Iran Chamber of Commerce,

Industries, Mines and Agriculture

Iran Automotive Industry Report

Toward a Competitive, Low-Carbon and Just Transition

An analysis of the current state, challenges, and opportunities for emission reduction and sustainable growth in Iran's automotive industry.

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Introduction

Greenhouse gas emissions are among the most significant environmental impacts of industrial activities. A carbon management system provides a framework for quantifying, monitoring, and managing emission sources, as well as reducing greenhouse gas emissions across an organization. Many companies worldwide have taken substantial steps toward reducing energy consumption, cutting carbon emissions, and promoting sustainable development, making considerable investments in these areas. The sustainability goals and environmental strategies adopted by some of the world's leading companies clearly demonstrate this growing commitment.

Through the identification and prioritization of effective and cost-efficient solutions, carbon management recommends the measures needed to optimize energy consumption and reduce greenhouse gas emissions. It also monitors the implementation of these measures and evaluates the progress and results achieved. Carbon management encompasses a set of policies, frameworks, and guidelines designed to ensure that greenhouse gas emissions are effectively measured, controlled, and reduced in a verifiable and auditable manner.

Key drivers highlighting the necessity of implementing this project include increasingly stringent national and international emissions-monitoring requirements; applicable laws, regulations, and policy documents; rising energy prices and emission-related costs; and the economic benefits of emissions reduction. Further drivers include system upgrades and technological advancements, access to financial and technological incentives, preparedness to operate within permitted emissions limits, reduced direct safety risks, enhanced corporate credibility and brand reputation, and growing expectations from stakeholders and the public.

In recent years, leading international companies have made substantial investments in developing low-carbon strategies and implementing operational measures to manage greenhouse gas emissions. By improving energy efficiency, reducing emissions, and minimizing gas flaring, these companies have made significant progress toward greater transparency in their climate performance. Other key initiatives undertaken by these companies include implementing comprehensive carbon management systems, expanding the use of renewable energy, and promoting an environmental culture across their organizations.

1. The Impacts of Air Pollution on Mortality and Public Health in Iran

The impacts of air pollution extend far beyond environmental degradation, affecting human health, healthcare systems, and the sustainable development of societies. According to the *State of Global Air 2025* report, approximately 7.9 million deaths worldwide were attributed to air pollution in 2023. This figure highlights the extensive health consequences of air pollution and underscores the urgent need for effective policies to reduce pollutant emissions. (1)

According to data released by Iran's Ministry of Health and Medical Education, exposure to fine particulate matter (PM2.5) was responsible for an estimated 58,975 deaths among people

aged over 30 in 1403 (2024–2025), averaging approximately 161 deaths per day. In addition to its serious consequences for public health, air pollution places a considerable economic burden on the country. The financial losses associated with air-pollution-related deaths were estimated at approximately USD 17.2 billion during the same period. (4, 6)

According to the *National Air Pollution Report for 2024*, annual average PM2.5 concentrations across Iran's provincial capitals ranged from 9 to 42 μg/m³. Ahvaz recorded the highest concentration at 42 μg/m³, followed by Isfahan (34 μg/m³), Tehran (32.9 μg/m³), Arak (32 μg/m³), Karaj (31 μg/m³), and Mashhad (29 μg/m³) (4). Furthermore, IQAir's 2025 international assessment reported an annual average PM2.5 concentration of 28.1 μg/m³ for Iran, placing the country 22nd among 143 countries and regions in terms of air pollution levels. (2)

The 2024 National Air Pollution Report also reveals that the entire urban population of Iran (100%) was exposed to annual average PM2.5 concentrations above the World Health Organization (WHO) guideline of 5 μg/m³. The health risks associated with air pollution are particularly significant for vulnerable groups, including children, older adults, pregnant women, and people with chronic health conditions, especially cardiovascular and respiratory diseases. (3,4 and 5)

These challenges highlight the need for a comprehensive and systematic approach to air quality management. Key priorities include identifying major pollution sources, monitoring emissions on an ongoing basis, enforcing compliance with environmental regulations, and implementing targeted pollution-control measures in the transportation sector. Together, these efforts are essential to safeguarding public health and fostering a cleaner, healthier, and more sustainable environment.

