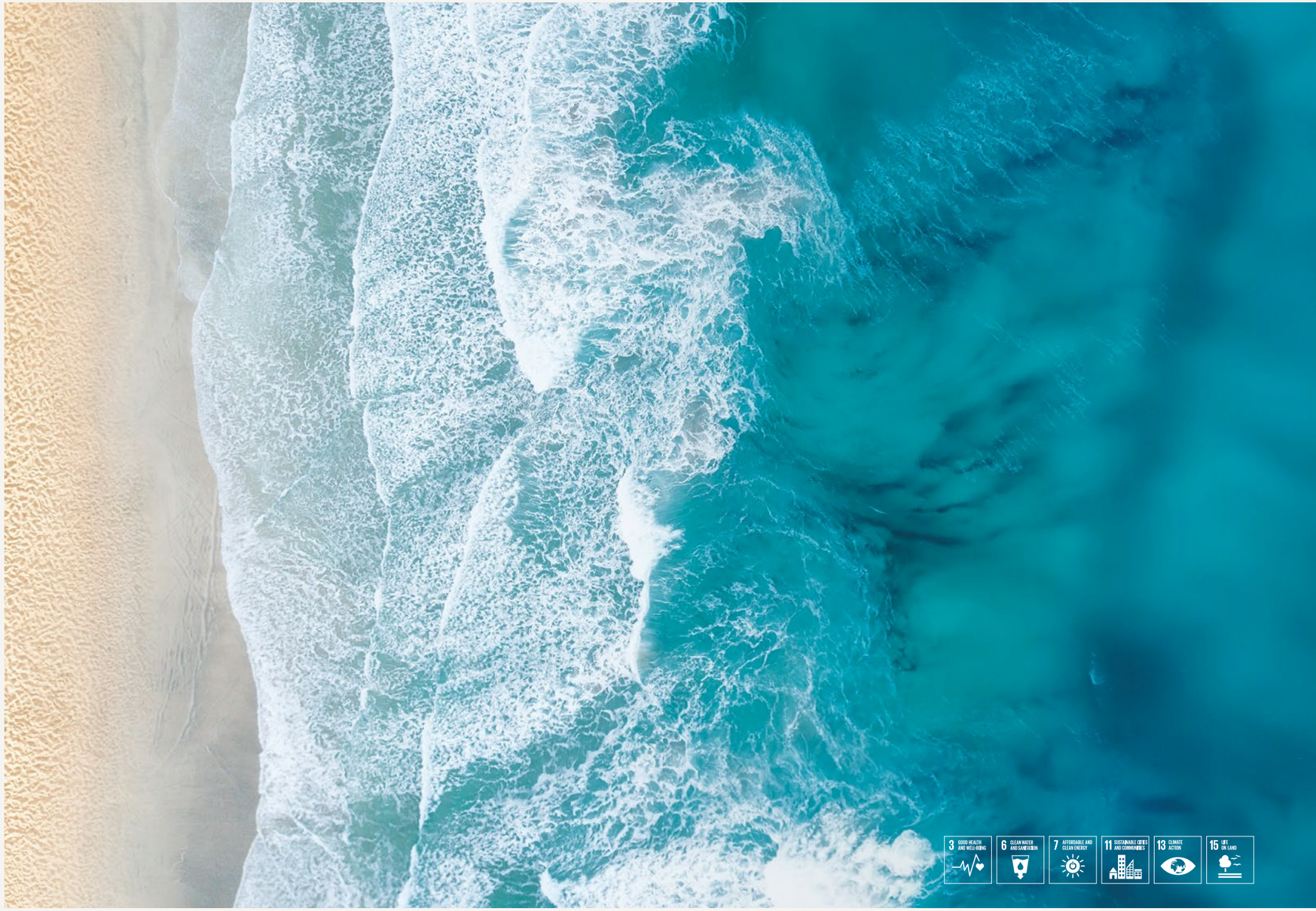
Environmental

Hyundai is committed to innovation for people and the planet in the hope and belief that the basic value of human mobility will be realized in a way that does not burden the earth, while striving to minimize the environmental impact of Hyundai's value chain. In particular, we will take the lead in achieving carbon neutrality that is healthy, inclusive, and eco-friendly, thereby reaching beyond mobility innovation to build a circular economy ecosystem and thus creating a sustainable future for all.



Environmental Management

Environmental Management System

Hyundai has established environmental management policies and principles, in order to minimize the negative environmental impacts of its corporate activities, and constantly updates them to meet the rapidly changing business environment and the diverse environmental management needs of stakeholders. In addition, we have set a governance system required to implement environmental management and are striving to identify and manage major environmental issues through close and regular communication with stakeholders. Major activities and decision-making issues related to improving our environmental performance are regularly discussed at the ESG Committee, in which the top management participates, and at the Sustainability Management Committee, a BOD subcommittee.

Environmental Management Policy

In June 2022, Hyundai revised its environmental policy in its continuous efforts to improve environmental performance through eco-friendly management, and to minimize negative environmental impact throughout the entire value chain. The employees of Hyundai's domestic headquarters and business sites, overseas subsidiaries, subsidiaries, etc. are subject to this environmental policy. In addition, we recommend this environmental policy to stakeholders such as suppliers and business partners including joint ventures, outsourcing partners, and service providers.

Hyundai Motor Company Environmental Management Policy

Environmental Management Principles

Upon implementing its environmental management policy, Hyundai complies with the following principles – 1) complying with environmental laws and regulations; 2) declaring environmental management implementation policies; 3) establishing an environmental management system and adopting internal management standards; 4) monitoring environmental performance; 5) identifying risks and developing tasks; and 6) operating processes designed to improve environmental performance. Our environmental management-related organizations periodically reflect any revisions of the laws and regulations, changes in social issues, and the peculiarities of corporate environment so as to keep implementation measures up-to-date.

Implementation of Environmental Management System

Hyundai assesses the impacts of its value chain on the environment and associated risks through its environmental management system, and manages environmental management performance on a systematic basis, thereby minimizing negative environmental impacts of its value chain including products and business sites. Regarding products, the company's R&D Center has taken the lead in promoting the reduction of carbon and harmful tailpipe emissions by new cars, the development of material recycling technologies, the minimization of the content of harmful substances in products, and the development of electrified vehicles.

In particular, to reduce carbon and harmful tailpipe emissions from new models, Hyundai is applying the "eco-design", whereby it manages fuel efficiency improvement and harmful tailpipe reduction as major goals in the new model development process. We also apply the life cycle assessment (LCA) based on ISO 14040 & 14044, having established different LCA processes for internal combustion engine vehicles (ICEVs), EVS and FCEVs since they have different value chains. These efforts have been enabling us to improve the environmental-friendliness of our new models.

Hyundai has formed dedicated environmental teams for each of its production plants, and they have established an environmental management system (EMS) that meets the ISO 14001 requirements, obtained the ISO 14001 certification, and successfully undergone a renewal audit every three years. Hyundai Motor Manufacturing Indonesia, which began operations in January 2022, is now in the process of acquiring the ISO 14001 certification. Apart from the ISO audits, Hyundai's business sites are striving to improve their environmental management systems on a continuous basis through regular internal inspections or external audit/verification by external environmental experts such as TÜV SÜD.

In addition, we include the GHG reduction performances of domestic and overseas plants in key performance indicators (KPIs), and are also operating a company-wide Greenhouse Gas Council that oversees reductions in the company's GHG emissions at all its domestic sites. As an enterprise subject to the requirements of the Korean government's GHG and Energy Target Management Scheme, we set the GHG reduction targets of our domestic business sites based on the annual GHG quota allocated by the Korean government and act on them vigorously.

Basic Principles of the Environmental Management Policy

Classification	Basic principles	Classification	Basic principles
1. Raw materials	Efficient use of raw materials	5. Waste	Waste treatment tracking and management
	Reuse of production waste in the production cycle		Waste recycling
	Traceability of raw material production sites		Waste upcycling
2. Energy	Promotion of energy reduction	6. End-of-life products	Disclosure of end-of-life product recovery information
	Introduction of renewable energy		Recovery of end-of-life products
	Operation of energy management systems		Recycling of end-of-life products
3. Water	Water recycling	7. Environmental pollutants	Reduction of air pollutants
	Water storage		Reduction of water pollutants
	Traceability of water sources		Reduction of harmful substances
4. Greenhouse Gas	Reduction of GHG emissions at business sites		
	Reduction of value chain GHG emissions		
	Reduction of GHG emissions due to products and services		

Status of ISO 14001 (EMS) Certification

Site	Certification term	Remarks
Domestic sites	2020-2023	Integrated certification from 2014
Hyundai Motor Manufacturing Alabama (HMMA)	2021-2024	
Beijing Hyundai Motor Company (BHMC)	2021-2024	
Hyundai Motor India (HMI)	2020-2023	
Hyundai Motor Manufacturing Russia (HMMR)	2019-2022	
Hyundai Motor Brasil (HMB)	2021-2024	
Hyundai Motor Manufacturing Czech (HMMC)	2021-2024	
Hyundai Assan Otomotive Sanayi (HAOS)	2021-2024	
Hyundai Motor Manufacturing Indonesia (HMMI)	Plan to be certified in 2022	Began operations in January 2022
Hyundai Truck & Bus China (HTBC)	2020-2023	

Management of Environmental Performance

Environmental Management Governance

Roles of the Management and BOD

Regarding the product environment, the head of the R&D Center is responsible for efforts to reduce harmful tailpipe emissions including CO2, use recycled materials, and develop electrified models when developing new cars as part of constant attempts to improve the environmental performance of our products. The Carbon Neutrality Execution Team, established under the direct control of the CEO, takes the lead in achieving carbon neutrality to reduce or neutralize carbon emissions in our entire value chain, including supply chain, as well as to reduce carbon emissions from new models. In 2021, we appointed a Chief Safety Officer (CSO), who is responsible for worksite environment, health and safety. Hyundai manages environmental management risks through the ESG Committee, in which the company's key decision makers participate to promote and manage overall performance improvement activities. In relation to our business operations, mid- to long-term environmental management strategies and investment plans for environmental management are reported and reviewed by the BOD or the Sustainability Management Committee.

Roles of the Dedicated Environmental Organization

The main roles of the dedicated organization include all aspects related to the implementation of environmental management system, preparations for licenses and permits to install and operate environmental facilities, the protection and restoration of environmental capital, the management & reduction of pollutant emissions generated in the course of business operations, the identification and mitigation of environmental risks, the coordination of environmental protection measures, the registration and resolution of environmental grievances, and external public relations.

Evaluation of Environmental Performance

As for products, Hyundai conducts annual performance management by using such factors as average fleet fuel efficiency or CO_2 emissions by region as well as sales proportion of EVs as KPIs. As for business sites, we manage each plant's GHG emission reduction as a KPI.

Planning and Making Environmental Investments

On the 2022 CEO Investor Day held in March 2022, Hyundai announced its 2030 mid-to long-term electrification investment plan, accordingly we will invest a total of KRW 19.4 trillion by 2030 to develop electrification technology and build the relevant infrastructure. In 2021, to implement our environmental management initiatives, we established an investment plan worth KRW 848.9 billion, of which KRW 722.5 billion has been executed.

Environmental Issue Grievance Handling System

Hyundai operates a grievance filing process that allows its employees and the members of other organizations (individuals) to report their environmental-related grievances arising in the course of its business operations. We thoroughly review the received grievances and set response plans accordingly. The ESG Committee takes the lead in developing countermeasures in the event that a grievance may lead to a violation of laws and regulations or have a significant impact on the local community or stakeholders, ultimately resulting in a risk to Hyundai's corporate reputation.

Key Reporting Channel

- E-mail: ESG@hyundai.com

Environmental Education

Hyundai provides its employees and other stakeholder with environmental education designed to raise or improve their awareness of the necessity of environmental management. This education course also focuses on encouraging employees to develop an eco-friendly mindset in the course of carrying out their work. In 2021, 47,637 employees completed 651 hours of environmental education.

Environmental Management Goals and Performance

Armed with a commitment to protecting the global environment while achieving sustainable progress for the future of mankind, Hyundai aims to achieve carbon neutrality by 2045 across all phases from raw material production to vehicle production and operations. To this end, we have set a number of carbon-neutral goals and worked to achieve them, as shown in the table below.

Carbon Neutral Goals and Performance

Classification	Goal	Performance
Vehicle electrification	Plan to sell 840,000 units by 2026, 1.87 million units by 2030 Achieve 100% electrification of Genesis by 2030 Achieve 100% electrification of vehicles sold in Europe by 2035 Achieve 100% electrification of vehicles sold in main markets by 2040	• Sold 141,101 units in 2021, a year-on-year increase of more than 40% (more than Hyundai's 2021 sales target)
Hydrogen business synergy	Expand hydrogen mobility Produce and supply green hydrogen	• Collaborating with H2Pro to develop high-efficiency hydrogen production technology • Collaborating with NextHydrogen to develop a green hydrogen water electrolysis system • Sold 9,620 units of FCEV, a year-on-year increase of 41.9% • Gained 53.5% share of the global FCEV market
Carbon neutrality in our factories	Achieve RE100 by 2045	• Renewable energy accounted for 12.8% of total electricity consumption at HMMC in 2021 • Renewable energy accounted for 35.5% of total electricity consumption at HMI in 2021
Encouraging our supply chain to achieve carbon neutrality	Reducing carbon emissions by 10% or more by 2030 and by 65% or more by 2040 to achieve carbon neutrality by 2045	• Conducted investigation of GHG emissions by tier-1 suppliers, and reviewed major companies' reduction plans

Consultation & Communication with Stakeholders on Environmental Issues

Hyundai conducts an annual stakeholder survey to identify its sustainability issues including the environment. We discuss our sustainability performance and improvements through continuous consultation and communication with investment institutions such as APG and Hermes, and also with ESG rating providers such as Sustainalytics. Furthermore, on the basis of consultation and communication with industry associations (Korea Automobile Manufacturers Association, European Automobile Manufacturers Association (ACEA), etc.), environmental groups and government organizations (Healthy Seas, Korea Forest Service, etc.), we present opinions and conduct eco-friendly activities in areas related to our business.

1. Government Agencies Hyundai shares its environmental management performance with government agencies and proactively responds to changes in the direction of their policies. Overseas, the company systematically monitors and complies with each country's environmental laws and regulations.

2. Shareholders and Investors Hyundai will achieve environmental performance that meets the requirements of its shareholders and investors, thereby building long-lasting, trusting relationships and expanding investments aimed at improving its corporate value.

3. Supply Chain Hyundai shares its know-how and experience in environmental management across entire supply chain, while operating communication channels to enable continuous consultation with its suppliers aimed at creating environmental values throughout value chain.

4. Customers Hyundai provides environmental information on its products and services while reflecting opinions gathered through customer contact channels in the process of developing eco-friendly products and services.

