Welcome to your CDP Climate Change Questionnaire 2022

C0. Introduction

C0.1

(C0.1) Give a general description and introduction to your organization.

Since its establishment in 1952 under the founding philosophy of ‘contributing to the nation and society’, Hanwha Corporation has continued its growth playing crucial role in supporting the nation’s economic development over the last seven decades.
Starting off as ‘Korea Co., Ltd’ in 1952, Hanwha corporation, with its success in the development of the nation’s first dynamite, the Global division has become a leader in the global market. The Global division’s success was followed up by developing and providing safe and high-quality explosives and related chemicals to both domestic and global industries, which has resulted in establishing stable profit foundation with its world-class technology and safety standards. Hanwha is providing customer value in all around industries of organic and inorganic chemicals, by offering the market world-class products sand services including Magnificent firework business and customer-focused mining services with world-leading technologies and manufacturing competency. In 2020, the Global division has been newly launched to promote synergy effect through the integration between explosives division and trading division. In 2021, the newly established in-organic chemical division has accelerated the new business development and entry into the global markets.
Defense Division has contributed to safeguarding of the people and nation through their technology, experience and know-how over forty years. With preemptive investments and state involved business, the Defense Division has enhanced the national defense capabilities as well as the international competitiveness through actively entering into global markets and building partnerships with leading companies in global market. In addition, we have innovated our business into high-tech business system striving to keep pace with rapid changes in management surroundings of defense solution industries and higher safety and ethical standards required by international society such that we renovated the business structures to space, precision-guided munitions technology, laser, navigational equipment etc. and we continue to grow to become a solution provider leading ‘Global New Space’.
Momentum Division (old Machinery Division) is leading the global machinery and equipment industries based on our knowledge and technology accumulated for more than half a century since our establishment in 1953. Hanwha has produced a variety of high-value-added

mechanical equipment through continued technological enhancement and innovation and it is expanding its technology improvements with heat technology, logistics, vacuum deposition technology to evolve into a leading player. In particular, it has expanded its business scope to robotics in response to the trend of automated manufacturing system following up from fourth industrial revolution. We will continue to strengthen our partnership with customers by creating world-class technologies through constant research and development to become a global automation engineering solution provider.

C0.2

(C0.2) State the start and end date of the year for which you are reporting data.

	Start date	End date	Indicate if you are providing emissions data for past reporting years
Reporting year	January 1, 2021	December 31, 2021	No

C0.3

(C0.3) Select the countries/areas in which you operate.

Republic of Korea

C0.4

(C0.4) Select the currency used for all financial information disclosed throughout your response.

KRW

C0.5

(C0.5) Select the option that describes the reporting boundary for which climate-related impacts on your business are being reported. Note that this option should align with your chosen approach for consolidating your GHG inventory.

Operational control

C0.8

(C0.8) Does your organization have an ISIN code or another unique identifier (e.g., Ticker, CUSIP, etc.)?

Indicate whether you are able to provide a unique identifier for your organization	Provide your unique identifier
Yes, an ISIN code	ISIN code : KR7000880005

C1. Governance

C1.1

(C1.1) Is there board-level oversight of climate-related issues within your organization?

Yes

C1.1a

(C1.1a) Identify the position(s) (do not include any names) of the individual(s) on the board with responsibility for climate-related issues.

Position of individual(s)	Please explain
Director on board	Board of directors is the highest decision making body of Hanwha corporation. Hanwha has established the governance through approving the establishment of ESG committee consisting of experts in March 2021 to achieve the Net Zero project and climate change strategies for both professional and objective review and making decisions. To enhance implementation of ESG committee, Hanwha has established the committee outside the company but under the board of directors which has highest power to make decision under the law, and also for compliance and control of law and ESG related regulation, the committee included independent director to maintain the objectivity and expertise (1 Executive director and 2 independent directors). ESG committee determines various matters in relation to management and examines the performance evaluation of ESG, and also perform a role to manage the risk which may have major impact on ESG management such as climate change. In 2021, ESG Committee has reviewed and approved carbon-neutralization project so called 'Hanwha Carbon Neutral 2040'. And prepared slogan of 'Movement for Tomorrow' as well as installing solar energy generating facility to cut emission levels of GHG and to build green industries portfolio, Hanwha has established governance to find and secure new growth engines.

C1.1b

(C1.1b) Provide further details on the board's oversight of climate-related issues.

Frequency with which climate-related issues are a scheduled agenda item	Governance mechanisms into which climate-related issues are integrated	Please explain
Scheduled – some meetings	Reviewing and guiding strategy	The regular meetings of ESG committees are held on a quarterly basis but the meetings can also be held

	Reviewing and guiding major plans of action Reviewing and guiding risk management policies Overseeing major capital expenditures, acquisitions and divestitures Monitoring and overseeing progress against goals and targets for addressing climate-related issues	whenever it becomes necessary. The committee reviews mainly the target policies and activities for to respond to risks related to climate-changes that are GHG reduction plans and investment, emission trading, activity plan for preventing accidents within workplace etc. ESG consultative group consisting of CSO and safety environment executives from each division and working group, was established under ESG Committee and this group monitors the divisional response to climate-related issue and detailed projects based on ESG management promoted at company-wide level, and the result of which is reported to ESG committee quarterly. In 2021, ESG consultative group assesses the risk and opportunities in relation to climate-change in accordance with TCFD Recommendations and reported the assessment result to ESG Committees. In 2022, we have disclosed the climate-change information in our corporate sustainability report in accordance with TCFD recommendation.

C1.1d

(C1.1d) Does your organization have at least one board member with competence on climate-related issues?

	Board member(s) have competence on climate-related issues	Criteria used to assess competence of board member(s) on climate-related issues
Row 1	Yes	ESG affects financial performances of organizations and plays an important role to determine the corporate value. In particular, the climate-change is typical risk of ESG but at the same time is an opportunity factor for corporation therefore it is essential to consider climate-related issues for corporations in their decision-makings. Hanwha Corporation considers the expertise and competence on climate-related issues when deciding and choosing its members of ESG committee, as well as the professionalism with considerable understanding in the areas of defense and manufacturing division of Hanwha to combine their knowledge and competence to find future growth engines in relation to climate-change. Among the in-house experts who were in charge of strategies for Hanwha Corporation and Hanwha Group and were active in securing future growth engines, the professionalism was evaluated based on the following criteria. The Board of Directors for climate change and the

		environment sectors were appointed based on the industry experience related to climate change (renewable energy, solar energy etc.) and the ability to evaluate future growth strategies in response to climate change such as hydrogen and solar energy.

C1.2

(C1.2) Provide the highest management-level position(s) or committee(s) with responsibility for climate-related issues.

Name of the position(s) and/or committee(s)	Responsibility	Frequency of reporting to the board on climate-related issues
Other C-Suite Officer, please specify CSO	Both assessing and managing climate-related risks and opportunities	Quarterly

C1.2a

(C1.2a) Describe where in the organizational structure this/these position(s) and/or committees lie, what their associated responsibilities are, and how climate-related issues are monitored (do not include the names of individuals).

Board of directors of Hanwha is the highest decision-making body which decides the important issues in managing the corporation and it reviews and approves Environment, safety and health management plans and risk of climate-related response on quarterly basis. In 2021, Hanwha established governance in order to make decisions professionally and objectively in relation to climate-related and eco-friendly policies and strategies through newly established ESG committees under Board of directors which includes non-executing directors. Regular meeting of ESG committee are held quarterly but it can also be held as often as it is necessary. The committee reviews and examines the targets/goals of policy and activity to overcome the risk of climate-related issues including the reduction plans and investment plans of GHG emission, current status of emission trading, and activity plan to prevent accidents of operations.

Board of directors has also appointed CSO(Other C-Suite Officer) from the chief officers of Hanwha Group, to manage and monitor the climate-related issues more effectively at working level and CSO is given with top responsibility of the operation.

As Hanwha is recognizing the importance of safety and climate-related issues in operating the defense and machinery business closely related to safety facilities of nations, we have additionally appointed the safe environment executive within the Group who is given with power and authority at C-level. ESG committees has affiliate body of ESG consultative group consisting of CSO as chairman, safe environment executive and working group. ESG Consultative group monitors the response of climate-related issues and detailed promoted projects of each divisions based on the ESG management at company-wide level. We are systematically monitoring the climate-related issues and managing the company by reflecting

the assessment of ESG, CDP grade and performance on GHG emission reduction in KPI of CSO, the leader of ESG related groups.

C1.3

(C1.3) Do you provide incentives for the management of climate-related issues, including the attainment of targets?

	Provide incentives for the management of climate-related issues	Comment
Row 1	Yes	

C1.3a

(C1.3a) Provide further details on the incentives provided for the management of climate-related issues (do not include the names of individuals).

Entitled to incentive	Type of incentive	Activity incentivized	Comment
Other C-Suite Officer	Monetary reward	Emissions reduction project Company performance against a climate-related sustainability index	Hanwha is systematically managing the performance of the Board of directors linked with KPI of CSO as a leader of ESG related body on its target and goals to be achieved through reflecting the items of ESG assessment, CDP grade, and outcome of emission reduction.

C2. Risks and opportunities

C2.1

(C2.1) Does your organization have a process for identifying, assessing, and responding to climate-related risks and opportunities?

Yes

C2.1a

(C2.1a) How does your organization define short-, medium- and long-term time horizons?

	From (years)	To (years)	Comment
Short-term	0	1	
Medium-term	1	9	
Long-term	9	19	

C2.1b

(C2.1b) How does your organization define substantive financial or strategic impact on your business?

Hanwha Corporation defines significant financial impacts when expenses or gains and losses of more than KRW 10 billion are involved. In addition, strategic impact is defined as a case that has a serious impact on the implementation of the vision and strategy, and is defined as a significant strategic impact when an adverse financial impact or external image is expected. For financial impact below KRW 10 billion, CSO makes final decision after collecting opinions from ESG consultative group. Only in the case of financial impact of more than 5 billion won, the CEO, a member of the board of directors, participates in decision-making together. The quantifiable indicator used by our organization to define substantive financial impact includes operation costs, internal price on carbon, carbon emissions quantity, energy use quantity and investment costs for improving energy efficiency.

Hanwha Corporation has set out standards for not only significant impact but also for significant strategic impact.

We assess the significant strategic impact through the probability of occurrence and risk impact (strategic importance, urgency, management impact including substantive financial impact) and grade it into I, II , III. If it was graded with I then it is defined as significant strategic impact. Grade I is the highest level and requires a company-wide response. The probability of occurrence is 80% or more, which is 5 points out of 5, and the risk impact is defined as I grade when it requires company-wide treatment and there is a significant financial impact.