According to the latest Tehran Air Pollutant Emissions Inventory, mobile sources (including passenger cars, buses, motorcycles, trucks, and other motor vehicles) account for a substantial proportion of urban air pollution. These sources are estimated to contribute approximately 60–68% of particulate matter emissions and 80–83% of gaseous pollutant emissions. Passenger cars alone account for approximately 38% of pollutant emissions. (7) Road transportation is therefore considered one of the major sources of air pollutant emissions in urban areas. Motor vehicles, particularly passenger cars, play a significant role in emitting pollutants such as nitrogen oxides (NOx) and carbon monoxide (CO). Accordingly, upgrading vehicle technologies, improving fuel quality, continuously monitoring and controlling vehicle emissions, and developing clean transportation solutions are effective measures for reducing air pollution and improving urban environmental quality.

To control and reduce exhaust emissions from new passenger cars, the Department of Environment (DOE) has developed and issued a set of regulations, technical requirements, and monitoring mechanisms. The key measures and oversight processes implemented in this area are outlined below:

2. Processes for Monitoring Emissions and Exhaust Pollutants of Newly Produced Vehicles in Iran

- In accordance with the resolutions of the Council of Ministers, the monitoring of pollutant emissions from mobile sources, including passenger cars, heavy-duty diesel vehicles, and motorcycles, commenced at the beginning of 2000 (1379 AP) under the supervision of the Department of Environment (DOE). Vehicle manufacturers and importers are required to comply with the applicable regulations.
- European emission standards and the regulatory procedures adopted in developed countries were reviewed to establish national monitoring guidelines and procedures for implementing these standards and their associated requirements. These include production-line inspections, vehicle sampling for testing purposes, and emission testing in accordance with the European standard ECE R83, with the aim of controlling air pollutants and reducing emissions.
- Monitoring of passenger car emissions in accordance with the ECE R1504 and Euro 1 standards commenced in 2000 (1379 AP). The applicable emission standard is scheduled to be progressively upgraded to Euro 6, in accordance with the 06 series of amendments to ECE R83, with implementation planned for 2027 (1406 AP).

3. Implementation Timeline of Resolutions and Emission Standards for Passenger Cars from 2002 to the Present

In accordance with a Council of Ministers resolution, the DOE initiated monitoring of emissions from domestically manufactured vehicles in 1379 (2000) through the application of approved standards and officially issued guidelines at the type-approval and conformity-of-production (COP) stages. Following successive upgrades over the years, the currently applicable national emission standard for passenger cars is Euro 5.

The figure below illustrates the evolution of Euro emission standards from Euro 1 to Euro 6 in Iran.

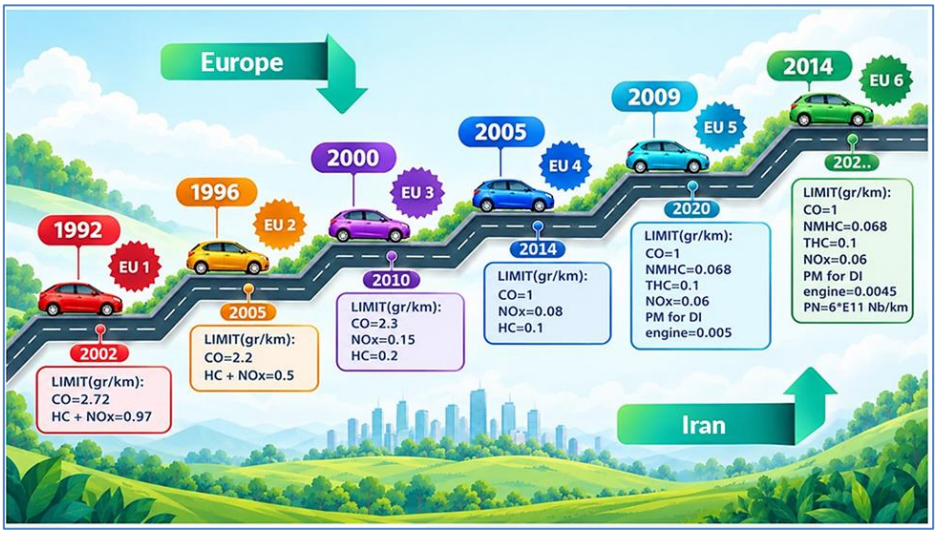


Figure 1. Implementation Timeline of Resolutions and Emission Standards for Passenger Cars

In 2005–2006 (1384), the Middle East's largest comprehensive vehicle emissions testing center was established and equipped as an independent facility, operating separately from automotive manufacturers. The center is accredited to ISO/IEC 17025 and serves as a trusted and recognized reference facility under the oversight of the relevant competent governmental authorities. Its laboratories are continuously upgraded and modernized in line with the implementation schedules of applicable standards.

