Environmental

The Earth is not only the home of mankind but also our responsibility to future generations. Hyundai has a clear understanding of its role and responsibility in reducing GHG emissions, thereby taking active parts in contributing to the global trend of achieving carbon neutrality. In particular, we are doing our best to protect the blue light of Earth with distinctive approach to climate change based on our own eco-friendly technology.

Environmental Management

Hyundai has established environmental management governance in which its highest decision-making body(C-suite) participates. We also have an environmental management system in place for sustainable business operations, including management and supervision of environmental management at the company level based on the environmental rule and policy. Environmental management enables us to respect nature capital and fulfill our corporate social responsibilities, thereby achieving sustainable growth through continued communication with stakeholders. Each business site operates an environmental management system based on international standards, and strives to manage it systematically and effectively by receiving outside certification and conducting internal audits. In particular, we establish a mid- to long-term environmental management plan to respond to climate change, expand resource circulation, and reduce pollutants. A performance evaluation system based on environmental management goals is also set in place with an aim to raise environmental management awareness and internalize it at the company level.

Composition of Environmental Management Policy

1. Overview	2. Basic principles	3. Execution system
A. Purpose of establishment	A. Raw and subsidiary materials	A. Governance
B. Application scope	B. Energy	B. Training and dissemination
C. Implementation measure	C. Water	C. Stakeholders communication
	D. Greenhouse gas	D. Performance management
	E. Waste	
	F. Waste product	
	G. Pollutants and hazardous materials	
	H. Local community	

Hyundai Motor Company Environmental Management Policy

Environmental Management System

ENVIRONMENTAL MANAGEMENT GOVERNANCE

Roles of the BOD The BOD and its subcommittee (Sustainability Management Committee) receive reports on environmental management performance as well as major risk factors and improvement activities on a permanent basis, and provide supervision. They also review and approve agenda items that are essential for business strategy execution and management activities, such as establishing mid- to long-term environmental management strategies that include carbon neutrality and making environmental investments.

Roles of the Management The Hyundai Business Strategy Meeting (or ESG Committee), in which the C-level executives participate, examine major company-wide environmental management plans and implementation status, including strategies for electric vehicle (EV) expansion and carbon neutrality, review improvement performance, discuss countermeasures for major risks, and manage other matters required to spread and disseminate environmental management. Environment-related issues that are expected to have a major impact on execution of business strategies, from among matters that are reported to the management, including the Hyundai Business Strategy Meeting, are reported to the BOD and subcommittee (Sustainability Management Committee).

Roles of the Dedicated Environmental Organization Hyundai has a company-wide supervising organization under the CEO and CSO's responsibility and an operating organization by business site in order to implement environmental management, and have two-way discussion on a regular basis for more efficient environmental management.

Company-Wide Supervising Organization The supervising organization at the head office is in charge of company-wide environmental management governance to implement sustainable environmental management in Korea and abroad. It performs diverse tasks, such as establishing a system to respond to environmental accident risks; planning and operating environmental management KPIs; responding to environmental regulation improvements; and planning and managing the supervision of environmental investment/culture/technology/training, through which it plays a central role in establishing an environmental management system, thereby achieving our environmental vision and goals.

Business Site Management Organization The environmental management organization at each business site is in charge of such roles as establishing and operating an environmental management system; enhancing business site environmental efficiency; and operating facilities to manage and reduce pollutants that occurs in the business operation process. It also implements environmental policy; identifies and addresses environmental risks; spreads and disseminates environmental management; and receives and handles environment-related grievance reports.

R&D Organization With our R&D Center performs a central role, the R&D organization is in charge of conducting R&D on environmental technology, developing eco-friendly products such as EVs, and carrying out other environmental improvement activities. Theses include reducing vehicles' carbon and tailpipe emissions by developing EVs; developing eco-friendly design which takes recycling into account; conducting life cycle assessment (LCA); developing eco-friendly materials; replacing harmful substances, and developing decarbonization technologies such as carbon capture, utilization and storage (CCUS) technology.

IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT

Environmental Management Principles We established the environmental management rule to actively practice environmental management based on recognition of the environment as a key corporate element. We periodically amend it by reflecting environmental regulations and the latest issues in Korea and abroad (recent amendment in 2022). Consisting of seven items, it includes items that we must focus on managing while implementing eco-friendly management. Key management items include responding to climate change, reducing pollutants, protecting biodiversity, preserving natural capital, and supporting environmental management of suppliers. Through this rule, Hyundai declares active efforts toward corresponding activities.

Environmental Management Policy Hyundai and all its subsidiaries and business units continually improve environmental performance according to the environmental policy and strive to minimize negative environmental impact of business activities and the overall value chain. In addition, we encourage our supply chain, including all suppliers and contract partners, to implement environmental management by recommending them to comply with our environmental management policy and providing necessary support. We place priority on compliance with environment-related laws and regulations in each country where we do business over our environmental management policy. We implement environmental management according to this policy in cases where the respective country's laws and regulations do not cover matters or do not have special clauses. We are periodically improving our environmental management policy by reflecting the establishment and amendment of laws and regulations and changes in the external market environment and corporate circumstances.

Environmental Management Execution Our environmental management is implemented based on the plan-do-check-action process that includes 1) Comply with laws and regulations; 2) Declare the environmental management policy; 3) Establish an environmental management system and adopt internal management standards; 4) Monitor and analyze environmental performance and data; 5) Identify risks and implement improvement activities; and 6) Continually improve environmental performance.

Establishment of an Environmental Management System Hyundai's all business sites in Korea and overseas plants had established an environmental management system (EMS) that meets international standards, including ISO 14001 and are obtaining certification from a third-party organization to secure the environmental management system's credibility and public confidence. Business sites that obtained ISO 14001 certification regularly receive an audit from a certification agency every year and implement improvement measures based on the audit. They also receive a renewal audit every three years. In addition, internal auditors inspect whether the environmental management system is working properly. In addition, an audit and verification are received on the environmental management system from external environmental experts, such as TÜV NORD. The supervising organization at the head office implements internal audit and performance assessment on domestic and overseas sites' environmental management.

System for Responding to Business Site Environmental Accidents and Regulations Hyundai has set in place an emergency response system to take immediate measures in the event of an environmental accident, such as air/water/waste and chemical substance leakage, based on international safety, health & environment (SH&E) standards. The head office and each business site have an emergency response organization and emergency contact system, and also have an emergency response manual that includes the status of disaster prevention facilities and equipment aimed at responding to environmental accidents and have all employees familiarize themselves with the manual. In addition, we create an alternative scenario for environmental accidents and continually conduct an emergency response drill at each department. In particular, we estimate environmental accident cases that may occur at business sites, based on which departments disseminate and provide training on actually applicable response measures. With regards to responding to regulations, a Hyundai/Kia environmental council is held every quarter through which employees in charge at each business site systematically discuss environmental regulations and response measures and respond to the regulations as part of business site environmental management.

Status of ISO 14001 Certification

Site	Term of validity
Domestic sites	2020-2023
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)	2022-2025
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)	2022-2025
Hyundai Truck & Bus China (HTBC)	2020-2023

Environmental Management

MANAGEMENT OF ENVIRONMENTAL PERFORMANCE

Management of Environmental Goals Through our environmental management implementation system, we set mid- to long-term performance goals for environmental factors that have a considerable environmental impact due to business operations, such as carbon emissions. Mid- to long-term performance goals are set in consideration of business as usual (BAU) as well as external economic circumstances, government policy direction, and internal business strategies.

To respond to climate change, we set the goal to achieve carbon neutrality by 2045 throughout the entire life cycle that ranges from raw material collection to parts procurement, production, and operation. To achieve the goal, we are implementing such strategic tasks as a strategy to transition to EVs, achieving RE100 at business sites, and reduction of supply chain carbon emissions. For quantitative improvements to environmental indexes, excluding carbon, we set improvement goals for water and wastes based on the direction of suppressing increases in water consumption and waste generation that are on the rise in connection with production that is increasing after COVID-19. In addition, we strive to reduce pollutant emissions (air: dust, NOx, SOx, THC / water quality: TOC, TP, BOD, SS) at our business sites by setting higher pollutant emissions standards than those required by law.

Evaluation of Environmental Management Performance To improve business site environmental performance, we are reflecting and managing operational efficiency improvements, energy reduction activities, adoption of renewable energy, other GHG reduction performance, and internal goals on environmental pollutants in business site KPIs. In case of business site environmental pollutants, we examine monthly emission indicators. For business sites in excess, we analyze the cause and implement improvement measures. In the area of products, we set and manage our fleet average fuel economy or CO_2 emissions, electric vehicle sales goal achievement rate, and others as KPIs.

Environmental Investment Plan and Execution Hyundai established a plan to invest a total of KRW 109.4 trillion (KRW 47.4 trillion in R&D, KRW 47.1 trillion in facility investment, KRW 14.9 trillion in strategic investment) by 2032 to achieve its mid-to long-term electrification strategy. In addition, we established a mid- to long-term investment plan that additionally invests KRW 24 trillion by 2030 to strengthen the upstream and downstream EV industry ecosystem, such as building EV-dedicated production facilities in Korea and expanding EV charging infrastructure, at the Group level. Hyundai's environmental investment budget in 2022 was KRW 667.6 billion, of which KRW 506.1 billion was executed. A total of KRW 21.5 billion was executed in 2022 as environmental facility investments to reduce the emission of environmental pollutants at domestic sites.

ENVIRONMENTAL MANAGEMENT COMMUNICATION

Training to Raise Environmental Management Awareness Hyundai operates an environmental management training course that addresses requirements specified in environment-related laws and regulations, company-wide environmental management goals and plans, outstanding cases of environmental management activities, matters required to perform major duties, and results of benchmarking relevant companies. Various opportunities are provided to employees in charge of the environment so as to enable global ESG responses, including participation in overseas forums and seminars. In addition, environmental expert ISO auditor training is provided to improve practical environment-related job competencies and to systematically manage statutory environmental training. In 2022, a total of 48,837 employees completed environmental training, and total operation hours of the programs stood at 95,372.

In addition to our employees, we provide environment-related training programs to suppliers. Through an online platform's ESG training course, we are communicating the need for environmental management and suppliers' roles. In addition, a group course and seminars are provided to offer in-depth environmental training.

Stakeholder Engagement and Consultation Hyundai conducts a stakeholder survey every year to identify sustainability issues, including environmental issues. By regularly holding an ESG Non-Deal Roadshow (NDR) for domestic and overseas investors, we are strengthening investor communication on ESG issues, including environmental issues. Furthermore, on the basis of consultation and communication with industry associations (Korea Automobile Manufacturers Association, European Automobile Manufacturers Association, 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.

Grievance Handling Channel We operate a channel for receiving environment-related grievance from various stakeholders, including employees. Once received, the grievance reports are handled and notified according to set procedures and standards. In particular, the ESG Committee discusses countermeasures for grievances that have a high possibility of violating laws and regulations and may cause a considerable setback in business operations or expect to have a negative impact on the local environment. Environment-related grievances can be reported to an organization exclusively in charge of the environment at each business site and key grievance-handling channel (ESG@hyundai.com).

Environmental Management Goals and Implementation Status

Classification	Mid- to long-term goal	Performance in 2022
Transition to electric vehicles	Plan to sell 940,000 EVs by 2026, 2 million EVs by 2030 Achieve 100% electrification of Genesis by 2030 Sell only EVs in Europe by 2035 Sell only EVs in main markets by 2040	• Sold a total of 506,793 units of electrified vehicles • Sold a total of 210,352 units of EVs • Sold 15,594 units of Genesis EV models
Hydrogen business synergy	Expand hydrogen mobility sales	• Sold 11,217 units of FCEVs
	Produce and supply green hydrogen	• Collaborated with H_2Pro to develop high-efficiency hydrogen production technology • Collaborated with NextHydrogen to develop a green hydrogen water electrolysis system
Carbon neutrality in our factories	Achieve RE100 by 2045	• Renewable energy accounted for 7.7% of total electricity consumption in 2022 (HMMC 100%, HAOS 51.7%, HMI 42.1%)
Carbon neutrality in our supply chain	Encourage to achieve carbon neutrality by 2045	• Conducted investigation of GHG emissions by tier-1 suppliers, and reviewed major companies' reduction plans • Distributed carbon neutrality guidelines to tier-1 suppliers • Provided training to around 360 tier-1 suppliers to strengthen their carbon neutrality capabilities

Stakeholder Engagement and Consultation

Stakeholder group	Engagement
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.
Shareholders and Investors	• Hyundai will achieve environmental performance that meets the requirements of its shareholders and investors, thereby building long-lasting, trusting relationship and expanding investment aimed at improving its corporate value.
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.
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.
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.
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

Hyundai responds to climate change at a company level by identifying, evaluating, and managing related risks and opportunities on a constant basis. We also have set major climate strategies through our climate change governance to analyze the potential impact of climate change on our business and respond to macroscopic changes in the business environment due to changes in laws and regulations. We identify various climate risk and opportunity factors, and preemptively respond to changing market demands through the development of eco-friendly mobility and various mobility solution technologies.

Climate Change Risk Management

CLIMATE CHANGE GOVERNANCE

Roles of BOD and Management Hyundai preemptively identifies its risks related to ESG and strengthens its management activities, while strategically utilizing various ESG factors to explore new business opportunities and develop competitive advantages. Major ESG issues, including climate change, are discussed semiannually by the Sustainability Management Committee and the ESG Committee under the Board of Directors. The ESG Committee, a subcommittee within the Hyundai Business Strategy Meeting, shares and discusses information on the company's ESG status and issues among its executive members. Important agenda items selected by the ESG Committee are presented to the Sustainability Management Committee, which reports directly to the BOD and makes decisions on important ESG issues reported to management.

Greenhouse Gas Council In order to respond to climate change and achieve its mid- to long-term goals of carbon neutrality, Hyundai has formed company-wide GHG response organizations and does its best to improve energy efficiency, expand the use of renewable energy, and improve the working environment at its business sites.

ROLES OF DEDICATED TEAMS

Company-wide Planning Team In 2021, Hyundai established the Carbon Neutrality Execution Team, a dedicated organization within the Planning & Finance Division at the head office respond to climate change more actively. The team works with relevant organizations to establish implementation strategies in various areas such as product, business site, and supply chain.

R&D Organization Hyundai also makes efforts at the R&D organization level to respond to climate change and achieve its goal of carbon neutrality. As part of these efforts, in March 2022, Hyundai entered into a joint research agreement with Aramco and KAUST on ultra-lean combustion engines and eco-friendly synthetic fuels and embarked on joint development to reduce GHG.

CLIMATE RISK AND OPPORTUNITY MANAGEMENT

Climate Risk and 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 companywide response strategies.

Identification Stage In the identification stage, we figure out issues by region and team regarding risks and opportunities that may affect the company due to climate change at the Product Committee and the Hyundai Business Strategy Meeting.

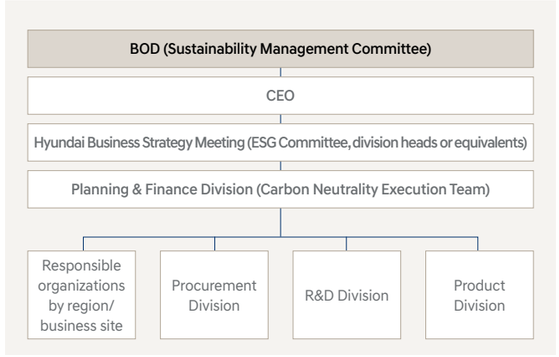
Assessment and Reporting Stage The Planning and Finance Division at the head office figures out the strategic and financial impact that factors and issues identified in the identification stage may have on the company, and depending on their materiality, reports them to the CEO or the BOD through the ESG Committee for decision-making.

Management Stage The decided climate change issues are proactively reflected in the KPIs of each working-level division of the relevant region or organization. The Carbon Neutrality Execution Team and related organizations join forces to systematically manage climate change factors in various areas.

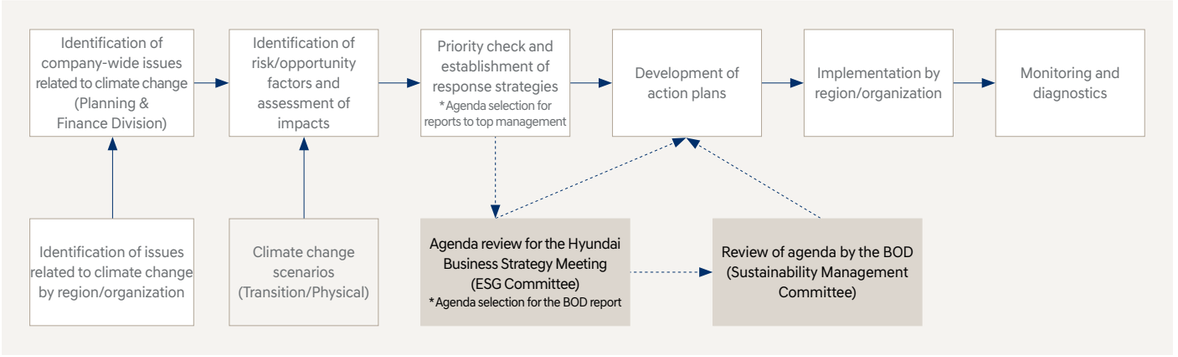
Incentives for Climate Change Management Hyundai includes climate change-related items in the KPIs of the CEO, plant managers (heads of manufacturing subsidiaries), and employees (related teams), with the results of the performance evaluation aligned with the incentive and annual salary system. The CEO performance evaluation items includes the implementation rate against carbon neutrality target and the level of establishment of carbon neutrality implementation system, while the performance evaluation items for plant managers include GHG emissions, emissions per vehicle, and RE100 target achievement rate. In addition, we have set goals related to GHG emissions reduction for employees at related teams and use them for their performance evaluation.