ESG consultative group in each division identifies the risks and opportunities of business at least once a year taking account of various regulations, physical and environmental aspects, requirements of stakeholders, and issues that our company is faced with. If significant issue is identified, the issue is reported to ESG committee. The CSO of each division/department will discuss with ESG committee and consultative group to define risk by type and establish and execute the strategy and assignments. The performance of risk management is monitored on regular basis to make medium and long term improvement.

C2.2

(C2.2) Describe your process(es) for identifying, assessing and responding to climate-related risks and opportunities.

Value chain stage(s) covered

Direct operations

Risk management process

Integrated into multi-disciplinary company-wide risk management process

Frequency of assessment

More than once a year

Time horizon(s) covered

Short-term
Medium-term
Long-term

Description of process

Hanwha established the regulation on corporate sustainability management risk to respond to climate-related issues more efficiently and to seek new business expansion. Safety environment team of each division identifies the risks and opportunities of overall ESG performance as per performance indicator based on relevant regulations and restrictions, physical and environmental aspects, requirements of stakeholders, and issues that our company is faced with on quarterly basis. The identified issue is assessed for materiality (short-, medium- and long-term) and risk impact (strategic importance, urgency, operational impact). The ESG consultative group consisting of safe environment executive and working group, assess the climate-related issues and CSO makes decision. The decided matter will then reported to CEO of Hanwha, the Board member. The significant issue or issue with financial impact exceeding KRW 5 billion will be submitted to Board of directors by ESG Committee and Board of directors will make final decision.

The assessment on risks and opportunities should be performed once a year but in case where any new business or service is launched or any changes are made to existing products, or any change are made according to market changes or other external factors, or changes to response strategy were made, or accidents occurs which increases potential risk, then the assessments are to be made as often as it becomes necessary.

The result of risk based assessment is made into grades of I, II, III and the executive who is in charge of risk module should submit action plan to overcome or to make any improvements on the results. The executive includes the target value, completing period, person in charge, resource needed for improvements in their action plan and they carry out the responding activities in accordance with the action plan. The monitoring of risks were done regularly as per each grades and significant impact is monitored once a week at company-wide level.

C2.2a

(C2.2a) Which risk types are considered in your organization's climate-related risk assessments?

	Relevance & inclusion	Please explain
Current regulation	Relevant, always included	Risk type example : Emission Trading regulation Hanwha has been nominated as target company under emission trading scheme as per Act on Low Carbon Green Growth since June 2012. We have been participating in the scheme with our Onsan plant in 2014 and Yeosu plant in 2017 were nominated as allocation target company under emission trading scheme. From year 2021, the starting year of third phase of emission trading

		scheme, the range of allocation target company has expanded to all business sectors of Hanwha, and accordingly the importance of managing supply and demand of carbon credits as well as estimating emission quantities as accurate as possible has grown. If emission level exceeds the allotment allocated by Emission trading scheme, the company is faced with financial risk due to fine imposed thereof or increased direct costs for additional purchasing price for carbon credits. The price of carbon credit is showing upward trend every year by increase of 53% compared to 2020. (KRW 35,100 in 30-Dec-2021, KRW 23,000 in 30/Dec/2020). With 10% of paid allotment given during phase 3, we are preparing action plan to keep our emission level below 90% against the allotment of 2021 (92,320 tCO2eq). In this regard, Hanwha has formed an exclusive team to monitor the price of carbon credits and analyze the emission trading market on regular basis so that we can establish the strategy of submitting proposals for Emission trading scheme through method of balance carried forward, loan, purchase, sale etc. In 2021, we have converted KOC, retained through CDM project of Onsan plant, into carbon offset credit(KCU), and also securing insufficient carbon credits through buying-in and selling-out the carbon credit in carbon trading market.
Emerging regulation	Relevant, always included	Risk type example : Renewable Energy Regulation (RE100) The demand and requirement of RE100 (Renewable Energy 100) under the low-carbon transition plan recently have been growing, and many global companies are proactively responding to requirement of RE100. The compliance with RE100 affects the decision-making process of clients as well as investors. If we adhere to using fossil fuel energy without responding to RE100, there is a risk of divestment by investing institutions and loss of customers. In this context, we are looking into introducing an internal systems for RE100 and Electric Vehicle 100 (EV 100) which are raising social issues due to the trend of pursuing carbon neutralization. Through the short-term investment, we plan to make fundamental changes in our environment using energy. For this, we are examining the third-party PPA contracts for renewable energy, providing the idle site to be used for building solar energy generating facilities that has enabled us to take the lead in extending the foundation for environmental friendly energy production.
Technology	Relevant, sometimes included	Technology type example: Renewable energy and Blue Hydrogen technology As demands and need for renewable energy to substitute existing resources such as oils and coals to address the climate-change issues are growing, Hanwha is expanding its business by establishing hydrogen value chain including blue hydrogen manufacturing

		technology in connection with its solar energy business. We recognize the developing technology for renewable energy and hydrogen industry ecosystem is a great opportunity but also a risk for Hanwha as it meets Hanwha's growth vision. We have classified the technology for hydrogen and renewable energy into risk type. The global division of Hanwha is promoting ammonia extracted hydrogen business since 2020 and planning on expanding its business area to supplying hydrogen fuel cell and hydrogen for power stations using hydrogen premixed. Also Hanwha Momentum division(old Machinery division) is continuously expanding and promoting its business of constructing renewable energy plants such as energy waste plant, wood pallet production plant and biomass energy plant since 2021. Hanwha corporation has signed MOU with Hanwha Impact (old Hanwha General Chemical Co., Ltd.), WONIK Materials Co., Ltd., and WONIK Holdings, to cooperate in manufacturing and supplying hydrogen based on ammonia.
Legal	Relevant, always included	Risk type example : ESG related legislation, regulation and system We regularly and frequently review and reflect ESG related law and regulations including amendments into our risk assessment process. If we do not actively involve ourselves to respond and address the ESG public announcements in relation to emission trading scheme and climate-related issues, we are exposed to facing the risk of serious violation of law or illegality. In addition, if illegal trades under the emission trading scheme occurs, a fine of up to KRW 100 million or imprisonment of up to three years can be imposed on the business owner, which can have a significant impact on business maintenance and operation. In response, Hanwha monitors the company's operation and performances to be lawful and legal to maintain the legality and to avoid any risk that might have serious effect on company's reputation as well as ESG assessment result. As we are actively responding to the law and regulation related to climate-change systematically, it is expected that there is no risk of any illegality. But we nevertheless reflect it to risk assessment to manage and monitor the risk at all times. Hanwha has never experienced any problem or illegality under climate-change related law and regulation and we strongly believe we continued to do so in future through our well managed system.
Market	Relevant, always included	Risk type example : Changes of EV (Electric Vehicles) market supply and demand in Machinery business sector Global market is experiencing rapid growth with transition into future eco-friendly system, typically the EV market of Green Mobility, and the

		regulation in relation to internal combustion engine vehicles are becoming more tightened. Momentum division of Hanwha is operating the assembling line installation business of internal combustion engine(engine, mission), and the sales of this business are decreasing continuously year by year. The changes in supply and demand of internal combustion engine market caused by climate-change, the resources that increases emission efficiency, the response strategy to external factors and market situation including EV market, are included in our risk assessment process. We seek to make up for potential financial loss through business transition such as production facilities of secondary battery and EV battery etc. in response to climate-change issue. Moreover our sale is increasing substantially every year by securing the technology and competitiveness through continuous R&D (KRW 149 billion in 2017 to KRW 308.6 billion in 2021) and we plan to increase our total sale further by 20% by 2030. Momentum division has developed the facility to produce secondary batteries which is the essential part of EV in response to market growth. Starting from establishment of secondary battery center in November 2019, we are expanding our business partners from domestic and global automakers to global battery companies by securing various product line-up through customer tailored R&D and advancement of secondary battery facility.
Reputation	Relevant, always included	Risk type example : announcement and assessment of non-financial information The clients, stakeholders and investors of Hanwha corporation are demanding the disclosure of information related to ESG management and climate-change issues in accordance with international standards. ESG is directly connected with corporation's existence and reputation, not only in Korea but globally. Non-financial information together with financial information is used as main measuring tool in investigation, and ESG assessment result will have effect on funding and financing made by investors. Hanwha recognizes the reputation part as a risk to manage it more efficiently and any effect of risks that may damage company's reputation are included in risk assessment to be examined and assessed. As climate-related issues are highly and sensitively recognized worldwide, we are recognizing the risk of reputation as the risk which we should have control of to maintain corporation's brand value and reputation. Also since national pension and other main financial organization are investing based on how companies respond to ESG and climate-related issues such as K-CGS etc. and with increasing demand from stakeholders to disclose the non-financial information,

		Hanwha is actively disclosing the demanded information. Hanwha has disclosed information in relation to climate-change in 2021 with its new entry with CDP, and also through disclosure of TCFD report, we are putting our effort to maintain our reputation by responding adequately in disclosing climate-related information.
Acute physical	Relevant, always included	Risk type example : extreme weather condition such torrential rain, floods and wildfires Hanwha is recognizing natural disasters caused by climate-change such as drought, heatwave, torrential rain, sea level rise as a risk. As our plants and offices are located in mountainous areas and coastal areas that are easily affected by wildfire, heavy rain and floods from climate change, we are monitoring acute physical environment changes at all times and assess the risk to prepare for the action plan. The typical natural disastrous situation which have huge effect on business operations in mountainous area are flood by rapid flooding, the road closure and factory building damage/destruction by landslides and for coastal areas, the flooding caused by sea level rise etc. Due to torrential rains in the past, we had a situation where the soil surrounding the explosives manufacturing facilities was washed away so we had to address it at a cost of about KRW 100 million. In response, all workplace of Hanwha established an emergency response system taking the past cases and weather forecasts into account. We are also responding to emergency situations by constructing extra facilities to prevent natural disasters such as floodwalls, and water pumps, etc. In addition, we are maintaining the emergency response system to normalized the operation of companies as soon as possible through regularly held emergency training. Recently, massive destructive forest fires have occurred in Korea causing huge losses to country and people. Our facilities located near mountainous area can also be affected by such massive fires thus we have established an emergency response system to respond and address such situation as well. We invested large money into setting up fire control system to act promptly to extinguish fires and expanded the watch out areas upto boundaries of our business site.
Chronic physical	Relevant, always included	Risk type example : change of average precipitation and rise of average temperature We are faced with the risk of difficulty in supplying water to business sites due to shortage of waters caused by change of average precipitation in a year, which in turn can cause the increase of operational cost and decline in water quality causing product quality to fall, with further potential sales drop followed by. Our company considers the risk of chronic physical environmental changes same as the acute physical changes and we check and assess the risks by

		taking account of operational costs and product quality aspects. The extreme weather caused by climate-change is intensifying over the long-term. Chronic physical environmental changes as well as acute physical changes in relation to climate-changes can have a significant impact on maintaining our business. Some of our workplace (e.g. Boeun plant and Yeosu plant) are using underground water in their operation and if the precipitation decreases, the available underground water that could be used also decreases or the quality falls below acceptable standards. Thus we are continuously monitoring and investing on facilities to manage sustainable water resources. The waste water disposal pipe buried underneath the workplace is monitored regularly to check if any leakage incurred to maintain the reliability of our pipe system and have new built facilities for water saving to respond to chronic physical changes. Moreover, Yeosu plant are managing its water resources through improved process of waste water recycling and separation of production facilities removing cause of waste water.