4. Trends in Average Pollutant Emissions from Mobile Sources

The analysis is based on emissions test results obtained from new passenger cars sampled directly from automakers' production lines and independently assessed at the emissions testing laboratory. The results cover the reporting period and reflect the successive implementation of emission standards, from Euro 2 to Euro 5. The chart below illustrates the average levels of various exhaust pollutants recorded during this period.

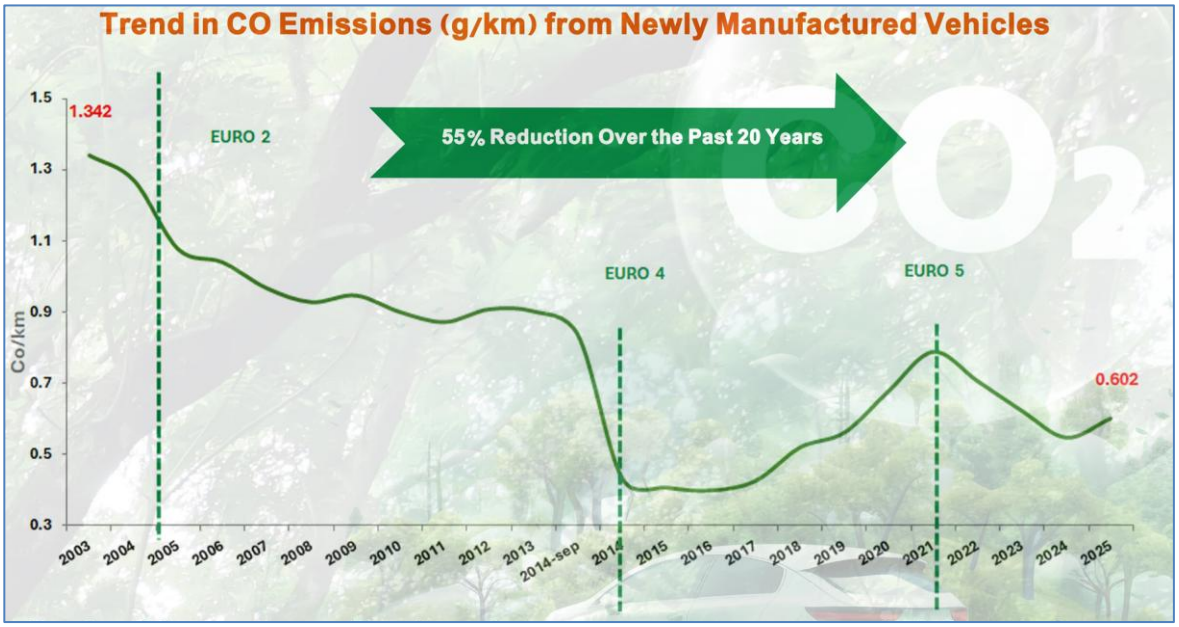


Chart 1. CO emission trend from domestic passenger cars

As illustrated in the chart 1, carbon monoxide (CO) emissions from domestically manufactured vehicles showed a general downward trend between 2003 and 2025, despite some fluctuations. CO emissions decreased from 1.342 grams per kilometer (g/km) in 2003 to 0.602 g/km in 2025, representing an approximately 55% reduction over this 22-year period.

A substantial proportion of this reduction occurred alongside the upgrading of emission standards from Euro 2 to Euro 4. In particular, a marked decline in CO emissions was observed between 2005 and 2014. However, an upward trend began around 2018, followed by a renewed decline after the implementation of the Euro 5 standard.

During the final years of the assessment period, CO emission levels showed only slight variations and consistently remained below the Euro 5 regulatory limit. This trend underscores the importance of comprehensive laboratory testing, ongoing emissions monitoring, and

technical evaluations in supporting continued improvements in the environmental performance of Iran's automotive industry.

5. Comparison of Average CO_2 Emissions from New Passenger Cars in Iran and Europe

The chart below compares the average CO_2 emissions of new vehicles in Europe and Iran, illustrating changes over time based on the latest available data published by the European Environment Agency (EEA). Under Europe's standardized carbon balance method for measuring fuel consumption, CO_2 emissions are directly linked to the amount of fuel consumed. Consequently, lower fuel consumption leads to reduced CO_2 emissions.