5. Local Communities To mitigate the environmental impacts of its business operations, Hyundai collects opinions from local organizations and public-private consultative bodies, while also striving to identify and resolve grievances raised by local communities.

6. Employees Hyundai shares its environmental management principles and policies with its employees and raises their awareness of environmental management through environmental education. The company also reflects its employees' proposals to improve environmental performance.

Response to Climate Change

Climate Change Strategies

Hyundai has established a governance system and climate risk management process to manage its climate change risks systemically. We have set major climate change strategies through the climate change governance to analyze the potential impact of climate change on our business and respond to macroscopic changes in the business environment caused by changes in laws and regulations. We identify various climate risk and opportunity factors, and preemptively responds to changing market demands through the development of eco-friendly vehicles and various mobility solution technologies.

Climate Change Management System

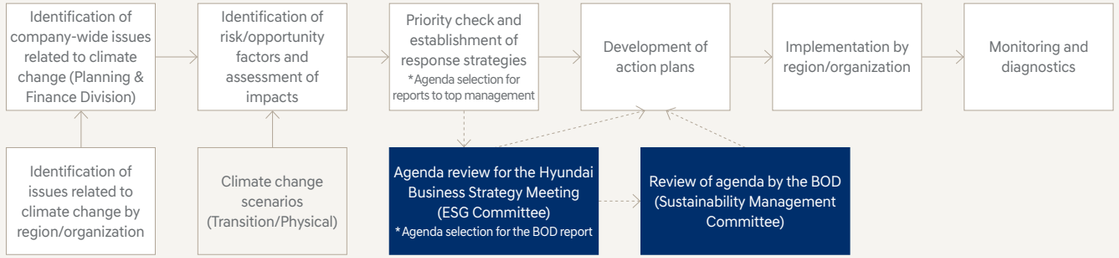
Climate Change Governance

At Hyundai, the ESG Committee, composed of the company's key decision makers, manages matters deemed necessary to respond to climate change, such as reviewing climate change risks, discussing countermeasures, and evaluating the performance of climate change response initiatives. In order to respond to climate change more actively, in 2021 we launched an organization dedicated to promoting carbon neutrality and establishing strategies in such areas as products, business sites, and supply chains in collaboration with the related departments.

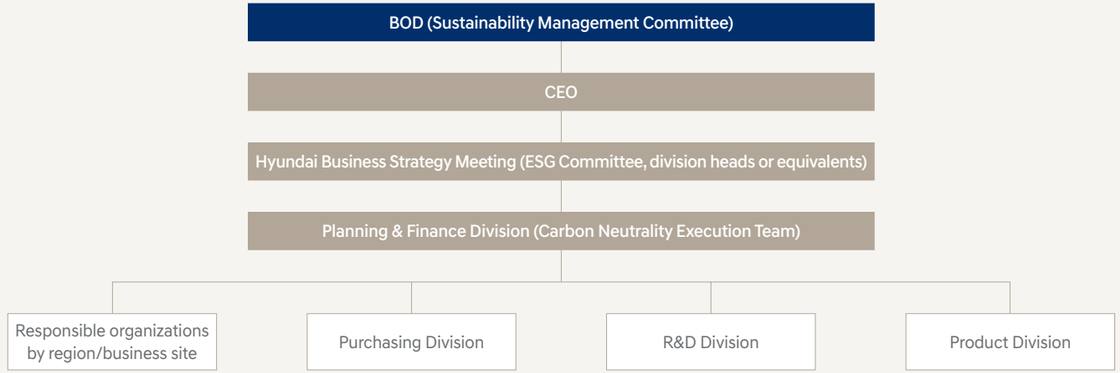
Climate Risk/Opportunity Management Process

Hyundai identifies, assesses, and manages risk and opportunity factors to respond to climate change issues at the company level. The climate change issues identified by each region/organization are submitted to the head office's Planning & Finance Division, which then figures out risk and opportunity factors for each issue, assesses the strategic and financial impacts of each factor on the company, and determines company-wide response strategies. Material issues are reported to the BOD or top management, and specific action plans are drawn up according to the decisions made. The established climate change response plans and policies are implemented by each region/organization, while the headquarters continuously monitors their progress and makes any necessary improvements.

Identification, Assessment, and Management Process of Climate Risk/Opportunity



Climate Change Governance



Methodology for Deriving Climate Risk/Opportunity Factors

Climate scenarios in use	Scenario analysis	Application timelines	Application scope
☑ Transition ☑ Physical	☑ Quantitative ☑ Qualitative	☑ Short term (0-3 years) ☑ Medium term (3-10 years) ☑ Long term (10-25 years)	☑ Business sites ☑ Upstream ☑ Downstream

- **Transition**
  Usingforecast reports from the IRENA, EIA, IEA, and BP[1] and nationally determined contributions (NDC[2]), considering IEA B2DS and NZE 2050
- **Physical**
  RCP 8.5 (baseline scenario), RCP 2.6[3] (below 2°C scenario), RCP 1.9[4] (1.5°C scenario)

- **Business sites**
  All global operations (including new ones, expected facility life-cycle considered)
- **Upstream activities**
  Purchased goods and services, employee commuting, business travel, etc.
- **Downstream activities**
  Transportation, use (customers), end-of-life treatment and recycling, etc.

[1] Renewable Power Generation Costs (IRENA), Future of Solar Photovoltaic (IRENA), Annual Energy Outlook (EIA), World Energy Outlook (IEA), Energy Outlook (BP)
[2] Goals submitted by each UN member country under the Paris Agreement in such areas as reduction, adaptation, finance, technology, capacity building, and transparency
[3] One of four scenarios based on the GHG concentration announced in the 5th Assessment Report (ARS) of the International Panel on Climate Change (IPCC) to keep global warming to within 2°C above pre-industrial levels
[4] Scenario announced in the IPCC Special Report on the Impacts of Global Warming of 1.5°C to achieve net zero by 2050 so as to keep global warming to within 1.5°C above pre-industrial levels

Cases of Climate Change Risk Management

Regulatory Risk

In order to respond to climate change, Hyundai manages the laws and regulations of various countries and regions where it operates as regulatory risk. We faithfully comply with laws and regulations, preemptively respond to expected regulations according to climate change scenarios, and minimize the impact and damage.

Response to the Emission Trading System at Business Sites

Subject to the allocation of emission rights in accordance with the "Act on the Allocation and Trading of Greenhouse Gas Emission Permits", Hyundai participates in the Korea Emissions Trading Scheme (K-ETS). Accordingly, if we emit more GHGs than allocated by the law, we must purchase rights for the shortfall or, in the event of failure to do so, pay a fine equivalent to three times the average price of emission permits. The company's quota for GHG emissions in 2021 was about 1.45 million tCO_2-eq.

In order to avoid financial losses due to excess carbon emissions, Hyundai has set a more stringent reduction target than allowed by the government while continuing to invest in GHG emissions reduction and energy conservation programs.

Furthermore, when purchasing emission permits, we strive to minimize the purchase cost by selecting the most optimized option based on an analysis of transaction prices and volumes.

Vehicle CO_2 Emissions Regulations and Tax Reforms

As part of each government's efforts to reduce GHG emissions in the transport sector in accordance with the Paris Agreement, regulations on CO_2 emissions by new vehicles are being strengthened along with those on corporate average fuel economy. In 2021, the European Commission significantly increased the target of CO_2 emission reduction for 2030 from 37.5% to 55% compared to the 2021 level, while announcing the goal of lowering it to 0g/km by 2035. This means that from 2035 the sale of new vehicles with internal combustion engines will be banned in the EU market. Apart from these regulations, major Western European countries such as France and Germany have long imposed an eco-friendly vehicle tax that differentially imposes automobile taxes based on vehicles' CO_2 emissions.

The Korean government has also significantly lowered the average level of CO_2 emissions for automobiles from 97g/km in 2020 to 70g/km in 2030, while preparing to introduce an eco-friendly tax that imposes a car tax based on CO_2 emissions, as is already the case in some European countries, in order to further reduce the country's GHG emissions in the transport sector.

If Hyundai fails to meet its CO_2 emissions target, it may incur significant additional costs in proportion to its sales volume, which will lead to higher manufacturing costs and product prices.

Hyundai is focusing on improving the fuel efficiency of the internal combustion engine vehicles (ICEVs) of its Genesis brand and mid-to-large SUV vehicles to respond to major countries' tightening of the regulations on CO_2 emissions and corporate average fuel economy and changes in market demand caused by the expansion of the automobile tax based on CO_2 emissions. To reduce the carbon emissions of all Hyundai products, we are striving to improve the fuel efficiency of existing ICEVs in the short term and develop and distribute eco-friendly vehicles in the long term.

Transition Risk

Hyundai is making various efforts to analyze the trends in the rapidly changing vehicle market and satisfy consumer preferences. Hyundai has taken the lead in expanding hybrid/plug-in hybrid EVs (HEVs/PHEVs), EVs, and fuel cell EVs (FCEVs) and occupying their markets early on, as well as bolstering its related technology development capabilities.

Vehicle Electrification

Electrification regulations are being strengthened around the world. For instance, the EU Commission is getting ready to introduce a carbon border tax to reduce net GHG emissions by at least 55% compared to 1990 by 2030, while proposing legislation to ban the sale of new ICEVs in the EU starting in 2035. Meanwhile, France has banned the sale of ICEVs starting from 2030, and Norway has announced that it will phase out new vehicles with internal combustion engines from 2025.

Hyundai has established a mid- to long-term roadmap for the transition from ICEVs to EVs and has begun accelerating the relevant technology development and EV launching. It will set up an electrified lineup for all its commercial vehicles, including buses and heavy trucks, with high carbon emissions by 2028 while completing electrification in Korea by 2035 and gradually promoting 100% electrification in other regions as well. Hyundai is preparing to expand its FCEV lineup from one to three starting in 2023, and ultimately plans to achieve the goal of 100% electrification of all its vehicles sold in the European market in 2035 and in other major markets by 2040.

Changing Consumer Preferences

According to the International Energy Agency (IEA), approximately 6.6 million EVs were sold in 2021, more than three times the number in 2019 (2.2 million units), indicating an intensifying trend towards eco-friendly vehicle consumption by consumers. In line with increasing EV sales, demand for EV batteries is growing, with an estimated rise of as much as 4,028 GWh by 2030.

Hyundai has signed a joint investment agreement with LG Energy Solution to build a battery cell factory as part of its efforts to secure batteries of the highest quality. We are also developing technology for the solid-state battery, a next-generation battery, to improve the stability, mileage, and charging time of EVs.

Physical Risks

Due to climate change, the frequency and intensity of extreme weather events are increasing. Hyundai identifies business sites that are exposed to short-term physical risks such as typhoons, floods, and heat waves, as well as long-term physical risks such as changes in precipitation and sea levels, in order to take preemptive countermeasures to physical risks.

Preparations for Extreme Weather Events

Hyundai is faced with a great physical risk as it runs a manufacturing plant in Alabama in the southeastern part of the U.S. which is vulnerable to tornado damages in the summer. Compared to 2010, GHG emissions are expected to increase significantly by 2030, leading to more severe abnormal climate events such as hurricanes and tornadoes that may hit the company's business in the US hard. To cope with such a situation, we have developed emergency response manuals, purchased disaster insurance, and improved the stability of facilities.

Preparations for Declining Average Precipitation

A decrease in average precipitation due to climate change can have a significant impact on business operations, such as insufficient water supply and an increase in the cost of water use. As such, Hyundai assessed the risk of depletion of water resources at its major domestic and overseas business sites and found that that five of them were rated as high risk, for which it is considering building "a zero wastewater discharge system" in stages. The Asan Plant has built wastewater reuse facilities to secure sufficient water and reduce the amount of wastewater generation, and now reprocesses and re-supplies all its wastewater as industrial water.

Key Climate Risks/Opportunities and Responses

Type		Issues	Risks	Opportunities	Response Directions	Financial Impacts
Rules and Regulations	Current	• Emissions Trading Scheme • Vehicle CO_2 emissions regulations	• Increased operating costs due to purchasing allowances/ credits to achieve regulatory or legal compliance	• Revenue generation through sale of spare allowances/credits	• Increase use of renewable energy • Increase proportion of EV/FCEVs in vehicle portfolio • Improve fuel efficiency of internal combustion engine vehicles	Mid 
	Emerging	• Prohibition of ICEV sales • Regulatory target expanded due to the strengthening of CBAM[1] of EU	• Decline in sales due to ban on sales of internal combustion engine vehicles in developed markets like the EU and the U.S. • Rise in costs and shifts to customers due to tax increases	• Sales increases due to enhanced EV/FCEV performance and price competitiveness • Cost savings in responses to regulations through energy conversions and reductions in CO_2 emissions	• Establish differentiated EV expansion strategy for each region • Increase use of renewable energy	High 
Technologies		• Acceleration in competition for technology development for eco-friendly vehicles	• Decrease in market share if not achieving superior performances (EV mileage, FCEV fuel cell efficiency, etc.) compared to competitors	• Preemptive response to FCEV market based on hydrogen fuel cell technology competitiveness	• Increase investments in R&D • Promote partnerships with companies with leading technologies • Implement Eco-design	High 
Markets		• Increased sales of EVs and FCEVs in line with the expansion of EV markets	• Increase in procurement costs of raw materials (lithium, cobalt, nickel) due to limited supply following rising demand for EV batteries • Decrease in sales if not achieving sufficient FCEV profitability	• Achieving large potential EV/the second life EV battery customers, including car rental/car sharing/ESS[2] companies • New industrial fuel cell (ship/AAM[3]) business expansion • Increased sales of EV/FCEV models	• Establish a vehicle electrification plan • Build mass production system using dedicated EV platform • Launch EV brand and build a dedicated lineup • Scale up FCEV/fuel cells	High 
Reputations		• Increase in demand from investors and other stakeholders to respond to climate change	• Falls in stock prices, withdrawal of investors, and customer churn at perceived lack of will to respond to climate change	• Rising stock prices, increasing investments, and enhancing brand image due to climate change response activities and reduction performances	• Aim for transparent information disclosure • Set and implement carbon neutrality targets • Utilize green financing and investments	Mid-high 
Physical	Acute	• Increase in abnormal weather conditions, such as typhoons/floods/heavy snowfalls	• Plant downtimes due to damage to facilities • Production disruptions due to discontinuance of raw materials and parts supplies	• Increased market share due to stable product supply when compared to competitors	• Develop emergency response manual (business sites, supply chain) • Reinforce stability of facilities • Buy insurance against disasters • Develop real-time inventory management system for raw materials and parts • Assess suppliers' supply stability	High 
	Chronic	• Changes in average temperatures and precipitation	• Lack of available resources (water/energy, etc.) • Disruption of drinking water in areas with high water resource risks (such as India) • Destruction of ecosystems	• Reduced operating costs due to improved resources efficiency • Attracting potential customers by supporting local communities and helping them adapt to climate change • Earning offset credits through carbon absorption	• Use water and energy more efficiently • Develop better resource recycling and reuse technologies • Assist in increasing supply of drinking water for the vulnerable in developing countries • Promote forest conservation	High 

[1] Carbon Border Adjustment Mechanism [2] Energy Storage System [3] Advanced Air Mobility

Carbon Neutrality

Hyundai's vision of "Progress for Humanity" includes not only technological development for the convenience of mobility, but also advancement for a sustainable future. Hyundai has instituted "Integrated Solutions to Climate Change" to achieve carbon neutrality by 2045, and is striving to build a sustainable operating system for future generations by expanding its electrification capabilities and making a successful transition to renewable energy with clean mobility, the next-generation platform, and green energy as its core values. We will make every effort possible to achieve carbon neutrality by 2045, including reducing our actual carbon dioxide emissions to zero through advanced responses to climate change based on eco-friendly technologies.