Target	Incentive	KPIs	KPI Details
CEO	Financial rewards (Included in bonus)	Carbon neutrality & Energy transition	1) Accomplishment rate to carbon neutrality goal 2) Level of carbon neutrality implementation system
Plant managers (Heads of manufacturing subsidiaries)		GHG emissions reduction	1) Total emissions 2) Emissions per vehicle 3) RE100 target achievement rate
Employees (Related teams)			Set goals related to GHG emissions reduction for staff at related teams and use them for performance evaluation

Climate Change Governance



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



Response to Climate Change

RISK ANALYSIS OF CLIMATE CHANGE SCENARIO

Scenario Analysis Methods Hyundai systematically addresses potential climate risks and opportunities through transition and physical scenario analysis. We carefully set various timeframes – short-term (1-3 years), mid-term (3-10 years), long-term (10-25 years) – which allows us to identify potential impacts on value chain stages, including domestic and overseas business sites, as well as upstream and downstream operations. We conduct annual analyses of these scenarios, utilizing the findings to develop proactive response plans.

In regard to the transition scenario, we have established our own "2045 Carbon Neutrality Plan" with the goal of electrification, hydrogen society, smart city, and circular economy ecosystem in line with the level required by IEA NZE 2050. For the physical scenario, we have evaluated the impact on our business by using RCP 8.5 (non-reduction scenario), the most conservative of the RCP (Representative Concentration Pathway) scenarios based on the concentration of CO_2 in the atmosphere. Based on the evaluation results, we set response priorities for each major issue and manage them preemptively.

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** IEA B2DS, IEA STEPS, NZE 2050, NDC • **Physical** RCP 8.5 (baseline scenario), RCP 2.6 (below 2°C scenario), RCP 1.9 (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.

Overview of Transition Risk Scenario Analysis As the damage caused by abnormal climate has increased rapidly, a number of major countries including Korea have declared their commitment to carbon neutrality. In order for them to achieve the goal of carbon neutrality, however, it is essential to reduce GHG emissions in the transportation sector. In its efforts to take active part in the eco-friendly industry, Hyundai has conducted an analysis that takes into account the requirements for carbon neutrality by 2050 and an annual average reduction rate of more than 4.2% on the basis of the IEA NZE 2050 scenario.

To meet the level required by IEA NZE 2050, we analyzed our energy consumption status and trends, based on which we derived business as usual (BAU) scenario using growth rate and regression analysis. We then calculated the amount of our GHG reduction compared to BAU and reviewed various measures to achieve the goal. First, we sought ways to directly reduce GHG emissions and estimated the reduction potential based on applicable reduction technologies. We established the RE100 roadmap, which aims to use 100% renewable energy in our global production plants by 2045. We plan to promote carbon neutrality at our business sites by improving energy efficiency for major manufacturing processes and switching to hydrogen and other eco-friendly fuels. Lastly, for areas where direct reduction is difficult, we have sought ways to offset GHG emissions and achieve the net zero goal through carbon capture utilization & storage (CCUS), a technology that captures and treats CO_2 in the atmosphere; the Hyundai Green Zone Project, a global ecological restoration project; and the marine ecosystem restoration and upcycling project.

Estimating the Damage Caused by Transition Risk Under the Paris Agreement, governments around the world are setting targets to reduce GHG emissions by 2030. Europe announced "Fit-for-55," which aims to reduce carbon emissions by 55% compared to 1990 by 2030. To comply with vehicle CO_2 emission standards, Hyundai will adopt the internationally recognized Worldwide Harmonized Light Vehicle Test Procedure (WLTP) as the standard for light vehicles. Failure to meet this standard poses the risk of lawsuits and penalties for non-compliance. CO_2 emission standards vary by type of vehicle, but if the standard is not satisfied, a penalty of "number of cars sold x amount of CO_2 exceeding the standard (1g/km)" will be incurred, which may cause significant financial damage to the company.

Overview of Physical Risk Scenario Analysis Electricity accounts for around 70% of Hyundai's Scope 1 & 2 GHG emissions. Electricity has therefore a significant impact on Hyundai's operating costs, and since electricity consumption has a direct impact on global temperature rise, physical scenarios were analyzed based on RCP 8.5, which predicted a 3-4°C increase in global temperature in the future. First, based on the World Resources Institute (WRI) scenario and the physical scenario analyzed by the Korea Meteorological Administration, we have analyzed risks posed by RCP scenarios for all our business sites in Korea, the U.S., China, India, Turkey, the Czech Republic, Russia, and Brazil.

RCP 8.5 scenario analysis shows that the failure to actively respond to physical scenarios will directly lead to an increase in operating costs, which will have a significant impact on consumer burden and our product sales due to higher production costs. Hyundai therefore recognized climate change as a critical issue and has set Net Zero and RE100 targets by 2045. We plan to actively participate in setting and implementing these goals to contribute to lowering the global GHG concentrations and minimize the risk of operating cost risks.

Estimating the Damage Caused by Physical Risks Analysis of the effects of climate change disclosed by the WRI and the Korea Meteorological Administration confirms that the global temperature is continuously rising, which means that the impact on Hyundai varies depending on the extent of the temperature rise. In the case of RCP 8.5, we have compared the operating costs in 2100 to the present, assuming a 3°C increase by 2100 compared to 2021 and a 1.5-fold increase in electricity consumption for every 0.5°C increase in global temperature. The result shows that if we do not take active part in responding to climate change, we will incur about 8.4 times more electricity costs than present.

Moreover, as climate and environmental charges have been reflected in the unit price of electricity in Korea since 2021, the rise in global temperature will act as a factor in increasing the electricity unit price, which will also increase operating costs. Assuming that the unit price of electricity increases KRW 0.3/kWh when the earth's temperature rises by 1°C, Hyundai will be affected very seriously for electricity takes large portion of its energy consumption.

Response to Climate Change

MAJOR CLIMATE RISKS AND COUNTERMEASURES

Regulatory Risk
Hyundai responds to climate change by designating and managing 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.

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) markets, as well as bolstering its related technology development capabilities.

Physical Risks
Due to climate change, the frequency and intensity of extreme weather events are increasing. Hyundai is equipped with a system to identify business sites that are exposed to short-term physical risks (typhoons, floods, heat waves, etc.) and long-term physical risks (changes in precipitation, sea levels rise, etc.) to take preemptive countermeasures to physical risks.

GHG Emissions Trading System

RISK FACTORS
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 allowance units. We bought allowance units in 2022 because we produced more emissions than our allowance for the year, which was about 1.46 million tCO_2-eq.

COUNTERMEASURES
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.

Accelerating the Electrification

RISK FACTORS
The EU countries gave final approval to a landmark law to end sales of new CO_2-emitting cars by 2035. The EU law will require all new cars sold to have zero CO_2 emissions from 2035, and 55% lower CO_2 emissions from 2030 versus 2021 levels. The targets are designed to drive the rapid decarbonization of new car fleets in Europe. Among the EU member countries, France will ban the sale of ICEVs from 2030 while nations around the world are tightening regulations on electrification.

COUNTERMEASURES
Hyundai has established a mid- to long-term roadmap for the transition from ICEVs to EVs and has been accelerating the relevant technology development and EV launching. Starting with Europe by 2035, we will complete the transition to 100% electrification in other regions as well, while continuing to expand our FCEV lineup. On the back of such efforts, we will achieve the goal of 100% electrification of all vehicles sold in the European market by 2035 and other major markets by 2040.

Damage to Facilities Due to Abnormal Climate Events

RISK FACTORS
Hyundai operates a facility in Alabama, located in the southeastern region of the U.S., which is susceptible to tornadoes. There is a projected substantial increase of GHG emissions by 2030 compared to 2010, which can contribute to heightened occurrences of severe climate events like hurricanes and tornadoes. These events pose a potential impact on the company's operations in the U.S.

COUNTERMEASURES
Hyundai Motor Manufacturing Alabama (HMMA) strives to minimize tornadoes damage by expanding shelter for employees, strengthening bridge superstructures, developing emergency response manual, purchasing disaster insurance, and making other various efforts.

Fleet-wide CO_2 Emission Standards and Taxation

RISK FACTORS
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 emission standards for vehicles sold are being strengthened along with those on corporate average fuel economy. The European Union adopted a target to reduce CO_2 emissions to 0g/km by 2035, which means that from 2035 the sale of new vehicles with internal combustion engines (ICEVs) will be banned in the EU market. 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.

COUNTERMEASURES
Hyundai is focusing on improving the fuel efficiency of ICEVs of its Genesis brand and mid-to-large SUVs in response to the tightening of CO_2 emission standards and the corporate average fuel economy regulations in major markets, including EU, as well as changes in market demand due to the spread of CO_2 emission-based automobile taxation. Furthermore, to reduce the carbon emissions of all products produced by Hyundai, we are striving to improve the fuel efficiency of existing internal combustion engines in the short term while developing and distributing eco-friendly vehicles in the long term.

Promoting Eco-friendly Consumption

RISK FACTORS
According to the International Energy Agency (IEA), global sales of eco-friendly vehicles, such as EVs, exceeded 10 million units for the first time in 2022 while the trend of eco-friendly consumption by automobile consumers is strengthening as well. Demand for EV batteries are growing and is expected to rise to a maximum of 4,028 GWh by 2030.

COUNTERMEASURES
As part of our efforts to secure the highest quality batteries, we have signed an investment agreement with LG Energy Solutions to build battery cell plants together. We are also developing technology for the solid-state battery, a next-generation battery, to improve stability, mileage, and charging time of our EVs.

Water Shortage due to Reduced Precipitation

RISK FACTORS
In the long term, climate change may cause a decrease in average precipitation, which can have a significant impact on water supply shortages and rising water costs, posing risks to business operations.

COUNTERMEASURES
Hyundai has conducted a water depletion risk assessment for its major business sites in Korea and overseas, and five business sites are rated as high-risk. Accordingly, we are striving to establish a zero-wastewater discharge system in stages for the relevant business sites. The Asan Plant has taken measures such as securing sufficient water usage, reducing wastewater generation through wastewater reuse facilities, and resupplying all its reprocessed wastewater as industrial water.

Response to Climate Change

Climate Risks and Opportunities

Type		Issues	Risks	Opportunities	Response Directions	Financial Impact
Technologies		• Acceleration in competition for technology development for eco-friendly vehicles	• Strengthening fuel economy regulations worldwide • Declining market share upon failure to lead technological change	• Proving the EV technological prowess by winning global automotive awards, aimed at increasing market share	• Expanding R&D investment in FCEVs, etc. • Establishing a goal of 100% electrification for vehicles sold in major markets by 2040 • Launching brands based on E-GMP, an EV-dedicated platform	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[1] companies • New industrial fuel cell (ship/AAM[2]) business expansion • Increased sales of EV/FCEV models	• Diversifying supplier diversification • Conducting real-time monitoring of raw material prices • Recycling waste battery and developing the solid-state batteries • Scaling up FCEV/fuel cells	High ↑
Reputations		• Increase in demand from investors and other stakeholders to respond to climate change	• Failure to disclose climate change information and lack of response to climate change leading to a decline in brand image, withdrawal of investment and customer attrition	• Raising brand image and securing investment through active climate change information disclosure and response	• Disclosing climate data transparently • Participating in international initiatives such as CDP • Joining RE100 and promoting carbon neutrality goal by 2045 • Encouraging the Group affiliates and suppliers to participate in climate change response	Mid-high ↗
Legal		• Tightening fuel economy regulations for ICEVs	• Increased response costs due to fines imposed on non-compliance with regulations • Degradation of brand image, withdrawal of investment and customer attrition due to fuel economy-related lawsuits	• Reduced regulatory response costs through fuel economy innovations	• Monitoring peer litigation cases • Conducting research on fuel efficiency improvement and joint development of new energy parts with suppliers • Promoting fuel efficiency improvement by vehicle unit	High ↑
Regulation	Current	• Emissions Trading Scheme	• Penalties due to emission in excess of emission allowances	• Generating revenue through the sale of spare credits	• Increasing use of renewable energy • Establishing a management system for the entire process including emission forecast and reduction	Mid →
	Emerging	• Strengthening of CBAM[3] of EU	• Rise in costs and shifts to customers due to tax increases	• Securing price competitiveness by increasing the portion of local purchase overseas	• Conducting life cycle assessment (LCA) by vehicle model • Conducting continuous monitoring of the inclusion of automotive items • Implementing practical ways to reduce carbon emissions	High ↑
Physical	Acute	• Increasing abnormal weather phenomena (typhoons, floods, heavy snowfall, etc.)	• Damage to facilities, production facility shutdown and delays, etc. • Increasing damage to business sites located on the coast	• Increased market share due to stable product supply when compared to competitors	• Monitoring weather change • Establishing emergency response manuals • Strengthening stability in the workplace	High ↑
	Chronic	• Increasing rate of sea level rise	• Increased risk of flooding in most domestic workplaces located near the coast	• Attracting potential customers by supporting local communities and helping them adapt to climate change	• Conducting continuous monitoring of sea level rise • Reviewing plans to relocate business sites in the mid- to long-term • Establishing drainage measures to prevent flooding at business sites located on the coast	High ↑

[1] Energy storage system
[2] Advanced air mobility
[3] Carbon border adjustment mechanism

Response to Climate Change

Carbon Neutrality

CARBON NEUTRALITY STRATEGY

Carbon Neutrality Direction Hyundai is committed to its vision of "Progress for Humanity", valuing mobility for human being while ensuring minimal burden on the environment. Hyundai has instituted the Integrated Solutions to Climate Change to achieve carbon neutrality by 2045 at IAA Mobility in September 2021 as part of its efforts to pass on a sustainable global environment to future generations and do the right thing for humanity. With Clean Mobility, Next-Generation Platform, and Green Energy at its core, we will establish a sustainable operating system for future generations by expanding our electrification capabilities and transitioning to renewable energy. Additionally, we will continue to strive to build a circular economy ecosystem with the goal of achieving carbon neutrality across the entire mobility value chain.

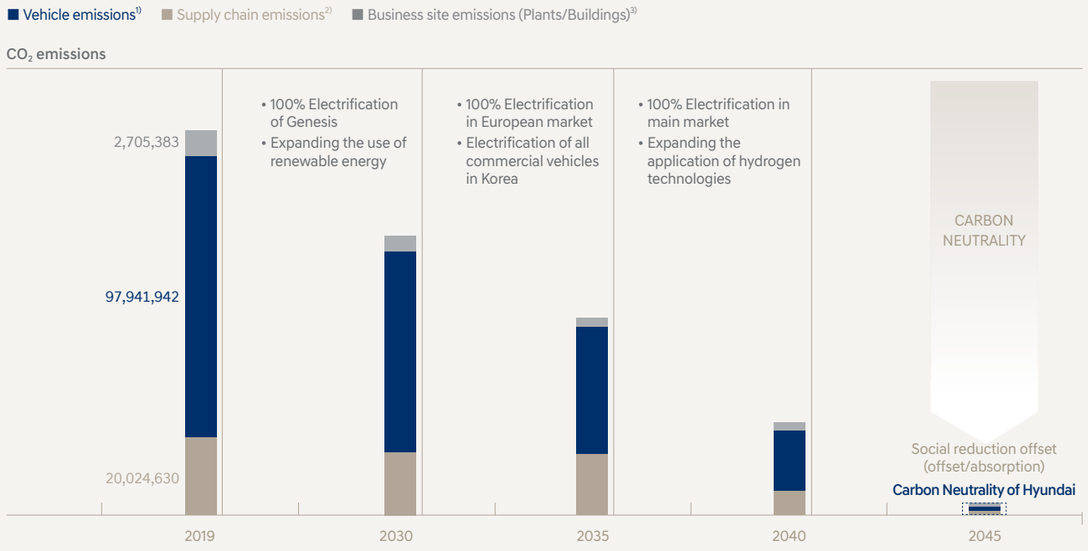
Based on its own hydrogen energy production technology and integrated solutions that encompass the entire city, Hyundai will realize a sustainable future that includes not only electrification but also a hydrogen society and smart cities. For the electrification business, we are considering ways to reduce GHG emissions even after vehicle sales, such as recycling batteries. In the hydrogen business, we plan not only to build a lineup of passenger and commercial FCEVs, but also to promote storage, transportation, charging, and production of hydrogen energy. Moreover, we are also accelerating the development of new mobility based on eco-friendly power, such as advanced air mobility (AAM) and purpose-based mobility (PBV), for a clean and mobility-free urban lifestyle of the future.

Carbon Neutrality Targets Hyundai's carbon neutrality target goes far beyond simply reducing GHG emissions at its business sites and aims to completely eliminate and offset the GHG emissions generated by our customer's use of sold vehicles (Tank to Wheel) through electrification. Regarding vehicle emissions, Hyundai aims to achieve 100% electrification in the European market by 2035 and 100% electrification 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. To reduce GHG emissions in the process of vehicle production, we will establish a cooperative system between subsidiaries and directly produce renewable energy through solar panels, etc. Additionally, we will implement RE100 (100% Renewable Energy) by 2045 through renewable energy procurements (PPAs, RECs) and the purchase of green premium electricity, among others. For supply chains such as parts and raw materials, we will encourage them to achieve carbon neutrality by 2045 by collaborating for energy transition and reducing carbon emissions of critical raw materials supply chain.