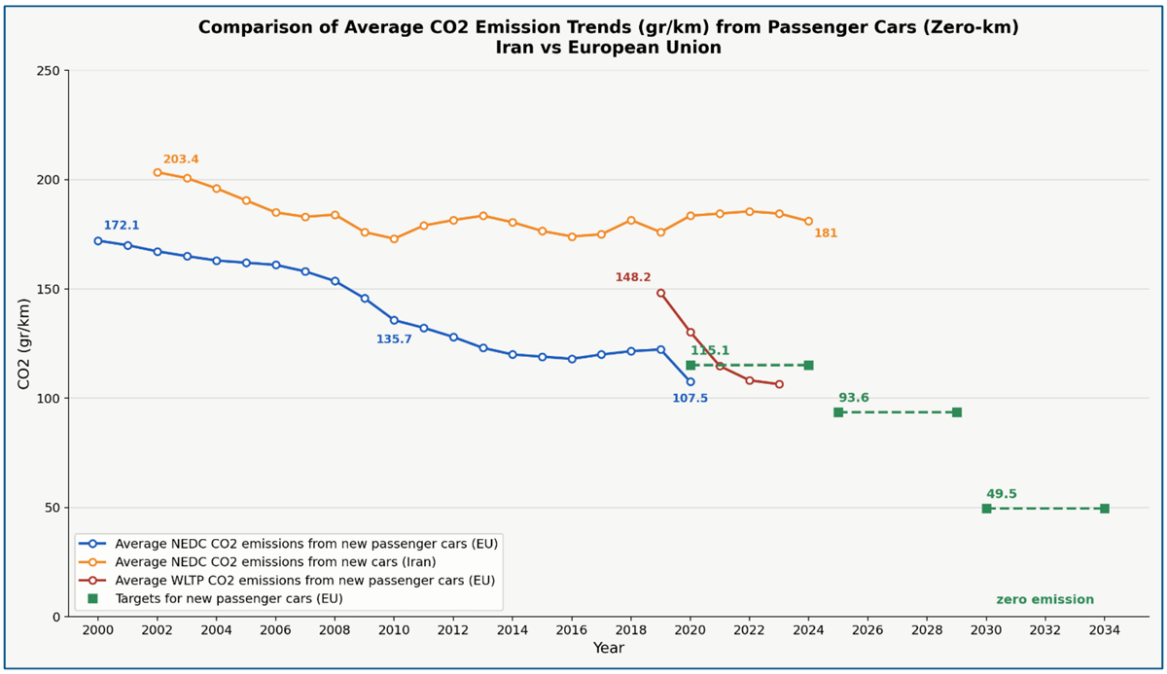


Chart 2. Comparison of Average CO_2 Emissions from New Passenger Cars in Iran and Europe

Chart 2 illustrates the trends in passenger-car CO_2 emissions in Iran and the European Union (EU), highlighting the key differences between the two, as outlined below:

Trends in CO_2 emissions from new passenger cars manufactured in Iran

- The average CO_2 emissions of passenger cars in Iran decreased from 203.4 g/km in 2002 to approximately 181 g/km in 2024.
- This represents a reduction of 22.4 g/km, equivalent to approximately 11% over the period under review.
- Unlike other pollutants, CO_2 emissions from passenger cars in Iran have not declined substantially, and the overall downward trend has remained limited.

Trends in CO_2 emissions from new passenger cars in the European Union, based on the NEDC test cycle

- Average CO_2 emissions from new passenger cars decreased from 172.1 g/km in 2000 to approximately 107.5 g/km in 2020.
- This represents a reduction of 64.6 g/km, equivalent to approximately 37.5% over the period under review.
- This trend demonstrates a significant reduction in CO_2 emissions from new passenger cars in the European Union over the past two decades.

Trends in CO_2 emissions from new passenger cars in the European Union, based on the WLTP test cycle

- Average CO_2 emissions decreased from 148.2 g/km in 2019 to 106.4 g/km in 2023.
- This represents a reduction of 41.8 g/km, equivalent to approximately 28.2%.
- These results also indicate a substantial reduction in CO_2 emissions under the WLTP test cycle.