Carbon Neutral Strategy

Carbon Neutral Direction

Hyundai hopes that its vision of Progress for Humanity will be realized in ways that the value of human mobility does not burden the planet. In order to do the right thing for mankind and pass on a sustainable global environment to future generations, in September 2021 we announced our plan to achieve carbon neutrality by 2045, primarily through electrification and establishment of the hydrogen society, smart cities and circular economy ecosystems. Hyundai's carbon neutrality plan includes not only the reduction of GHG emissions across our entire value chain, including the purchase and procurement of raw materials and subsidiary materials, design, production, and sales of vehicles, but also activities to reduce or offset GHG emissions from the incidental activities necessary for business operations outside its value chain. To this end, we manage Scope 1 and Scope 2 emissions generated by the business sites that we owns operate and manage, while also strengthening the management of Scope 3 emissions from indirect activities such as upstream partners and downstream distribution networks. Based on Scope 1, Scope 2, and Scope 3 emission data, Hyundai will promote effective GHG reduction activities and investment based on scientific estimation, analysis, and verification processes.

Reducing Scope 1 Emissions

Scope 1 emissions refer to GHG emitted by the company's direct energy use within the boundaries of business sites owned, operated and managed by the company. Hyundai uses LNG as its main fuel to produce the heat necessary for vehicle production and to heat its business sites, with GHG emissions from LNG combustion accounting for a significant portion of Scope 1 emissions.

We are striving to reduce fuel consumption, such as LNG, across our global business sites by improving the efficiency of production processes, facilities and equipment in addition to our efforts to recover and recycle energy. In the long term, we are planning to replace fossil fuels such as LNG with eco-friendly energy such as green hydrogen.

Reducing Scope 2 Emissions

Scope 2 emissions refer to GHG emitted by energy purchased from outside the boundaries of the business sites owned, operated, and managed by the company. Scope 2 emissions from electric energy used by Hyundai's business sites account for about two-thirds of all Scope 1 and Scope 2 emissions. In order to convert electricity into renewable energy, we are exploring various approaches such as the construction of renewable energy facilities, the signing of a Power Purchase Agreement (PPA), and the purchase of renewable energy certificates (RECs). Hyundai Motor India has converted about 35.5% of its total electricity consumption to renewable energy through such efforts as installing solar panels and purchasing wind energy. We plan to expand the introduction of renewable energy in stages, starting with production sites in regions with favorable conditions for renewable energy generation, excellent power generation infrastructure, or relatively low institutional constraints.

Reducing Scope 3 Emissions

Scope 3 emissions refer to other indirect GHG emitted during the process of providing goods and services for the company from outside the company's boundaries and during the use of products and services supplied by the company. Of Hyundai's Scope 3 emissions, those emitted during the use of sold vehicles account for the largest share (about 80%). We will therefore not only improve the fuel efficiency of ICEVs but also shift our business portfolio to electrification, including EVs and FCEVs, in the long term as a way to reduce emissions generated by vehicle usage. In addition, we have set up and implemented a basic emission reduction plan for supply chain including suppliers. We plan to reduce emissions originating from employees' business trips and commuting by gradually electrifying our business vehicles. Hyundai is also reducing emissions at the disposal stage by expanding the recycling and reuse of materials and parts from end-of-life vehicles.

Scope 1 and Scope 2 Emissions (Unit: tCO_2-eq, tCO_2-eq/Vehicle)

Classification	2019	2020	2021
Scope 1	807,498	716,237	723,966
Scope 2[1]	1,897,885	1,680,079	1,660,238
Scope 1 + Scope 2	2,705,383	2,396,316	2,384,204
Emission intensity (GHGs emissions per vehicle produced)	0.603	0.642	0.616

Scope 3 Emissions (Unit: tCO_2-eq)

Categories		2019	2020	2021
Upstream emissions	Supply chain (purchase of raw materials and parts)	20,024,630	17,014,155	18,359,619
	Capital goods (purchase of furnishings and equipment)[2]	265	22	139
	Other energy-related activities (excluding Scope 1 and 2)[2]	97,253	93,518	149,556
	Waste generated in operation	2,053	1,760	1,911
	Business travel[2]	24,836	5,222	7,069
	Employee commuting (commuting buses)[2]	15,093	14,314	5,911
Downstream emissions	Transportation and distribution (by sea and land)[2]	954,579	655,831	838,575
	Use of sold vehicles (Tank to Wheel)[3][4]	97,941,942	81,598,073	80,887,513
	End-of-life treatment of sold vehicles (recovery, disassembly, disposal)[4][5]	922,294	780,338	810,794
	Leased assets (headquarters and leased office buildings)[2]	4,126	3,325	804
	Investments (6 affiliates)	394,946	369,926	728,902
Scope 3		120,382,017	100,536,484	101,790,793

[1] Used a location-based method to calculate Scope 2 emissions
[2] Based on the country where the Headquarters is located
[3] Excluding emissions before vehicles are fueled/charged (Well-to-Tank)
[4] Figures of previous years have been changed because the number of vehicles is now based on sales units instead of production units, and they now some completely knocked down (CKD) units as well.
[5] Figures of previous years have been changed as we have updated the emission factor database and applied a specific incineration emission factor to each type of material.

Carbon Neutrality Targets

Hyundai has announced its target to achieve carbon neutrality (Net-Zero) by 2045 in the hope that future generations will be able to breathe comfortably and enjoy a beautiful natural environment and a sustainable global society. Hyundai's carbon neutrality target goes far beyond simply reducing GHG emissions at its business sites, and aims to completely eliminate or offset GHGs generated at all stages of its value chain, including purchase, procurement, production, sales, use and disposal. With regard to vehicle emissions, we aim to achieve 100% electrification in the European market by 2035, and in other major markets by 2040. In the emerging markets, we plan to accelerate electrification by considering consumer needs, market conditions and infrastructure construction status. In order to reduce GHG emissions in the process of vehicle production, we will strive for the establishment of a cooperative system between affiliates; direct production of renewable energy through solar panels, etc.; power purchase agreements and renewable energy certificates (PPAs/RECs) for renewable energy; and purchase of green premium electricity, thereby achieving RE100 (Renewable Energy 100%) by 2045.

Hyundai will also encourage its supply chain of raw materials and parts to achieve carbon neutrality, aimed at reducing their emissions by more than 10% by 2035, more than 65% by 2040, and carbon neutrality by 2045.

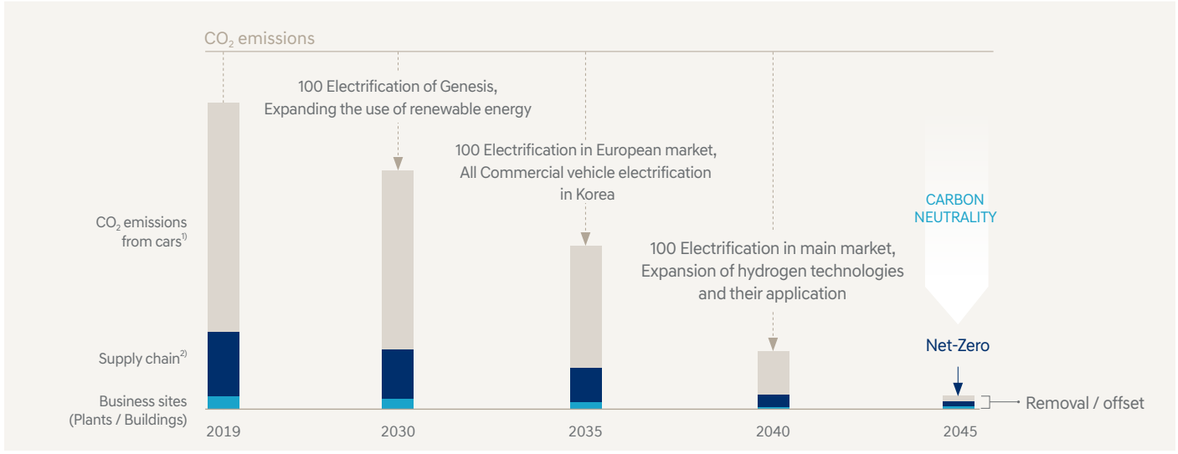
We will manage the rest of our carbon emissions through investments in carbon capture and utilization & storage (CCUS) technologies, offset activities to recycle second life batteries into energy storage devices, and REDD+ (Reducing Emissions from Deforestation and Forest Degradation Plus Conservation). To achieve true carbon neutrality by 2045, Hyundai will expand the production and conversion of green hydrogen based on renewable energy, promote electrification based on the hydrogen fuel cell system, and maximize the synergy between hydrogen business and carbon neutrality through hydrogen power generation and processes.

Carbon Neutrality by Area

The five key areas on which Hyundai is focused on achieving carbon neutrality are vehicle electrification, reducing our carbon emissions at work, support for net zero in the supply chain, social activities for reducing carbon emissions, and hydrogen business synergy effects. For a detailed explanation of the direction and goals related to each area of carbon neutrality, please refer to the Hyundai Motor Company website.

Hyundai Motor Company's Carbon Neutrality Vision

2045 Net-Zero Roadmap



[1] Tank-to-wheel (TTW) that refers to the use of fuel in the vehicle and emissions during driving
[2] Suppliers' carbon emission that we aim to reduce and achieve net zero through collaboration with partners

Methodology for Setting Carbon Neutrality Targets

To ascertain the current status of its GHG emissions and set carbon neutrality targets, Hyundai measures and verifies its company-wide Scope 1 and Scope 2 emissions in accordance with the GHG Protocol Corporate Standard. In addition, we measure and verify our Scope 3 emissions based on upstream-downstream cooperation. By conducting a comprehensive review of our Scope 1-3 emissions data, the climate change forecast reports of the IRENA, EIA, IEA, and BP, as well as the below 2°C scenario and the 1.5°C scenario, we have set a carbon reduction path – including targets for 2030, 2035, and 2040 – aimed at achieving carbon neutrality by 2045. In the carbon neutrality and interim target setting process, we referred to the science-based target (SBT) establishment methodology to review domestic and overseas policy and regulatory trends, changes in industrial technology development, and their relevance to our business strategies.

Five Key Areas to Achieve Carbon Neutrality

Vehicle electrification To promote carbon zero beyond carbon reduction, Hyundai aims to achieve the shift to 100% electrification in its major markets by 2040, after the 100% electrification in the European market by 2035. We will establish EV lineups of all our commercial vehicles including buses and large trucks by 2028, and will gradually promote 100% electrification to other regions, starting with the Korean market in 2035. In 2023, Hyundai will begin to expand its FCEV lineup from one to three, and we are also planning to launch a facelift for NEXO models and the STARIA-class FCEV model in the second half of 2023, followed by the introduction of a large FCEV SUV model in 2025.

Reducing our carbon emissions at work Hyundai strives to reduce carbon emissions generated by its automobile manufacturing processes by switching to renewable energy, improving the energy efficiency of production processes through the application of high-efficiency motors and inverters, and using hydrogen energy with the goal of achieving carbon neutrality at its workplaces by 2045. In particular, we have received approval of The Climate Group joining the efforts to achieve RE100, aimed to transition to 100 percent renewable energy by 2045. Hyundai Motor India has converted about 35.5% of its total electric energy use to renewable energy through various efforts, including the adoption of photovoltaic power generation systems and the purchase of wind power, while Hyundai Motor Manufacturing Indonesia has installed 3.2 MW solar panels at its production plant. As for the Ulsan and Asan plants in Korea, they now produce electricity using solar panels with a combined capacity of about 19 MW.

Support for net zero in the supply chain Hyundai helps its suppliers not only to improve quality and make technological advances, but also to achieve carbon neutrality. We monitor suppliers' carbon emissions and provide them with a carbon-neutral implementation guide designed to enable them to reduce their carbon emissions substantially. In association with our support for the suppliers' construction of smart factories, Hyundai will continue to improve company-wide ICT-based energy efficiency. In particular, we will join forces with the suppliers of raw materials with a high proportion of carbon emissions in a bid to promote a joint response in conjunction with automotive design technologies, such as recycling materials and expanding the use of new materials.

Social activities for reducing carbon emissions Hyundai monitors the market continuously and promotes technology development to commercialize CCUS technology, which captures and processes carbon generated in the process of burning fossil fuels such as LNG. We are also committed to reducing social carbon emissions through resource circulation, such as recycling and reusing materials from waste resources recovered from end-of-life car parts and waste plastics collected from local communities. In addition, we are planning to offset residual carbon emissions by executing external carbon reduction projects.

Hydrogen business synergy effects In alignment with the implementation of RE100, Hyundai aims to expand the use and conversion of green hydrogen produced without carbon emissions to secure renewable energy. Green hydrogen will be used as a substitute for LNG in the hydrogen power generation facilities and processes of our business sites. We will ensure that green hydrogen plays a pivotal role in the transition to electrification by installing a hydrogen fuel cell system based on green hydrogen in all mobility groups, such as passenger cars and commercial vehicles, public transportation, trams, ships, and AAM. Going forward, we will make every effort to ensure that hydrogen energy is widely used in all areas of human life and industry, beyond the means of mobility, by 2040.

Creating Hydrogen Ecosystem

Utilization of Green Hydrogen

Green hydrogen is hydrogen produced through the electrolysis of water, hence it is often referred to as “the ultimate eco-friendly hydrogen” because no CO_2 emissions are generated during its production process, whereas hydrogen and oxygen are produced by using electric energy obtained through renewable energy such as solar or wind power. Hyundai is striving to significantly lower the production cost of FCEVs and hydrogen by utilizing green hydrogen technology. We will promote the development of hydrogen production by expanding the application of hydrogen fuel cell systems to various industries, while building close cooperative relationships with businesses and partners in the field of green hydrogen production.