To deal with residual carbon emissions, Hyundai will invest in CCUS and will continue to pursue offsetting activities such as recycling second life batteries for ESS and restoring marine ecosystems. In addition, we plan to maximize the synergy between the hydrogen business and carbon neutrality through hydrogen power generation and processes by using the electrification process based on the hydrogen fuel cell system.

2045 Carbon Neutrality Roadmap

(Unit: tCO_2-eq)



Classification	2019 (base year)	2030	2035	2040	2045
Business sites	Business site emissions[3] (2,705,383 tCO_2-eq)	Reduction of 1,217,422 tCO_2-eq (45% down compared to 2019) RE 60% transition	-	RE90% transition	RE100% achieved
Supply chain	Supply chain emisions[2] (20,024,630 tCO_2-eq)	Cooperation with major suppliers for raising awareness on carbon neutrality and energy transition	Encouraging carbon reduction in core raw material supply chain		Encouraging supply chain to achieve carbon neutrality
Vehicles	Vehicle emissions[1] (97,941,942 tCO_2-eq)	30% electrification	-	80% electrification	100% electrification
		100% electrification of Genesis vehicles	100% electrification of European market sales	100% electrification of major market sales	Accelerating electrification in emerging markets

* GHG reduction targets were established based on the "Science-based Target", and the reduction targets were calculated for 100% of the base year's emissions.
[1] Vehicle emissions: Emissions from the customer's vehicle operation process (tank-to-wheel: TTW)
[2] Supply chain emissions: Emissions from raw material and parts suppliers we aim to reduce and achieve encourage carbon neutrality
[3] Business sites emissions (plants/buildings): Sum of Scope 1 + Scope 2 emissions

Response to Climate Change

FIVE MAIN AREAS TO ACHIEVE CARBON NEUTRALITY

Electronification To achieve carbon zero beyond carbon reduction, Hyundai has declared 100% electrification of the Genesis by 2030 and 100% electrification in the European market by 2035 while aiming for 100% electrification for all its vehicles sold in major markets by 2040. For commercial vehicles such as large trucks and buses, we plan to completely convert all lineups to electrified vehicles by 2028. We are also continuing R&D and investment in commercial FCEVs. In 2023, we launched the UNIVERSE hydrogen electric bus in Korea and introduced the XCIENT fuel cell tractor in North America.

Reducing Our Carbon Emissions at Work Hyundai is an active supporter for the Paris Agreement and recognizes its corporate role and responsibility to reduce global GHG emissions. In this regard, we strive to achieve carbon neutrality at our business sites by 2045 by switching to renewable energy, improving the energy efficiency of production processes through the introduction of high-efficiency motors and inverters, and utilizing hydrogen energy. In the short term, in conjunction with the RE100 roadmap, we plan to promote the transition from electric energy used in the manufacturing process to renewable energy first. In the long term, our goal is to achieve carbon neutrality by 2045 by expanding the application of green hydrogen and the use of renewable energy in conjunction with the realization of a hydrogen society.

Social Activities for Reducing Carbon Emissions (treatment of residual emissions) In addition to reducing carbon emissions, Hyundai is strengthening its activities such as carbon absorption and removal and resource recycling. We developed CCUS technology in 2012 and has since applied it in Korea while continuously pursuing designs that can recycle waste batteries and maximize recycling at the scrap vehicle stage. We apply recycled plastic materials to wheel guards, under covers, and battery trays while actively utilizing eco-friendly materials in the production of the IONIQ 6.

Hydrogen Business Synergy Effects Hyundai announced its hydrogen business vision of "2040, The Completion of Hydrogen Energy Shift" in 2021, based on which we are striving to increase the popularity of the hydrogen business by focusing on three primary areas (scalability, economic feasibility, and eco-friendliness) so that hydrogen energy could be used widely in all areas of human life and industry, beyond the means of mobility, by 2040. To achieve this vision, we will continue to grow and develop both our hydrogen energy system-related business and technology use endeavors. We will supply hydrogen energy systems at competitive prices and contribute to carbon neutrality and environmental improvement through the transition to hydrogen energy.

Support for Net Zero in the Supply Chain In line with global trends such as climate change, carbon neutrality, and ESG management, Hyundai not only improves the quality and technology of its suppliers, but also encourages and supports their carbon neutrality. To achieve this objective, our initial step involves assessing the carbon emission status of our primary suppliers. We will then identify key suppliers for enhanced management and provide them with guidelines to align their practices with our sustainability goals. Additionally, we plan to carry out reduction activities for each supplier grouped according to their characteristics, and prepare supply chain collaboration programs, including carbon neutrality education and awareness raising. In particular, we will join forces with the suppliers of raw materials with a high proportion of carbon emissions to promote a joint response in conjunction with automotive design technologies, such as recycling materials and expanding the use of new materials.

BUSINESS CASE

Blue Carbon Project

As part of implementing a unique carbon offsetting strategies to respond to climate change, Hyundai has been reviewing marine ecosystem restoration projects, and has discussed cooperation plans with related organizations for the creation of sea forests. Based on these discussions, on May 10 of 2023, Hyundai signed an MOU with the Ministry of Oceans and Fisheries and the Korea Fisheries Resources Agency for cooperation in the development of seaweed blue carbon.

The term "sea forest" describes a coastal area characterized by abundant growth of seaweed, forming a forest-like ecosystem that serves as a habitat for diverse marine species. It is known to be able to absorb carbon dioxide, in addition to its excellent ecological value. Blue carbon refers to the carbon absorbed by marine ecosystems such as seaweed and tidal flats. Under this agreement, Hyundai will support research on carbon reduction effects and development of related methodologies so that seaweed blue carbon can be officially recognized by the international community as a carbon sink.

Furthermore, Hyundai plans to participate in the Sea Forest Blue Carbon Council, which consists of the Ministry of Oceans and Fisheries, the Korea Fisheries Resources Agency, academia, and NGOs, according to the agreement while striving to create synergies by leveraging our global network. The Sea Forest Blue Carbon Council is scheduled to be launched in the second half of 2023 after discussing its composition. With the goal of seaweed being registered as an official sink of blue carbon with the Intergovernmental Panel on Climate Change (IPCC), an organization devoted to assessing the impact of climate change, we will share research data and develop results. As a member of the council, Hyundai will consider methodology registration and R&D support while serving as a potential source of blue carbon credits to achieve carbon neutrality.

To restore sea forests, we plan to create sea forests through seaweed planting activities in the coastal areas of Korea whose ecosystem is severely damaged due to ongoing sea desertification. Restoration of sea forests will bring various positive effects, such as reducing GHG emissions, improving species diversity in marine ecosystems, and purifying marine water quality by removing heavy metals such as nitrogen and phosphorus. Through these efforts, we intend to contribute to the preservation of the environment and the response to climate change.

The project will include the planting of seaweed in areas where ecosystems have been severely damaged by marine desertification caused by rising water temperatures and reckless development in coastal areas. Sea forest restoration not only reduces greenhouse gas emissions, but also has various positive effects, such as promoting the diversification of species in the marine ecosystem, purifying marine water by removing nitrogen, phosphorus and heavy metals, and contributing to communal fishing. Hyundai will also contribute to environmental preservation and respond to climate change through a blue carbon seaweed related project that is currently under the spotlight around the world.

* Source: Korea Fisheries Resources Agency

Response to Climate Change

Monitoring GHG Emissions 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. Our Scope 2 emissions from the use of electricity at our business sites account for approximately 70% of all our Scope 1 and Scope 2 emissions. Scope 3 emissions refer to other indirect GHGs emitted outside the company to produce goods and provide services for the company or to consume products and services offered by the company. Emissions from the use (driving) of vehicles sold by the company account for the largest share (approximately 80%) in Scope 3.

Hyundai manages Scope 1 and Scope 2 GHG emissions from activities at the business sites owned, operated, and managed by the company, while further strengthening management of Scope 3 emissions from upstream suppliers and downstream distribution networks. Based on Scope 1, Scope 2, and Scope 3 emission data, we will promote effective GHG reduction activities and investment through scientific estimation, analysis, and verification processes.

Scope 1 and Scope 2 Emissions

(Unit: tCO_2-eq)

Classification	2020	2021[1]	2022[2]
Scope 1	716,237	724,013	704,726
Scope 2 (location-based)	1,680,079	1,660,058	(1,853,813)
Scope 2 (market-based)[3]	-	-	1,684,121
Scope 1 + Scope 2[4]	2,396,316	2,384,071	2,388,847
Emission intensity (GHGs emissions per vehicle produced)	0.642	0.616	0.597

Scope 3 Emissions[5]

(Unit: tCO_2-eq)

Classification		2020	2021	2022
Upstream emissions	Supply chain (purchase of raw materials and parts)	17,014,155	18,359,619	19,852,763
	Capital goods (purchase of furnishings and equipment)[6]	22	139	326
	Other energy-related activities (excluding Scope 1 and 2)[6][7]	93,518	149,556	145,177
	Waste generated in operation[6]	1,760	1,911	1,978
	Employee business trip[6]	5,222	7,069	21,370
	Employee commuting (commuting buses)[6]	14,314	5,911	6,617
Downstream emissions	Transportation and distribution (by sea and land)[6]	655,831	838,575	964,206
	Use of sold vehicles (Tank to Wheel)[8]	81,598,073	80,887,513	81,959,096
	End-of-life treatment of sold vehicles (recovery, disassembly, disposal)[9]	780,338	810,794	2,133,743
	Leased assets (headquarters and leased office buildings)[6]	3,325	804	539
	Investments[10]	369,926	728,902	704,970
Scope 3		100,536,484	101,790,793	105,790,785

Participation in the GHG Emissions Trading Scheme The Greenhouse Gas Emission Trading Scheme is a GHG reduction system that allows the government to allocate emission rights on an annual basis to businesses that emit GHGs in accordance with Article 17 of the Kyoto Protocol, so that they can emit GHGs within the allocation range. Then their actual GHG emissions are evaluated, and their remaining/insufficient emission rights can be traded with other business sites. Hyundai strives not to exceed the government-allocated emission allowance by setting strict GHG reduction targets and reducing emissions through efficiency improvements and facility improvements at its business sites. Additionally, we seek to minimize the financial losses caused by the purchase of emission credits when we need to do so.

Data Disclosure through the Environmental Information Disclosure System The environmental information disclosure system aims to enhance the voluntary will of companies to promote environmental management in accordance with the Environmental Technology and Industry Support Act. It not only lays the foundation for environmental management throughout society but also contributes to green loans and green investments for eco-friendly companies by providing financial institutions with verified environmental information. As a company subject to environmental information disclosure, Hyundai discloses key information on environmental management promotion system, resource and energy conservation, and environmental pollutant emission reduction goals and achievements. Hyundai energizes environmental management through the disclosure of environmental information and increases achievements through continuous environmental information management.

Third-party Verification of GHG Emissions Hyundai undergoes third-party verification of its GHG emissions. In 2022, we received independent verification from LRQA (Lloyd's Register Quality Assurance) for our GHG inventory and energy consumption. In particular, we were evaluated for compliance with the GHG protocol as well as the accuracy and reliability of the information on direct GHG emissions (Scope 1), indirect GHG emissions (Scope 2) from our domestic and overseas operations, and other indirect GHG emissions (Scope 3).

Establishment of Supply Chain GHG Data Management System In the second half of 2023, we plan to monitor the carbon emissions of domestic suppliers through the establishment of a carbon emission history management system for our suppliers. Through the system, we intend to provide a basis for our suppliers to calculate and manage their own GHG data. By assisting suppliers in enhancing their capacity to measure and manage GHG emissions, Hyundai is poised to play a leading role in carbon reduction initiatives.

1) According to the results of the conformity assessment of the domestic emissions trading scheme, the 2021 emissions have been slightly adjusted.
2) In 2022, additional sites were added (Indonesia, Vietnam, and Mexico). The sum of Scope 1 and 2 emissions produced in 2022 excluding the added sites is 2,242,879tCO_2-eq.
3) Scope 2 emissions: Addition of market-based emissions in 2022
4) Began to calculate the sum of Scope 1 and 2 emissions (market-based) in 2022
5) Some Scope 3 emissions increased because of reopening after COVID-19 recovery (increase in product sales, increase in employee business trips, normalization of supply chain, etc.)
6) Based on the country where the Headquarters is located
7) Upstream emissions of fuel consumed at business sites (excluding electricity and steam)
8) Excluding emissions before vehicles are fueled/charged (Well-to-Tank)
9) Emissions produced at the end-of-life treatment stage was increased due to the addition of emissions in 2022 produced during the recycling process
10) Scope 1 and Scope 2 GHG emissions from six of the listed investee companies in which Hyundai owns more than 20% of the shares.

Response to Climate Change

Reducing Product Carbon Footprint

CONVERSION TO ELECTRIFICATION

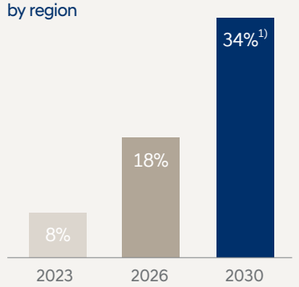
Transition Direction of Electrification Hyundai does its utmost to achieve carbon neutrality by 2045 by promoting carbon reduction and zero-emission in our vehicle sales. To accomplish this, we are transitioning our business structure from internal combustion engine vehicles to an electrification-focused approach. Hyundai is continuously developing and producing not only hybrid and PHEVs but also EVs and FCEVs that have zero carbon emissions during operation. Hyundai is prioritizing the development of EV-focused technologies, such as the E-GMP (Electronic-Global Modular Platform), and enhancing the performance of hydrogen fuel cell systems that can be applied to a variety of types of vehicles, including passenger cars and commercial vehicles. Additionally, we are actively driving the expansion of electric and hydrogen infrastructure to ensure convenient and accessible charging and refueling facilities anytime and anywhere. As a Mobility Solution Provider, we are not only focused on improving the hardware performance of mobility devices but also on strengthening our software capabilities to consistently provide optimized services, generate revenue, and promote sustainable development.

2030 Mid-to Long-term Electrification Strategy In its efforts to achieve the 2030 electrification strategy goals, Hyundai is pursuing a comprehensive electrification strategy that includes expanding production within regions where there is high demand for EVs, developing next-generation battery technologies, implementing battery modularization, and enhancing the marketability of EVs through the integration of hardware and software. In particular, we are accelerating the transition toward carbon neutrality by pursuing the following electrification initiatives of achieving 100% electrification for Genesis vehicles by 2030, 100% electrification in the European market by 2035, and 100% electrification in major markets by 2040.

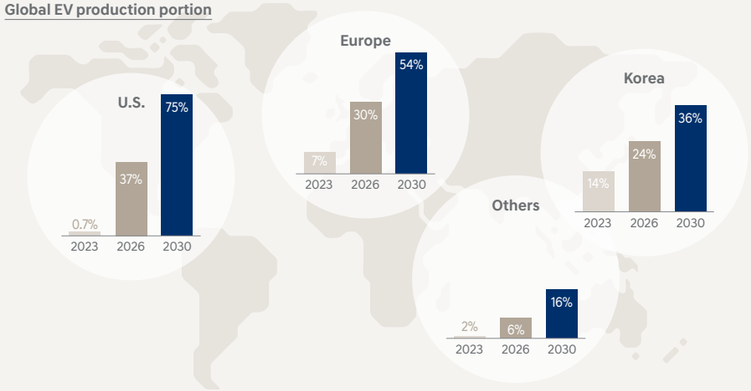
We plan to increase our share of global EV production from 8% in 2023 to 34% by 2030, while gradually expanding our regional production volume by employing a two-track approach to line conversion and the establishment of new plants, rather than focusing solely on production in Korea.

Transition to EV Production

Increase the portion of EV production efficiently through transition to EV lines and addition of new dedicated EV plants by region



Global EV production portion



1) Major markets (Korea, U.S., Europe) 48%

Vehicle Electrification Roadmap by 2030

2030	2035	2040	2045
• 100% electrification of Genesis models	• 100% electrification for the European market	• 100% electrification for the major markets	• Accelerate electrification for the emerging markets (carbon neutrality achieved)

Gaining EV Technology Competitiveness To expand EV sales, Hyundai is implementing a comprehensive battery strategy that combines three key strategies – stable battery supply, next-generation battery technology development, and modularization. To procure the required large-scale batteries for the sale of 2 million EVs by 2030, Hyundai is strengthening collaboration with global top-tier battery suppliers. In addition, we are pursuing local battery sourcing in key production regions and establishing a battery cell joint venture factory in Indonesia. We are focusing on maximizing the performance of existing lithium-ion batteries to achieve EV performance improvements and cost reductions. Simultaneously, we are also investing in the development of next-generation battery technologies such as all-solid-state batteries. Furthermore, Hyundai is working toward the standardization and modularization of key EV components like batteries and motors through the development of an integrated modular architecture (IMA) system, which is expected to be completed by 2025.