C2.3

(C2.3) Have you identified any inherent climate-related risks with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.3a

(C2.3a) Provide details of risks identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Risk 1

Where in the value chain does the risk driver occur?

Direct operations

Risk type & Primary climate-related risk driver

Current regulation

Carbon pricing mechanisms

Primary potential financial impact

Increased indirect (operating) costs

Company-specific description

Hanwha is participating in emission trading scheme as Onsan plant in 2014 and Yeosu plant in 2017 were being nominated as allocation target companies in accordance with Act on low-carbon green growth. An investment on emission and energy reduction

activities is needed in order not to exceed the allotment and if emission has exceeded the allotment, a fine worth 3 times the average carbon credit price of the year in question shall be imposed. In third phase of emission trading scheme starting from 2021, the range of allocation target companies was extended to all sectors of Hanwha which has placed Hanwha with greater financial risk due to fines and paid allotment. With 10% of paid allotment given during phase 3, we are preparing action plan to keep our emission level below 90% against the allotment of 2021 (92,320 tCO2eq). Hanwha's Onsan plant adopt emission reduction technology which reduces nitrogen dioxide when producing nitric acid and Hanwha has obtained carbon credit with its certification as reduction facility. We are also planning on building facility which adopts emission reduction technology in Yeosu, but if we do not obtain the approval of reduction facility, we are faced with risk of losing or reducing the carbon credits. As such, while the direct cost of investment increases for emission reduction, there is also the risk of additional purchase of emission rights due to the risk of not being recognized for internal reduction performance by the government. In this respect, Hanwha has classified carbon credit as intangible asset and in case where emission has exceeded allotment as mentioned above, the additional purchasing cost of carbon credit is measured as "emission debt".

Time horizon

Short-term

Likelihood

Virtually certain

Magnitude of impact

High

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

324,043,200

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

If emission level exceeds the allotment allocated by Emission trading scheme, the company is faced with financial risk due to fine imposed thereof or increased direct costs for additional purchasing price for carbon credits. The price of carbon credit is showing upward trend every year by increase of 53% compared to 2020. (KRW 35,100 in 30-Dec-2021, KRW 23,000 in 30-Dec-2020)
Hanwha was allocated with 92,320 tCO2eq in 2021, and if we assume the paid allotment ratio of 10% is not met, the financial impact of Hanwha is calculated to be KRW 324,043,200. (KRW35,100/tCO2eq, based on 30-Dec-2021)

* Calculation of financial impact : the allotment of 2021 (92,320 tCO2eq x nonachievement rate (10%) x Price of carbon credit (KRW35,100/tCO2eq) = KRW324,043,200

Cost of response to risk

1,587,868,819

Description of response and explanation of cost calculation

Hanwha is submitting the emission performances to our government after going through verification by external third party and carrying out various activities company-wide in response to emission trading scheme. In 2021, we have conducted 4 major projects and reduced Scope 1 & 2 emission as a result. We reduced 517 tCO2eqe of Scope 1 emission by re-using excising heat wastes by investing KRW30 million for energy efficiency, and have reduced further 151 tCO2eq of emission annually by adopting solar energy equipment. For solar energy, we plan to reduce emission by continuous renewable generation and consumption.

Our organization have been certified with for emission deduction activities centered with CDM projects. Onsan plants of nitric acid production factory have reduced 240,000 tCO2eq and this project is registered as CDM activities to be operated. In order for us to report the emission quantity of 2021 to our government through external third party verification, we have spend KRW17,875,000 for verification costs, and KRW100 million for energy efficiency improvement activities of production process and solar energy. We further have spent KRW168,453,414 in 2021 for operation cost of CDM business. Total costs: verification costs by third party for emission (KRW17,875,000) + CDM project costs of Onsan project (KRW1,469,993,819) + investment on emission reduction activities (KRW100,000,000) = KRW 1,587,868,819

Comment

C2.4

(C2.4) Have you identified any climate-related opportunities with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.4a

(C2.4a) Provide details of opportunities identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Opp1

Where in the value chain does the opportunity occur?

Upstream

Opportunity type

Products and services

Primary climate-related opportunity driver

Development and/or expansion of low emission goods and services

Primary potential financial impact

Increased revenues resulting from increased demand for products and services

Company-specific description

With growing sense of crises in regards to accelerating climate-change, efforts to reduce emission and wastes of international society are hitting its stride. International society including EU is establishing regulation to include recycling materials when producing plastic goods. According to recent “K-Economy circulation performance plan” jointly announced by Ministry of environment and Ministry of Trade, Industry and Energy, our Government has revised relevant guidelines so that carbon credits are to be approved where plastic pyrolysis oil is used as a material for petrochemicals considering its effects of emission reduction. Hanwha is developing technology to make new plastics from using recycling plastic waste in petrochemical process. We are operating pilot plants to run empirical test on the machine equipment which uses recycled oils as fuels extracted from plastic wastes through method of low-temperature pyrolysis. Lately one of the research has published that if plastic wastes are pyrolyzed instead of incinerated, 2.7ton of carbon dioxide per 1ton of plastic waste will be reduced. And according to ‘markets and markets’, the global market research company, has predicted the size of recycled plastic market will grow from USD 27.9 billion in 2020 to USD43.5 billion. Hanwha’s Momentum division plan to reduce carbon emission through developing technology of recycling plastics wastes and increasing sales from market demand. In 2021, Hanwha has singed MOU with government body, Chuncheongbuk-do of ‘2050 Project on promoting pyrolysis of plastic waste for carbon neutralization’ and concretizing the ‘construction of city oilfield in Chuncheongbuk-do’. Hanwha plan to establish the collecting/selecting plastic wastes model, new market opening promotion model with pyrolyzed clean oils, and operational independence model and through demonstrating commercialization and industrialization of manufacturing technology, to supply and spread clean fuels from 2025.

Time horizon

Medium-term

Likelihood

Very likely

Magnitude of impact

High

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

1,330,000,000

Potential financial impact figure – maximum (currency)

1,621,000,000

Explanation of financial impact figure

The global market research company of Markets and Markets have predicted the global market of recycling plastic will extend upto USD 43.5 billion in 2026 and in case where we assume Hanwha to take up shares of 2.5%~3% of domestic market, by assuming the share of this business in domestic market to be 0.1%, we can calculate the opportunity expenses of KRW 1,330,000,000 ~ 1,621,000,000. Based on conservative approach, we have calculated the medium- and long-term estimate cost of orders for resourcing plastic wastes reflecting market growth rate, industry strategy and trend of costs for raw materials to be about in between of KRW 1,330,000,000 to KRW 1,621,000,000 in 2026. Calculation : KRW 54.4 trillion *0.1% * 0.25 ~ 0.3% = KRW 1,330,000,000 ~ 1,621,000,000

Cost to realize opportunity

1,740,000,000

Strategy to realize opportunity and explanation of cost calculation

In 2021, we signed a business agreement with Chungcheongbuk-do for '2050 pyrolysis activation project of plastic wastes for carbon neutralization', and are materializing the ' Chungcheongbuk-do-type urban oilfield construction' through this agreement. We also established plans to supply and expand clean fuels from 2025 by establishing waste plastic collection and sorting model, pyrolysis clean oil market pioneering model, and operational independence model, and going through demonstrating commercialization and industrialization of production technology. For this, Hanwha is carrying out pilot test for plastic waste resourcing facility using idle sites in Gunsan area. We have invested KRW 672,000,000 in 2021 to plastic wastes resourcing facility in Gunsan for pilot test. We plan to invest about KRW 1,068,000,000 for these facility in 2022.
* Calculation of opportunity cost : 2021 investment cost(KRW 672,000,000) + 2022 investment plan(1,068,000,000) = 1,740,000,000

Comment

C3. Business Strategy

C3.1

(C3.1) Does your organization’s strategy include a transition plan that aligns with a 1.5°C world?

Row 1

Transition plan

Yes, we have a transition plan which aligns with a 1.5°C world

Publicly available transition plan

Yes

Mechanism by which feedback is collected from shareholders on your transition plan

We do not have a feedback mechanism in place, but we plan to introduce one within the next two years

Attach any relevant documents which detail your transition plan (optional)

C3.2

(C3.2) Does your organization use climate-related scenario analysis to inform its strategy?

	Use of climate-related scenario analysis to inform strategy
Row 1	Yes, quantitative

C3.2a

(C3.2a) Provide details of your organization's use of climate-related scenario analysis.

Climate-related scenario	Scenario analysis coverage	Temperature alignment of scenario	Parameters, assumptions, analytical choices
Transition scenarios IEA NZE 2050	Company-wide		Hanwha made its analysis with IEA NZE2050 scenario to respond to climate-related risk. This scenario concentrates more on renewable energy such as solar energy, wind power and less dependable on nuclear energy than 450 scenario. We have chosen IEA NZE2050 scenario as we can be used effectively to review our strategy on renewable energy. The main assumptions are nuclear energy and CCUS will be converted into wind power and solar PV system by 2030 and basic plan for energy (ninth edition) with development capacity of renewable energy of Korea will increase upto 35%. We have analyzed IEA NZE 2050 scenario putting sales and investment as parameters and with assumption of continuous maintenance/increase of sale (total revenue of KRW 50 trillion in recent three years in a row, increase of 3.75% compared to previous year of 2021) and new investment resulting in increase of sale and emission.

Physical climate scenarios RCP 8.5	Company-wide		Hanwha has analyzed the risk and impact by comparing RCP2.6 scenario with RCP 8.5 scenario to respond and address the physical environmental changes when we carry out climate-related scenario analysis. We have analyzed the physical changes of climate-changes which includes the average temperature of climate-change, days of heat wave, rainfall intensity on medium-and long-term basis upto year of 2040. We have used analyzed data from national Meteorological Administration and have applied amount of electricity used and operational cost for electricity as parameters. The main assumptions are that existing business sites and workplaces are maintained, the amount of electricity used and operational cost for electricity will change in proportion to days of heat waves and other variables were removed. We have analyzed the values of RCP scenarios of each year and estimated loss/damages that may be occurred in case we do not respond to climate-related issues by addressing the difference of RCP 8.5 compared to RCP 2.6 within administrative area reflecting the regional characteristics.