Cooperation for Green Hydrogen Competitiveness Acquisition

According to the International Energy Agency (IEA), grey hydrogen extracted from fossil fuels like natural gas and other by-product gases accounts for about 96% of all hydrogen sources, with carbon being emitted during its production. As such, converting it to green hydrogen based on renewable energy is the most urgent task.

To secure the core technology required to produce green hydrogen, Hyundai is exploring various types of water electrolysis technology including alkaline capable of large capacity with low-cost production, polymer electrolyte membrane (PEM) capable of responding to rapid renewable energy volatility, and next-generation solid oxide electrolysis cell (SOEC) with excellent efficiency. To secure competitive hydrogen production costs of the alkaline type, Hyundai is working with Next Hydrogen and H2Pro.

Not only water electrolysis, but also green ammonia-based hydrogen production is attracting attention in the market as a way to secure the competitiveness of green hydrogen. As regards cracking technology, which produces hydrogen by decomposing ammonia, Hyundai is joining hands with CSIRO/FMG of Australia to develop a technology that uses metal membranes. In this regard, an ammonia cracking system could be used upon importing hydrogen from Australia, etc., ultimately laying the foundation for the supply and use of carbon-neutral hydrogen.

To promote fuel cell power generation that can combine green hydrogen infrastructure and fuel cell technology, we are conducting a pilot project for MW-class power generation in cooperation with a number of domestic power companies.

Expanding Hydrogen Mobility

In September 2021, Hyundai Motor Group announced its vision for the hydrogen society, “2040 Hydrogen for Everyone, Everything, Everywhere”, and introduced various means of hydrogen mobility such as an unmanned transportation system called a trailer drone, a disaster relief vehicle, and a high performance hydrogen vehicle. We also presented a step-by-step plan to achieve the goal of installing hydrogen fuel cells in all our commercial vehicle lineups by 2028 for the first time in the global automotive industry. In accordance with this plan, Hyundai is getting ready to expand hydrogen mobility with particular focus on commercial vehicles.

Hyundai has been striving to achieve economies of scale in fuel cells through FCEVs in the passenger car sector. In 2021, we sold about 9,600 NEXO FCEVs worldwide, consolidating our No. 1 position in the global FCEV market. The creation of such large-scale demand in the passenger car market will provide a basis for providing fuel cell-based hydrogen mobility at a reasonable price.

Building Hydrogen Charging Infrastructure

Hyundai is collaborating with Saudi Aramco to expand its domestic hydrogen charging infrastructure and increase the supply of FCEVs in Saudi Arabia, while securing global competitiveness in robust hydrogen tanks and vehicle weight reduction. Saudi Aramco aspires to develop hydrogen production technology using its petroleum resources, and in order to expand it into a global business, it is working with us for the development of an LPG reformer by applying Hyundai’s reformer technology. Following the execution of a joint development agreement in June 2022, the two companies are planning to conduct a pilot project in 2023 using an LPG refueling station.

We are also making investments and building partnerships in various fields, including acquiring a stake in “H2 Mobility”, a German hydrogen infrastructure company, while working closely with both the private and public sectors to build the hydrogen infrastructure.

Reducing Product Carbon Footprint

To take part in the drive for carbon neutrality, which has been made the focus of all future global economic growth and development, Hyundai is working to achieve carbon neutrality by 2045 through the introduction of an “eco-friendly mobility ecosystem”. To reduce carbon production in its vehicles, the company is shifting its focus from vehicles equipped with an internal combustion engine to EVs. To this end, Hyundai is leading the evolution of transportation by expanding its electrification lineup based on EV technology and infrastructure, such as the E-GMP (Electric-Global Modular Platform), a platform dedicated to EVs, and strengthening the competitiveness of its hydrogen fuel cell system for eventual application to all its mobility groups including passenger cars, commercial vehicles, public transportation, trams, etc. We will newly position ourselves as a leading company that realizes carbon neutrality ahead of others by expanding the electricity and hydrogen charging infrastructure, thereby contributing to the transition of the global energy system to carbon neutrality.

Roadmap for Vehicle Electrification

Vehicle Electrification Strategy

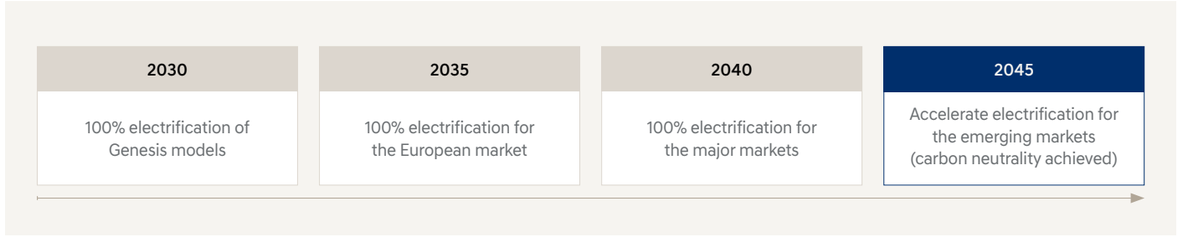
2022 CEO Investor Day

With 2021 as the starting point for the transition to carbon neutrality, Hyundai has declared it goal to achieve carbon neutrality by 2045, centered around the transition from ICEVs to EVs. Hyundai has established a roadmap to achieve carbon neutrality by 2045 through 100% electrification of its Genesis models by 2030, 100% electrification for European markets by 2035, and 100% electrification in other major markets by 2040. Three main innovation themes will play a key role in achieving the goals of the roadmap, namely innovation in production capacity, strengthening of H/W product competitiveness, and enhancement of software expertise and technology development. At the company’s 2022 CEO Investor Day, Hyundai presented investors with a blueprint for the automotive industry of the future.

Major Achievements and Plans for Electrification

In 2021, Hyundai sold 3.89 million automobiles worldwide and recorded a consolidated operating profit of 5.7%. In particular, we sold 140K EVs in 2021, a year-on-year increase of 44% in the proportion of EVs against total vehicle sales. To lead the EV market, Hyundai continues to make bold investments and develop new technologies. It plans to complete the Integrated Modular Architecture (IMA) development system, which standardizes and modularizes core electrification components, and apply it to a platform for passenger EVs (eM) and a PBV-dedicated EV platform (eS) by 2025. In addition, we will invest KRW 12 trillion in software by 2030 to strengthen our competitiveness in software, such as autonomous driving of EVs and vehicle connectivity.

Vehicle Electrification Roadmap

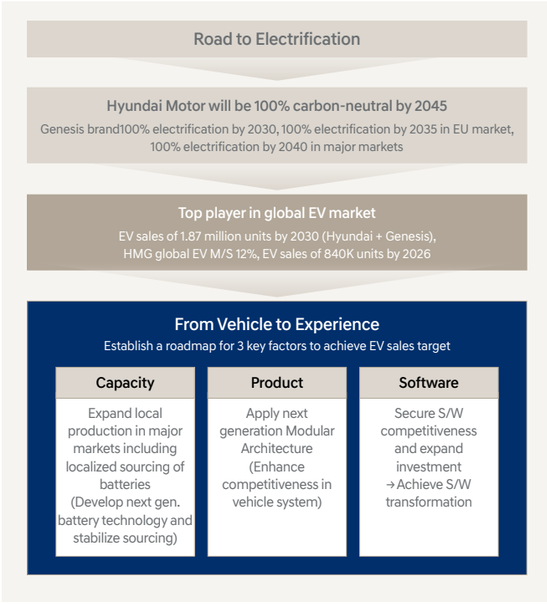


Expanding the EV Market Share

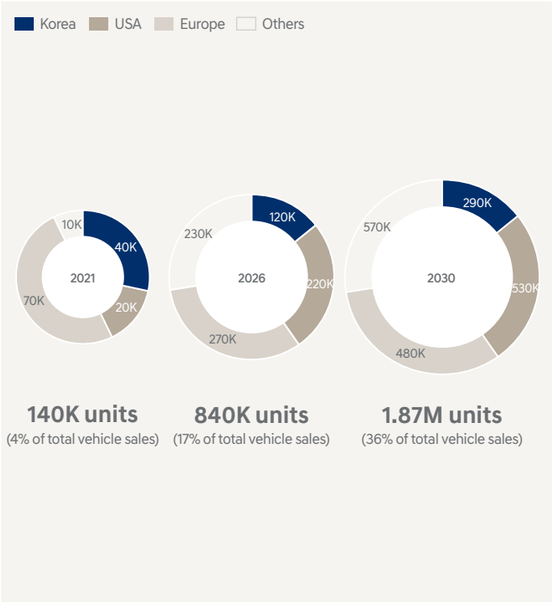
Hyundai has set its EV sales target to 840,000 units by 2026 (17% of total vehicle sales) and 1.87 million units by 2030 (36% of total vehicle sales). More specifically, by 2030, we plan to sell 530,000 units in the US (58% of total sales), 480,000 units in the European market (69% of total sales), 290,000 units in the Korean market (58% of total sales), and 570,000 units in other markets. Once the 2030 sales target is achieved, Hyundai’s global EV market share is expected to rise from 3% in 2021 to 7% in 2030, with the market shares in the US and Europe rising to 11% and 6%, respectively.

To expand its global EV sales and market share, Hyundai plans to launch a total of 17 EV lineups including 11 Hyundai brands and 6 Genesis brands by 2030. We will release the IONIQ 6 in 2022 and the IONIQ 7 in 2024, while launching EV lineups for six types of SUVs, three passenger vehicles, one small commercial vehicle, and another new vehicle by 2030. All new models of the Genesis brand will be launched as EVs starting from 2025, while being equipped with EV lineups for four types of SUVs and two types of passenger vehicles by 2030.

Vehicle Electrification Strategy



2030 EV Sales Target



Securing EV Technology Competitiveness and Expanding the Charging Infrastructure

Compared to the existing internal combustion engine platform, Hyundai's EV-only platform E-GMP offers a number of differentiated advantages such as flexibility in vehicle development, a design and structure optimized for EVs, a standardized large-capacity battery system, a longer cruising range, future-oriented design, and innovative space. The EMP is therefore regarded as the leader of future mobility in various areas such as fast/rapid charging, autonomous driving, and connectivity.

In addition to leading the EV platform technology, it is increasing customer convenience by expanding and building EV charging stations, and is continuously expanding or building ultra-fast EV charging stations such as the E-pit domestically, while strengthening cooperation overseas to expand its charging infrastructure in European and American markets.

E-pit Website (Korean)

E-pit – an Ultra-fast EV Charging Station

E-pit, the fastest charging station for EVs in Korea, is capable of charging the IONIQ 5 within 18 minutes (from 10% to 80% of battery capacity). Hyundai has also launched an ultra-fast charging service based on big data to provide customers with an innovative charging service experience. The service includes the Charging Route Recommendation System, which guides customers to charging stations, the Digital Queue Service, which informs customers of the expected charging time and order, and the Plug-and-Charge Technology, which offers customers a one-stop service from charging to payment. Going forwards we will continue to ensure that EV users can enjoy the best charging service possible through continuous technological innovations and service improvements.

IONITY – EV Charging Infrastructure in Europe

To secure an EV charging infrastructure in the European market, Hyundai has made a strategic investment in IONITY, a European fast charging network for EVs. As of 2021, it has more installed than 1,500 high-power (350 kW) ultra-fast chargers in Europe, with a plan to expand the number to 7,500 by 2025. As Hyundai operates a combination of fast and slow charging infrastructures and various convenience facilities, its charging infrastructure is expected to be used in diverse ways. Having established collaborative relationships with IONITY, Hyundai is expected to enjoy synergistic effects including increased sales of the IONIQ 5 and the Genesis GV60, both of which have been well-received in the European market.

MOU with Shell to Expand Charging Infrastructure in the US

Hyundai has signed an MOU with Shell, a global energy company, for comprehensive cooperation in hydrogen, digital technologies, low carbon energy solutions, and EV charging. Hyundai will leverage Shell's approximately 45,000 gas stations in some 80 countries to expand our EV infrastructure. We are also exploring ways to enhance charging convenience for Shell Recharge Solutions, Shell's EV charging service, and the Genesis brand. Meanwhile, Hyundai has set a goal of using 100% of renewable energy by 2045, and as part of the effort, we plan to adopt Shell's renewable energy solutions.

E-pit charging station

IONITY charging station

Signing of MOU with Shell

Expanded Use of Hydrogen Fuel Cells and Establishment of Hydrogen Infrastructure

Hyundai has been building many milestones such as world's first mass production of FCEVs, sales of 20,000 NEXOs with performance comparable to ICEVs, and export of the Xcient, hydrogen-powered electric truck, to Europe. We are now working to expand the hydrogen fuel cell technology for vehicles to various fields so that hydrogen energy can be used by people and industry across the world, beyond a mere means of transportation. With HTWO, our hydrogen fuel cell system brand, we are accelerating the establishment of the hydrogen ecosystem by selling the system and building cooperative relationships.

Hyundai's competitiveness in hydrogen fuel cell system technologies is recognized by global industry and government agencies, as Hyundai is consolidating its position as a global first mover. To speed up the transition to a hydrogen society where hydrogen serves as the key energy source, Hyundai is striving to build the hydrogen infrastructure and reinforce cross-industry collaboration.

Expanding Hydrogen Fuel Cell System Business

Since its mass-production of the world's first FCEVs in 2013, Hyundai has led the passenger and commercial FCEV market based on the technology it has accumulated. Furthermore, it has expanded the horizon of hydrogen applications by sharing its hydrogen fuel cell systems proven in the automotive industry with other industries. We began to export fuel cells to GRZ Technologies, a Swiss hydrogen storage technology company, in 2020 while widely publicizing the scalability and potential of hydrogen fuel cells through various pilot projects in non-automotive sectors such as hydrogen trams, forklifts, and power generation.

Collaborating for Hydrogen Technology

Hyundai is collaborating with various domestic and foreign organizations to develop hydrogen technology. Overseas, we have joined forces with Hazer Group in Australia to develop technology for reducing CO_2 emissions generated in the process of hydrogen production, as well as introducing and investing in liquid organic hydrogen carrier technology from Hydrogenious of Germany. In Korea, Hyundai participates in the H2 Business Summit to accelerate cooperation in Korea's hydrogen industry, and is building cooperative relations with local governments and public institutions. Going forward, we will expand technological cooperation with various organizations while providing innovative hydrogen services to customers based on outstanding technological competitiveness.

H Moving Station – a Mobile Hydrogen Charging Station

Under its hydrogen vision of "Hydrogen for Everyone, Everything, Everywhere," Hyundai provides a mobile hydrogen charging service that allows consumers to access hydrogen mobility easily by making the service available in areas where the hydrogen charging infrastructure has yet to be established or where demand for charging is rapidly increasing. Hyundai's mobile hydrogen charging station, "H Moving Station", can store 80 kg of hydrogen per unit and charge up to 25 FCEVs per day with a charging pressure of 350 bar. Going forward, we will further strengthen hydrogen infrastructure to make the H Moving Station service available to other types of hydrogen mobility, including heavy equipment and drones powered by hydrogen.