Development of Dedicated EV Platforms Hyundai's E-GMP is a vehicle chassis that encompasses the battery, motor, and power electronics system. It is a modularized and standardized integrated platform that allows for the configuration of a variety of types of vehicles, thanks to its expandable wheelbase. Additionally, Hyundai plans to introduce two dedicated EV platforms – the "eM" platform for passenger vehicles and the "eS" platform for PBVs. The eM platform features an expanded common range compared to E-GMP, and will be developed in a form that can be applied to all segments. eS will be developed with a flexible structure and will play a key role in responding to B2B demand such as delivery and car hailing. We are developing our next-generation EV-dedicated platforms with the goal of increasing battery capacity by 40% and motor output by 28%, while raising competitiveness by increasing the charging time following increased battery capacity. In addition, we are seeking to reduce the slow charging time by 50% compared to the current level. In terms of safety, we plan to introduce a new structure that will not be exposed to flames in the event of a battery fire, while maintaining the existing highest crash safety performance in all regions.

Standardization and Modularization of Core EV Components Hyundai aims to standardize a total of nine types of battery systems, allowing for easy response to battery demand based on vehicle class. Furthermore, we plan to transition from the current "cell-to-module" structure to a "cell-to-pack" approach by 2025, removing the module stage. This transition is intended to enhance energy density and improve overall battery performance.

Expanding EV Charging Infrastructure Hyundai is expanding the charging infrastructure for EVs and FCEVs to enhance the convenience of using eco-friendly vehicles and accelerate their adoption. In Korea, we have been expanding our service operations for the high-speed EV charging service known as "E-pit" ever since its launch in 2021. In Europe, we are expanding high-speed charging infrastructure through strategic investment in IONITY, an EV charging network company. In the U.S., we have entered into a business agreement with global energy company Shell to explore and review options for expanding EV charging infrastructure and enhancing charging convenience.

E-pit – Ultra-fast EV Charging Station E-pit provides the fastest charging speed in South Korea, allowing EVs to be charged in less than 18 minutes (based on the IONIQ 6, from 10% to 80% battery charge with a 350-kW ultra fast charger.) Furthermore, E-pit offers several services to its customers, including Digital Queue which provides estimated charging time and queue information to users; Plug & Charge Technology which enables users to automatically authenticate, charge, and make payments; Digital Wallet which allows users to authenticate and make charging payments even at other charging networks; and Route Recommendation which guides users to the nearest available charging station with the optimal route.

H Moving Station – Mobile Hydrogen Charging Station H Moving Station is a mobile charging station (truck) that can be easily moved to areas where hydrogen charging stations are not provided or are out of order. 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. In particular, these charging pressure figures are in accordance with the international standard charging protocol (SAE J2601), and durability and safety for mobile facilities are also procured. Going forward, we will expand operations to enable the charging of a variety of mobilities such as heavy equipment and drones that use hydrogen fuel.

Response to Climate Change

EXPANSION OF ELECTRIFICATION

EV Starting with the development of the dedicated eco-friendly model IONIQ in 2016, Hyundai unveiled the Kona EV, a compact SUV, in 2018, which was followed by the 2020 launch of IONIQ, a dedicated EV brand based on E-GMP. As of 2022, we have six EV models (3 models from Hyundai and 3 models from Genesis), including the IONIQ 6. Hyundai's global EV sales in 2022 stood at 210,352 units, up 49.1% from the previous year.

HEV and PHEV Hybrid models are available for all models except for large SUVs and small sedans such as IONIQ, Elantra (AVANTE), Kona, Sonata, Tucson, Santa Fe, and Grandeur. We are also offering a plug-in hybrid lineup in our IONIQ, Sonata, Tucson, and Santa Fe models. In 2022, Hyundai's global HEV sales volume stood at 239,181 units and PHEV sales were 46,043 units, up 2.6% and 20.3%, respectively, from the previous year. Going forward, we will increase the sales portion of HEVs and PHEVs to 15.6% of the entire sales volume with sales of 910,200 units (HEV:873,900, PHEV:36,300) by 2030.

FCEV The NEXO, launched by Hyundai in 2018, is a leading FCEV with a maximum driving range of 611 km (US certification) and a charging time of about 5 minutes (6.33 kg per charge). We are expanding our FCEV lineup by expanding our FCEV leadership and mass-producing the Elec-City fuel cell bus, and the XCIENT fuel cell heavy-duty truck. Hyundai's global FCEV sales in 2022 stood at 11,217 units, up 22.5% from the previous year.

Other Eco-friendly Vehicles Hyundai has also launched regional eco-friendly models that run on bioethanol, liquid petroleum gas (LPG) and compressed natural gas (CNG). In South America, we launched the HB20, a bi-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. Going forward, we are aiming to expand the sales portion of flex-fuel vehicles and liquid petroleum gas vehicles to 5.2% and 1.5% by 2030.

EV Sales Performance and Expansion Plan

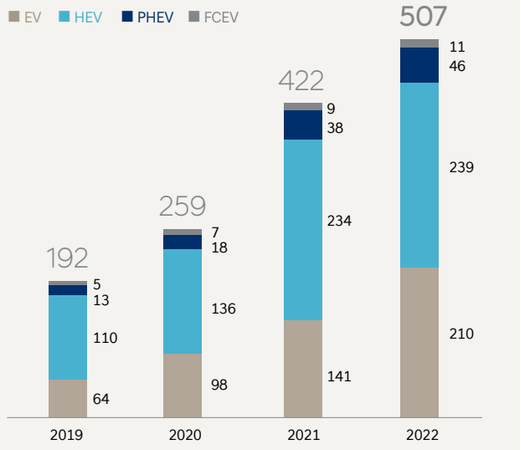
EV Sales Performance In 2022, Hyundai's EV sales volume is 210,352 units, accounting for approximately 5.3% of total vehicle sales. This figure grew by about 49.1% compared to 2021 EV sales of 141,101 units. In particular, IONIQ 5, IONIQ 6, and GV60 based on the EV-dedicated platform E-GMP led EV sales growth.

EV Sales Goal As global EV demand grows faster than market forecasts, we have raised the 2030 sales target that we announced at the 2022 CEO Investor Day from 1.87 million to 2 million units. We have also raised our sales targets for each of our major regions, and are prepared to flexibly adjust those sales targets according to regional market demand.

Expansion of Models Based on EV-dedicated Platform Hyundai plans to launch the IONIQ 7 in 2024 following the release of the IONIQ 5 and the GV60 in 2021, based on the first EV-dedicated platform E-GMP, and the IONIQ 6 in 2022. Based on the next-generation EV-dedicated platform, which will inherit the original features of, and further develop, the E-GMP, we plan to expand our EV lineup significantly by launching nine new models (four Hyundai and five Genesis models) from 2025 to 2030.

Global Sales of Electrified Vehicles

(Unit: 1,000 units)



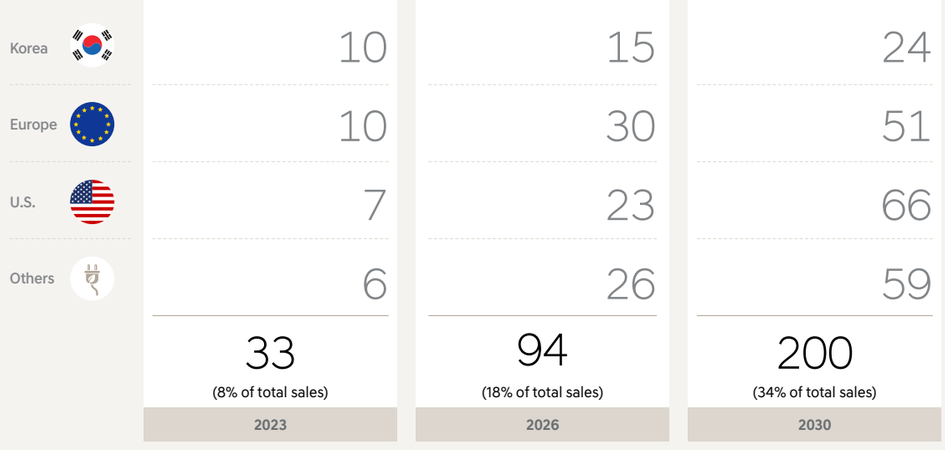
Sales of Other Eco-friendly Vehicles

(Unit: Vehicles)

	2019	2020	2021	2022
Flex-feul vehicles (Bio-ethanol/Bi-fuel)	201,874	152,977	179,193	195,485
Compressed Natural gas vehicles	3,005	1,352	1,489	1,581
Liquid petroleum gas vehicles	59,634	49,534	40,350	35,797
Total	**264,513**	**203,863**	**221,032**	**232,863**

EV Sales Goal for 2030

(Unit: 10,000 units)



Response to Climate Change

Development of EV Battery Efficiency Improvement Technology Hyundai continues to research and develop "thermal management technology" to minimize the waste heat in EVs and increase battery efficiency. To minimize the energy supplied from the battery for heating, Hyundai has developed "radiant heat warmer" technology, which raises the temperature of the heating element based on radiant heat. We have also developed the "heated glass defrost system" technology, which uses heated glass to remove snow and ice from the front windshield, rather than using hot air. Hyundai's dedicated EV batteries are designed to provide a maximum driving range of 250,000 to 300,000 kilometers when reaching 70-80% of battery performance. This translates to a cumulative usage of 12 to 15 years when assuming an annual driving distance of 20,000 kilometers. Furthermore, to maintain optimal charging speed and efficiency under a variety of weather conditions, Hyundai is developing an "external thermal management station". This system injects cooling water of the required temperature from the outside during charging to optimize the battery temperature.

Battery Management Based on Digital Twin Hyundai is implementing digital twin technology to manage the performance of a key component of EVs – batteries. The battery life prediction technology, utilizing digital twin, analyzes a variety of factors based on the actual vehicle's driving history to continuously re-evaluate the battery life, enabling more accurate battery life predictions. By creating a virtual EV in the digital world based on a variety of driving data collected from real-world driving of EVs (such as the IONIQ 5), Hyundai predicts the battery life for each vehicle. The integration of AI, machine learning, and physics models is utilized in a sophisticated data analysis model to comprehensively analyze vehicle-specific information, including charging/discharging, driving habits, parking, and driving conditions, which can impact EV battery performance. This approach aims to increase the accuracy of battery life predictions.

Certified Energy Efficiency by EV Model

Model	Korea (Combined)[1]	Europe (WLTP)[2]	U.S. (EPA)[2]
Electrified G80	4.3 km/kWh	19.1 kWh/100km	97 MPGe
Electrified GV70	4.6 km/kWh	19.2 kWh/100km	91 MPGe
GV60	5.1 km/kWh	17.0 kWh/100km	112 MPGe
Kona Electric	5.5 km/kWh	14.7 kWh/100km	120 MPGe
IONIQ 5	5.2 km/kWh	17.0 kWh/100km	114 MPGe
IONIQ 6	6.0 km/kWh	14.3 kWh/100km	140 MPGe
IONIQ Electric	6.3km/kWh	13.8 kWh/100km	133 MPGe

[1] Electrified G80 (19-inch, 2,265 kg), Electrified GV70 (19-inch, 2,230 kg), GV60 (standard 2WD), Kona Electric (long range, 1,720kg), IONIQ 5 (long-range 2WD exclusive, without built-in cam), IONIQ 6 (long-range 2WD, 18-inch)
[2] Europe and the USA make distinctions based on the representative TRIM standards for each model

FCEV Battery Performance

Vehicle	Fuel tank capacity	Fuel economy (combined)	Driving distance per charge	Warranty period for separately guaranteed parts
Nexo	6.33 kg / 156.6 Liter	96.2 km/kg	609 km	10 years, 160,000 kilometers
	Based on Modern I 17-inch tire			

IMPROVING FUEL ECONOMY

Improvement of Vehicle Fuel Economy Hyundai is aiming for a long-term transition to EVs while also making efforts to minimize greenhouse gas emissions from ICEVs which take large portion of our total sales volume as of current. Through continuous research and development of powertrain efficiency improvement, we are adapting to country-specific fuel economy and emission regulations while achieving greenhouse gas reduction during vehicle operation. Furthermore, we are focusing on R&D aimed at making vehicles more lightweight, enhancing aerodynamics, and other measures to improve fuel economy, thus enhancing both environmental and economic benefits.

Technologies to Enhance Vehicle Fuel Economy The 7th generation Grandeur, launched in 2022, was able to reduce its carbon emissions despite increased vehicle specifications and improved convenience features, thanks to aerodynamic enhancements and a variety of fuel economy technologies. Compared to the previous models, the 7th generation Grandeur achieved a maximum 9.2% reduction in carbon emissions, decreasing from 178 g/km to 163 g/km. The hybrid model, in particular, achieved an additional 10.2% reduction, lowering carbon emissions from 97 g/km to 88 g/km. This was achieved by setting development goals for aerodynamic improvements in design and engineering across a variety of areas, such as optimizing bumper curvature, trunk end kick-up, and full undercovers, as well as applying technologies like air guards (ICEV) and active air flap (HEV) to reduce cooling resistance. In addition, the optimal injection method suitable for driving conditions was achieved by applying the 3rd generation powertrain involving the advantages of both MPI and GDI, resulting in a 4.9% improvement in fuel economy. The integration of a flow control valve also allowed for optimizing cooling water temperature control based on driving conditions, further enhancing fuel economy. Furthermore, the addition of fuel economy technologies such as Continuously Variable Valve Duration (CVVD) in the intake system and Low-Pressure Exhaust Gas Recirculation (LP-EGR) in the HEV powertrain contributed to the reduction of carbon emissions.

Making Vehicles Lightweight Hyundai uses not only carbon-fiber-reinforced plastics but also lightweight materials such as aluminum, clay nano, and clad metal. The Genesis G70, for example, incorporates aluminum in its hood (-9.1 kg), front suspension (-6.7 kg), and rear suspension (-5.2 kg), resulting in a weight reduction of 29.7 kg.

Enhancing the Public Confidence in Fuel Economy Testing Hyundai complies with the fuel economy regulations of key markets such as Korea, North America, Europe, China, and India. To obtain fuel economy certification, we conduct tests according to the standards of each country. To enhance the reliability of fuel economy and emission measurements conducted in controlled conditions (on-cycle), Hyundai undergoes inspections of fuel economy measuring equipment by external specialized organizations such as the Korea Laboratory Accreditation Scheme (KOLAS) and the Korea Automotive Technology Institute (KATECH). Furthermore, Hyundai collaborates with a variety of government research institutes and conducts fuel economy tests jointly to ensure public confidence in the accuracy of the fuel economy measurement results. The results of on-cycle and off-cycle test comparative analysis are reported to the executive in charge of powertrain research and development at least once a year.

Real-Road (Off-Cycle) Fuel Economy Test The vehicle fuel economy is influenced by a variety of factors, including internal factors such as gear shifting, vehicle weight, and air conditioning, as well as external factors like road conditions and traffic congestion. In light of this, Hyundai conducts fuel economy tests not only in controlled conditions (on-cycle) considering a variety of factors but also performs off-cycle tests that simulate real-world driving profiles.

Collaboration with Third-Party Agencies Hyundai conducts correlation analysis between the fuel economy test results obtained from real-world (off-cycle) tests and those of other organizations. In the US market, we compare our fuel economy data with those published by third-party organizations such as the EPA, J.D. Power, and Consumer Reports. In the European market, comparisons are made with data from third-party organizations such as Green NCAP, Auto Bild, and Spritmonitor. By comparing the fuel economy measurement results with those of third-party organizations in each country, we enhance the credibility of our own fuel economy test results.

Response to Climate Change

Responding to Fleet average CO_2 standards (Fuel Economy) in Major Markets The fleet average CO_2 standards or corporate average fuel economy regulations, implemented in major countries, are continuously being strengthened to achieve their carbon reduction goals. In the EU, regulatory targets have been adopted to reduce passenger car CO_2 emissions by 55% by 2030 compared to 2021 and achieve complete decarbonization of vehicle CO_2 emissions by 2035. The US government has announced regulations starting in 2023 to progressively increase fuel economy standards by 5-10% annually, aiming to reach 55 miles per gallon by 2026. They have also set a target to replace 50% of new vehicle sales with electrified vehicles (including EVs, PHEVs, and FCEVs) by 2030. The government of California in the U.S. plans to replace 35% of new vehicle sales with zero-emission vehicles (including EVs) starting from 2026, increasing to 68% by 2030, and has set plans to prohibit the sale of new internal combustion engine vehicles starting from 2035.

Hyundai is expanding the sales of electrified vehicles in response to the strengthening of CO_2 regulations in major regions until 2030, aiming to reduce the average carbon emissions of our fleet in each region. We have a long-term goal of achieving zero fleet carbon emissions, and to minimize regulatory risks, we at Hyundai are calculating and incorporating the regulatory compliance volume, including the volume of EVs, into our annual sales volume plan. We also monitor and evaluate regulatory compliance based on monthly sales performance. To prepare for the possibility of not meeting regulations, we adjust our sales volume and utilizes a variety of measures such as the use of accumulated credits to mitigate regulatory risks in advance.

Korea

Korea has strengthened its GHG regulations related to automotive emissions, demanding a reduction in vehicle emissions from 97 g/km in 2020 to 89 g/km by 2025 and 70 g/km by 2030. In case the emission limits are exceeded, a fine of KRW 50,000 per gram is imposed. Furthermore, a basic plan has been presented to promote eco-friendly vehicles, aiming to supply 2.83 million units by 2025 and 7.85 million units by 2030, leading to a 24% of exhaust gas emission reduction.