C3.2b

(C3.2b) Provide details of the focal questions your organization seeks to address by using climate-related scenario analysis, and summarize the results with respect to these questions.

Row 1

Focal questions

Focal question : Can we resolve the national and global climate-change risk though gathering core competence of our company?
Hanwha group has analyzed scenarios to establish the business strategy to deal with climate-change risks using its own solar energy, chemical and hydrogen infra. We plan to gather core competence of our company and cooperate with affiliated companies of Hanwha group to limit the increase of temperature due to climate-change and has analyzed IEA NZE 2050 as main scenario to reorganize business strategy. We have also carried out analysis and comparison of RCP 2.6 and RCP 8.5 to measure and analyze of impacts of climate-change strategy as well as the financial impact in respect of electricity usage as per temperature changes of global climate-change.

Results of the climate-related scenario analysis with respect to the focal questions

We have analyzed the physical scenarios (RCP2.6, RCP8.5) and as a result, the days of heat wave has differ by almost three times in latter period(upto 2100). In particular, Jeju, Gyungnam, Gwnagju, Gyeongki shows the number of days of heat waves to increase by almost five times in present year and 2030 compared to 2050. Also accumulated amount of electricity used was analyzed to be KRW 278,085 million by 2050, an increase by 6% due to change of average temperature in RCP 8.5 scenario compared to RCP 2.6.
From result of analyzing scenario, we decided that it is possible to set up carbon-neutralization by 2040 through increase of renewable energy development capability and increase of resource efficiency. The Defense division of Hanwha has built the solar energy generating facility in their general research center which produces approx. 270MWh per year (8.2% compared to total electricity used in general research center) and when investing on building new facilities, we review possible ways to reduce emission indirectly at investment planning stage through reduced use of electricity utilizing solar energy. Hanwha is contributing towards expanding the basis of Government's eco-friendly energy production businesses by providing idle site of its workplace to be used for solar energy development. We also believe that the carbon neutralization can come forward by securing emission reduction through our CDM project. Onsan Plant under Global division has been securing the carbon credit by their performance of emission reductions through CDM project every year. Total of 2,300,000 tons (as per approved standards of domestic emission reduction) of greenhouse gas was reduced so far and have reduced the emission further in 2021 by 240,000 tons. As expanded investment on nitric acid plant was decided in 2021, we plan to install N20 reduction facility in new nitric acid plant to continue our activities to reduce emission. Hanwha has exclusive team to monitor and analyze the carbon credit price and carbon trading markets on regular basis to establish strategy for proposals of carbon credit with method of balance forward, loan, purchase and sale etc.
Through the analysis of scenario corresponding to transition plan such as hydrogen and solar energy business and government's policy, we believe it was necessary to secure hydrogen production technology based on value chain road map including blue hydrogen production technology development of Hanwha Group. Hanwha has completed the value chain strategy through production and supply of hydrogen using ammonia. In 2021, Hanwha has signed MOU with Hanwha Impact, WONIK Materials, and WONIK holdings to cooperate over whole period of hydrogen ecosystem. In particular, we are carrying out the business of producing Blue hydrogen based on Ammonia and to run field tests. We plan on providing hydrogen energy to overcome climate-related risks in connection with policy supporting increase of hydrogen distribution.

C3.3

(C3.3) Describe where and how climate-related risks and opportunities have influenced your strategy.

	Have climate-related risks and opportunities	Description of influence

	influenced your strategy in this area?	
Products and services	Yes	Demand for new renewable energy to replace existing resources such as oils and coals in response to climate-change. In this respect, Hanwha has established and strengthening the green growth business portfolio. The momentum division (old Machinery division) is expanding the business of constructing new renewable energy plant, such is that biomass energy plant including wood pellet production line, starting off with constructing solid refuse fuel plant at Wonju in 2012. Through preemptive development of technology, we have been supplying facilities to the secondary batteries manufacturing companies for the whole process, from materials, electrode, assemble parts, formation, to module pack process. Global division has been supplying ammonia since 1991, and based on this supply we have expanded our new renewable energy business of hydrogen production which had led us to promote eco-friendly business more actively and we expect to make contribution to hydrogen economy in production/storage/utilization of Blue hydrogen sector.
Supply chain and/or value chain	Yes	Hanwha group has established value chain road map including green hydrogen producing technology in connection with solar energy business to develop hydrogen producing technology. In addition, we are in charge of supply and production of hydrogen using ammonia. We have expanded the business cooperation with Petroleum Public Corporation which is equipped with storage and supply infra of hydrogen to establish hydrogen business ecosystem. We are also jointly developing technology to extract pure hydrogen with WONIK Materials. From our long experience of handling and trading ammonia, we plan on promoting business to procure clean ammonia that is produced abroad, and supply clean hydrogen in domestic market after cracking process. We expected to take part in procuring and trading of ammonia as well as producing of hydrogen through cracking of ammonia in the hydrogen value chain of Hanwha Group.
Investment in R&D	Yes	The plastic waste from homes and industries are considered a main cause of environmental pollution. Hanwha's Momentum division (old machinery division) is developing the mentioned technology and their development work as well as supplying of the machine equipment which uses recycled oils extracted from plastic wastes are on going. Hanwha using the idle site in

		Gunsan to run test on pilot plant for plastic waste recycling facility, and have invested KRW 672 million in 2021 for this project. We plan to invest KRW 1086 million for plastic waste recycling facility in 2022.
Operations	Yes	For the plants which emit greenhouse gas directly, the medium-term Greenhouse gas plan is established and it reflects the risk of climate-change. With the estimates of emission quantity for phase 3(2021~2025), we calculated the shortage of carbon credit compared to the allocated carbon credits in advance to establish response plan for the shortfall. To implement detailed plan, the business strategy shall be established by reflecting the reduction activities for upcoming year investment plan at the end of every year. We are operating 'N2O Reduction Business' that is to remove N2O generated from processing nitric acid in Onsan plant, which is approved by CDM project and we plan on building facilities to remove/reduce N2O with new nitric acid plants. Yeosu plant under Defense Division has established the boiler waste heat recovery system and have reduced average of 517ton of emission per year as a result. This outcome was recognized as K-ETS internal reduction achievement and have secured carbon credit for about 100 ton of emission every year during the phase 3.

C3.4

(C3.4) Describe where and how climate-related risks and opportunities have influenced your financial planning.

	Financial planning elements that have been influenced	Description of influence
Row 1	Access to capital Assets	With know-how and experience of operating ammonia based producing process, Global Division of Hanwha is promoting business of producing and supplying hydrogen used for power generation and transportation through process of cracking ammonia(NH3), and distributing the clean ammonia using their import and transport infra and business capabilities. The Momentum Division of Hanwha (old Machinery Division) have strengthened their capacity of production facilities for renewable energy such as secondary batteries, solar energy, waste energy etc. The green mobility market of EV is rapidly growing along with transition into future ecofriendly system. The Momentum division have developed production facilities for secondary batteries, which is the essential component of EV, in response

		to this growing market. The Momentum division also operates pilot plant to run empirical tests on recycling technology of plastic waste generated from homes and industrial sites. Some capitals were spent in development of above mentioned technology and investment made on facilities, and it is put as tangible and intangible assets in budget. As the increase in sales is expected in this sector, we plan to reflect the sales in the financial plan. Onsan plant of Global division is securing carbon credit from its emission reduction achievements through operating CDM project every year, and have reduced 2,300,000 ton of emission so far based on standards of domestically certified emission reduction achievements. We plan to secure additional carbon credit by reducing about 240,000 ton of emission in 2021 and we expect to secure more carbon credit through emission reduction at our new nitric acid plant. The carbon credits are reflected in financial plan of the year when certificate for reduction quantity becomes invalid. Currently Hanwha is reflecting certificate obtained in 2020 in financial plan of 2022.

C3.5

(C3.5) In your organization's financial accounting, do you identify spending/revenue that is aligned with your organization's transition to a 1.5°C world?

No, but we plan to in the next two years

C4. Targets and performance

C4.1

(C4.1) Did you have an emissions target that was active in the reporting year?

Absolute target

C4.1a

(C4.1a) Provide details of your absolute emissions target(s) and progress made against those targets.

Target reference number

Abs 1

Year target was set

2020

Target coverage

Company-wide

Scope(s)

Scope 1

Scope 2

Scope 2 accounting method

Location-based

Scope 3 category(ies)

Base year

2019

Base year Scope 1 emissions covered by target (metric tons CO2e)

127,764

Base year Scope 2 emissions covered by target (metric tons CO2e)

52,333

Base year Scope 3 emissions covered by target (metric tons CO2e)

Total base year emissions covered by target in all selected Scopes (metric tons CO2e)

180,097

Base year Scope 1 emissions covered by target as % of total base year emissions in Scope 1

100

Base year Scope 2 emissions covered by target as % of total base year emissions in Scope 2

100

Base year Scope 3 emissions covered by target as % of total base year emissions in Scope 3 (in all Scope 3 categories)

Base year emissions covered by target in all selected Scopes as % of total base year emissions in all selected Scopes

100

Target year

2030

Targeted reduction from base year (%)

65

Total emissions in target year covered by target in all selected Scopes (metric tons CO2e) [auto-calculated]

63,033.95

Scope 1 emissions in reporting year covered by target (metric tons CO2e)

43,345

Scope 2 emissions in reporting year covered by target (metric tons CO2e)

56,443

Scope 3 emissions in reporting year covered by target (metric tons CO2e)

Total emissions in reporting year covered by target in all selected scopes (metric tons CO2e)

99,788

% of target achieved relative to base year [auto-calculated]

68.6032014372

Target status in reporting year

Underway

Is this a science-based target?

No, but we are reporting another target that is science-based

Target ambition

Please explain target coverage and identify any exclusions

No exclusion

Plan for achieving target, and progress made to the end of the reporting year

Hanwha has announced carbon neutralization goal namely “Hanwha Carbon Neutral 2040” and to achieve this goal, have established detailed plans for emission reductions in 2030. Onsan plant have reduced 240,000 ton of GHG through CDM project in 2021. The Defense division is reducing average of 517 ton of GHG through boiler waste heat recovery system in their Yeosu plant. Also we plan to reduce GHG of 16,000tCO2eq of emission quantity per year through using idle sites for solar energy and expanding our own consumption level.