Comparison of trends in Iran and the European Union

- In the European Union, average CO_2 emissions from new passenger cars have declined significantly. Combined with the gradual introduction of emission-reduction targets, this progress has supported the transition toward cleaner, low-carbon transportation.
- In contrast, the approximately 11% reduction in CO_2 emissions from passenger cars in Iran between 2002 and 2024 indicates limited progress in reducing this pollutant.
- The difference in emission-reduction trends between the two regions highlights the need to strengthen technical measures, regulatory oversight, and policymaking efforts to reduce CO_2 emissions from vehicles manufactured in Iran.

The figure below presents a breakdown of changes in carbon dioxide (CO_2) emissions in Iran and Europe, based on the data provided in the chart 2.

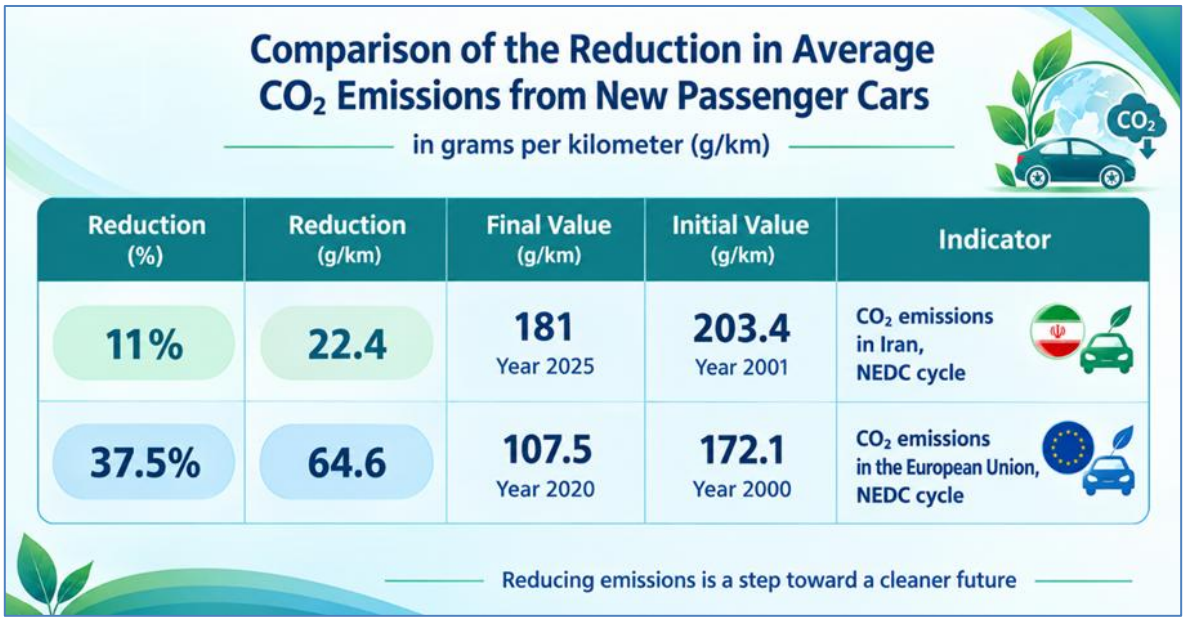


Figure 2. Comparison of the reduction in average CO_2 emission from new passenger cars

6. Estimating the Increase in CO_2 Emissions from Vehicles in Operation

To evaluate the potential environmental impact of vehicle production on urban transportation, annual CO_2 emissions were estimated for passenger cars and pickup trucks manufactured between 2018 and 2025. The calculations were based on an assumed average annual driving distance of 20,000 km per vehicle. The resulting estimates demonstrate the annual CO_2 emissions associated with the operation of vehicles produced in each year, as shown in the chart below.