Hydrogen fuel cell system

Hydrogen trains

H Moving Station

Responding to Regulations on Average Fleet CO_2 Emissions & Fuel Economy in Major Markets

Regulations on vehicle carbon emissions are being strengthened in major markets such as the EU and the US. The EU has introduced a regulation to reduce 55% of its CO_2 emissions of passenger cars compared to the 2021 level by 2030, while the US has introduced regulations requiring fuel economy up to 40 miles per gallon by 2026.

Accordingly, in order to preemptively respond to regulations of major markets, Hyundai is striving to achieve zero CO_2 emissions by improving the fuel efficiency of ICEVs and by increasing the proportion of EVs. In addition to main markets, we are paying special attention to the regulation of CO_2 emissions in emerging markets such as Brazil and India.

Regulations in the EU

The EU, the largest EV market in recent years, has enforced a strong carbon reduction policy. The EU will reduce CO_2 emissions limit by 55% by 2030 compared to the 2021 level. Continuous tightening of the regulations is also planned, including prohibition of the sale of new cars with gasoline and diesel engines starting in 2035. CO_2 emission metrics was also be changed to the Worldwide Harmonised Light Vehicle Test Procedure (WLTP), an international standard which measures emissions on real roads. In order to respond to such changes, significant improvements in fuel economy are needed to be made.

Regulations in the US

The US aims to improve vehicle fuel efficiency by 40% and reduce carbon emissions by 30% by 2026. To this end, it has announced that only cars that satisfy a fuel efficiency rate of 40 miles per gallon will be sold starting with models released in 2026. Currently, the fuel economy of vehicles sold in the US is 24 miles per gallon on average. To meet the new fuel efficiency regulation, automobile manufacturers are required to improve their fuel efficiency by 8% in 2023 and 2024, respectively, and by 10% in 2026.

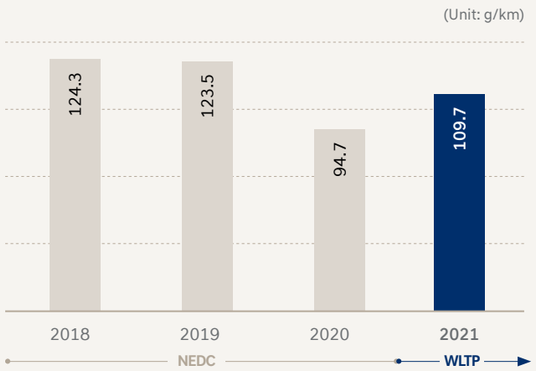
Regulations in China

China is implementing a "New Energy Vehicle Credit Scheme" whereby auto makers are obligated to supply EVs. The scheme requires manufacturers to accumulate credit by producing gasoline vehicles with lower emissions than the national standards or by producing battery EVs, PHEVs, and FCEVs. In addition, China has set the goal of increasing the share of new energy vehicles (NEVs) as a proportion of total vehicle sales to 20% in 2025, 40% in 2030, and 50% in 2035, with the proportion of battery EVs (BEVs) exceeding 95% of NEVs by 2035.

Regulations in Korea

Since announcing Carbon Neutrality 2050, Korea has established carbon regulations and policies comparable to those of advanced countries. As the automobile CO_2-related system of 2012 has been strengthened, auto makers are required to reduce their vehicle emissions from 97 g/km in 2020 to 89 g/km in 2025 and 70 g/km in 2030. Manufacturers that breach the emission limit will receive a fine of KRW 50,000 per 1g. Korea also aims to expand the supply of eco-friendly vehicles to 2.85 million units by 2025, while integrating 1,000 parts companies into the country's car industry of the future by 2030.

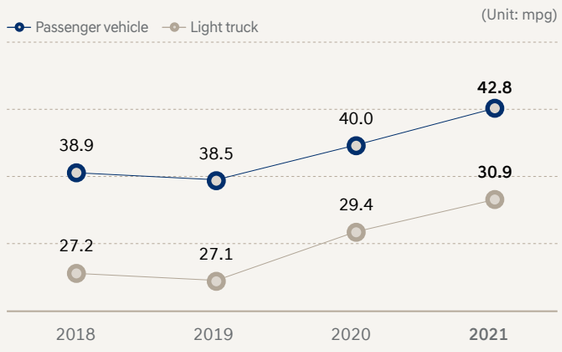
Average CO_2 Emissions in the EU



* 2021 performance is not able to be compared with the performance of prior years for the EU Commission changed the CO_2 emission standard from NEDC to WLTP; and the regulatory value was also from 95g/km(2020) based on NEDC to 112.5g/km(2021) based on WLTP according to the change of methodology.

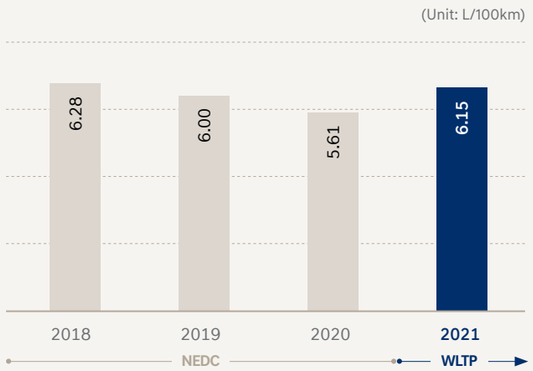
** The average CO_2 emissions of EU reflectthe average CO_2 emission performance calculated/disclosed by the European Commission on the basis of vehicles registered annually by the Commission; and the 2021 figure is an estimate calculated by Hyundai based on its sales performance.

Average Fuel Economy in the US



* The average fuel economy performance in the US and China reflects the average fuel economy performance of each car maker announced by the relevant government agencies (NHTSA, Ministry of Industry and Information of China) each year.

Average Fuel Economy in China



* 2021 performance is not able to be compared with the performance of prior years for the Chinese government changed the fuel economy certification standard from NEDC to WLTP.

Expanding EV Lineups

To meet the goal of achieving carbon neutrality by 2045, Hyundai is constantly expanding its lineup of eco-friendly vehicles. We are striving to become a top player in the EV sector by introducing HEVs and PHEVs, as well as EVs and FCEVs that do not emit any GHG emissions at all. In 2021, we sold 422K EVs, accounting for 10.8% of our global vehicle sales. In particular, we are leading global EV and FCEV markets, posting a 44% increase in sales in 2021.

We plan to continue strengthening our EV lineup in 2022 by launching the IONIQ 6 and GV70 EV. By 2030, we will be equipped with an EV lineup of 17 models, including 11 Hyundai models (3 passenger vehicles, 6 SUV models, 1 light commercial vehicle, 1 other type of vehicle) and 6 Genesis models (2 passenger vehicles, 4 SUV models). In this way we will secure our position as a global EV powerhouse with the goal of selling 1.87 million EVs and achieving a 7% EV vehicle market share by 2030.

HEV and PHEV

Hybrids (HEV) are highly eco-friendly vehicles with lower pollutant emissions and higher fuel efficiency than vehicles powered by internal combustion engines. Hyundai's SONATA hybrid model, for example, boasts a carbon emissions output of only 79 g/km (based on the Korean model), which is 39% less than its gasoline-powered model (131 g/km). We sell hybrid versions of all our models, except for large SUVs and subcompacts. To reduce the carbon emissions of SUVs, which emit more carbon than sedans, Hyundai launched the KONA HEV model in 2019, followed by the TUCSON and SANTA FE HEV models in 2020. In addition, we are expanding the PHEV lineup by launching the IONIQ PHEV in 2016, Sonata PHEV in 2017, and the TUCSON and SANTA FE PHEVs in 2021.

EV

An EV is an eco-friendly vehicle that does not emit GHG. Starting with the launch of the IONIQ in 2016, Hyundai gains traction in developing EVs. In 2018, we launched the KONA EV, the first SUV EV ever released by a popular brand, followed by the IONIQ 5, the first EV based on the E-GMP in 2021, emerging as a leader in the global EV market. Meanwhile, the launch of EVs from the Genesis brand, such as the G80 EV and GV60, is also in full scale. By 2030, we will expand EVs, with a particular focus on SUVs, while the Genesis brand will achieve 100% electrification, taking a big step closer to the goal of becoming carbon-neutral.

FCEV

Like EVs, FCEVs do not emit any pollutants including GHG, generating only energy and water. As they can also remove ultrafine dust from the atmosphere during operation, they are attracting attention as an eco-friendly form of mobility for the future. Hyundai launched the TUCSON ix, the world's first FCEV in 2013, and the NEXO FCEV equipped with a next-generation fuel cell system in 2018. The NEXO, which features a three-stage air purification system, boasts performance comparable to that of an ICEV. It can travel 609 km on a single charge. In addition, we have been expanding our FCEV lineup by launching the ELEC CITY FCEV, a hydrogen electric bus in 2020, and the Xcient Fuel Cell, a hydrogen-powered electric truck, in 2022.

Other Eco-friendly Vehicles

Hyundai has also launched regional eco-friendly models that run on bioethanol and compressed natural gas (CNG). In South America, we launched the HB20, a hybrid fuel vehicle, to meet the demand for bioethanol, while in India we introduced the Aura CNG model to respond to the country's growing demand for CNG. In 2021 alone, Hyundai sold 179,193 biofuel vehicles and 1,489 CNG vehicles.

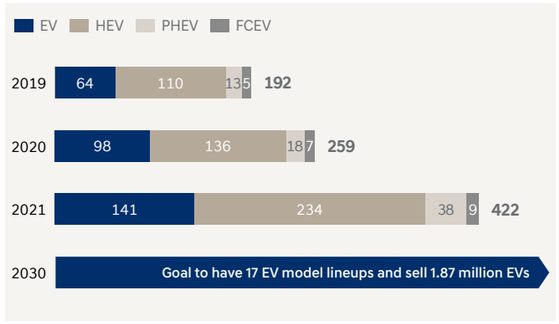
Sales of Other Eco-friendly Vehicles

(Unit: Vehicles)

	2019	2020	2021
Biofuel model	201,874	152,977	179,193
CNG model	3,005	1,352	1,489

Global Sales of Eco-friendly Vehicles

(Unit: 1,000 units)



EV – IONIQ

EV – GV60

FCEV – NEXO

HEV/PHEV – TUCSON

Improving Fuel Economy

In addition to launching new models with improved fuel efficiency, Hyundai makes continued efforts to improve the efficiency of its next-generation powertrain (P/T) to respond to the increasingly stringent regional regulations on fuel economy and carbon emissions, while also reducing carbon emissions significantly. The fuel efficiency of Hyundai's third generation P/T has been improved by 10% on average compared to the second generation, and we are continue developing lineups that incorporate the technology. Although we are aiming for a 100% transition to EV moving forward, at the same time, we are making concerted R&D efforts to improve the P/T fuel economy of ICEVs, which still account for a high proportion of sales, and to improve the fuel economy of the internal combustion engines by reducing their weight and installing solar roofs, while maximizing the fuel economy of each vehicle.

Technologies to Enhance Vehicle Fuel Economy

While making continuous efforts to improve the fuel economy of its new ICEVs aimed at reducing product carbon emissions, Hyundai is increasing R&D efforts to improve the overall fuel economy of per vehicle, such as by reducing vehicle weight and air resistance. As a result, the third-generation Genesis G80, released in 2020, boasts improved fuel economy of more than 20% compared to the second-generation version, which was achieved by engine downsizing and aerodynamic and driving resistance improvements. The fourth-generation Genesis G90, launched in 2021, boasts lower carbon emissions, down from 196 g to 184 g, on the back of various technologies to improve fuel economy, despite increased specifications and enhanced displacement of the main engine compared to models of the previous generation. The latest model's fuel economy has been improved by 5.7% through engine efficiency advancement with an ultra low loss diode (ULLD), friction load improvement with an air-conditioner compressor, and transmission efficiency enhancement with a torque converter with centrifugal pendulum absorber (CPA). Moreover, we improved fuel efficiency by developing an integrated thermal management system that controls the optimum engine temperature under specific driving conditions, while reducing carbon emissions from vehicles by reducing vehicle weight by 40 kg.

Solar Roof

Various forms of renewable energy that do not pollute the environment or pose a risk of depletion are growing in importance as an alternative to fossil fuels and nuclear energy. Solar (photovoltaic) power generation is one of the most common types of renewable energy and is easily available to the public.

Hyundai has applied solar power generation technology to reduce their carbon emissions. Starting with the eighth-generation SONATA Hybrid, allowing it to be driven about 1,300 km a year without producing any carbon emissions, solar roof has been applied to EVs such as the IONIQ 5 and the G80. In particular, the IONIQ 5 can obtain sufficient electricity to drive 1,500 km per year via its solar roof. Hyundai is striving to raise the density levels of solar cells and boost their performance to make the technology more viable. We will continue make efforts to further reduce vehicle carbon emissions by using more renewable energy.

Improve Fuel Economy on the Road (Off-cycle Test)

Hyundai conducts fuel economy tests in accordance with the legal standards in order to obtain certifications in Korea as well as in our major export markets including North America, Europe, China, and India. However, a gap occurs with each certification value in terms of actual road driving conditions due to various external factors such as weather and road congestion, as well as internal factors including gear shifting, vehicle weight, and air conditioning conditions. Hyundai therefore conducts off-cycle tests related to fuel economy (CO_2 emissions) with various driving profiles applied, as well as correlation analysis with the official results.

Hyundai always provides reliable fuel economy data in collaboration with third-party organizations. In the US, we present reliable fuel economy data through comparison with third-party data from EPA, J.D. Power and CR (Consumer Reports) among others. In Europe, which has the strongest regulations on carbon emissions, we are striving to bolster the credibility of fuel economy tests by comparing them with data from agencies such as Green NCAP, Auto Bild, and Spritmonitor.

We receive regular (weekly or monthly) inspections of fuel efficiency and emission measurement facilities by external authorized organizations (KOLOAS, KATECH, etc.), and aim to further raise the reliability of results by conducting fuel economy tests with various national research institutes. The department in charge of on/off cycle comparison reports the results of comparative analysis to the executive in charge of powertrain R&D at least once a year.

G90 engine with improved fuel economy, durability, and acceleration

IONIQ 5 with a solar roof

G80 EV with a solar roof

Carbon Reduction at Business Sites

Hyundai fully supports the direction and goals of the Paris Agreement on Climate Change, recognizes the roles and responsibilities in reducing global GHG emissions as a business, and carries out various activities to contribute to achieving the goals. While continuing energy reduction activities, such as the introduction of high-efficiency facilities and process improvements at all business sites, we aim to realize eco-friendly manufacturing based on the transition to renewable energy sources including solar energy. We will collaborate with the Group affiliates to achieve the goal of 100% renewable energy at all our business sites across the globe by 2045, ahead of the 2050 deadline recommended by the RE100 (The Climate Group).