List the emissions reduction initiatives which contributed most to achieving this target

Target reference number

Abs 2

Year target was set

2020

Target coverage

Company-wide

Scope(s)

Scope 1

Scope 2

Scope 2 accounting method

Location-based

Scope 3 category(ies)

Base year

2019

Base year Scope 1 emissions covered by target (metric tons CO2e)

127,764

Base year Scope 2 emissions covered by target (metric tons CO2e)

52,333

Base year Scope 3 emissions covered by target (metric tons CO2e)

Total base year emissions covered by target in all selected Scopes (metric tons CO2e)

180,097

Base year Scope 1 emissions covered by target as % of total base year emissions in Scope 1

100

Base year Scope 2 emissions covered by target as % of total base year emissions in Scope 2

100

Base year Scope 3 emissions covered by target as % of total base year emissions in Scope 3 (in all Scope 3 categories)

Base year emissions covered by target in all selected Scopes as % of total base year emissions in all selected Scopes

100

Target year

2040

Targeted reduction from base year (%)

100

Total emissions in target year covered by target in all selected Scopes (metric tons CO2e) [auto-calculated]

0

Scope 1 emissions in reporting year covered by target (metric tons CO2e)

43,345

Scope 2 emissions in reporting year covered by target (metric tons CO2e)

56,443

Scope 3 emissions in reporting year covered by target (metric tons CO2e)

Total emissions in reporting year covered by target in all selected scopes (metric tons CO2e)

99,787

% of target achieved relative to base year [auto-calculated]

44.5926361905

Target status in reporting year

Underway

Is this a science-based target?

No, but we are reporting another target that is science-based

Target ambition

Please explain target coverage and identify any exclusions

No exclusion

Plan for achieving target, and progress made to the end of the reporting year

Hanwha has announced carbon neutralization goal namely “Hanwha Carbon Neutral 2040” and to achieve this goal, have established detailed plans for emission reductions in 2030. Onsan plant have reduced 240,000 ton of GHG through CDM project in 2021. The Defense division is reducing average of 517 ton of GHG through boiler waste heat recovery system in their Yeosu plant. Also we plan to reduce GHG of 16,000tCO2eq of emission quantity per year through using idle sites for solar energy and expanding our own consumption level.

List the emissions reduction initiatives which contributed most to achieving this target

Target reference number

Abs 3

Year target was set
2020

Target coverage
Business activity

Scope(s)
Scope 3

Scope 2 accounting method

Scope 3 category(ies)
Category 15: Investments

Base year
2019

Base year Scope 1 emissions covered by target (metric tons CO2e)

Base year Scope 2 emissions covered by target (metric tons CO2e)

Base year Scope 3 emissions covered by target (metric tons CO2e)
1,017,125

Total base year emissions covered by target in all selected Scopes (metric tons CO2e)
1,017,125

Base year Scope 1 emissions covered by target as % of total base year emissions in Scope 1

Base year Scope 2 emissions covered by target as % of total base year emissions in Scope 2

Base year Scope 3 emissions covered by target as % of total base year emissions in Scope 3 (in all Scope 3 categories)
99

Base year emissions covered by target in all selected Scopes as % of total base year emissions in all selected Scopes
99

Target year
2030

Targeted reduction from base year (%)

10

Total emissions in target year covered by target in all selected Scopes (metric tons CO2e) [auto-calculated]

915,412.5

Scope 1 emissions in reporting year covered by target (metric tons CO2e)

Scope 2 emissions in reporting year covered by target (metric tons CO2e)

Scope 3 emissions in reporting year covered by target (metric tons CO2e)

947,293

Total emissions in reporting year covered by target in all selected scopes (metric tons CO2e)

947,293

% of target achieved relative to base year [auto-calculated]

68.6562615214

Target status in reporting year

Underway

Is this a science-based target?

No, but we anticipate setting one in the next 2 years

Target ambition

Please explain target coverage and identify any exclusions

Over 90% of our Scope 3 emission is emitted from investment sector. As we recognized the need to manage Scope 3, to preemptively manage the measurable range, we firstly selected 15. investment in Scope 3 category and managing it. We have set 15. category as target range for the basic year same as Scope 1 and 2, and have established our target by selecting organization with large carbon emission companies among companies to invest as our range.

Plan for achieving target, and progress made to the end of the reporting year

As our organization is the holding company of Hanwha Group, we retain shares of affiliated companies and we plan to make reduction of Scope 3 emission through climate-related reduction activities and business development with these affiliated companies. Hanwha Solution, as our major investing company, have reduced Scope 1 & 2 emission through solar energy business and facility improvement, making Hanwha corporation to achieve performance of reducing Scope 3 emission. We plan to support reduction activities of our invested company by 2030 so that we can reduce our Scope 3, 15. investment emission by 10%.

List the emissions reduction initiatives which contributed most to achieving this target

C4.2

(C4.2) Did you have any other climate-related targets that were active in the reporting year?

Target(s) to increase low-carbon energy consumption or production

C4.2a

(C4.2a) Provide details of your target(s) to increase low-carbon energy consumption or production.

Target reference number

Low 1

Year target was set

2021

Target coverage

Company-wide

Target type: energy carrier

Electricity

Target type: activity

Consumption

Target type: energy source

Renewable energy source(s) only

Base year

2020

Consumption or production of selected energy carrier in base year (MWh)

314

% share of low-carbon or renewable energy in base year

0.09

Target year

2040

% share of low-carbon or renewable energy in target year

100

% share of low-carbon or renewable energy in reporting year

0.1

% of target achieved relative to base year [auto-calculated]

0.0100090081

Target status in reporting year

New

Is this target part of an emissions target?

Abs2

Is this target part of an overarching initiative?

No, it's not part of an overarching initiative

Please explain target coverage and identify any exclusions

Hanwha established target to us renewable energy applying to all workplaces for 2040 Carbon Neutral Plan. There are no exclusions.

Plan for achieving target, and progress made to the end of the reporting year

Hanwha has introduced RE100 and EV100 system internally to realize the carbon neutralization by setting up 2040 Carbon Neutral Plan. Reviewing and enforcing the business investment for solar energy is also continuously carried out. The general research center of Defense Division is producing 270MWh per year which is 8.2% of total amount of electricity used through solar energy generating facility, and Momentum Division (old Machinery Division) has built solar energy generating facility that generates 2.8MW in idle site of Changwon plant and producing 3,670MWh every year. We are expanding the solar energy generation and consumption with investment worth about KRW40 billion by 2035.

List the actions which contributed most to achieving this target

C4.3

(C4.3) Did you have emissions reduction initiatives that were active within the reporting year? Note that this can include those in the planning and/or implementation phases.

Yes

C4.3a

(C4.3a) Identify the total number of initiatives at each stage of development, and for those in the implementation stages, the estimated CO2e savings.

	Number of initiatives	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)

Under investigation	0	0
To be implemented*	6	3,426
Implementation commenced*	9	511,566
Implemented*	3	298,910.06
Not to be implemented	0	0

C4.3b

(C4.3b) Provide details on the initiatives implemented in the reporting year in the table below.

Initiative category & Initiative type

Energy efficiency in production processes

Waste heat recovery

Estimated annual CO2e savings (metric tonnes CO2e)

517

Scope(s) or Scope 3 category(ies) where emissions savings occur

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

96,000,000

Investment required (unit currency – as specified in C0.4)

30,000,000

Payback period

<1 year

Estimated lifetime of the initiative

Ongoing

Comment

Establishment of waste heat recovery system by recycling condensate water from boiler steam into water

Initiative category & Initiative type

Low-carbon energy generation

Solar PV

Estimated annual CO2e savings (metric tonnes CO2e)
151

Scope(s) or Scope 3 category(ies) where emissions savings occur
Scope 2 (location-based)

Voluntary/Mandatory
Voluntary

Annual monetary savings (unit currency – as specified in C0.4)
6,240,000

Investment required (unit currency – as specified in C0.4)
70,000,000

Payback period
4-10 years

Estimated lifetime of the initiative
21-30 years

Comment
Reduction of indirect emission quantity through low-carbon energy generation and own consumption from own solar energy generating facilities

Initiative category & Initiative type
Energy efficiency in production processes
Process optimization

Estimated annual CO2e savings (metric tonnes CO2e)
298,242

Scope(s) or Scope 3 category(ies) where emissions savings occur
Scope 1

Voluntary/Mandatory
Voluntary

Annual monetary savings (unit currency – as specified in C0.4)
7,844,036,000

Investment required (unit currency – as specified in C0.4)
1,469,993,819

Payback period
11-15 years

Estimated lifetime of the initiative
>30 years

Comment

Reduction of emission through N2O reduction facility of nitric acid production process in Onsan plant

C4.3c

(C4.3c) What methods do you use to drive investment in emissions reduction activities?

Method	Comment
Dedicated budget for energy efficiency	In order to increase the energy efficiency of plant production facilities, Hanwha has expanded and reflected investment costs such as replacement of low-carbon energy facilities and transition of renewable energy sources in connection with the operation strategy.
Internal price on carbon	Hanwha has secured low-carbon investment opportunities by using the internal price on carbon and is reflecting the internal carbon price of 38,000 won in 2021 when investing in the project.

C4.5

(C4.5) Do you classify any of your existing goods and/or services as low-carbon products?

No

C5. Emissions methodology

C5.1

(C5.1) Is this your first year of reporting emissions data to CDP?

No

C5.1a

(C5.1a) Has your organization undergone any structural changes in the reporting year, or are any previous structural changes being accounted for in this disclosure of emissions data?

Row 1

Has there been a structural change?

No

C5.1b

(C5.1b) Has your emissions accounting methodology, boundary, and/or reporting year definition changed in the reporting year?

	Change(s) in methodology, boundary, and/or reporting year definition?	Details of methodology, boundary, and/or reporting year definition change(s)
Row 1	Yes, a change in boundary	Scope 3 boundaries have been expanded to advance Scope 3 management. In the past, category 15 and investment were calculated and managed, but all categories of Scope 3 were calculated as of 2020.

C5.1c

(C5.1c) Have your organization's base year emissions been recalculated as result of the changes or errors reported in C5.1a and C5.1b?

	Base year recalculation	Base year emissions recalculation policy, including significance threshold
Row 1	No, because the impact does not meet our significance threshold	Based on the IPCC Scope 3 calculation guidelines, all categories of Scope 3 emissions for 2020 were calculated. Emissions in the base year are not recalculated because they are calculated by expanding the new category from the existing Scope 3 management category. Emissions in the base year do not meet the materiality threshold because the reduction performance is managed by reflecting it as a scope 3 target.

C5.2

(C5.2) Provide your base year and base year emissions.