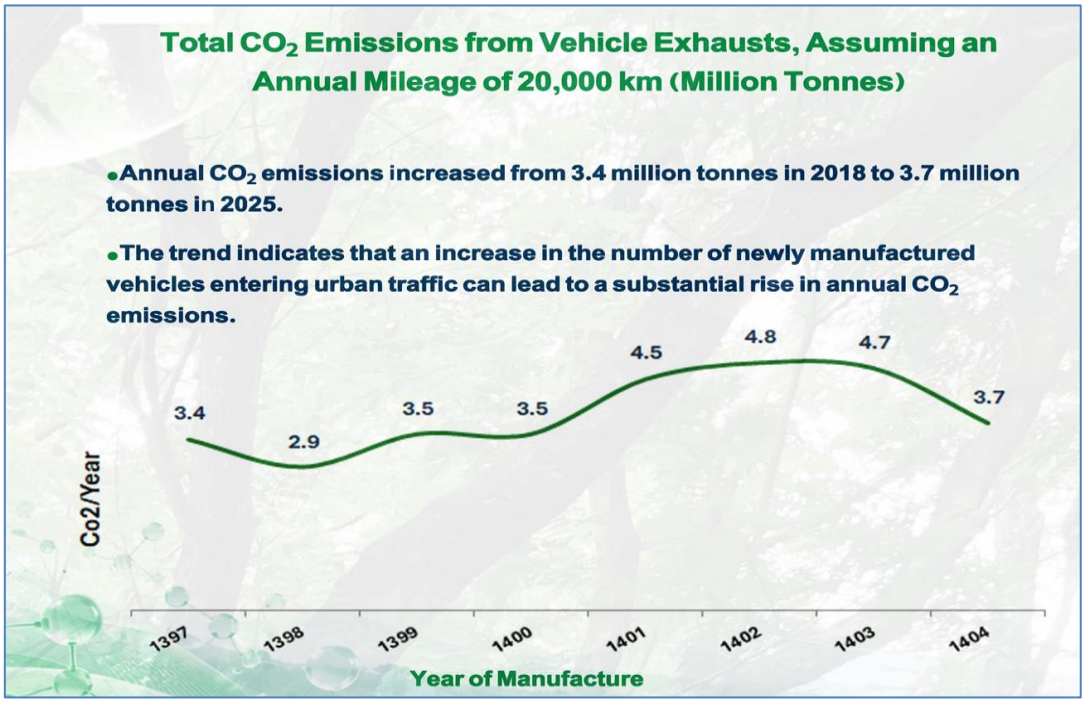


Chart3. Total fleet exhaust CO_2 emissions

As shown in the chart, estimated annual CO_2 emissions from passenger cars and pickup trucks manufactured in each year fluctuated considerably between 2018 and 2025. Estimated emissions increased from 3.4 million tons in 2018 to 3.7 million tons in 2025. This trend indicates that an increase in the number of newly manufactured vehicles entering the urban transportation system can lead to a significant rise in annual CO_2 emissions.

It should be noted that these values are estimates based on the assumed annual mileage of 20,000 kilometers per vehicle. They represent the annual emissions attributable to vehicles manufactured in each respective year, rather than the total emissions generated by the entire national vehicle fleet.

The chart below illustrates the total annual tailpipe CO_2 emissions from vehicles manufactured by all automakers between 2018 and 2025, expressed in tons per kilometer.