Direction of Carbon Reduction at Business Sites

Energy Efficiency in Production Processes

Hyundai makes various efforts to increase energy efficiency in production processes and realize carbon neutrality by 2045. To this end, we are increasing the use of renewable energy and introducing high-efficiency motors and inverters in addition to utilization of hydrogen energy. We will replace the fossil fuels and electric energy used in manufacturing process with renewable energy while improving efficiency in painting process, which uses LNG as main fuel, by introducing high-efficiency equipment, recycling waste heat, and improving production processes.

Sites with the Energy Management System Certificate (ISO 50001)

Site	Certificate validation date
Beijing Hyundai Motor Company (BHMC)	Jan. 26, 2025 (Renhe/Yangzhen Plants) Dec. 12, 2024 (Changzhou Plant)
Hyundai Motor India (HMI)	Oct. 04, 2024
Hyundai Assan Otomotiv Sanayi (HAOS, Turkey)	Jul. 16, 2024

Carbon Capture Utilization & Storage

To achieve carbon neutrality, we should stop using fossil energy in automobile manufacturing processes. However, it will take years to complete transition to next-generation deoxygenation energy, carbon capture utilization & storage (CCUS), a new technology that captures and processes CO_2 emitted by fossil energy combustion, is gathering traction as a potential carbon-neutral tool during the transition period.

Hyundai has been developing CCUS technology to capture carbon emitted by LNG in manufacturing processes, given that a large amount of the fuel is used despite its relatively low carbon emissions among fossil fuels. To prepare for the commercialization of the CCUS technology for not only automobile business but other types of business as well, the Namyang R&D Center is conducting empirical research on CCUS in addition to monitoring the market continuously and pursuing the relevant technology development.

RE100 Roadmap

In July 2021, Hyundai Motor Company, along with other Group affiliates including Kia, Hyundai MOBIS and Hyundai WIA, declared the joining of the RE100, which advocates a 100% transition to renewable energy. Having been admitted into the global initiative in April 2022, Hyundai now aims to achieve 100% renewable energy transition by 2045, ahead of the RE100's target year, 2050.

Hyundai will gradually increase the use of renewable energy by 2045, taking into account t the renewable energy supply and demand environment as well as the government policies and regulations by country, such as the Czech Republic, where there is greater availability of renewable energy sources, India and the US. We will also apply optimal solutions for each plant, such as installing solar panels on the roofs of production plants, purchasing renewable energy certificates, and signing a power purchase agreement (PPA) with an external renewable energy generator.

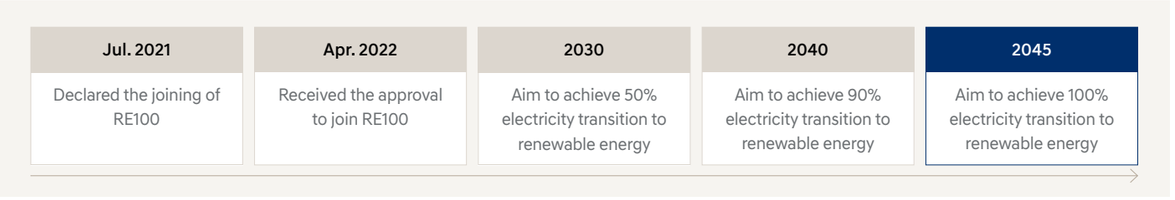
RE100 Implementation Plan

Hyundai Motor Manufacturing Czech (HMMC) converted 100% of electricity consumed at its plant into renewable energy through the Guarantee of Origin (GO) scheme in 2022. Hyundai Motor India (HMI) installed a 10 MW solar panel on the roof of its plant in 2021 while pursuing 100% renewable energy by 2025 through photovoltaic power generation and PPAs. Starting with the US market in 2025, most of Hyundai's overseas business sites in Brazil, Indonesia, Turkey and other countries are set to achieve their RE100 targets by 2030.

In Korea, Hyundai is supplying electricity to the external grid by installing solar panels on the roofs of its production plants under joint investment and rooftop lease agreements with a large public power company. We will standardize the installation of solar panels in new buildings and plants while pursuing a phased expansion of renewable energy through PPAs. We are also carrying out a pilot project to connect with photovoltaic power generation by installing an energy storage device (ESS) that recycles waste batteries.

Hyundai will boost the carbon emission reduction activities of its business sites by developing technology that optimizes energy use in digital technology-based production processes utilizing AI and big data, while taking the lead in achieving RE100 by 2045.

RE100 Roadmap



Carbon Reduction Activities at Business Sites

Carbon Reduction Activities in Korea

Ulsan Plant

Following the completion of a 9 MW photovoltaic power generation facility in the parking lot of its driving test site in 2020, the Ulsan Plant will start construction of a 15 MW second-stage photovoltaic power generation facility in the Seongnae parking lot for finished vehicles in 2022. To reduce its GHG emissions, the plant reduces power consumption by replacing high-efficiency pumps, configuring motor power saving circuits in engine factories, and applying inverters, while reducing gas consumption by extending the electro-deposition oven preheating zone, etc.

Asan Plant

The Asan Plant is concentrating on reducing energy consumption during equipment waiting times. In the finished vehicle part, it applies an inverter to the driving part of the hamming press facility during the car body process, conserving energy during not only waiting times but also brief standby times for the change of vehicle models. In the engine process, the plant has reduced energy use by building a power-saving circuit into all the processing equipment, while also contributing to reducing carbon emissions by setting and implementing aging facility replacement plan.

Jeonju Plant

The Jeonju Plant has introduced high-efficiency equipment to reduce GHG emissions, and has replaced its production system with an eco-friendly system. It has applied an inverter to the supply/exhaust system to block unnecessary energy use, and is replacing old refrigerators with high-efficiency ones. The plant has also reduced LNG consumption by introducing the waterfall washing method, which lowers the water temperature, to the truck paint shop.

R&D Centers and Other Business Sites (incl. Delivery Centers & Branches)

Hyundai's R&D centers reuse recovered waste heat and steam for boilers, and reduce GHG emissions by using waste heat generated during waste treatment. We are currently operating a 562 kW photovoltaic power generation facility and plan to install an additional 3 MW facility after consultation on the location. Hyundai's R&D centers as well as delivery centers and service centers have improved their energy efficiency by replacing aging facilities, while our own sales branches have reduced their GHG emissions by turning off lights during lunchtime. The headquarters has reduced electricity use by 135 kWh per month by installing LED lights on the world clock and the world map installed in the lobby on the 1st floor of the West Building.

A photovoltaic power generation facility in the parking lot of the Ulsan Plant's driving test site

A photovoltaic power generation facility in HMI

Carbon Reduction Activities in Overseas Subsidiaries

Beijing Hyundai Motor Company (BHMC)

BHMC has improved the operations of its production facilities to reduce down-time while continuing to reduce standby power in its production facilities. It has reduced GHG emissions by optimizing facility operations, including suspending the supply of steam to the paint shop when the external temperature rises, except in winter.

Hyundai Motor Brasil (HMB)

HMB regularly checks for energy loss factors while making various improvement efforts such as the introduction of an optimized compressed air supply system. It strives to reduce GHG emissions by continuously promoting energy conservation through the introduction of high-efficiency facilities and the replacement with LED lights.

Hyundai Motor Manufacturing Czech (HMMC)

HMMC has improved its energy efficiency by installing the EcoSmart VEC system based on a gas monitoring system at its paint shop. It has conserved energy by controlling the supply of compressed air and replacing the lighting with LED lights. In 2022, HMMC converted 100% of electricity consumed at its plant into renewable energy through GO.

Hyundai Motor Manufacturing Alabama (HMMA)

HMMA minimizes energy waste by using automatic cooling/heating monitoring systems that maintain the appropriate temperature, and has reduced GHG emissions by increasing energy efficiency through the installation of high-efficiency common utility facilities.

Hyundai Assan Otomotiv Sanayi (HAOS)

To conserve energy, HAOS in Turkey has made improvements to various processes including the reduction of compressed air consumption and the minimization of welding processes, while introducing the latest equipment such as high-efficiency inverters. In particular, it has minimized the unnecessary consumption of power in the paint shop at weekends and when the plant is not in operation.

Hyundai Motor India (HMI)

HMI operates its plant with electricity from renewable energy sources supplied through PPAs, thereby meeting about 35.5% of its total electricity consumption. Other than purchasing renewable energy from outside, HMI installed a 10 MW photovoltaic power generation facility in addition to existing 0.69 MW photovoltaic power generation facility in 2021.

Hyundai Motor Manufacturing Russia (HMMR)

HMMR is replacing the lighting at its business sites with high-efficiency LED lights. By the end of 2021, it had replaced 100% of office lighting and about 50% of its plant lighting, with the rest to be replaced by 2025. HMMR has reduced GHG emissions by saving energy during holiday shutdowns by upgrading its compressed air supply system.

Hyundai Motor Manufacturing Indonesia (HMMI)

Since April 2021, HMMI has been running a 3.2 MW photovoltaic power generation facility for its manufacturing plant following a pilot operation. It is now in the process of registering carbon credits with the CDM[1] Secretariat of Indonesia.

[1] Clean Development Mechanism: One of the reduction mechanisms stipulated in the Kyoto Protocol to allow emission-reduction projects in developing countries to earn certified emission reduction credits

Life Cycle Carbon Reduction

Governments around the world are tightening carbon emission regulations in line with the accelerating global efforts to respond to climate change. Automobiles are considered the main culprit of air pollution and thus the automotive industry is being asked to conduct life cycle assessments (LCAs) as part of the governments' environmental regulations. After establishing an assessment process, Hyundai conducted LCAs on the Kona EV in 2020 and four other vehicle models in 2021. We will analyze environmental impacts of each sector in order to continuously identify areas of improvement and make them better to minimize environmental impacts.

Life Cycle Assessment

Hyundai conducts LCAs to assess the environmental impact of each vehicle's life cycle, from the acquisition of raw materials and manufacturing to use, end-of-life treatment, and recycling. We conduct LCAs in accordance with the international standards (ISO 14040 & 14044) for vehicles produced in domestic plants for the Korean and European markets. In 2021, we conducted Full-LCAs for each of the core products of EV, HEV and ICE, and Simplified-LCAs for the core product of FCEV. As the result, we completed LCAs for 14.4% of total vehicles sold.

LCA Methodology

When conducting LCAs, Hyundai follows the Environmental Product Declaration of Ministry of Environment (Korea) and applies the CML (Centrum voor Milieukunde Leiden) methodology to appraise its performance in the following six categories – global warming potential (GWP), abiotic depletion potential (ADP), acidification potential (AP), eutrophication potential (EP), ozone depletion potential (ODP), and photochemical oxide creation potential (POCP). In addition to these six impact categories, we conduct LCAs on human toxicity and water depletion for the European market.

Expanding Implementation of LCAs

Based on the EV LCA process established in 2020, Hyundai was certified in 2021 by TÜV Rheinland of Germany that its LCA of the IONIQ 5, an EV subject to the E-GMP appraisal, was properly performed according to the ISO standards. In 2021, we expanded the assessment targets and established the LCA process for ICEVs and HEVs, based on which we completed the LCAs of the TUSCON gasoline and hybrid models. In 2022, we will develop an LCA process aligned with those of suppliers as a way to advance the assuagement system.

LCA Results

The LCA results show that of all the assessed models, TUCSON Gasoline emits the largest amount of GHGs in its entire life cycle and use stage, while EVs produce a relatively low level of emissions during use. Furthermore, it has been confirmed that the largest amount of emissions is produced in the operation stage of all assessed models, followed by the pre-manufacturing stage and the manufacturing stage. The result also shows that EVs produce more GHG than others in the pre-manufacturing stage, attributable to the battery system.

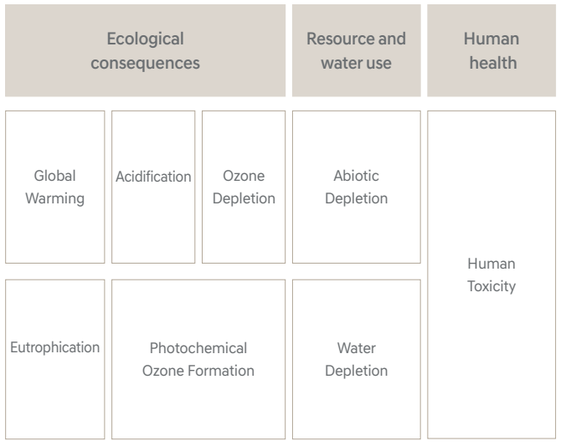
LCA Results

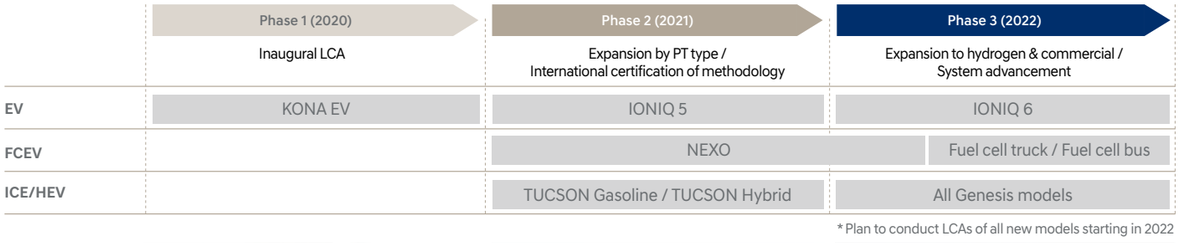
Model	IONIQ 5	TUCSON Hybrid	TUCSON Gasoline
Life Cycle GHG emissions (gCO_2-eq/km)	169.6	241.6	311.1

Utilization of LCA Results

Hyundai is using its LCA results as the basic data to identify the current status of progress in achieving carbon neutrality targets. We also use the data as a preemptive measure regarding the LCA legislation currently being promoted in the EU. Based on the results, we conduct comprehensive analyses of the environmental impacts of each stage and determines the efforts required to improve the environmental performance of products. We are also striving to develop new models with a minimal environmental impact by reflecting the LCA results in new car development process, and have elaborated plans to use them in the development of alternative raw materials and parts as well as eco-friendly recycled materials.