Scope 1

Base year start

January 1, 2019

Base year end

December 31, 2019

Base year emissions (metric tons CO2e)

127,764

Comment

Scope 2 (location-based)

Base year start

January 1, 2019

Base year end

December 31, 2019

Base year emissions (metric tons CO2e)

52,333

Comment

Scope 2 (market-based)

Base year start

January 1, 2019

Base year end

December 31, 2019

Base year emissions (metric tons CO2e)

0

Comment

Scope 3 category 1: Purchased goods and services

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

3,984

Comment

Scope 3 category 2: Capital goods

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

349

Comment

Scope 3 category 3: Fuel-and-energy-related activities (not included in Scope 1 or 2)

Base year start
January 1, 2020

Base year end
December 31, 2020

Base year emissions (metric tons CO2e)
3,433

Comment

Scope 3 category 4: Upstream transportation and distribution

Base year start
January 1, 2020

Base year end
December 31, 2020

Base year emissions (metric tons CO2e)
0

Comment

Scope 3 category 5: Waste generated in operations

Base year start
January 1, 2020

Base year end
December 31, 2020

Base year emissions (metric tons CO2e)
1,199

Comment

Scope 3 category 6: Business travel

Base year start
January 1, 2020

Base year end
December 31, 2020

Base year emissions (metric tons CO2e)
2,127

Comment

Scope 3 category 7: Employee commuting

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

22

Comment

Scope 3 category 8: Upstream leased assets

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

0

Comment

Scope 3 category 9: Downstream transportation and distribution

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

217

Comment

Scope 3 category 10: Processing of sold products

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

488

Comment

Scope 3 category 11: Use of sold products

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

39

Comment

Scope 3 category 12: End of life treatment of sold products

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

218

Comment

Scope 3 category 13: Downstream leased assets

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

0

Comment

Scope 3 category 14: Franchises

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

0

Comment

Scope 3 category 15: Investments

Base year start

January 1, 2019

Base year end

December 31, 2019

Base year emissions (metric tons CO2e)

1,017,125

Comment

Scope 3: Other (upstream)

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3: Other (downstream)

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

C5.3

(C5.3) Select the name of the standard, protocol, or methodology you have used to collect activity data and calculate emissions.

IPCC Guidelines for National Greenhouse Gas Inventories, 2006
ISO 14064-1
Korea GHG and Energy Target Management System Operating Guidelines

C6. Emissions data

C6.1

(C6.1) What were your organization's gross global Scope 1 emissions in metric tons CO2e?

Reporting year

Gross global Scope 1 emissions (metric tons CO2e)

43,344.57

Comment

C6.2

(C6.2) Describe your organization's approach to reporting Scope 2 emissions.

Row 1

Scope 2, location-based

We are reporting a Scope 2, location-based figure

Scope 2, market-based

We have no operations where we are able to access electricity supplier emission factors or residual emissions factors and are unable to report a Scope 2, market-based figure

Comment

C6.3

(C6.3) What were your organization's gross global Scope 2 emissions in metric tons CO2e?

Reporting year

Scope 2, location-based

56,442.56

Comment

C6.4

(C6.4) Are there any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1 and Scope 2 emissions that are within your selected reporting boundary which are not included in your disclosure?

No

C6.5

(C6.5) Account for your organization's gross global Scope 3 emissions, disclosing and explaining any exclusions.

Purchased goods and services

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

3,464.57

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Calculated GHG emission by reflecting emission figures against purchased goods.
Method of Scope 3 calculation
Product purchase quantity of Global workplace x produced emission figure (Emission figure in Environment Product Declaration used)

Capital goods

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

375.58

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Average emission of capital goods within carbon labeling were reflected in the figures of mission per capital goods. We have calculated Scope 3 with the collectable purchasing data of capital goods in all workplaces of our organization.
Method of Scope 3 calculation
Purchased existing capital goods x emission figure per manufacturing stages of each capital goods (before manufacturing + manufacturing stages)

Fuel-and-energy-related activities (not included in Scope 1 or 2)

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

2,759.44

Emissions calculation methodology

Fuel-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Used emission figure within carbon labeling of such products.
Method of Scope 3 calculation
Purchased quantity of Scope 1 & 2 fuels x produced emission figure by fuels

Upstream transportation and distribution

Evaluation status

Not relevant, calculated

Emissions in reporting year (metric tons CO2e)

0

Emissions calculation methodology

Distance-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Cooperative partners that supplies products in category 1 & 2 under Scope 3 are operating upstream transportation and distribution together so relevant calculated

emission is included in category 1 & 2. As a result, the emission % of upstream transportation and distribution is set as 0.

Waste generated in operations

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

921.03

Emissions calculation methodology

Waste-type-specific method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Reflected the emission figure for each wastes disposing method under carbon labeling (Feb. 2019)
Method of Scope 3 calculation
Produced emission quantity of each types of wastes and waste disposing method x emission figure of each types of waste and waste disposing method

Business travel

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

2,079.93

Emissions calculation methodology

Distance-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Reflected the emission figures under Ministry of Environment’s guidelines of low-carbon Green events. The ERP travelling data was collected to calculate traveled distance.
Method of Scope 3 calculation
Distance by domestic transportation method x emission figure of each transportation + overseas flying distance x emission figure of business trip by air

Employee commuting

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

14.36

Emissions calculation methodology

Distance-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Reflected the emission figures under Ministry of Environment's guidelines of low-carbon Green events. The data from cooperating partners was collected to calculate transported distance.
Method of Scope 3 calculation
∑ (travelled distance by each transportation x emission figure by each transportation method)

Upstream leased assets

Evaluation status

Not relevant, calculated

Emissions in reporting year (metric tons CO2e)

0

Emissions calculation methodology

Asset-specific method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

We do not possess any upstream leased assets therefore 0% of emission figure was calculated.

Downstream transportation and distribution

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

473.92

Emissions calculation methodology

Distance-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Emission made by transporting trucks within carbon labeling was used for emission calculation (Feb. 2019). The transporting distance and quantity was collected from cooperative companies and calculated within collectable range. Since Hanwha is operating its defense business for national security facilities, we are not allowed to provide certain delivery data so the calculation was made with limited data where possible.
Method of Scope 3 calculation
Global transporting distance per year x emission figure produced by land-transporting trucks

Processing of sold products

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

515.32

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Case where sold products of Hanwha is processed is the chemical products of Global division, we used sales volume of nitric acid and ammonia as basis for calculation. Data of emission figure in processing parts were used.
Method of Scope 3 calculation
Sales volume of Nitric acid, ammonia x carbon emission figure of using each fuels source

Use of sold products

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

41.53

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Case where sold products are used is the products manufactured by our Momentum(old machinery) division, the electricity used after installing the machine products are used as basis for calculating emission.
Method of Scope 3 calculation
Number of Sales facility x electricity consumption per facilities * carbon emission figure of electricity consumption

End of life treatment of sold products

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

229.93

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

Chemical substance sold by Global division are used entirely without any disposal, but products of Momentum division need to be disposed as more than 90% of products are made of steels, and when these products are disposed, it is disassembled into parts for recycling, so recycled figure are reflected to calculate emission for disposal.
Method of Scope 3 calculation
Weight of 1 equipment x number of equipment sold x carbon emission figure of recycling nonferrous metals wastes

Downstream leased assets

Evaluation status

Not relevant, calculated

Emissions in reporting year (metric tons CO2e)

0

Emissions calculation methodology

Asset-specific method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

For downstream leased assets, we are using Scope 1 & 2 for our calculation so emission under Scope 3 in this column is set as 0. To actively manage and reduce the emission we are using Scope 1 & 2 for leased assets.

Franchises

Evaluation status

Not relevant, calculated

Emissions in reporting year (metric tons CO2e)

0

Emissions calculation methodology

Franchise-specific method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

We do not operate any franchise business so the emission under this subject is set as 0.

Investments

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

947,293

Emissions calculation methodology

Investment-specific method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

Used Scope 3 calculating emission for companies with shared ownership (Hanwha Hotel & Resorts, Hanwha Connect, Hanwha Impact). We have collected emission data from these companies and multiplied our shares of ownership.
Method of Scope 3 calculation
GHG emission quantity of companies with shared ownership x share ratio of our ownership

Other (upstream)

Evaluation status

Not relevant, explanation provided

Please explain

N/A

Other (downstream)

Evaluation status

Not relevant, explanation provided

Please explain

N/A

C6.7

(C6.7) Are carbon dioxide emissions from biogenic carbon relevant to your organization?

No

C6.10

(C6.10) Describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tons CO2e per unit currency total revenue and provide any additional intensity metrics that are appropriate to your business operations.

Intensity figure

0.0000000175

Metric numerator (Gross global combined Scope 1 and 2 emissions, metric tons CO2e)

99,787.16

Metric denominator

unit total revenue

Metric denominator: Unit total

5,704,498,000,000

Scope 2 figure used

Location-based

% change from previous year

24.86

Direction of change

Decreased

Reason for change

The basic unit of sale in 2020 has decreased by 24.86% compared to 2021. The main causes of decrease are reduction activities such as optimizing process, replacing facilities with high-efficiency, CDM business for direct carbon emission reduction. With the increase of sale of 2021 compared to 2020, the basic unit has decreased from 0.02328 in 2020 to 0.01749 in 2021 as a result. But to calculate the figure in decimal places, the unit total of metric denominator is set as KRW 1 million. - % change of basic unit of sales in 2021 compared to previous year(%) = [basic sale unit of 2021 (0.02328 tCO2e/KRW1mil.) ÷ basic sale unit of 2020 (0.01749 tCO2e/KRW1mil.) – 1) x 100 = 24.86%

C7. Emissions breakdowns

C7.1

(C7.1) Does your organization break down its Scope 1 emissions by greenhouse gas type?

Yes

C7.1a

(C7.1a) Break down your total gross global Scope 1 emissions by greenhouse gas type and provide the source of each used greenhouse warming potential (GWP).

Greenhouse gas	Scope 1 emissions (metric tons of CO2e)	GWP Reference
CO2	33,554.34	IPCC Second Assessment Report (SAR - 100 year)
CH4	29.02	IPCC Second Assessment Report (SAR - 100 year)
N2O	9,761.24	IPCC Second Assessment Report (SAR - 100 year)
HFCs	0	IPCC Second Assessment Report (SAR - 100 year)
PFCs	0	IPCC Second Assessment Report (SAR - 100 year)
SF6	0	IPCC Second Assessment Report (SAR - 100 year)
NF3	0	IPCC Second Assessment Report (SAR - 100 year)

C7.2

(C7.2) Break down your total gross global Scope 1 emissions by country/region.

Country/Region	Scope 1 emissions (metric tons CO2e)
Republic of Korea	43,344.57

C7.3

(C7.3) Indicate which gross global Scope 1 emissions breakdowns you are able to provide.