EU

The EU has finalized its goals through a resolution by the European Parliament, which includes reducing the current fleet average CO2 standards for passenger cars (119 g/km based on WLTP), with an aim to achieve a 15% reduction by 2025 and a 55% by 2030 compared to the levels in 2021. In addition, the EU has set a goal to achieve a 100% reduction in emissions from passenger cars by 2035. As a result of these regulations, starting from 2035, the sale of new ICEVs in the EU market will be practically impossible. Furthermore, countries like Norway, the Netherlands, and Germany are even pursuing individual national policies to prohibit the sale of new internal combustion engine vehicles earlier than 2035.

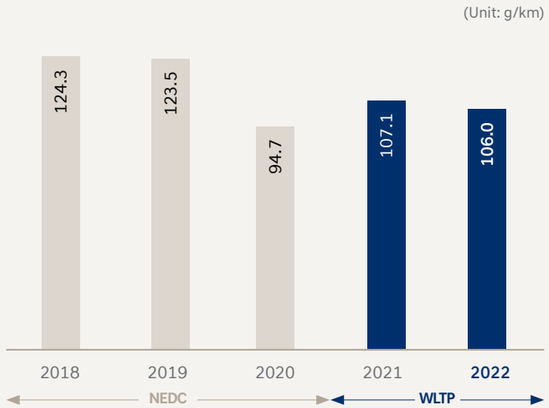
U.S.

The US government has increased their average fuel economy target from 40 miles (64.4 km) per gallon to 55 miles (88.5 km) per gallon by 2026. They have also set a goal to reduce greenhouse gas emissions from 224 grams per mile to 161 grams per mile by 2026. Furthermore, both the federal and state governments are expanding incentives for the transition to eco-friendly vehicles through increased purchase subsidies. The federal government has set a goal to transition 50% of all vehicles, including electric vehicles (EVs), to zero-emission vehicles by 2030. Additionally, the California state government is pursuing a policy to ban the sale of internal combustion engine vehicles starting in 2035.

China

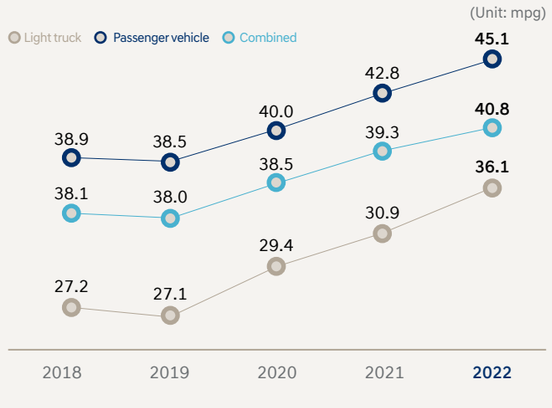
The Chinese government is also continuously strengthening fuel efficiency regulations and enhancing the mandatory sales requirements for new energy vehicles (NEVs), including EVs. In particular, they aim to progressively increase the mandatory sales share of NEVs, reaching 20% by 2025, 40% by 2030, and 50% by 2035. Additionally, they have set a target for EVs to account for over 95% of NEV sales by 2035.

Average CO_2 Emissions in the EU



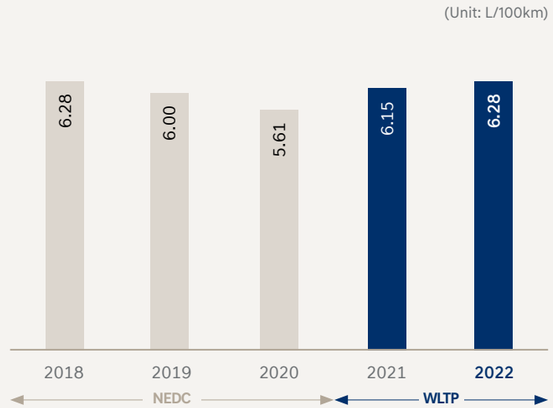
* 2021/2022 performance is not able to be compared with the performance of prior years for the EU Commission (EC) changed the CO_2 emission standard from NEDC to WLTP; and the regulatory value was also from 95 g/km (2020) based on NEDC to 112.5 g/km (2021) based on WLTP according to the change of methodology.
** The figure for 2021 has been revised from our internal estimate (109.7 g) to the officially announced figure by the European Commission (107.1 g).
*** The input figure for 2022 is based on our sales performance and is our own estimate. Going forward the final confirmation of the figures by the EC will be necessary.

Average Fuel Economy in the US



* The average fuel economy in the U.S. and China is determined annually based on the average fuel economy performance of individual car brands as disclosed by the respective government agencies (NHTSA) in the U.S. and the Ministry of State Security in China).

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.

Response to Climate Change

Carbon Reduction at Business Sites

DIRECTION OF CARBON REDUCTION AT BUSINESS SITES

Energy Efficiency Hyundai acknowledges and supports the direction and goals set by the 2015 Paris Agreement, and we recognize our role and responsibility in global greenhouse gas reduction and have been actively developing and implementing a variety of energy-saving initiatives. Leading example includes the adoption of energy-efficient facilities to reduce energy consumption in our operations, and we strive to transition to renewable energy sources as part of our commitment to sustainability.

Carbon Capture Utilization and Storage To achieve carbon neutrality, it is necessary to cease the use of fossil fuels in the automotive manufacturing process. However, reaching the target point for energy transition requires a significant amount of time. During this transitional period, Carbon capture utilization and storage (CCUS) technology, which involves capturing and processing CO_2 emitted from fossil fuel combustion, is being recognized as a practical solution and a high-potential means for carbon neutrality.

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. In addition, Hyundai's research institute is conducting CCUS pilot studies to commercialize the technology, aiming to extend its application beyond the automotive industry to other business sectors. Continuous market monitoring is also being carried out to stay updated on the latest developments in CCUS technology.

Improvement of Production Process Hyundai is committed to improving energy efficiency in our production processes through a variety of efforts. We plan to incorporate high-efficiency motors and inverters and transition to renewable energy sources. By using hydrogen energy, we aim to achieve carbon neutrality at our business sites by 2045, and we will be replacing fossil fuels and electric energy used in the manufacturing process with renewable energy. Also planned is to enhance the efficiency of the paint process, which primarily uses LNG fuel, through the introduction of high-efficiency equipment, waste heat recovery, and process improvements.

Sites with the Energy Management System (ISO 50001) Certification

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

Energy Consumption[1)]

(Unit: MWh, MWh/vehicle)

Classification		2020	2021	2022
Non-renewable energy consumption	LNG	3,534,350	3,562,760	3,442,276
	Diesel, kerosene, gasoline	184,158	154,015	131,268
	Steam, heat	98,777	90,510	94,027
	Other fuel	123,433	143,460	172,986
	Electricity (non-renewable)	3,344,292	3,338,657	3,377,133
Renewable energy consumption	Electricity (renewable)	70,376	120,171	280,498
Total of energy consumption[2)]		7,355,386	7,409,573	7,498,188
Energy intensity		1.97	1.91	1.87

* Intensity: A value representing the environmental resources used or the environmental impact emitted when producing one car
1) Due to changes in energy consumption calculation criteria and an expansion of the calculation scope, the data for previous years has been revised.
2) In 2022, additional sites were added (Indonesia, Vietnam, and Mexico). The total of energy consumption in 2022 excluding the added sites is 7,217,893 MWh.

TRANSITION TO RENEWABLE ENERGY

RE100 Implementation Plan Hyundai, along with other major Group affiliates of Kia, Hyundai MOBIS, and Hyundai WIA, declared our commitment to the global initiative RE100 in July 2021, aiming for 100% renewable energy usage. In April 2022, this commitment was approved. Hyundai now aims to achieve 100% renewable energy transition by 2045, ahead of the RE100's target year, 2050. To achieve this goal, we take into account the renewable energy supply environment, government policies and regulations, and plant-specific conditions in each country. We plan to install solar panels on the roofs of key production plants, purchase renewable energy certificates, and establish power purchase agreements (PPAs) with external renewable energy generators. The aim is to gradually expand the use of renewable energy until 2045 by applying optimal solutions. Hyundai's manufacturing subsidiaries in the United States, India, and Turkey, specifically, have set a target to achieve RE100 by 2025.

ADOPTION OF RENEWABLE ENERGY AND ENERGY SAVING AT MAJOR BUSINESS SITES

R&D Sites To reduce GHG emissions, Hyundai utilizes recycled waste heat and steam from facilities and equipment in its research facilities. We also harness waste heat generated during waste disposal. In addition to the existing 562 kW-scale photovoltaic power generation facility, we plan to install an additional 3 MW-scale facility.

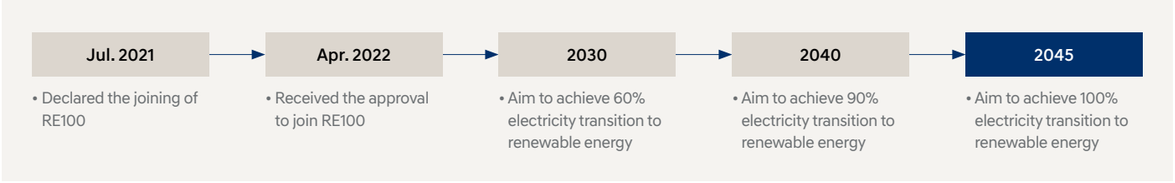
Hyundai Motor India (HMI) HMI sources approximately 33.3% of its total electricity consumption through the purchase of eco-friendly energy (PPAs) to power its factories, and 8.5% of its electricity is purchased through renewable energy certificates (RECs). Furthermore, HMI has its own photovoltaic power generation facility, with a capacity of 0.3% (0.69 MW). It procures 42.1% of its total electricity from renewable sources and aims to meet 100 percent of its electricity consumption with renewable energy by 2025.

Hyundai Motor Manufacturing Indonesia (HMMI) HMMI achieved RE100 in its vehicle production in 2023 by signing a forward purchase agreement for RECs issued by a geothermal power plant located in Bandung in the West Java province.

Hyundai Motor Manufacturing Czech (HMMC) HMMC has transitioned to 100% renewable energy for the electricity used in its plant through the guarantee of origin (GO) system in 2022. It has also implemented the Eco Smart vapour emission control (VEC) system, based on the gas monitoring system in the paint shop, to improve energy efficiency. In addition, HMMC is implementing measures such as compressed air supply control and LED lighting replacement to reduce energy consumption.

Hyundai Assan Otomotiv Sanayi (HAOS) HAOS in Turkey set the goal of achieving RE100 by 2025, so did HMI and HMMC. HAOS procures 51.7% of its total electricity from renewable sources, and it has also implemented a variety of process improvements and introduced state-of-the-art equipment, such as reducing compressed air usage and installing high-efficiency inverters, to minimize unnecessary power consumption.

RE100 Roadmap



Response to Climate Change

Life Cycle Carbon Reduction

CARBON REDUCTION IN THE SUPPLY CHAIN

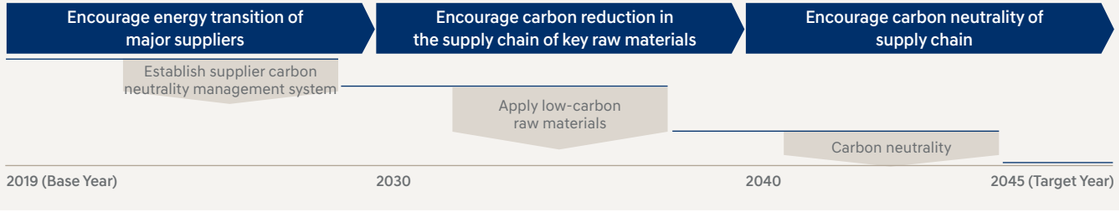
Supplier Carbon Neutrality Hyundai is committed to encouraging its tier-1 part suppliers and raw material suppliers to achieve supply chain carbon neutrality. GHG emissions generated by our raw material supply chain are 20 million tons, which is about 18% of total GHG emissions generated throughout the life cycle of Hyundai's products. To support the carbon neutrality of suppliers, we plan to establish a monitoring and management system for suppliers' carbon emissions. In the long term, we plan to promote carbon reduction in the supply chain through eco-design and the use of low-carbon materials. In addition, we developed and distributed the Carbon Neutral Guide for Suppliers and plan to introduce the CDP Supply Chain program starting from 2023 to engage suppliers in environmental initiatives and support them. As such, we are making multifaceted efforts to reduce GHG emissions throughout the entire automotive manufacturing process in addition to helping our suppliers reduce their carbon emissions.

Support for Suppliers' Carbon Reduction Efforts Hyundai conducts surveys on suppliers' carbon emissions and reduction plans, and based on the results, we establish and implement initiatives to support suppliers' carbon reduction. We offer training courses to raise awareness of carbon neutrality among suppliers' employees and provide them with guidelines for implementing carbon neutrality. In March and July 2022, we operated the Supplier Carbon Neutrality Council to gather opinions on Hyundai's carbon neutrality strategy and exchange views on key issues. Furthermore, we set greenhouse gas emission standards and targets for top-emitting suppliers and promote their establishment of internal carbon neutrality response systems through support activities.

Participation in CDP Supply Chain Hyundai and Kia have jointly joined CDP Supply Chain in 2023. CDP Supply Chain is one of the environmental disclosure projects operated by CDP, which enables the assessment of suppliers' carbon-related information such as climate change issues, strategies, carbon emissions, and more. To facilitate smooth participation of suppliers in CDP Supply Chain, Hyundai provides on/offline training on a variety of topics including carbon neutrality overview, emissions calculation, and questionnaire guidance to some 360 tier-1 suppliers in Korea. Continuous support is also offered through the production of instructional videos and the operation of a Help Desk.

Creation of an Ecosystem for Low Carbon Logistics and Transportation Hyundai strives to reduce carbon emissions from the "first mile" stage, where freight moves from production plants to logistics warehouses, to the "middle mile" and "last mile" stages, where it moves from warehouses to a variety of hubs. In the first mile stage, hydrogen-powered electric trailers suitable for long-distance driving are being deployed. In the middle mile and last mile stages, electric trucks and other innovative technologies such as EVs, FCEVs, urban air mobility, and robotics are being utilized to lead the reduction of carbon emissions in the logistics and transportation service ecosystem. Furthermore, Hyundai has signed a multi-stakeholder agreement with Hyundai Glovis, the Ministry of Land, Infrastructure and Transport, the Ministry of Trade, Industry and Energy, and the Ministry of Environment to expand the electrification of the logistics and transportation sector by 2030. Hyundai is striving to distribute 10,000 hydrogen-powered trucks in the logistics field by 2030.

Roadmap for Supply Chain Carbon Neutrality



Activities for Supporting Suppliers' Carbon Reduction Efforts

Activity	Description of activities
Training for and raising awareness of suppliers	• CEOs: Hosting the Partnership Day for suppliers and introduce Hyundai's carbon neutrality strategies • Employees: Offering training on the enhancement of suppliers' capabilities of carbon neutrality (Global Partnership Center)
Operation of the Supplier Carbon Neutrality Council	• Convening the Supplier Carbon Neutrality Council (March and July 2022) • Gathering opinions on Hyundai's carbon neutrality strategies and exchange opinions on major issues
Providing suppliers with the carbon neutral guide for suppliers	• Presenting suppliers with an implementation guide to promote carbon neutrality • Establishing an in-house management system, reducing GHG emissions at business sites/supply chain/logistics, disclosing emission information, etc.

Activity	Description of activities
Survey of suppliers' GHG emissions and energy consumption	• Investigating GHG emissions and energy consumption of parts suppliers, etc. • Promoting the establishment of a supplier carbon emission management system (second half of 2023)
Review of suppliers' reduction targets and development of support programs	• Specifying suppliers' GHG emission reduction plans (criteria and targets) • Promoting projects such as support for carbon reduction facilities for suppliers and consultation on GHG emission diagnosis

Supply Chain Carbon Information Disclosure & Services for Logistics/Transportation Energy Efficiency

Disclosure of carbon information of the supply chain	**Goal**	• Establishing a plan to specify and support our supply chain carbon reduction strategy by disclosing information on carbon emissions of suppliers
	Efforts for education and support	• Conducting on/offline education related to CDP Supply Chain (carbon neutrality overview and emission calculation, guidance on questionnaire items, etc.) • Continuing support for suppliers by offering educational videos, verifying carbon emissions, and operating a help desk
	Future utilization measures	• Planning to upgrade the calculation of carbon emissions (Scope 3, Category 1) at suppliers' workplaces using the CDP supply chain • Planning a review to reflect CDP supply chain results in purchase policy
Services for enhancing the efficiency in logistics and transportation	**Achievement of packaging efficiency**	• Reducing the amount of energy used for collecting packing materials through the development of foldable plastic boxes[1] • Pursuing packaging efficiency through cooperation with suppliers and expand logistics energy efficiency
	Transitioning to eco-friendly transportation means	• Enhancing energy efficiency and reduce GHG emissions through coastal shipping
	Eco-driving of cargo vehicles	• Enhancing the integrated transportation management system within the logistics business and improve the fuel efficiency of cargo vehicles • Monitoring fuel efficiency improvement activities by installing a digital tachograph (DTG)

[1] When used as a packaging material for automobile parts, foldable plastic boxes can be recovered and folded up to a fifth of their size, greatly increasing the amount of boxes that can fit into a collection container.