Impacts Covered by LCAs





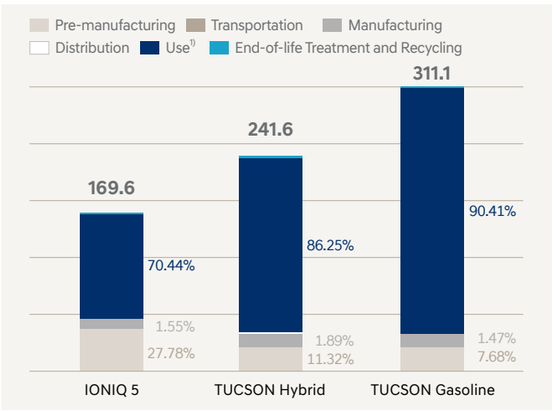
* Plan to conduct LCAs of all new models starting in 2022

KONA EV

IONIQ 5

G90

Global Warming Potential by Life Cycle (Unit: gCO_2-eq/km)



1) Including GHG emissions in the process of producing and distributing energy used for vehicle use (Well-to-Tank)

Carbon Neutrality in the Supply Chain and Logistics/Transportation

Carbon Neutrality in the Supply Chain

Hyundai is encouraging our supply chain's 2045 carbon neutrality which includes tier-1 auto-part suppliers. Estimated GHG emissions of our supply chain are 18.36 million CO_2-eq, which is about 18% of total GHG emissions generated throughout the life cycle of Hyundai's products. In the short term, we plan to establish a supply chain carbon emissions monitoring system to induce suppliers' carbon neutrality, and in the long term, we plan to reduce carbon emissions in the supply chain through applying low-carbon materials and eco-design.

Action Plan to Reduce Carbon Emissions in the Supply Chain

In 2021, Hyundai established a basic action plan to support its suppliers' efforts to reduce their carbon emissions based on the results of a survey of their carbon emissions and reduction plans.

In 2022, we offered them training to improve awareness of carbon reduction and enhance working-level capabilities, while publishing and distributing an implementation guide that they must follow to promote carbon neutrality. In the second half of 2022, we plan to specify the carbon reduction criteria and targets that will apply to suppliers and operate various support programs to contribute to their carbon reduction efforts through the construction or expansion of smart factories.

In particular, the results of the 2021 supplier carbon emission survey show that tires, aluminum wheels and battery manufacturing industries have a high intensity of carbon emissions, and the top 92 suppliers (more than 5,000 tonnes of carbon emissions based on our purchases) account for approximately 75% of total supply chain emissions. We will induce them to pursue carbon reduction while helping them to establish their own carbon neutrality management system.

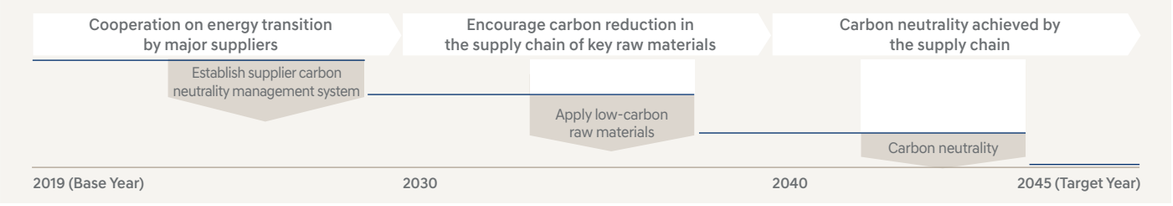
Carbon Reduction at the Logistics/Transportation Stage

Hyundai uses eco-friendly means of logistics and transportation including the procurement of parts and raw materials, the storage of inventory and work-in-process, and the sales and transportation of finished vehicles. Hyundai GLOVIS, which is in charge of Hyundai's major logistics and transportation on consignment, has contributed to reducing the volume of carbon emissions generated in Hyundai's logistics/transportation processes by improving the fuel economy of its freight vehicles and promoting a modal shift toward more energy-efficient means of transportation. We intend to promote a step-by-step modal shift to eco-friendly, low-carbon modes of logistics/transportation, with a plan to switch 100% of company-owned vehicles by 2030.

Creating Eco-friendly Logistics/Transportation Ecosystem

In order to reduce carbon emissions in the logistics/transportation service ecosystem, Hyundai is developing an eco-friendly and autonomous unmanned logistics/transportation business based on new technologies such as EVs, FCEVs, urban air mobility, and robotics. In the first mile stage, where cargo moves from a plant to a warehouse, we will use fuel cell trailers suitable for long-distance driving, while using electric trucks for the middle mile and last mile stages, from a warehouse to each base, leveraging our EV strengths. In addition, we are expanding cooperation with the government and industry to supply them with fuel cell trucks as a way to expand electrification in the logistics/transportation sector.

Roadmap for Supply Chain Carbon Neutrality



2022 Plan to Promote Carbon Reduction in the Supply Chain

Training for and raising awareness of suppliers	• CEOs: Host the Partnership Day for suppliers and introduce Hyundai's carbon neutrality strategies • Employees: Offer online ESG basic/intensive training courses (Global Partnership Center)
Operation of the Supplier Carbon Neutrality Council	• Convene the Supplier Carbon Neutrality Council on a regular quarterly basis • Gather opinions on Hyundai's carbon neutrality strategies and exchange opinions on major issues
Providing suppliers with the carbon neutral guide for suppliers	• Present suppliers with an implementation guide to promote carbon neutrality • Include the establishment of an in-house management system, reduction of GHG emissions at business sites/ supply chain/logistics, and disclosure of emission information, etc.
Survey of suppliers' GHG emissions and energy consumption	• Survey GHG emissions and energy consumption by raw material suppliers, etc. • Develop survey forms and broaden the suppliers subject to the survey
Review of suppliers' reduction targets and development of support programs	• Specify suppliers' GHG emission reduction plans (criteria and targets). • Develop supplier support programs (in connection with smart factory construction, etc.)

Major Activities to Improve Energy Efficiency in Logistics/Transportation

Activities	Main content
Reduction of environmental pollution in ships	Voluntarily reduce pollutants such as nitrogen oxides, sulfur oxides, diesel dust, and carbon dioxide (CO_2) in vehicle carriers
Eco driving of cargo trucks	Improve the fuel economy of cargo trucks by recording/analyzing instantaneous speed, brake signals, acceleration, and mileage
Transition to eco-friendly transportation	Transition to coastal shipping with lower carbon emissions than land transport

MOUs to Supply Fuel Cell Trucks in Korea

To achieve the government's goal of procuring 10,000 fuel cell trucks by 2030, the Ministry of Environment (Korea) provides subsidies for the purchase of fuel cell trucks; the Ministry of Land (Korea), Infrastructure and Transport offers fuel subsidies to reduce the operational burden of fuel cell trucks; and the Ministry of Trade, Industry and Energy (Korea) provides development and demonstration support to improve the performance of the trucks, while logistics companies such as Hyundai GLOVIS are preparing for full conversion to fuel cell trucks. Under the circumstances, we plan to mass produce and distribute fuel cell trucks in earnest starting in the second half of 2022.

Other Types of Cooperation for the Supply of Fuel Cell Trucks

Partner	Content
Pyeongtaek City	Supply a total of 850 fuel cell trucks and buses to Pyeongtaek by 2030
POSCO	Begin supplying fuel cell trucks in 2025 and promote phased conversion for 1,500 trucks at the steelworks
Hyundai Steel	Use fuel cell trucks to transport mobility parts for short/medium distances

Circular Economy

Creating a Recycling Ecosystem

Based on awareness of extended producer responsibility (EPR) regarding the recovery and recycling of end-of-life vehicles, Hyundai is committed to improving the recyclability of end-of-life vehicles and reducing environmental impact from end-of-life vehicles. We comply with the end-of-life vehicle recovery and disposal regulations in countries where we sell our vehicles, while also increasing collection, disposal and recycling rate of end-of-life vehicle, in cooperation with auto dismantling companies. To this end, we have been strengthening design which taking recycling into consideration at the vehicle development stage, and are shifting from a linear (production-consumption-disposal) to a circular (production-consumption-regeneration) business system by evaluating and applying materials and parts from the perspective of recyclability.

Recycled Materials and Recycling Technologies

Designs for Recycling

Having recognized that expanding the use of recycled materials in an eco-friendly way will play an important role in achieving carbon neutrality, the company designs its new vehicles by taking into account the need to reduce carbon and pollutant emissions and promote the circular use of materials during the development stage. On the back of such design practices, Hyundai vehicles are 85% recyclable, and the recyclability rate rises to 95% if the recovery of thermal energy from waste disposal is included. In particular, ferrous and non-ferrous materials, which account for approximately 70% of our vehicle parts and materials, are mostly reused and recycled during the scrap phase. Going forward, we will reinforce eco-friendly factors, including natural and biomaterials as well as recycled materials, in the new car design process and continuously enhance the environmental performance of non-metals such as plastic, glass and rubber.

Increasing the Use of Recycled Materials/Natural Materials and Biomaterials

Hyundai is leading the circular economy by focusing more on plastic recycling. We are striving to improve the recycling rate of waste resources generated by the existing end-of-life vehicle network, and we also operate the Resource Circulation Council, launched in 2021 aimed at seamless implantation of related tasks. Recycled plastics recovered from scrap car parts are no longer limited to wheel guards, undercover parts, battery trays and fan shrouds, as work has now begun to expand recycling to include lamps, exterior parts, and closure parts. In addition, we make continuous efforts to find ways to recycle waste resources as a means to securing a stable supply chain for recycled plastics, while reviewing plastic recycling in various fields such as marine and agricultural pollutants.

We are also establishing a strategic cooperative relationship for the recycling of plastics with leading companies in the chemical industry at home and abroad, and hold technical meetings on a regular basis. Through such processes, Hyundai specifies and clarifies technology roadmap for pursuing a more efficient application of recyclates.

Hyundai continues to develop eco-friendly materials using various natural resources and parts based on them. Leading example includes the development of a TPO sheet for internal parts with a bio content of 20% using non-food resources. It is a sheet suitable for automobile interior parts created through a process of extracting, converting, and polymerizing ethanol from sugar cane discarded during the production of sugar. We also have developed eco-friendly PU artificial leather by manufacturing, processing, and applying bio-polyol extracted from corn starch, as well as an eco-friendly artificial leather that reduces carbon dioxide emissions by 47% compared to petroleum-derived PU artificial leather. We continue developing a bio-composite material using coffee grounds in order to convey the images of premium Hyundai brands and their eco-friendliness to consumers. In particular, bio-composite materials using Starbucks' coffee grounds have been expanded their scope to include parts development stage. We are also developing eco-friendly parts by producing real wood sheets from recycled wood, whiskey/oak barrels and newspapers, while developing technologies to improve product marketability through the application of upgraded interior parts.

The recently launched Genesis brand models, such as GV60, Electrified GV70, and Electrified G80, use recycled and biomaterials as their interior materials. Hyundai has processed yarn from recycled PET bottles into knitted and suede fabrics and applied them to the head linings, pillar trims, sun visors, package trays, and luggage trims of its GV60, Electrified GV70, and Electrified G80 models.

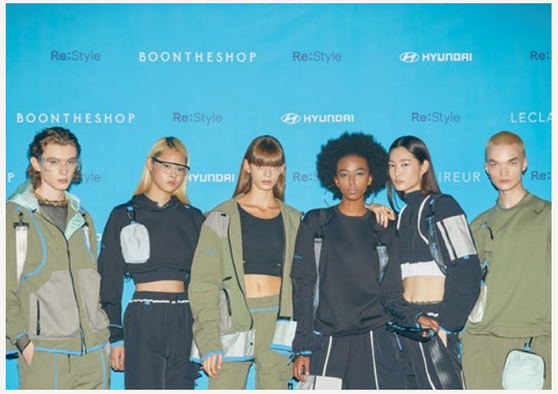
In addition, we have processed bio-yarn mixed with wool and PET into fabric and applied it to the seat covering of Electrified GV70, and applied eco-friendly PU artificial leather containing bio-polyol derived from corn/sugar cane to seat coverings and door trims of GV60. Going forward, we will develop yarn from waste fishing nets into BCF fabrics for carpets and apply them to the floor carpet of the 2023 Genesis G90.

"Re:Style" Upcycling Project

Hyundai constantly explores new uses for parts and materials with a low recycling rate, such as leather seats, glass, and airbags generated during the scrapping process. Hyundai's Re:Style project aims to spread upcycling through a unique collaboration between the worlds of fashion and automobiles. Through the project, we introduced jumpsuits made of scrap leather seats, bags made of discarded car carpets and jewelry made with scrap glass, the proceeds of which are donated to the British Fashion Council to promote eco-friendly fashion products. We will continue exploring ways to create new values for waste generated in the process of scrapping cars, while taking the lead in promoting sustainability in all industries including automobiles and fashion.

Marine Ecosystem Restoration and Upcycling Project

In partnership with Healthy Seas, a marine conservation organization, Hyundai promotes marine pollution-related education while working to prevent marine pollution and restore the marine ecosystem. We began our first action on Greek beaches, while planning to expand our efforts to other European countries including Norway, Germany, Britain, the Netherlands, Spain, Italy and France. Central to the restoration of marine ecosystems is the collection of abandoned fishing nets by a team of volunteer divers. The collected fishing nets are processed into ECONYL®, a biodegradable material made of nylon recovered from upcycled nets and cloths, and we are considering applying ECONYL® as a material for Hyundai vehicles.



"Re:Style" Upcycling Project

Marine Ecosystem Restoration and Upcycling Project © Cor Kuyvenhoven

Recovering and Recycling End-of-Life Vehicles

Establishing the End-of-Life Vehicle Resource Circulation System

In 2011, Hyundai signed an agreement with the Korean Ministry of Environment to implement a pilot project to advance the recycling system for end-of-life vehicles by justifying the adoption of EPR in the automobile sector after introducing it to packaging materials and electronic products. As part of this project, we provide vehicle dismantling manuals and necessary training to scrap car companies, subsidize the recycling of materials that are difficult to recycle, and support the eco-friendly disposal of waste refrigerants contributing to climate and ecosystem change, as well as continuously improving resource reuse and recycling rates at the end-of-life vehicle stage in collaboration with scrap car recycling companies. In 2021, such collaboration enabled us to recover about 195,000 tons of resources at the end-of-life stage, with the recycling rate of end-of-life cars reaching 82.6% without including heat recovery and 92% when included. By the way, Hyundai does not have a financial benefit from the end-of-life vehicles' take back programs.

Eco-friendly End-of-Life Car Service

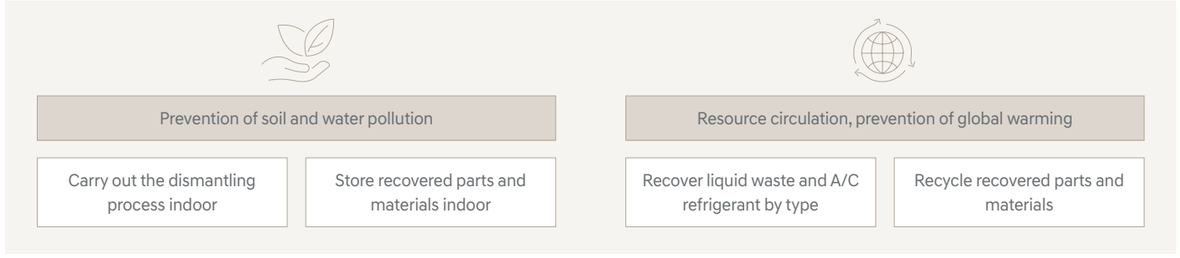
In response to customers' desire for eco-friendly ways of scrapping vehicles, Hyundai provides a one-stop service that assists its customers through the vehicle recovery, dismantling, and recycling processes. When a customer applies for the service at Hyundai's website, we pick up the scrapping vehicle at the time and place desired by the customer, after which the vehicle is sent to an eco-friendly junkyard for eco-friendly dismantling and recycling.