By facility

C7.3b

(C7.3b) Break down your total gross global Scope 1 emissions by business facility.

Facility	Scope 1 emissions (metric tons CO2e)	Latitude	Longitude
Hanwha Gangwon branch	285.01	37.470146	129.060272
Hanwha Gyeongsang branch	7.7	35.156334	128.97536
Hanwha Gumi plant	119.83	36.110089	128.383411
Hanwha Daegu-Gyeongbuk office	3.72	35.793826	128.308702
Hanwha Daejeon plant	5,064.74	36.401782	127.327505
Hanwha Boeun plant	12,059.38	36.5667	127.631451
Hanwha Head office	655.24	37.567421	126.98555
Hanwha Seobu Branch	7.7	37.567421	126.98555
Hanwha Asan 1 plant	26.68	36.913069	127.061108
Hanwha Asan 2 plant	11.83	36.893881	127.020992
Hanwha Yeosu plant	12,721.55	34.728581	127.694885
Hanwha Onsan plant	11,097.87	35.413956	129.338628
Hanwha Jecheon business office	190.1	37.175707	128.292702

Hanwha Defence R&D Institute	419.1	36.403437	127.36669
Hanwha Changwon plant	486.73	35.187163	128.698982
Hanwha Changwon operating office	174.17	35.198399	128.668917
Hanwha Cheonan business office	7.39	36.758605	127.127852
Hanwha Taebaek business office	5.84	37.174522	128.988728

C7.5

(C7.5) Break down your total gross global Scope 2 emissions by country/region.

Country/Region	Scope 2, location-based (metric tons CO2e)	Scope 2, market-based (metric tons CO2e)
Republic of Korea	56,442.56	0

C7.6

(C7.6) Indicate which gross global Scope 2 emissions breakdowns you are able to provide.

By facility

C7.6b

(C7.6b) Break down your total gross global Scope 2 emissions by business facility.

Facility	Scope 2, location-based (metric tons CO2e)	Scope 2, market-based (metric tons CO2e)
Hanwha LPG station	18.84	0
Hanwha Gangwon branch	34.13	0
Hanwha Gyeongsang branch	5.83	0
Hanwha Gumi plant	2,155.12	0
Hanwha Daegu-Gyeongbuk office	12.59	0
Hanwha Daejeon plant	5,747.6	0

Hanwha Boeun plant	10,412.51	0
Hanwha Head office	729.76	0
Hanwha Seobu Branch	22.05	0
Hanwha Asan 1 plant	1,515.24	0
Hanwha Asan 2 plant	5,137.08	0
Hanwha Yeosu plant	11,665.41	0
Hanwha Youngnam center	12.68	0
Hanwha Onsan plant	12,582.04	0
Hanwha Jecheon business office	38.5	0
Hanwha Defence R&D Institute	1,343.79	0
Hanwha Changwon plant	1,942.27	0
Hanwha Changwon operating office	776.72	0
Hanwha Cheonan business office	11.39	0
Hanwha Taebaek business office	13.69	0
Hanwha Hwasoon plant	72.16	0
Hanwha R&D center Pangyo	2,193.17	0

C7.9

(C7.9) How do your gross global emissions (Scope 1 and 2 combined) for the reporting year compare to those of the previous reporting year?

Decreased

C7.9a

(C7.9a) Identify the reasons for any change in your gross global emissions (Scope 1 and 2 combined), and for each of them specify how your emissions compare to the previous year.

	Change in emissions (metric tons CO2e)	Direction of change	Emissions value (percentage)	Please explain calculation
Change in renewable energy consumption	151.06	Decreased	0.03	Reduced 151.06 tCO2eq by reducing electricity consumption from operating and constructing solar energy generating facility (Reduced emission quantity in 2021 (151.06tCO2eq) ÷ Emission quantity in 2020 (439739.126tCO2eq) × 100= 0.03)
Other emissions reduction activities	344,767	Decreased	78.4	Reduced total of 344,767 tCO2/y from emission reduction activities by establishing waste heat recovery system of collecting and recycling the boiler steam condensate water into water (achievement of certified internal reduction achievement of Korea's K-ETS policy)(Reduced emission quantity in 2021 (344,767tCO2eq) ÷ Emission quantity in 2020 (439,739.126tCO2eq) × 100 = 78.4)
Divestment				
Acquisitions				
Mergers				
Change in output				
Change in methodology				
Change in boundary				
Change in physical operating conditions				
Unidentified				

Other				

C7.9b

(C7.9b) Are your emissions performance calculations in C7.9 and C7.9a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?

Location-based

C8. Energy

C8.1

(C8.1) What percentage of your total operational spend in the reporting year was on energy?

More than 0% but less than or equal to 5%

C8.2

(C8.2) Select which energy-related activities your organization has undertaken.

	Indicate whether your organization undertook this energy-related activity in the reporting year
Consumption of fuel (excluding feedstocks)	Yes
Consumption of purchased or acquired electricity	Yes
Consumption of purchased or acquired heat	No
Consumption of purchased or acquired steam	Yes
Consumption of purchased or acquired cooling	No
Generation of electricity, heat, steam, or cooling	Yes

C8.2a

(C8.2a) Report your organization's energy consumption totals (excluding feedstocks) in MWh.

	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total (renewable and non-renewable) MWh

Consumption of fuel (excluding feedstock)	HHV (higher heating value)	0	153,083.61	153,083.61
Consumption of purchased or acquired electricity		0	326,228.6	326,228.6
Consumption of purchased or acquired steam		0	1,271.11	1,271.11
Consumption of self-generated non-fuel renewable energy		328.81		328.81
Total energy consumption		328.81	480,583.33	480,912.14

C8.2b

(C8.2b) Select the applications of your organization's consumption of fuel.

	Indicate whether your organization undertakes this fuel application
Consumption of fuel for the generation of electricity	Yes
Consumption of fuel for the generation of heat	Yes
Consumption of fuel for the generation of steam	Yes
Consumption of fuel for the generation of cooling	No
Consumption of fuel for co-generation or tri-generation	No

C8.2c

(C8.2c) State how much fuel in MWh your organization has consumed (excluding feedstocks) by fuel type.

Sustainable biomass

Heating value

HHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

Other biomass

Heating value

HHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

Other renewable fuels (e.g. renewable hydrogen)

Heating value

HHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

Coal

Heating value

HHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

Oil

Heating value

HHV

Total fuel MWh consumed by the organization

58,529.91

MWh fuel consumed for self-generation of electricity

124.5

MWh fuel consumed for self-generation of heat

58,405.4

MWh fuel consumed for self-generation of steam

0

Comment

Gas

Heating value

HHV

Total fuel MWh consumed by the organization

70,912.47

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

70,912.47

MWh fuel consumed for self-generation of steam

0

Comment

Other non-renewable fuels (e.g. non-renewable hydrogen)

Heating value

HHV

Total fuel MWh consumed by the organization

23,641.23

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

23,352.92

MWh fuel consumed for self-generation of steam

288.31

Comment

Total fuel

Heating value

HHV

Total fuel MWh consumed by the organization

153,083.61

MWh fuel consumed for self-generation of electricity

124.5

MWh fuel consumed for self-generation of heat

152,670.8

MWh fuel consumed for self-generation of steam

288.31

Comment

C8.2d

(C8.2d) Provide details on the electricity, heat, steam, and cooling your organization has generated and consumed in the reporting year.

	Total Gross generation (MWh)	Generation that is consumed by the organization (MWh)	Gross generation from renewable sources (MWh)	Generation from renewable sources that is consumed by the organization (MWh)
Electricity	328.81	328.81	328.81	328.81
Heat	0	0	0	0
Steam	0	0	0	0
Cooling	0	0	0	0

C8.2g

(C8.2g) Provide a breakdown of your non-fuel energy consumption by country.

Country/area

Republic of Korea

Consumption of electricity (MWh)

326,557.41

Consumption of heat, steam, and cooling (MWh)

1,271.11

Total non-fuel energy consumption (MWh) [Auto-calculated]

327,828.52

C9. Additional metrics

C9.1

(C9.1) Provide any additional climate-related metrics relevant to your business.

C10. Verification

C10.1

(C10.1) Indicate the verification/assurance status that applies to your reported emissions.

	Verification/assurance status
Scope 1	Third-party verification or assurance process in place
Scope 2 (location-based or market-based)	Third-party verification or assurance process in place
Scope 3	Third-party verification or assurance process in place

C10.1a

(C10.1a) Provide further details of the verification/assurance undertaken for your Scope 1 emissions, and attach the relevant statements.

Verification or assurance cycle in place

Annual process

Status in the current reporting year

Complete

Type of verification or assurance

Reasonable assurance

Attach the statement

AS_GHG_(주)한화_En_2021-r1.pdf

Page/ section reference

P1

Relevant standard

ISO14064-1

Proportion of reported emissions verified (%)

100

C10.1b

(C10.1b) Provide further details of the verification/assurance undertaken for your Scope 2 emissions and attach the relevant statements.

Scope 2 approach
Scope 2 location-based

Verification or assurance cycle in place
Annual process

Status in the current reporting year
Complete

Type of verification or assurance
Reasonable assurance

Attach the statement

AS_GHG_(주)한화_En_2021-r1.pdf

Page/ section reference
P1

Relevant standard
ISO14064-1

Proportion of reported emissions verified (%)
100

C10.1c

(C10.1c) Provide further details of the verification/assurance undertaken for your Scope 3 emissions and attach the relevant statements.

Scope 3 category
Scope 3: Purchased goods and services
Scope 3: Capital goods
Scope 3: Fuel and energy-related activities (not included in Scopes 1 or 2)
Scope 3: Waste generated in operations
Scope 3: Business travel
Scope 3: Employee commuting
Scope 3: Investments

Verification or assurance cycle in place
Annual process

Status in the current reporting year
Complete

Type of verification or assurance
Limited assurance

Attach the statement

Scope3 Verifiction _ 22.pdf

Page/section reference

1-3 page

Relevant standard

AA1000AS

Proportion of reported emissions verified (%)

100

C10.2

(C10.2) Do you verify any climate-related information reported in your CDP disclosure other than the emissions figures reported in C6.1, C6.3, and C6.5?

Yes

C10.2a

(C10.2a) Which data points within your CDP disclosure have been verified, and which verification standards were used?