Response to Climate Change

LIFE CYCLE ASSESSMENT

LCA Methodology Hyundai conducts life cycle assessments (LCA) based on ISO 14040 and 14044 international standards to assess the environmental impacts throughout the entire process of vehicle production, including raw material extraction, component manufacturing, component transportation, vehicle manufacturing, vehicle distribution, vehicle operation, and end-of-life treatment. As of 2022, the proportion of vehicle models that underwent LCA was 25.03%. The LCA was conducted using the full-LCA methodology for all vehicle models.

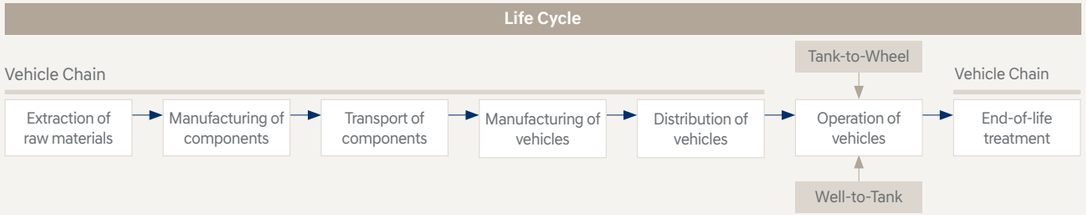
LCA was conducted using the CML (Centrum voor Milieukunde Leiden) methodology, considering a variety of impact categories such as global warming (GW), abiotic depletion potential (ADP), acidification potential (AP), eutrophication potential (EP), ozone depletion potential (ODP), and photochemical ozone creation potential (POCP), as well as human and ecosystem impact categories. To assess the impacts arising from suppliers' manufacturing processes, reliable commercial databases were utilized. For factors such as vehicle transportation, distribution, and energy use, as well as pollutant emissions, actual data measured at the facilities were applied. In 2022, the accuracy of the LCA was improved by differentiating primary materials, such as aluminum, into virgin and recycled sources at the raw material extraction stage. Additionally, the operational stage of EVs involved predicting the impact on future electricity production based on the basic plan for power supply.

LCA Expansion Based on the LCA process established until 2021, LCA was conducted for four powertrains (ICEV, HEV, EV, FCEV), a total of 14 passenger vehicle models and 2 commercial vehicle models in 2022. In addition, the Genesis brand has completed LCA for all of its vehicle models.

Use of LCA Hyundai comprehensively analyzes the environmental impacts at each stage of the entire process based on the results of LCA. Using this information, we identify and promote activities to improve the environmental friendliness of our vehicles. In the raw material extraction stage, we are expanding the use of eco-friendly steel and aluminum materials. In the part-manufacturing and vehicle-production stages, we are committed to carbon neutrality through initiatives like RE100 and resource circulation. When developing new models, we aim to minimize environmental impacts by considering LCA.

LCA Results As of 2022, we have completed LCA for a total of 20 vehicle models. The LCA results of 14 passenger vehicle models that underwent LCA are shown on the right. The results for the remaining factors, such as parts manufacturing and vehicle maintenance stages, which are currently not included, will be addressed and improved through advanced LCA methodologies.

Life Cycle Stages Covered by LCA



Impacts Covered by LCA

Ecological consequences			Resource use	Human health
Acidification (AP)	Ecotoxicity (ETP)	Eutrophication (EP)	Abiotic depletion (fossil fuels, minerals)	Human Toxicity (HTP)
Global Warming (GW)	Ozone Depletion (ODP)	Photochemical Ozone Formation (POCP)	Water Depletion	

Cumulative Vehicle Models and Ratio of Sales by Model in 3-year Full-LCA

LCA Results by Model

Pre-manufacturing, Transportation, Manufacturing, Distribution, Use, End-of-life treatment, Recycling (Unit: gCO_2-eq/km)

Model	Classification	GHG emissions	Percentage of GHG emissions generated by life cycle stage
NEXO[1]	FCEV	224.8	
IONIQ 6	EV	157.4	
Grandeur (IG)	ICEV	220.2	
Grandeur (IG)	HEV	169.1	
Grandeur (GN7)	ICEV	215.4	
Grandeur (GN7)	HEV	156.8	
GV60	EV	146.9	
G70	ICEV	236.8	
GV70	ICEV	265.2	
GV70E	EV	214.7	
G80[2]	ICEV	311.6	
G80E	EV	234.1	
GV80[2]	ICEV	325.6	
G90	ICEV	311.0	

[1] Based on the case using hydrogen produced via steam methane reforming (SMR) process
[2] Based on gasoline 3.5 AWD

Establishment of a Circular Economy

Hyundai complies with the end-of-life vehicle (ELV) recovery and disposal regulations in countries where it sells its vehicles, while also implementing extended producer responsibility (EPR) to increase the recovery, disposal, and recycling of ELVs. [Re-think] We continue look for materials that minimize negative impact on the environment and human health starting from the vehicle design phase. [Reduce] While reducing the use of one-time raw materials, such as plastics, as much as possible, we are increasing the application of eco-friendly materials. [Recycle] In addition, we are shifting our business operation method from a linear structure to be circular so that recyclable materials can be recycled. To increase the recovery, disposal, and recycling of ELVs, we are intensifying the process internally while also strengthening cooperation with outsourced companies.

Extended Producer Responsibility

DESIGN FOR RECYCLING AND RECYCLED MATERIALS

Designs for Recycling Starting from a new vehicle's design and development phase, we take the recovery, disposal, and recycling of wastes that are generated from ELVs. In addition to increasing the application of recyclable materials, we are replacing non-metals, such as plastic and glass, with recycled materials, biomaterials, and other eco-friendly materials to enhance vehicles' eco-friendliness. Hyundai vehicles are 85% recyclable if vehicles' thermal energy is not recovered, and the recyclability rate rises to 95% if the recovery of thermal energy from waste disposal is included. In particular, metals, such as ferrous and non-ferrous materials, account for approximately 70% of vehicle materials, and we are reusing or recycling most of them.

Eco-friendly Material Technologies Hyundai values recycling as a way to preserve a sustainable future environment. We are therefore expediting the establishment of a closed loop for recycling plastic waste, while also building an open loop system for waste from other industries than automobile industry as well as domestic waste as part of our efforts for eco-friendly activities that consider the recycling ecosystem.

Based on the circular plastic system, we make continued efforts to expand the use of recycled plastics to exterior parts of lamps and closure parts, in addition to applying recycled plastics to interior parts of wheel guards, undercover parts, battery trays, and fan-shrouds. We have established a mid- to long-term plan on continually discovering new wastes and developing recycling element technologies, and are giving concrete shape to strategies on applying and expanding recycled plastics based on these internal resources. Moreover, we will build a system that can monitor the status of recycled plastic application to our vehicles to efficiently manage the entire recycled plastic application process.

In addition to recycled plastics, we produce bioplastics made of raw materials extracted from sugar cane and wood, and use them for finishing materials of dashboards and others, and also use eco-friendly paint that uses coconut seed extracts. Vegetable oil that is produced from flaxseeds is applied for seat processing, and we have developed eco-friendly anthropogenic leather that applies bio-polyol derived from cornstarch, thereby reducing around 47% in carbon generation compared to previous anthropogenic leather. As part of an environmental project that makes marine environment pollutants into resources and applies them to automotive parts, we developed a technology that recycles waste tuna fishing nets and applied them to floor mats and plastic parts. To expand application, we are establishing collaborative relations with outside parties, such as agreements with the fishing industry. We are continually securing recycled material technologies, such as developing parts that apply bio-composite materials using coffee grounds and developing interior parts that reuse waste wood, including whiskey/oak barrels.

Increased Application of Eco-friendly Materials to New Vehicles Hyundai is applying eco-friendly materials, including recycled materials, to its new EV models first. Yarn extracted from sugar cane and processed yarn from recycled PET bottles were applied to the IONIQ 5's door trims and seats, followed by expanded application to the head linings, pillar trims, sun visors, and package trays of the IONIQ 6, GV60, Electrified GV70, and Electrified G80 models. In addition, materials made of recycled waste fishing nets that were discarded in the ocean were applied to the floor mats of the IONIQ 5 and IONIQ 6. Natural fabric that contains 30% wool was applied to the front of the headrest and side of seats for the Electrified GV70. Also, the Electrified G80 applied forged wood decoration that is made of leftover pieces of wood.

Application of Eco-friendly Materials to EV Models

IONIQ 5	Bio paint extracted from rape blossoms and corn, oil extracted from flaxseed, yarn extracted from sugar cane, processed yarn from recycled PET bottles, etc.
IONIQ 6	Paint from recycled waste tire, plant raw material-based paint, yarn extracted from sugar cane, processed yarn from recycled PET bottles, etc.
GV60	Bio-polyol derived from corn and sugar cane, processed yarn from recycled PET bottles, etc.
Electrified GV70	Natural fabric containing 30% wool, processed yarn from recycled PET bottles, etc.
Electrified G80	Natural dye, processed yarn from recycled PET bottles, forged wood made of recycled leftover pieces of wood, etc.

Eco-friendly materials applied to IONIQ 5

Eco-friendly materials applied to Electrified G80

Establishment of a Circular Economy

ESTABLISHING THE ELV RESOURCE CIRCULATION SYSTEM

Eco-friendly ELV Service In line with customers' requirement for eco-friendly ways of scrapping vehicles, we provide a one-stop service that assists our customers through the vehicle recovery, dismantling, and recycling processes. Customers can apply 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 based on the principle of indoor storage of recovered materials and recycling of all recovered parts and materials.

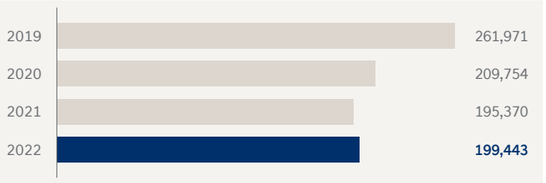
Recovering and Recycling ELVs Hyundai signed an agreement with the Korean Ministry of Environment in 2011 to implement a pilot project to advance the recycling system for ELVs by justifying the adoption of EPR in the automobile sector after introducing it to packaging materials and electronic products. We are strengthening collaborative relations with scrap car companies, such as providing vehicle dismantling manuals and necessary training to scrap car companies, supporting the eco-friendly disposal of waste refrigerants contributing to climate and ecosystem change, and subsidizing the recycling of materials that are difficult to recycle. In 2022, we recovered about 199,443 tons of resources at the end-of-life stage, with the recycling rate of end-of-life cars reaching 82.4% without including heat recovery and 91% when included. In the meanwhile, Hyundai does not have a financial benefit from the end-of-life vehicles' take back programs.

Eco-friendly ELV Principles

Prevention of soil and water pollution	Resource circulation, prevention of global warming
• Carry out the dismantling process indoor • Store recovered parts and materials indoor	• Recover liquid waste and A/C refrigerant by type • Recycle all recovered parts and materials

Resources Recovered from ELVs

(Unit: Tons)



UPCYCLING PROJECTS

Hyundai goes beyond the reuse and recycling of wastes and continues with upcycling projects that create new value based on wastes, such as fashion accessories, new materials, and renewable energy. We will make continued efforts to conduct various upcycling projects, thereby creating new value of waste resources in the automotive industry as well as other industries.

Re:Style

Hyundai unveiled "Re:Style", an eco-friendly upcycled fashion platform, in 2019 in collaboration with designer Maria Cornejo to combine leftover leather and fabric from car seats that are discarded in the automobile manufacturing process with Maria Cornejo's signature pieces to be reborn as 15 innovative pieces of clothing. For the second project of Re:Style, we took a step further from the 2019 project to use various waste materials, such as vehicles' glass, carpet, and airbag that are discarded in the automobile manufacturing process, and create a collection that reflects the philosophies of six eco-friendly designers.

In early 2023, we joined hands with the world-renowned fashion designer Jeremy Scott and unveiled a collection that used bio plastic skin (fabric containing a bio-material extracted from sugar cane), an eco-friendly material that was applied to the IONIQ 6, as well as wipers, tail lights, and seat belts used for EVs. In addition, the "parametric pixel", which gives a geometric form to pixel, the smallest unit to constitute an image, was used to produce various accessories for sale, including micro mini bags, notes, and keyrings.

Producing clean hydrogen using biogas based on organic waste resources

Hyundai is moving forward with a business that produces and supplies clean hydrogen by using biogas (methane) generated at public sewage treatment plants in collaboration with the Ministry of Environment, Cheongju City in North Chungcheong Province, and Institute for Advanced Engineering, through which we seek to contribute to reducing carbon and vitalizing the hydrogen ecosystem. We plan to complete construction of a hydrogen production facility in a public sewage treatment plant in 2024 after commencing construction in 2023 in partnership with Cheongju City, with an aim to begin operations in 2025. Once the hydrogen production facility goes into operation, 500 kg of hydrogen is planned to be produced a day. The facility will later be extended to increase daily hydrogen production to 1,000 kg in 2027. Hydrogen produced at the facility will also be supplied to hydrogen charging stations in the local community to supply local residents with clean hydrogen at reasonable prices compared to byproduct hydrogen. Its areas of use will be expanded to include mobility for public services, such as hydrogen buses and hydrogen cleaning trucks.

Overseas, we are running a business of producing electricity by converting livestock excretions into biogas in Lampung, located on the island of Sumatra, Indonesia, through which we are contributing to reduction of GHG emissions and job creation for the local community.

Appling renewed materials based on marine waste

In partnership with Healthy Seas, a marine conservation organization in Europe, Hyundai is carrying out marine ecosystem restoration activities while providing marine pollution-related education and striving to prevent marine pollution. In 2022, we undertook large-scale cleanup and education project in Ithaca, Greece and collected 18.5 tons of abandoned fishing nets and 5 tons of other marine wastes. The collected fishing nets and marine wastes are processed into ECONYL® (nylon material recovered from upcycled nets and cloths) to be used in diverse areas, including fashion products, clothing, and floor mats of the IONIQ 5 and IONIQ 6. In addition, in collaboration with Enaleia, an NGO in Greece, we provided incentives to fishermen who stopped fishing in the breeding season, when fish should be protected, and instead collected marine plastic wastes. We plan to widen the scope of marine ecosystem restoration activities to include northern Africa and Korea, in addition to Europe. Going forward, we will expand the application of marine waste-based renewed materials to new car models and our brand accessories.

Establishment of a Circular Economy

Establishment of a Virtuous Circulation System for Batteries

ECO-FRIENDLY BUSINESS BASED ON SECOND-LIFE BATTERIES

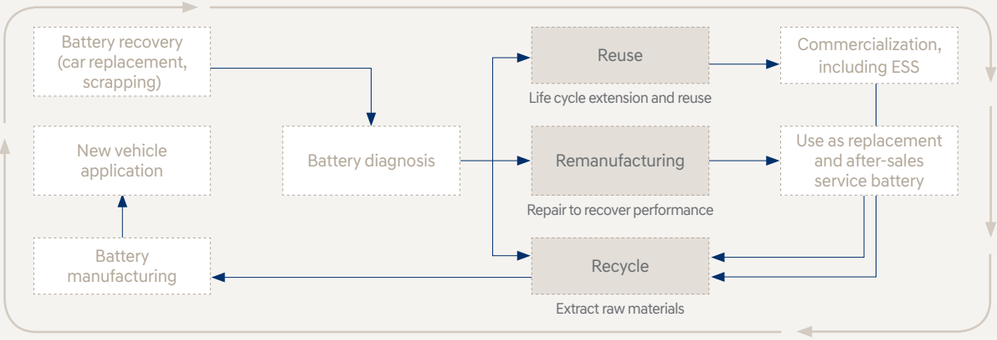
Establishment of Cooperative System for Battery Circulation Based on the battery life cycle, Hyundai is establishing an eco-friendly battery circulation system that aims for sustainability through the recycling and reuse of second-life batteries generated from end-of-life EVs. The battery life cycle consists of an eco-friendly loop encompassing manufacturing of battery cells using raw materials to production of battery systems for electric vehicles, reuse of batteries after use, extraction of materials from finally discarded batteries, and application of the extracted materials to battery manufacturing. We formed a taskforce team in 2022 to establish a group-wide cooperative system throughout the battery life cycle, while exploring green business models and developing relevant competencies.

In building a cooperative system for battery circulation among Hyundai Motor Group affiliates, Hyundai Motor Company will be in charge of creating a system that enables us to obtain large amounts of second-life batteries through our global sales and service network. We will also establish a virtuous circulation system for batteries through which we extract such key battery materials as cobalt, lithium, and nickel, from second-life batteries that cannot be recycled or remanufactured, and then use them for battery-manufacturing process.

Hyundai GLOVIS plans to use its global logistics network to conduct a business that recovers second-life batteries through ground/marine transportation and reuses the collected second-life batteries for energy storage system (ESS). Hyundai MOBIS is planning a remanufacturing business that prolongs the life of batteries by means of new packaging, such as sorting out collected batteries and restoring performance, and inputs them for use. Remanufactured batteries will be used for old electric vehicles and repair (after-sales service).

Recovery of Second-Life Batteries In partnership with Hyundai GLOVIS, we are building up a global network and transportation control system to collect and transport second-life batteries discharged from various places including junkyards and dealers around the world. Hyundai GLOVIS has 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 systems that meet the complex and diverse regulations of various countries. We will use Hyundai GLOVIS' logistics know-how and network to establish a second-life battery recovery system throughout the battery life cycle and complete the link between the downstream and upstream segments.