Resources Recovered from End-of-Life Vehicles

(Unit: Tons)

	2018	2019	2020	2021
Volume of annual recovery	262,775	261,971	209,754	195,370

Hyundai's Principles for End-of-Life Vehicle Dismantling and Recycling



Recycling Second Life Batteries

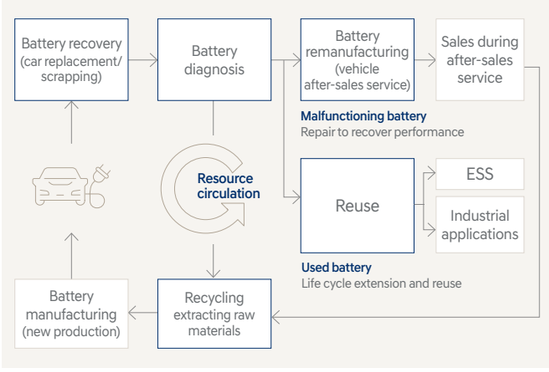
Eco-friendly Business Based on Second-Life Batteries

Based on the battery life cycle, Hyundai is establishing an eco-friendly battery circulation system that pursues sustainability through the recycling and reuse of second life batteries. The battery life cycle consists of an eco-friendly loop encompassing manufacturing to use, reuse of batteries after use, extraction of materials from finally discarded batteries, and application of the extracted materials to battery manufacturing. We launched a TFT in 2022 to establish a group-wide cooperative system throughout the battery life cycle, while exploring green business models and promoting advanced technology development.

Establishing the Second Life Battery Recovery System

In partnership with Hyundai GLOVIS, we are building up a global network and transportation control system to collect and transport used batteries discharged from various places including junkyards and dealers around the world. Hyundai GLOVIS developed and acquired a patent for a dedicated platform container that can transport hard-to-handle used batteries safely and effectively, and is equipped with logistics processes and systems that meet the complex and diverse regulations of various countries. We will use Hyundai GLOVIS' logistics know-how and network to complete the link between recovery and front-to-back business throughout the battery life cycle.

Virtuous Circulation System for Batteries



ESS Business Based on Second-Life Batteries

Hyundai has been conducting pilot projects to reuse second-life EV batteries for energy storage system (ESS). In December 2020, we became the first company in Korea to obtain approval to give a special regulatory sandbox demonstration of an energy storage device for reusing second life batteries. Having built a 2 MWh ESS and a 300 kWh ESS, respectively, at our Ulsan plant and the Gongju plant of OCI, our demonstration partner, we launched solar power-linked commercial operations in January 2021. The Ulsan plant's pilot project showcases our eco-friendly renewable energy power plant model, which combines a solar power plant on a temporary parking lot for produced vehicles with an ESS that reuses second life batteries. In April 2022, in cooperation with the Korea Water Resources Corporation, we built a new 400 kWh ESS in Busan Eco Delta Smart City, which will be used in the P2P-based power transaction pilot project. Going forward, Hyundai's various ESS pilot projects based on second-life batteries will be transferred to Hyundai GLOVIS, which is planning to convert into a full-fledged second-life battery reuse business equipped with a unified pipeline ranging from a recovery system to a reuse business.

Remanufacturing Business for After-Sales Service

The high-quality second-life batteries generated by our battery lifecycle are linked to Hyundai MOBIS' remanufacturing business according to classification criteria of Hyundai MOBIS. Hyundai MOBIS has established a collection system and a remanufacturing base that use the domestic and global after-sales parts supply chains to remanufacture purchased/collected second-life batteries into batteries for old vehicles, and provides an after-sales service, thereby prolonging the service life of batteries.

Establishing a System to Extract and Recycle Valuable Metals from Second-Life Batteries

Second-life batteries that cannot be remanufactured or recycled via Hyundai's battery circulation system are disassembled and sent to a recycling business that extracts from them valuable metals such as lithium, cobalt, and nickel. Hyundai is concentrating on securing technology that can recycle a large amount of second-life batteries in preparation for an era in which a far larger quantity of second-life batteries will be produced. In addition, we will complete the circulation system of batteries by taking the initiative in linking secured raw materials with battery manufacturing processes.

Resources Usage in Business Sites

Corporations are largely responsible for the depletion of the world's resources, and so is Hyundai as well. Due to climate change and reckless business activities, resource shortages including water are getting worse day by day while environmental issues such as air and water pollution are also causing great harm to the earth and all living things. In addition to these direct environmental risks, companies face a variety of crises. The three R's in resource – reduce, reuse and recycle – have become more importance than ever in the face of raw material risks cause by war and inflation and increasingly stringent environmental regulation to strengthen the circular economy. In response, Hyundai makes continuous efforts to use resources more efficiently and responsibly through the three R's.

Raw Materials Efficiency

Global inflation and rising uncertainty have led to rising raw material prices, a factor that directly affects operating profits. Hyundai is therefore striving to minimize the risks associated with raw materials by improving its raw materials efficiency. We place particular emphasis on the efficiency of steel that is easy to sort and recover in order to recycle it repeatedly. In 2021, the Asan Plant cut down its iron consumption by 160 tons by reducing the size of the blanks in the new Grandeur and 8th-generation Sonata models. Meanwhile, HMMR is striving to recycle not only steel but also various other materials to improve its raw materials efficiency. In 2021, HMMR not only recycled 28,044 tons of scrap iron, but also 11,021 tons of cartons and 3,837 tons of plastics, while HMB saved 138 tons of scrap iron and 27 tons of other materials during the year mainly attributable to efforts made at its pressing plant.

Water Reuse

As the global water shortage caused by climate change intensifies, a number of risks associated with water resources have already emerged. The World Resource Institute has warned that seventeen countries, including India and Iran, where about one quarter of the world's population lives, are at risk of running out of water resources.

In response, Hyundai aims to identify water risks that may affect its business operations, increase water reuse, and improve its water resource efficiency. We have not yet suffered any water shortage, nevertheless HMB has built four groundwater pumping stations to prepare for water shortages. The Asan Plant in Korea, HAOS in Turkey, and HMI are taking the leading role in increasing water reuse rate.

HMI and the Asan Plant have established a zero liquid discharge system to reuse 100% of the water they use, and the former actively responds to the risk of water shortage due to the severe water scarcity in Chennai where HMI's plant is located. HMI, which began building reservoirs within its premises in 2019, can now store a total of 335,000 tons of water at six reservoirs as of the first half of 2021. It has also linked all the drainage canals within its premises to collect as much water as possible when it rains. Having installed a super-large pump capable of pumping 4,000 tons per hour in the low-lying area of Plant 1, HMI has increased the maximum precipitation that it can collect from about 500 tons to 1,000-1,500 tons per millimeter of rainfall. HAOS recycles 42% of its water.

In addition, HMB and HMMR reuse pure water and washing water in their painting factories, while HMMC has increased its water reuse through continuous campaigns and inspections.

Zero Waste

In the automobile production process, not only iron and aluminum but also various other kinds of waste materials are generated. Hyundai recycles most of the metals it uses, such as iron and aluminum, and also recycles waste paint, waste thinner, packaging materials and sludge as much as possible. In 2021, we recycled 91.5% of all waste materials generated at our business sites, while treating difficult-to-recycle waste in an environmentally-friendly way. We are also increasing the amount of recycling by promoting the recycling of waste that was previously incinerated or landfilled.

In 2021, the Asan Plant recycled coated waste furniture generated from the renovation of its offices and dining halls rather than incinerating them, while the Jeonju Plant is working to recycle waste foundry sand rather than landfill it. In China, the Beijing Plant has reduced its final waste production by 180 tons by changing the method of drying paint chips generated by its paint shop. HMB has raised its waste recycling rate by implementing the Zero Landfill Campaign since 2018. To achieve the goal, it has also continuously monitored its use of chemicals to reduce the amount of sludge while recycling paint shop packages and construction waste.

Reducing Pollutants

In order to respond to air and water pollution preemptively, Hyundai is applying stricter in-house management standards than the legal standards of the countries in which its business sites are located. We are expanding the use of water-soluble paints to reduce the amount of air pollutants, especially volatile organic compounds (VOCs), while reducing air pollutant emissions by strengthening the monitoring of environmental prevention facilities, such as regenerative thermal oxidizers (RTOs) for oven exhaust gas treatment, improving dust collection efficiency, and replacing aging exhaust facilities. Meanwhile, for the effective management of water resources, an issue to which Hyundai's local communities pay keen attention, we are striving to improve water quality environment and ecosystem by setting water pollutant management and reduction goals for each business site.

Although it is difficult for the Ulsan Plant to check the amount of wastewater it transports in real time due to its vast size (approx. 6 million square meters), it is seeking to minimize its water pollution by operating a monitoring system based on the flow meters installed on its wastewater pipeline, which is 89 kilometers long.

The Jeonju Plant has minimized its air pollutant emissions by investing KRW 1.5 billion in air quality control facilities in 2021. It installed an activated carbon dust collector to remove air pollutants generated during the painting repair process, while improving air pollutant removal efficiency by replacing the filling inside the scrubber in the injection/melting line at the materials plant.

Input and Output at Business Sites

	2019	2020	2021
Resource Inputs			
Energy consumption (MWh)	7,680,491	6,791,668	6,169,739
Energy consumption per vehicle produced (MWh/vehicle)	1.71	1.82	1.59
Water consumption (Tons)	11,770,200	10,307,878	9,275,209
Water consumption per vehicle produced (Tons/vehicle)	2.63	2.75	2.44
Raw materials (steel and aluminum) consumption (Tons)	1,070,595	1,031,112	1,138,929
Raw materials (steel and aluminum) consumption per vehicle produced (Tons/vehicle)	0.242	0.276	0.293
Outputs			
Waste discharge (Tons)	633,300	498,318	538,772
Waste discharge per vehicle produced (Tons/vehicle)	0.143	0.133	0.138
GHG emissions (Scope 1/2, tCO_2e)	2,705,383	2,396,316	2,384,204
GHG emissions per vehicle produced (Scope 1/2, tCO_2e/vehicle)	0.603	0.642	0.616
Air pollutant emissions (Tons)	1,404	936	1,211
Air pollutant emissions per vehicle produced (kg/vehicle)	0.317	0.251	0.311
Water pollutant emissions (kg)	435,473	289,487	296,321
Water pollutant emissions per vehicle produced (kg/vehicle)	0.098	0.078	0.076
VOC[1] emissions (Tons)	10,944	11,047	10,756
VOC emissions per vehicle produced (kg/vehicle)	2.47	2.65	2.76

[1] VOC: Volatile Organic Compounds

Strengthening the Management of Harmful Substances

Management of Harmful Substances

Hyundai is committed to minimizing and strictly managing all harmful substances used in its products or generated by its worksites. To this end, we classify harmful substances not only in our products but also in production plants and take the appropriate measures according to the domestic laws and international standards. In December 2002, we established our own management standards for harmful substances (four major heavy metals), and since then we have been responding preemptively to the rules and regulations on harmful substances such as the Occupational Health and Safety Act and the Chemicals Control Act of Korea and the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) of the EU to protect the health and safety of all our stakeholders, including customers and employees, and to minimize adverse effects on the local ecosystem.

Management Process of Harmful Substances

Hyundai classifies and manages harmful substances in three stages – prohibition of use, limited use, strengthened management – according to international standards and initiatives. Substances classified as "prohibition of use" are banned from use as high-risk regulated substances for which substitutes must be found, while substances falling into the category of "limited use" can only be used for purposes specified in the exception article, and those falling into the category of "strengthened management" can only be used under constant monitoring and systematic management.

Although we strive to minimize harmful substances under internal standards, it is difficult to completely block harmful substances from products because automobiles consist of many thousands of parts. We therefore require the same management standards for harmful substances to be observed throughout our supply chain in order to ensure that the products that are delivered to us do not contain any regulated substances. Since 2004, Hyundai has applied the International Material Data System (IMDS), jointly operated by global automobile manufacturers, to systematically manage information on harmful substances in the materials and parts manufacturing stages, among others. We also apply the Material Analysis Management System (MAMS), developed in-house, to conduct risk assessments based on information on parts collected from the development/design stage of a new vehicle, thereby blocking the use of high-risk substances from the outset.

Moreover, in order to respond to newly regulated substances, we investigate the inclusion of regulated substances during the new car development stage based on the substance information registered with the IMDS. Hyundai also preemptively checks information on substances that are liable to change during the mass production processes through parts and material analysis and inspections during regular supplier site inspections.

Status of Harmful Substances Management

Hyundai strives to prevent the risk of accidents by preemptively reviewing newly announced harmful substances and finding and applying alternative substances. Upon handling hazardous chemicals, we maintain a safe working environment by utilizing the integrated monitoring system of environmental facilities to check for leakages of hazardous chemicals in real time.

Since 2003, we have been sharing information on domestic and international harmful substance regulations and response requirements with our suppliers, as well as strengthening suppliers' management of harmful substances, whenever necessary, by helping them to set up their own systems of response to harmful substance regulations, in addition to running annual IMDS user trainings to improve the consistency of IMDS data.

Response to Harmful Substances Regulations and Initiatives

Hyundai supports international regulations, standards, and initiatives concerning harmful substances and manages harmful substances based on them. We preemptively develop and use alternatives to harmful substances whose prohibition is anticipated at home and abroad, while striving to ban the use of high-risk substances ahead of the European ELV (End-of-Life Vehicles) and REACH regulations, the leading regulations governing harmful substances.

Persistent organic pollutants (PFOAs) that are resistant to environmental degradation accumulate in the body of animals and plants through the food chain, causing disturbances in the immune system and damage to the central nervous system, thereby adversely affecting the ecosystem and human health. As the related regulations have recently been considered in full swing, Hyundai has established the preemptive countermeasures. As for perfluorinated compounds (PFAS), which will be banned in Europe, we will take preemptive actions and replace them by the second half of 2025.

Management Standards for Four Major Heavy Metals

Starting in the European market in July 2003, Hyundai has gradually banned the use of the four major heavy metals – lead, cadmium, hexavalent chromium, mercury – which may accumulate in the human body and cause heavy metal poisoning. In addition, we prohibit the use of high-risk substances such as brominated flame retardants. Hyundai manages such harmful substances in accordance with the harmful substance management standards established in December 2002.