extended to automotive manufacturers, contingent on a comprehensive assessment of their commitment to factors such as the development of charging infrastructure, preparedness for after-service support, and collaboration with local communities during disasters.

As of February 2024, METI is in the process of determining the subsidy amounts based on vehicle types, with plans to finalize this by mid-March. The application process is scheduled to open at the end of March, targeting vehicles newly registered from the commencement of the Japanese fiscal year on April 1st.

ROAD TO L4

The project, launched in 2021, has been working towards the goal of starting remote-monitored autonomous mobility services on former railway lines by the end of the 2022 fiscal year. This goal is outlined in the “New Capitalism Grand Design and Execution Plan Follow-up (June 7, 2022).”

With the recent amendment to the Road Traffic Act, set to take effect on April 1, the Level 4 technology and services demonstration will be carried out using the newly approved system, called “ZEN drive Pilot Level 4.” The ZEN drive Pilot Level 4 system eliminates the need for a human driver, both in the vehicle and at a remote location. Previously, a human operator was required to take over in emergencies. However, the new system can autonomously handle various driving tasks, such as starting, stopping, and emergency braking, based on its surroundings.
The approved system is designed to operate within specific conditions set by the
Ministry of Land Infrastructure, Transport and Tourism (MLIT), including driving on electromagnetic induction lines and avoiding operation during inclement weather. The AVs will travel at a maximum speed of 12 km/h.

The current phase, Level 4, aims for full automation under specific conditions.

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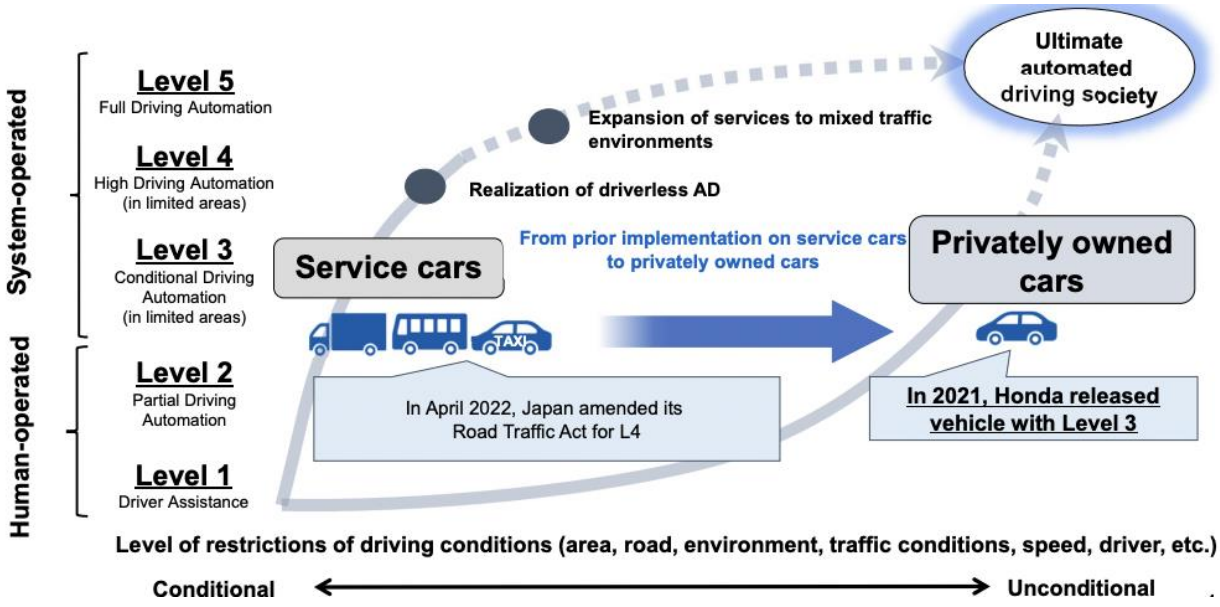
Aligned with Germany's 2021 amendment to the Road Traffic Act, adapting to Level 4 automation, the Japanese Government pursued a similar path. In April 2022, Japan amended the Road Traffic Act, stipulating that entities seeking to engage in automated driving must obtain permission from the prefectural Public Safety Commission. With enforcement set for April 2023, the project aims to promote the widespread adoption of automated driving.



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