Virtuous Battery Circulation System



Reuse of Second-Life Batteries Hyundai has been conducting pilot projects to reuse second-life EV batteries for 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 Specialty, our demonstration partner, we began commercial operations using photovoltaic power in January 2021. 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. Starting in 2023, Hyundai's various ESS pilot projects based on second-life batteries will be led by 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 of Second-Life Batteries Among second-life batteries generated from our battery life cycle, top-quality second-life batteries with high residual value will be linked to remanufacturing business according to our own classification criteria. We will work together with Hyundai MOBIS to establish a collection system and a remanufacturing base by using the domestic and global after-sales parts supply chains of Hyundai MOBIS. We then remanufacture purchased/collected second-life batteries into batteries for old vehicles and after-sales service, thereby prolonging the service life of batteries.

Recycling of Raw Materials from Second-life Batteries Second-life batteries that cannot be remanufactured or recycled via Hyundai's battery circulation system are broken into pieces 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 an eco-friendly, safe way. By linking the raw materials that are secured as a result with battery manufacturing processes, we will complete the virtuous circulation system of batteries. We plan to build a stable electric vehicle ecosystem by strengthening our battery raw material supply capabilities in the region through the virtuous battery circulation system.

Strengthening the Global Battery Supply Chain

Hyundai Motor Group is expanding battery cell plants in areas located near EV production sites in order to procure required batteries stably and locally for the global expansion of EV production and sales. To this end, it is increasing investments and strategic alliances with battery companies, including LG Energy Solution and SK on. Through local procurement of battery cells that are optimized in line with electric vehicles' performance and detailed specifications, we seek timely production and sales of high-efficiency, high-performance safe EVs with a high level of competitiveness in accordance with market circumstances. In addition to establishing EV-dedicated production plants in Korea and the US, we are changing previous internal combustion engine vehicle (ICEV) production sites to a system optimized for EV production. In particular, the manufacturing innovation platform that Hyundai Motor Group Innovation Center in Singapore (HMGICS) demonstrated and developed will be applied to new electric vehicle production sites to enable demand-centered intelligent control, use of eco-friendly, low-carbon construction methods, and safe, efficient work.

Establishment of a Battery Cell Production Joint Venture in North America

In partnership with SK on, Hyundai Motor Group is constructing a plant with an annual battery cell production capacity of 35 GWh in Georgia, US to stabilize battery procurement in North America. Hyundai MOBIS will assemble battery packs using cells from the plant, then supply them for the production of Hyundai, Kia, and Genesis EV models manufactured in the US. In addition, the plant is located close to Hyundai Motor Manufacturing Alabama (HMMA) and Hyundai Motor Group Metaplant America (HMGMA), EV production subsidiary that will be launched in 2025, which is expected to enable us to have a stable local procurement system based on which we will strive for increasing EV sales in North America.

Construction of a Battery Cell Plant in Indonesia

Hyundai Motor Company, Kia, Hyundai MOBIS, and LG Energy Solution are establishing a joint battery cell plant with an area spanning 330,000 m^2 in Indonesia to strengthen the battery cell supply chain that is optimized for EV-dedicated models. The plant will have the capacity to produce a total of 10-GWh worth of lithium-ion battery cells every year and is scheduled to begin mass production in the first half of 2024. In particular, Hyundai Motor Group will perform the role of strengthening battery cell production capability through integrated quality control regarding overall battery systems and application to finished vehicles. The battery cells produced at the joint plant in Indonesia will be used in various electric vehicles that will be produced in 2024 and onwards.

Reduction of Environmental Impact

Companies have the responsibility to meets the needs of the present without compromising the ability of future generations to meet their own needs. Hyundai is making utmost efforts to perform this role. There are rapid changes in the internal and external environment that surrounds companies, while water shortage grows in severity due to climate change and reckless corporate activities, and such environmental issues as air and water pollution cause great harm to Earth and all life on Earth. In addition, there is increasing raw material risk, which was triggered by war and inflation. Amid stricter regulations of environmental authorities, sustainable use of natural resources has become an important issue more than ever. Hyundai therefore strives to restrain increases of resource use and waste generation that are connected to the rise in production, which has been increasing after COVID-19.

Sustainable Use of Resources

RESOURCES INFLOWS

Increased Efficiency of Raw Material Input Volatility of raw material prices is rising, mainly attributable to global inflation, supply chain circumstances, and the Russia-Ukraine War. Raw material price volatility is a factor that directly affects finances. Hyundai is therefore striving to minimize internal and external risks that can be triggered by raw materials, including a rise in costs, instability in supply and demand, and depletion of natural capital, by improving efficiency in raw material use and expanding the three Rs (Reduce, Reuse and Recycle). Main raw and subsidiary materials that are used at Hyundai's production plants are steel sheets (steel), aluminum, paint, thinner, foundry sand, and plastics. In case of scraps that are generated by the press process, where steel sheets (steel) and aluminum are mainly used, we sell them to outside parties and enable reuse of the entire amount. In 2022, Hyundai Motor Manufacturing Russia (HMMR) not only recycled 4,351 tons of scrap iron, but also 1,877 tons of cartons and 172.55 tons of plastics as part of efforts to improve its raw material efficiency. Hyundai Motor Brasil (HMB) adjusted fender thickness and reduced steel input by around 8%. Hyundai Motor India (HMI) reduced steel use by 161 tons by reducing blank pitch.

Strengthening Water 3Rs (Reduce/Reuse/Recycle) As the global water shortage caused by climate change intensifies, a number of risks associated with water resources have already emerged. In response, Hyundai evaluates water risks by business site based on the WRI Aqueduct Water Risk Atlas Tool. As a result, we have identified HMI and HAOS as business sites with extremely high water stress and are increasing water 3Rs (Reduce, Reuse and Recycle) mainly at high-water-risk business sites. HMI and the Asan Plant in Korea have established a zero liquid discharge system to reuse and recycle 100% of the water they use. HMI, located in Chennai, India where water shortage is severe, reduced daily water consumption by 130 tons by taking diverse measures, such as strengthening rainwater harvesting facilities and expanding reservoirs. HMB reuses washing water in some production process steps. In 2022, water reuse amounted to 2,284,154 tons, a year-on-year increase of 5%, and the reuse rate remained similar to the previous year's at around 21%. The water usage target for 2022 was set as 10,868,795 tons, which is a 5% reduction from the estimated amount of use that was determined based on the 2022 production plan. Actual water usage was 10,790,093 tons.

RESOURCES OUTFLOWS

Expanding Waste 3Rs (Reduce/Reuse/Recycle) Various kinds of waste materials are generated in the automobile production process. Of these waste materials, metals are 100% recycled. We strive to recycle other waste materials as much as possible, such as waste paint, waste thinner, packaging materials, and sludge. In 2022, we recycled 90.8% of all waste materials generated at our business sites, while treating difficult-to-recycle waste in an environmentally-friendly way. The Asan Plant changed the filter media of the pressure filter at its industrial water purification plant to a recycling treatment method. Our service centers in Korea are holding campaigns on preventing loss of major resources, including aluminum wheels and batteries. The waste reduction target for 2022 was set as 59,875 tons, a 10% reduction from the estimated waste volume that was determined based on the 2022 production plan. Actual waste volume was 50,453 tons. Beijing Hyundai Motor Company (BHMC) changed the waste paint drying method from natural drying to electric heating and reduced final waste volume by 36.75 tons. Hyundai Motor Manufacturing Czech (HMMC) makes continuous efforts to reduce sludge in its wastewater treatment process through sludge dryers and compressors.

Raw Material Use

(Unit: Tons, Tons/Vehicle)

Classification	2020	2021	2022
Steel/aluminum use	1,031,113	1,138,929	1,177,082
Use per vehicle	0.27	0.29	0.29
Steel/aluminum scrap	382,965	400,419	408,662

Water Use

(Unit: Tons, Tons/Vehicle)

Classification	2020	2021	2022
Total use[1)]	10,967,709	9,941,274	10,790,093
Reuse and Recycling	-	2,179,600	2,284,154
Use per vehicle	2.94	2.57	2.70

[1)] Value resulting from excluding the discharge amount from the sum of urban water and water supply facility, surface current, and underground water intake amount

Waste Discharge

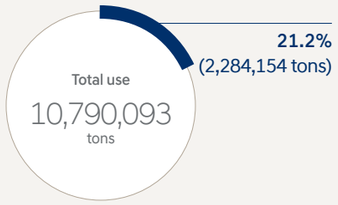
(Unit: Tons, Tons/Vehicle)

Classification	2020	2021	2022
Total reuse/recycling	455,211	492,787	498,162
Total waste volume[1)]	43,105	45,986	50,453
Waste volume per vehicle	0.0115	0.0119	0.0126

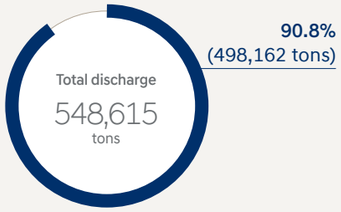
[1)] Sum of landfilled, incinerated, biodegraded waste that does not include the reused/recycled amount

Ratio of scrap amount in 2022

Ratio of water reuse and recycling in 2022



Ratio of waste recycling in 2022



Reduction of Environmental Impact

Reducing Pollutant Emissions Hyundai has set stricter in-house management standards than the legal standards of the countries in which its business sites are located as a way to preemptively respond to air and water pollution. The Ulsan, Asan, and Jeonju plants have each established an integrated monitoring system for IoT environmental facilities to comply with the environmental laws and prevent serious environmental accidents. They have reduced risks caused by environmental pollutants and established an efficient workplace environment management system by introducing advanced new technologies such as water level alarm systems for water tanks, remote disaster prevention facilities, and flow management of environmental facilities, as well as air quality monitoring. HMMC manages its air pollutant emissions considerably lower than the legal standards by reducing air pollutant emissions from each process. It has been planting trees on unused land within the factory, and checks for mercury (Hg) and cadmium (Cd) discharge every day and manages it to be less than 15% of the legal standards. HTBC does not use transport vehicles and utility center boilers any more, and thus reduced boiler load during cold weather to less than 5 t/h, leading to reduced pollutant emissions. The Asan Plant raised wastewater treatment efficiency by installing an additional vacuum dryer, resulting in stable production and supply of industrial water. In addition, facility improvements were made to result in increased wastewater treatment efficiency. HMI reduced pollutants by using chemical and biological treatment methods at its wastewater treatment plant.

Pollutant Emissions

(Unit: Tons, kg/Vehicle)

Classification		2020	2021	2022
Air pollutants	Total emissions (tons)	935	1,211	1,411
	Emissions intensity (kg/vehicle)	0.250	0.313	0.353
Water pollutants	Total emissions (tons)	605	643	723
	Emissions intensity (kg/vehicle)	0.172	0.166	0.181
VOCs	Total emissions (tons)	11,047	10,756	7,796
	Emissions intensity (kg/vehicle)	1.062	0.915	0.547

Management of Harmful Substances

HARMFUL SUBSTANCE MANAGEMENT SYSTEM

Harmful Substance Management Standard 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 apply the same management standards for harmful substances to our supply chain in order to ensure that the products that are delivered to us do not contain any regulated substances.

Inspection and Analysis of Harmful Substances Hyundai has adopted the International Material Data System (IMDS), jointly operated by global automobile manufacturers, to systematically manage information on harmful substances. We also apply the Material Analysis Management System (MAMS), developed in-house, to conduct risk assessments based on substance 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, we investigate the inclusion of regulated substances during the new car development stage in order to preemptively respond to newly regulated substances. Hyundai also 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.

Management of Harmful Substance Information Hyundai does its utmost to prevent accidents by preemptively reviewing new high-risk substances and replacing them with alternative substances. Upon handling hazardous chemicals, we are striving to maintain a safer 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 strictly managing harmful substances in the supply chain by helping suppliers set up their own systems of response to harmful substance regulations, whenever necessary, in addition to running annual IMDS user trainings to improve the consistency of IMDS data.

Preemptive Response to Regulation and Initiatives Hyundai supports international regulations, standards, and initiatives concerning harmful substances. We strive to preemptively develop and apply alternatives even before finalization of regulations that prohibit/restrict the use of harmful substances in Korea and abroad. In response to amendment and/or strengthening of legislation on end-of-life vehicles (ELV) and REACH of EU, a leader of governing harmful substances, we work on replacing high-risk substances. Persistent organic pollutants (POPs) that have recently become known to be resistant to environmental degradation accumulate in the body of animals and plants through the food chain, causing damage to the central nervous system and disturbances in the immune system, thereby adversely affecting the ecosystem and human health. As global discussions are in full swing on regulations that prohibit use of POPs, Hyundai has preemptively established countermeasures. Discussions on regulations concerning perfluorinated compounds (PFAS) have been taking place in Europe. Aiming to prohibit PFAS use before 2027, which is when regulations are expected to be adopted, we are identifying alternatives and the status of regulated substance use and reviewing when to apply alternatives.

Focused Management of Four Major Heavy Metals Hyundai prohibits use of the four major heavy metals – lead, cadmium, hexavalent chromium, mercury – that are prohibited from use in the EU market based on the July 2003 EU ELV regulation and that can accumulate in the human body and cause heavy metal poisoning. In addition, we strictly prohibit the use of high-risk substances such as brominated flame retardants. We manage such harmful substances in accordance with the harmful substance management standards established in December 2002.

Pyramid-type chemicals management system

Hyundai has set in place a pyramid-type chemicals management system that covers the head office–business sites–unit plants. We also operate the department responsible management system and social media communication channels for real-time sharing of chemicals injection information (planned time of injection, injection amount, etc.), thereby taking preemptive measures to prevent chemicals accidents.

Ulsan Plant's commitment to zero hazardous chemicals

Hyundai's Ulsan Plant is striving to reduce hazardous chemicals themselves with a goal of reducing chemical accidents. It has been making continuous plant facility improvements since 2014, while developing alternatives together with suppliers. As a result, it achieved a 90% reduction in hazardous chemicals and plans to become a zero hazardous chemicals business site by 2030.

Reduction of Environmental Impact

BUSINESS CASE

ECO-FRIENDLY ACTIVITIES BY PLANTS

Hyundai is improving quantitative environmental indicators for each business site in Korea and overseas. Our business sites also have been taking active part in eco-friendly activities and initiatives. These qualitative activities are included in business sites' performance indicators, along with quantitative indicators, and reflected in their environmental performance evaluations. Based on this performance system, we are strengthening the eco-friendly activities of each business site and leveling up the company's environmental management based on the horizontal development of excellent environmental activities.

Business Sites in Korea

Ulsan Plant As the company's largest single manufacturing plant complex, the Ulsan Plant engages in a range of eco-friendly initiatives individually tailored to each of its manufacturing plants. Plant 3 plans to build a wastewater reuse system including water transfer piping so that effluent from the wastewater treatment plant can be reused as circulating water for the scrubber in the painting booth, enabling the plant to reuse 52,000 tons of water per year. The engine transmission plant has installed a real-time leakage detection system to prevent environmental accidents caused by leakage of cutting oil used for cooling, rust prevention, and lubrication. The flow of leaked cutting oil is identified in real time, and an alarm system is activated immediately if necessary, enabling the plant to take action before any leaked oil enters the drainage ditch.

The materials plant became the first in Korea to apply an automatic management system for washing water of wet scrubbers to eliminate odor and reduce hydrogen chloride discharge concentration. If the pollution level – set based on this system – exceeds, washing water is automatically replaced, which has enabled us to manage air pollution prevention facilities in a more stable and efficient way. We also strive to implement ESG management through a wide range of cultural events that promote environmental management, such as ZUPZUP campaign of the Plant 1 and labor-management environmental workshop of the Plant 2.

Asan Plant The Asan Plant's waste recycling ratio is 95%, which is higher than the average waste recycling ratio (91%) of all our plants across the globe, and its waste-to-landfill is close to zero at 0.04%. Based on a high recycling ratio and very low landfill, the Asan Plant is working on receiving external Zero Waste To Landfill (ZWTL) certification which assigns a grade according to the actual recycling rate after confirming a business site's waste recycling level. According to the preliminary inspections of the certificate agency, the Asan Plant is anticipated to achieve Gold level validation. This will be the first ZWTL validation among automotive manufacturing plants, contributing to enabling Hyundai to strengthen its ESG competitiveness.

Jeonju Plant The Jeonju Plant is strengthening management step by step across the entire scope of air measurement, ranging from selection of an air measurement company to management of measurement result data, to prevent regulation risks from stricter laws concerning self-measurement of air pollutants and incorrect measurements. In particular, it has dual measurement companies to enable mutual comparison and analysis of results. In addition, it strengthened field surveys and continually discovers and reflects new pollutants. It is also strengthening follow-up improvement activities based on measurement and field survey results, such as scrubber improvements.

Asan Plant's Waste Treatment Status

1	2	3	4
Recycling	Heat recovery incineration	Neutralization	Landfill
95.43%	4.03%	0.07%	0.04%

Overseas Business Sites

Hyundai Motor Manufacturing Alabama (HMMA) Located in Montgomery, Alabama in the U.S., HMMA is carrying out multi-faceted improvement activities to reduce wastewater pollutants to protect Montgomery's water supply. In January 2023, HMMA established a regular conference body with an external professional company to inspect the water quality of wastewater, in addition to significantly strengthening water treatment standards of the wastewater treatment facility. It has also established a real-time wastewater quality monitoring system and strengthened water quality inspection equipment.