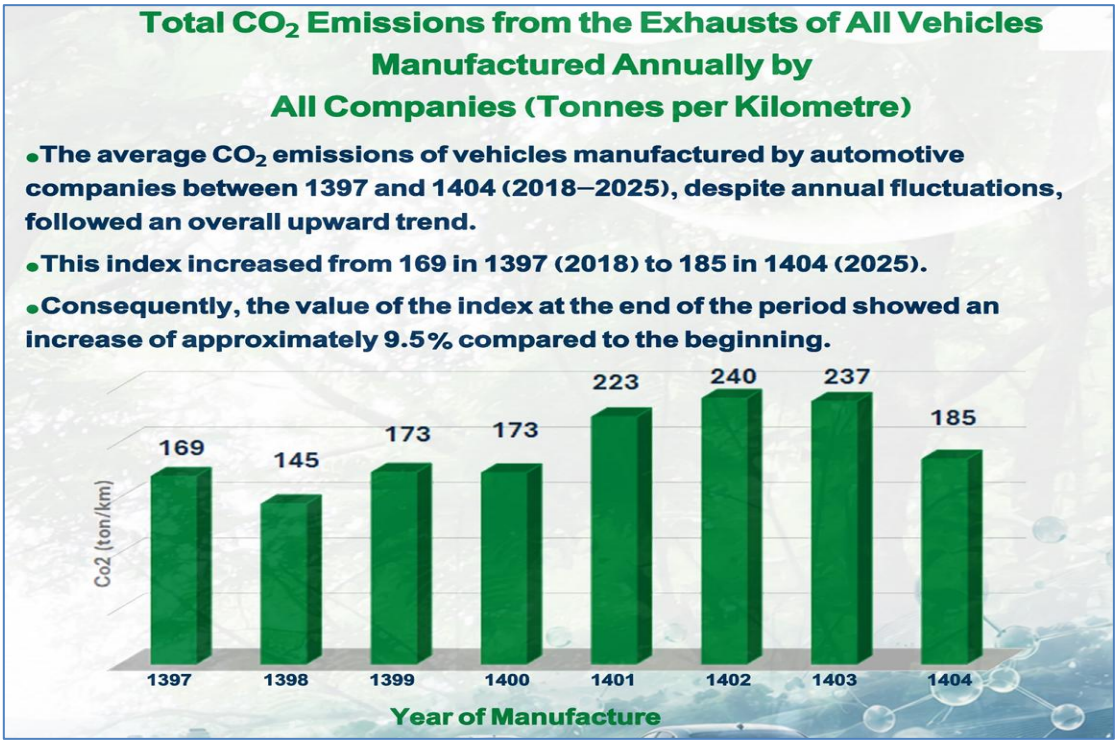


Chart4. Total fleet Exhaust CO_2 emissions per year (Tones per kilometer)

As illustrated in chart 4, average CO_2 emissions from vehicles manufactured by domestic automakers showed an overall increasing trend between 2018 and 2025, despite annual fluctuations. The average emission level rose from 169 ton/km in 2018 to 185 ton/km in 2025, representing an increase of approximately 9.5% over the reporting period.

Mitigating this upward trend requires a range of measures, including upgrading engine technologies, improving fuel efficiency, reducing vehicle weight, and optimizing aerodynamic design. Promoting the production of fuel-efficient and hybrid vehicles, together with setting progressive emission-reduction targets, can also contribute to lowering average CO_2 emissions. In addition, strengthening standardized fuel-consumption testing and conducting regular assessments of vehicle performance can help identify areas for improvement and evaluate the effectiveness of emission-reduction measures.

7. Technologies and Technological Bottlenecks in the Transportation sector

Achieving greenhouse gas emission-reduction targets in the transportation sector requires the development and deployment of advanced technologies in vehicle design, infrastructure, energy systems, and intelligent transportation management. Despite the country's considerable capabilities in vehicle and transportation-equipment manufacturing, the development and adoption of these technologies face several technical, economic, and institutional barriers.

Table 1. Technologies and Technological Bottlenecks in the Transportation Sector

Technology Field	Required Technologies	Technological and Operational Bottlenecks
Electric Vehicles (EVs)	Design and manufacturing of electric vehicles, electric motors, inverters, Battery Management Systems (BMS), power converters	Dependence on technology imports, high production costs, limitations in technology transfer, low production scale
Advanced Batteries	Lithium-ion batteries, battery management systems, battery recycling technology, battery cell and pack manufacturing	Lack of domestic supply chain, dependence on strategic raw materials (lithium, nickel, cobalt), limited cell production technology, high investment costs
Charging Infrastructure	Standard and DC fast-charging stations, load management systems, smart grid, connection equipment	Limited number of charging stations, lack of unified standards, power grid capacity limitations in certain regions, insufficient investment
Intelligent Transportation Systems (ITS)	Traffic management systems, intelligent traffic light control, travel information systems, fleet management, electronic toll collection	Fragmentation of systems, data integration weakness, lack of communication and digital infrastructure, absence of data exchange standards
Low-Consumption and Hybrid Vehicles	High-efficiency engines, hybrid systems, advanced transmissions, vehicle weight reduction using lightweight materials	Manufacturing technology limitations, production costs, dependence on imported parts
Alternative Fuels	Development of CNG and LNG technology, biofuels, green hydrogen, and fuel cells	Distribution infrastructure limitations, high cost of clean fuel production, lack of a stable commercial market
Public Transportation Fleet Renewal	Electric buses and trucks, electric locomotives, fleet energy management systems	Fleet obsolescence, financial resource limitations, dependence on imports of key equipment
Transportation Digitalization	Internet of Things (IoT), Artificial Intelligence (AI), Big Data, traffic prediction and demand management systems	Data processing infrastructure shortages, limited access to integrated data, weaknesses in cybersecurity and data governance

8. Key Technological Development Bottlenecks

In addition to technical challenges, the development of low-carbon technologies in the transportation sector faces the following structural barriers:

- **Investment Constraints:** High costs associated with developing charging infrastructure, modernizing vehicle fleets, and manufacturing advanced technologies.
- **Sanctions and Restrictions on Technology Transfer:** Limited access to advanced equipment, raw materials, and international technological partnerships.
- **Low Fossil Fuel Prices:** Weak economic incentives for the development and adoption of electric vehicles and fuel-efficient technologies.
- **Inadequate Standards and Regulatory Frameworks:** Lack of comprehensive standards and regulations governing charging infrastructure, batteries, electric vehicle safety, and battery recycling.
- **Power Grid Capacity Constraints:** The need to strengthen electricity distribution networks, improve load management, and develop smart grids to support the widespread adoption of electric vehicles.
- **Weak Domestic Supply Chains:** Heavy reliance on imports of batteries, semiconductors, power electronics, and critical minerals.
- **Insufficient Investment in Research and Development (R&D):** Limited funding for research, technology commercialization, and collaboration between industry and academia.
-

9. Achievements of the Vehicle Emissions Monitoring System

- Replacement of carburetor-based fuel systems with fuel-injection systems and equipping vehicles with electronic control units (ECUs).
- Elimination of lead from gasoline, reduction of sulfur content, and improvement in the quality of fuel production and distribution nationwide, in line with the progressive upgrading of emission standards.
- Mandatory installation of catalytic converters on vehicles and motorcycles to reduce pollutant emissions.
- Mandatory installation of activated-carbon canisters on vehicles to control gasoline vapors by capturing them and purging them to the engine for combustion, thereby preventing their release into the environment.
- Mandatory installation of on-board diagnostic (OBD) systems in vehicles to detect emission-related faults, together with the requirement to conduct the relevant tests.

- Suspension of production and/or implementation of corrective measures for vehicles that fail to meet the applicable approved emission standards.
- Upgrading of vehicle powertrains and updating of engine-management-system calibration to facilitate the production of fuel-efficient, low-emission vehicles that remain within permissible limits.
- A controlled downward trend in vehicle pollutant emissions, in parallel with the progressive enhancement of emission standards nationwide.

10. Challenges and Investment Opportunities for Reducing Carbon Emissions in Iran

✓ Challenges

- Obsolescence of the public transportation fleet and vehicles.
- Incomplete and ineffective implementation of the scrappage program for old vehicles and limitations in the process of replacing them with new, fuel-efficient vehicles.
- The technology and environmental/automotive standards gap between the country and current European standards.
- Limitations in access to advanced laboratory technologies and equipment in the fields of electric vehicles, emission measurement, and environmental controls.
- Inappropriate quality of a portion of the country's produced fuel relative to international standards, particularly regarding sulfur content. For example, in European standards, fuel sulfur content is below 10 ppm, whereas in some domestic fuels, this figure exceeds 1000 ppm.
- Outdated refinery technology and its impact on the quality of fuels produced in the country.
- Shortage of necessary infrastructure for the development of electric vehicles, including charging infrastructure and the required power supply network.

✓ Opportunities and Investment Fields Areas

- High capacity for vehicle and auto parts production in Iran which enables the development and manufacturing of new vehicles and technology transfer.
- Investment opportunities in fleet modernization and the scrapping of old vehicles through the creation of appropriate mechanisms to replace dilapidated cars with new, fuel-efficient ones.

- The possibility of developing and producing electric vehicles suited to the domestic market through the participation and presence of European companies and the utilization of existing production capacities in the country.
- Development of electric vehicle infrastructure, including charging stations and related infrastructure, concurrent with increasing the share of electric vehicles in the country's fleet.
- Utilizing Iran's high solar energy capacity to supply the electricity required for EV charging infrastructure and the development of clean transportation.
- Opportunities for the procurement and development of advanced laboratory equipment in the fields of electric vehicles, emission testing, fuel quality control, and environmental standards.
- Investment in the modernization and technological upgrading of refineries aimed at producing high-quality fuel compliant with international standards.

- Cooperation with European companies in the fields of technology transfer, joint ventures, and the development of industrial projects in the automotive, energy, environmental, and clean transportation sectors.
- The possibility of gradual convergence with European Union standards and technologies, which can pave the way for market development, technical knowledge transfer, and increased international industrial cooperation.

In summary, the transition to low-carbon transport is not limited to electric vehicles; it requires fleet modernization, the development of clean public transport, enhancement of energy efficiency, creation of charging infrastructure, technology transfer, and access to climate finance.

Overall, establishing the aforementioned conditions will lead to a reduction in greenhouse gas emissions, lower fuel consumption, the achievement of higher standard levels, and the preservation of public health and welfare. Since Iran is one of the countries vulnerable to climate change and requires greater support for adaptation, there is a need for the transfer of modern technology and financing to enable the implementation of greenhouse gas mitigation projects.

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