Hyundai Motor Brasil (HMB) HMB was the first Hyundai business site to achieve zero waste-to-landfill. Based on this performance, it became the first automotive company in Brazil to obtain the Responsible Company Seal in relation to waste management and the Waste Zero Seal for two consecutive years in 2023. In addition, HMB is conducting a regular impact assessment (monitoring) on the overall environment – including air, water quality, biodiversity, soil, underground water – to minimize its environmental footprint, while also making improvement based on assessment results.

Hyundai Motor Manufacturing Czech (HMMC) HMMC is strengthening its efforts to reduce sludge waste from the sewage treatment plant to protect nearby water supply. In order to improve its sludge compression process, HMMC changed the sludge coagulant to one with stronger alkalinity, thereby reducing sludge waste by 37%. It will adopt an additional sludge compressor to reduce sludge waste by at least 60%.

Hyundai Motor Manufacturing Russia (HMMR) Soil loss and erosion trigger floods and soil erosion, not to mention damage to biodiversity. To minimize negative impact from soil loss and erosion, HMMR is improving the business site environment by restoring old pipes in the business site that have a possibility of soil loss and erosion and inserting filter cartridges in areas where there was soil loss, thus preventing additional loss.

Hyundai Motor India (HMI) Air pollution caused by rapid industrialization is emerging as a social issue in India. In response, HMI is continually strengthening improvement activities aimed at reducing air pollutants, including Particulate Matter (PM) and nitrogen oxide (NOx). It recently built a system that recovers waste heat from regenerative thermal oxidizers (RTOs) and uses the waste heat as a substitute for boilers, resulting in a 27% reduction in air pollutants generated during boiler use. In addition, it has reduced fuel consumption by 91% through waste heat recycling, contributing to energy saving and cost reduction.

Hyundai Assan Otomotiv Sanayi (HAOS) HAOS has achieved a reduction of about 23% in the amount of contaminated wastes per vehicle in the last three years, but found it difficult to measure it by department since it was taking total measurements for HAOS. It therefore adopted a waste barcode system to address difficulties in detailing activities by department. By attaching a barcode sticker to each shop contaminated waste bag and measuring the weight in the waste warehouse, it can conduct real-time monitoring of the amount of contaminated waste by department. HAOS plans to implement additional reduction activities by department based on monitoring results.

Beijing Hyundai Motor Company (BHMC) The BHMC Yangzhen Plant in China reused and adopted a waste cutting oil treatment facility of the Changzhou Plant, which stopped operation according to a mid- to long-term plant operation plan, to strengthen treatment of waste cutting oil, which is an environmental pollutant. This has enabled the Yangzhen Plant to prevent environmental pollution that is caused by waste cutting oil by being equipped with a dual (separation/microbial) waste cutting oil treatment system that includes microbial treatment.

Hyundai Motor Manufacturing Indonesia (HMMI) HMMI began its plant operations in 2022 and provided employee training to raise environmental awareness in consideration of its low environmental implementation score compared to neighboring countries, including Singapore and Thailand. HMMI created an emergency manual and set up emergency equipment to respond to emergency situations, such as pollutant leakage and other such environmental accidents. It is also strengthening relevant employee training so that they can become familiar with relevant matters.

Protection of Biodiversity

Biodiversity is an essential element for life on Earth to maintain balance with the natural environment. Hyundai recognizes that biodiversity has a significant impact on humanity's food security, health, air, water, and soil quality. To minimize biodiversity loss due to business operations, we are assessing species composition and diversity as well as improving environmental factors that influence biodiversity. Moreover, we will undertake various projects that take characteristics of the natural ecosystem into account with a goal of enhancing biodiversity. To this end, we will continue with projects aimed at preserving/restoring species and population near business sites or local communities, and restoring habitats and establishing alternative habitats.

Preservation, Restoration, Expansion of Biodiversity

BIODIVERSITY PROTECTION SYSTEM

Establishment of Biodiversity Protection Policy In 2022, Hyundai established the Biodiversity Protection Policy based on the Convention on Biological Diversity (CBD), Convention on International Trade in Endangered Species of Wild Fauna and Flora, and Guidelines for Applying Protected Area Management Categories. We are complying with laws and regulations on diversity promotion, wild fauna and flora management, natural habitat conservation, and use of forest/soil/water resources of countries where our business sites are located. Also implemented based on the biodiversity policy includes the assessment of environmental impact throughout our business operations and conservation/restoration activities. Implementation of our pledge on mid- to long-term biodiversity restoration and promotion, biodiversity policy declaration and establishment/amendment, assessment of biodiversity and setting of impact reduction activities, and forest destruction prevention and reforestation project is endorsed by BOD or management.

Biodiversity Assessment and Protection by Business Site Hyundai conducts an environmental impact assessment of its large business sites based on relevant laws and regulations in the respective country to forecast and analyze the impact on resident life and natural environment by environmental factors that arise in the process of newly building/extending business sites or operating business sites. The air environment, water environment, land environment, fauna and flora, and other factors are subject to environmental impact assessment. Based on assessment results, we identify major risk factors and establish mitigation measures. Some production subsidiaries additionally conduct a biodiversity risk assessment that identifies numbers of fauna and flora and ecosystem status, through which they forecast impact and risk factors on specific species and population and establish mitigation measures. In addition, each business site carries out biodiversity and habitat protection activities and collaborates with government and relevant organizations, non-profit groups, and professional organizations to raise the effectiveness of protection activities.

Hyundai Motor Company Biodiversity Protection Policy

Biodiversity Assessment – Numbers of Fauna/Flora and Analysis of Impact

① **Select species and individuals**
We select species and individuals that are subject to an assessment in a way that allows identification of fauna and flora as well as the ecosystem status in consideration of a business site's operation method, operation size, and nearby local environment characteristics. In particular, we include endangered animals, protected wild animals, natural monuments, and species that are designated for preservation/protection by international agreements in assessment targets.

② **Set the assessment area (range)**
The area that has the business site's major axis length as the radius is used as the basis, but we set impacted neighboring areas from business site boundaries as the assessment range. If needed, we expand the assessment range in consideration of fauna and flora's movement route, area of activity, and vegetation distribution. Also, in consideration of seasonal characteristics, we conduct an assessment at a different time.

③ **Define the assessment method (means)**
We carry out a basic survey of ecosystem geography and ecology, including an inquiry, documentary survey, and questionnaire. We identify the status of numbers of species through unaided eye observation, field inquiry, picture-taking, sound detection, spot survey, and trap installation, in consideration of fauna and flora's area of activity, time, frequency, and other factors. Assessment results are managed as characteristics information, including method of confirming species per assessment spot, legally protected species, indigenous species, and observed and confirmed population.

④ **Forecast and analyze impact**
We forecast and analyze the impact and risk factors of natural environment changes caused by business operations, air/water/soil pollution, and noise and vibration generation on changes in species and population. When forecasting impact, we refer to similar assessment cases, such as establishment of new business site, capacity expansion, and business operation. Based on assessment results, expected changes to species and population are described in quantitative or qualitative form. We forecast impact in detail for major species and individuals that are expected to be substantially impacted from business operations. Priority is placed on considering species that are sensitive to anthropogenic interference.

⑤ **Establish mitigation measures**
Based on the results of forecasting and analyzing negative impact on species and population, we establish measures on mitigating negative impact on fauna and flora species and population. We change business site locations, adjust business operation schedules, and establish alternatives to avoid significant impact, and adopt environmental facilities to remove and minimize environmental pollution. In case of unavoidable damage to a major habitat, we establish alternative habitats and vegetation belts, and artificial space, including wildlife passage.

Methods for assessing the species and individual inhabitation status (picture-taking, spot survey, field inquiry)

Protection of Biodiversity

BIODIVERSITY PROTECTION APPROACH AND MITIGATION MEASURES

	Hyundai's Approach	Hyundai's Mitigation Measures
Avoid	• Restrict or put off the establishment and extension of business sites in areas that have a high impact on biodiversity • If negative impact is confirmed, conduct restricted operations until the impact is offset	• Before establishing/changing/expanding a large business site, we pre-assess how the activity will impact the nature assets, including biodiversity (flora and fauna) and natural environment (air, water, soil), of the planned project site and surrounding area. According to assessment results, we decide on carrying out the project or restricting/putting off the project.
Reduce	• Make facility investments to remove and minimize the discharge of air, water, and soil pollutants • Develop technologies that reduce environmental pollutants that arise in the process of manufacturing and using vehicles	• We adopt environmental facilities that can minimize discharge of air/water/soil pollutants of our business sites, such as use of the regenerative thermal oxidizer (RTO), dust collector, zero liquid discharge system, and waterborne-based paint. • We conduct life cycle assessments (LCAs) in the areas of global warming, acidification, eutrophication, and photochemical oxidant generation to assess our vehicles' potential impact on the environment - LCA results indicated that EVs can reduce the carbon footprint as much as 67% compared to ICEVs, when using new and renewable energy-based electricity. Hyundai is therefore striving for 100% electrification by 2045. • We apply exhaust gas-reducing technologies, such as the gasoline particulate filter (GPF) and diesel particulate filter (DPF), to reduce vehicle exhaust gas such as NOx and PM.
Transform	• Make structural improvements to the topography of business sites or surrounding areas so that there is no impact on biodiversity • Participate in policy-making and engage in cooperation in the industrial sector to reduce negative environmental impact	• We are establishing eco-friendly ecological parks based on private-government cooperation and developing/spreading new technologies that restore the ecosystem. - We established the Yeouido Saetgang Ecological Park based on a three-party agreement among Hyundai Motor Company, Seoul Metropolitan City, and social cooperative Hangang, adopted non-point pollutant source reduction facilities, and conducted a planting project in the area. - In partnership with The Nature Conservancy (TNC) in Brazil and Sao Paulo State University's Department of Forest Science, we established a research forest to develop new technologies for forest restoration (Green Field, etc.) and are spreading new technologies.
Restore	• Promote species and population that reduced or became extinct in a business site's surrounding or nearby area • Establish (alternative) habitats to maintain-restore species and population	• We restore endangered high-risk species and endangered species threatened by climate change. - Animal restoration: Preserving and restoring species, such as by setting protection zones for the endangered long-billed ringed plover and eagle, which is a natural monument, living in the Taehwa River in collaboration with Ulsan Metropolitan City and East Asian-Australasian Flyway Partnership - Plant restoration: Following a project in the Hongcheon area to restore Korean fir and tulip tree, endangered species threatened by climate change, we collaborated with the Korea National Park Service and conducted a project on restoring plants on Mt. Deokyu that are categorized as endangered species threatened by climate change, including the Korean fir, spruce, and yew.
Regenerate	• Contribute to enhancing natural/biological capital and improving productivity other than business site surroundings • Induce increases in species and population by improving the forest, ocean, and soil environment	• We undertake a land/marine/pond ecosystem regeneration project. - Land ecosystem: Through "IONIQ Forest" project, we will regenerate forests by planting 1 million trees by 2025 across the globe, to provide sustainable habitants for both flora and fauna (Trees support over 80% of the world's terrestrial biodiversity). - Marine ecosystem: In collaboration with Healthy Seas, we will collect a total of 230 tons of ocean waste (waste fishing nets, etc.) in 10 European countries and Korea by 2025 to increases in marine life population, including return of marine fish species. - Pond ecosystem: Together with the Gurugram city government of India, we are regenerating the ecosystem of three ponds. By regenerating ponds, which serve as habitats of various forms of life, we are inducing the restoration of species that mainly live in ponds.

Classification	Region	Metrics	Target	Progress
Terrestrial ecosystem	Korea, U.S., Brazil, Europe (the Czech Republic)	• Area of regeneration • No. of trees planted to build forests	• Area of regeneration: Regenerate a total of 650 ha of terrestrial ecosystem (forest, grassland) by 2025 • Planting trees: Plant 1 million trees by 2025	• Area of regeneration: Completed regeneration of a total of 270 ha of the terrestrial ecosystem, including forests and grasslands, from 2016 to 2022 (achieved 41% of the target) • Planting trees: Completed planting a total of 225,923 trees from 2016 to 2022 (achieved 23% of the target)
Marine ecosystem	10 countries in Europe, including Greece, Korea (Gangwon Province)	• Collected marine wastes, including waste fishing nets	• Collect 230 tons of marine wastes by 2025	• Completed collecting a cumulative 100 tons of marine wastes across around 20 occasions in 8 European countries and Korea from 2021 to 2022 (achieved 43% of the target)
Pond ecosystem	India (Hariahera, Palasoli, Tajnagar)	• Number and area of regenerated ponds	• Regenerate three ponds with an area of a total of 2.3 ha by 2023	• Completed regenerating 3 ponds with a total area of 2.3 ha from 2022 to the first half of 2023. Together with the regeneration of the pond ecosystem, 132,623 cum of water storage potential was secured (achieved 100% of the target)

Protection of Biodiversity

BUSINESS CASE

BIODIVERSITY IMPACT ASSESSMENT – HYUNDAI MOTOR BRASIL (HMB)

Overview of Biodiversity Assessment

Hyundai Motor Brasil (HMB) has been carrying out the seasonal biodiversity impact assessment annually since 2010 to track changes in biodiversity change near its business site, attributable to the use of natural capital required for its business operations and to the impact of the business operations. It also conducts biodiversity assessments to identify the impact that its internal restoration project of riparian forests (Corrego Capim Fino) has on surrounding biodiversity.

Description of the Assessment Area

The areas chosen for the biodiversity assessment are identified as Area T1, Area T2, Area T3, and Area T4, near Piracicaba City in the Brazilian state of Sao Paulo where HMB is located. In principle, a biodiversity assessment area should be within a 1-km radius from the business district, but the assessment area range can be expanded in consideration of the characteristics of amphibians, reptiles, mammals, and birds, which are the fauna mainly subject to the assessment. Area T-1 corresponds to the region of the mouth of Ribeirão Capim Fino, and has a secondary forest area where eucalyptus monoculture, a major plant species that grew naturally, was re-established. Area T-2 corresponds to the region of the permanent preservation areas (APPs), and this site has well preserved secondary forest. It is in the center of two residential condominium areas. Area T-3 is a water resource protection area, and this region has anthropic pressure on the borders due to intense sugar cane cultivation. The T-4 area has the APP of a water resource that flows directly into the Rio Piracicaba. This region has anthropic pressure on the edges due to the intense cultivation of sugar cane and the highway that runs along one side of the fragment.

HMB is identifying the status of species and numbers in areas surrounding the business site and also assessing the level of biodiversity impact of environmental factors that arise from the business site through the seasonal biodiversity assessment. If negative impact on biodiversity is expected, HMB carries out mitigation activities (maintain-restore-promote) to decrease impact and monitors whether the activities are effective for maintaining-restoring-promoting biodiversity. In addition, it conducts the Seasonal Biodiversity Assessment on a regular basis to track and manage changes (increases and decreases) in the number of species.

Methodology

With participation by an ecology expert, HMB conducted sample and field surveys on amphibians, reptiles, mammals, and birds. Based on literature materials on the status of biodiversity distribution of the assessment area, HMB pre-identified the species and population and then confirmed them by means of an unaided eye observation, field inquiry, picture-taking, sound detection, and spot survey. When the biodiversity assessment was conducted, optical image equipment, trap cameras, and GPS and sound-recording devices were used in consideration of the geographical characteristics of the assessment area and weather environment at the time of the assessment. HMB directly confirmed and estimated species' abundance, frequency, and area occupancy through the Seasonal Biodiversity Assessment, and also conducted a sensitivity analysis that estimates changes in species as a result of anthropogenic influence, including reduced habitats, depleted water resources, water pollution, fire, and traffic operation.

Species and Individual Inhabitation Status

The assessment results indicate that there are no indigenous species and introduced species that live only in the area and that there are no high-risk species, such as endangered species. Most species are generalist species that adapt to changes in the surrounding environment and anthropogenic influence. Some mammals and birds were confirmed as specialist species that are sensitive to changes in the surrounding environment. These specialist species are highly dependent on forests and sensitive to changes in the surrounding environment. They have been analyzed as species that inevitably move to a new habitat if there is a change in the environment. From among assessment areas, most species live near the river and areas that house indigenous vegetation. An imbalance in species or overpopulation was not found.

Species	No. of species identified in 2022	Cumulative no. of species identified since 2010
Amphibians/ reptiles	8[1)]	33
Mammals	6	25
Birds	87	197
Total	**101**	**255**

[1)] Including 2 newly identified species

Forecasting and Easing Biodiversity Impact

It was assessed that cumulative anthropogenic impact as a result of the development of farmlands and residential areas surrounding the business site and daily life activities of local residents and crop cultivation is significant on changes in species in the biodiversity assessment area, rather than environmental factors that arise during HMB operation having an impact on biodiversity. In addition, an imbalance in the number of species, such as a dominating specific species, or overpopulation of a specific species was not found in the assessment area and neighboring regions.

Based on the biodiversity assessment results, HMB is conducting a qualitative habitat improvement project for net positive impact on species. Starting in 2012, it has been planting indigenous plants through the project on restoration of riparian forests near the business site. HMB completed planting 50 thousand trees near the business site. Starting in 2023, it will collaborate with The Nature Conservancy (TNC) to further improve the habitats of land species by planting a total 100 thousand indigenous trees in a 40-ha area of Sao Paulo, where a Hyundai plant is located, and State of Minas Gerais nearby Sao Paulo.

1. Sample areas of the Seasonal Biodiversity Assessment (T-1, T-2, T-3, T-4)
2. Methodology – Night survey
3. Cururu toad – Amphibians identified through the species and individual inhabitation status survey