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Disclosure module verification relates to	Data verified	Verification standard	Please explain
C1. Governance	Other, please specify ESG management promotion system	GRI Standards SASB TCFD	Verified the corresponding data points through sustainability report of holding company verified by third party 1
C2. Risks and opportunities	Other, please specify Risk and opportunities related to Climate-change	GRI Standards SASB TCFD	Verified the corresponding data points through sustainability report of holding company verified by third party 1
C3. Business strategy	Other, please specify Business strategy by climate-change	GRI Standards SASB TCFD	Verified the corresponding data points through sustainability report of holding company verified by third party

			1
C4. Targets and performance	Emissions reduction activities	GRI Standards SASB TCFD	Verified the corresponding data points through sustainability report of holding company verified by third party 1
C8. Energy	Energy consumption	GRI Standards SASB TCFD	Verified the corresponding data points through sustainability report of holding company verified by third party 1
C12. Engagement	Other, please specify Regional community engagement activity	GRI Standards SASB TCFD	Verified the corresponding data points through sustainability report of holding company verified by third party 1

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C11. Carbon pricing

C11.1

(C11.1) Are any of your operations or activities regulated by a carbon pricing system (i.e. ETS, Cap & Trade or Carbon Tax)?

Yes

C11.1a

(C11.1a) Select the carbon pricing regulation(s) which impacts your operations.

Korea ETS

C11.1b

(C11.1b) Complete the following table for each of the emissions trading schemes you are regulated by.

Korea ETS

% of Scope 1 emissions covered by the ETS

100

% of Scope 2 emissions covered by the ETS

100

Period start date

January 1, 2021

Period end date

December 31, 2021

Allowances allocated

85,340

Allowances purchased

7,093

Verified Scope 1 emissions in metric tons CO2e

43,345

Verified Scope 2 emissions in metric tons CO2e

56,443

Details of ownership

Facilities we own and operate

Comment

Hanwha was nominated as a target management company in accordance with Act on Low-Carbon Green Growth in June 2012 and our Onsan plant and Yeosu Plant were also nominated for allocation target companies in accordance with GHG Emission Allocation and Trading Regulation. (Onsan: nominated in 2014, Yeosu: nominated in 2017). Moreover as per our Government's Allocation Plan of carbon credit in phase 3 (2021~2025), all of Hanwha's operating plants and offices were allocated with carbon credit and managing scope 1 and 2 emission annually.

C11.1d

(C11.1d) What is your strategy for complying with the systems you are regulated by or anticipate being regulated by?

Hanwha Corporation, as a company subject to the emission trading system in Korea, monitors its GHG emissions through the GHG inventory in the internal computer system. Through this, it verifies its GHG emissions every month. The company also verifies the financial impact of its KOC sales and KAU purchases by monitoring domestic GHG emission prices and trading trends every month.

As Korean governments have enhanced the regulation by reducing GHG allocation of carbon credits given to corporations to fulfill the requirements under Paris convention, free allotments of GHG emission are reduced with increase of paid allotments. Thus it is expected that the carbon credits will be scarce from phase 4 planning period with such decreasing trend of free allocation of carbon credits and increasing trend of paid allocation of carbon credits even if we try our best to play our part in reduction activities.

In response to regulation of emission trading, Hanwha has established target based reduction strategy. To achieve emission reduction targets, detailed assignments such as proceeding CMD projects inside and outside of the country, replacing facility equipment with high-efficiency and improving energy efficiency are ongoing. We are also planning to continuously expand CDM projects and reviewing CDM methodology that is multilaterally applicable.
Onsan plant of Global division are securing carbon credits from their performance on emission reductions through CDM business every year and have reduced total 2,300,000tons of emission (based on domestic certified standards of emission reduction) and have reduced 240,000tons of emission last year. In 2021, as investment on nitric acid plants is fixed, we plan to continue the emission reduction activities from installing N2O reducing system in our new nitric acid plants.
Furthermore we are continuing our investment on GHG emission reduction facilities. In 2021, we have issued green bond worth about KRW150 billion securing fund to promote ecofriendly business. Moreover, we are considering ways to reduce internal GHG emissions through the introduction of the internal RE100 system and EV100 system.
Our efforts were put in reducing the GHG emission by reduction of electricity use in ways which we taken into account and review carefully the applicability of solar energy generation from the investment stage when new facilities or offices are built.
We are securing future growth engines through establishment of green growth based business such includes expanding our field of business to carbon-neutral business, Blue hydrogen business, battery production facilities and renewable energy plant. We plan to reach our goal of 2040 Carbon Neutral Plan by reducing 56% of emission quantities in 2025(compared to 2019).

C11.2

(C11.2) Has your organization originated or purchased any project-based carbon credits within the reporting period?

Yes

C11.2a

(C11.2a) Provide details of the project-based carbon credits originated or purchased by your organization in the reporting period.

Credit origination or credit purchase

Credit origination

Project type

N2O

Project identification

N2O Reduction project of Nitric Acid plant Located in Ulsan Of Hanwha

Verified to which standard

CDM (Clean Development Mechanism)

Number of credits (metric tonnes CO2e)

130,394

Number of credits (metric tonnes CO2e): Risk adjusted volume

130,394

Credits cancelled

No

Purpose, e.g. compliance

Voluntary Offsetting

C11.3

(C11.3) Does your organization use an internal price on carbon?

Yes

C11.3a

(C11.3a) Provide details of how your organization uses an internal price on carbon.

Objective for implementing an internal carbon price

Drive low-carbon investment

Identify and seize low-carbon opportunities

GHG Scope

Scope 1

Scope 2

Application

To measure financial opportunity of Low-carbon transition investment

Actual price(s) used (Currency /metric ton)

38,000

Variance of price(s) used

Hanwha sets up an internal price on carbon by taking account of market trend of carbon credit price. As the trend is that the price of carbon credit is rising with the expectation of strengthening of regulations of carbon emission, we have set our internal price on carbon at KRW38,000 through internal decision making process.

Type of internal carbon price

Shadow price

Impact & implication

Hanwha is carrying out internal emission reduction activities and investment in response to shortage of carbon credit. We have calculated the impact of emission reduction

activities expected to be carried out by Energy Rationalization TF using internal price on carbon. We review applicability of solar energy generation when we build new plants and workplaces at investment planning stage, and we also use the internal price on carbon to calculate the opportunity costs in relation to GHG emission reduction in order to examine investment feasibility. On that basis, we included our investment on solar energy generating facility on roofs in construction project currently under progress by Defense Division. The solar energy generating facility with 500kW class is scheduled to be built within year 2022 and it is expected to reduce costs of KRW11,460,000 per year (internal price on carbon applied, reduction of 311,833tCO2eq per year was analyzed)

C12. Engagement

C12.1

(C12.1) Do you engage with your value chain on climate-related issues?

Yes, our customers/clients

Yes, other partners in the value chain

C12.1b

(C12.1b) Give details of your climate-related engagement strategy with your customers.

Type of engagement & Details of engagement

Education/information sharing

Share information about your products and relevant certification schemes (i.e. Energy STAR)

% of customers by number

1.7

% of customer - related Scope 3 emissions as reported in C6.5

99

Please explain the rationale for selecting this group of customers and scope of engagement

Customers of Hanwha's global division has recently been showing trend of enhancing their ESG parts. Customer have started to manage the supply network of upstream in value chain such as Hanwha in response to climate-related issue. To respond to these customer, we select those customers with the most sales volume and profit and request for ESG information as 1irst main engagement customer group. We established climate-related engagement activities with 4 customers namely BASF, Hanwha Solution, Hanwha System, Hanwha Defense in 2021. With this basis, we plan to expand the engagement customers by stages from 2022 by subdividing groups and types of engagement targeted customers.

Impact of engagement, including measures of success

We have made measurement of engagement impact as providing 100% of ESG information of our organization to customer. We measure our first assessment on performance by providing the customized ESG information to customer by extracting and revising process. The second assessment on performance is reducing activities of our emission quantity which will eventually reduce customer networking companies. Our main customers of Global division and Momentum division are located in foreign countries, so it is necessary to have response activities of climate-related issues beyond compliance with domestic regulation. Therefore providing information of our performance on climate-related issues and disclosing scope 1 & 2 emission reduction activities to our foreign customers is thought be main engagement strategy of our organization. Also, through continuous communication and monitoring, we consider our second engagement performance is achieved by having contributions to our customers' reduction targets from achieving it as a step towards low-carbon society, and we are continuing our effort to reduce carbon emission. One of our main customers, the Hanwha Solutions has announced "Net Zero 2050" and putting efforts to reach the goal at company-wide level. The emission quantity per unit of Hanwha is decreasing continuously and was in fact reduced by 13% compared to year 2020. (39.5tCO2-eq/ KRW100mil in 2020 -> 34.1tCO2-eq/ KRW100mil in 2021)

We induce Scope 3 emission reduction of our customers through our customer engagement strategy, and because the products of global division are processed by customer companies entirely due to industrial characteristics, emission reduction of Hanwha are reflected as major reduction strategy activities not only for Hanwha but also for our customers in terms of customers' upstream. We intend to extend our performance of emission reduction activities with our engagement customers by expanding customers who provides information of emission reduction activities and emission data, carbon neutral roadmap and intensity target information.

C12.1d

(C12.1d) Give details of your climate-related engagement strategy with other partners in the value chain.

Hanwha Group has established value chain road map and developing the Hydrogen manufacturing technology including development of blue hydrogen manufacturing technology in connection with solar energy business. Hanwha corporation has established strategy of providing hydrogen value chain for Hanwha Group through production and supply of hydrogen based on ammonia. We therefore define the other partners in the value chain to be the hydrogen specialized companies.

First of all, Hanwha is expanding its cooperation and collaboration to build ecosystem of hydrogen business with Petroleum Public Corporation that has the storage and supply infra of hydrogen. Ammonia has higher density of storing hydrogen than liquid hydrogen, so it is attractive substance that could be used for storage and transportation method of hydrogen. We are able to produce pure hydrogen by getting clean ammonia produced abroad and cracking it. Hanwha is using their capability of handling ammonia previously and their ammonia

transportation infra, to promote “Ecofriendly Ammonia based clean hydrogen manufacturing project”.
Hanwha has concluded business agreement(MOU) for “Establishment of Ecofriendly Hydrogen and Ammonia value chain” with Hanwha Impact, WONIK Materials, and WONIK Holdings in 2021. These 4 enterprise will cooperate in all areas related to hydrogen production such to include introducing ammonia, constructing storage infra, producing and supplying hydrogen from cracking ammonia throughout the whole period of hydrogen ecosystem. Hanwha corporation is jointly developing the technology to extract pure hydrogen with WONIK Materials, and carrying out “Production and utilization of blue hydrogen based on ammonia demonstration project” in regulatory free zone within Chuncheongbuk-do.
We are promoting business to supply clean hydrogen to domestic market by procuring clean ammonia aboard and cracking process followed by, based on our long experience of handling ammonia. Hanwha corporation will take charge of producing hydrogen by procuring, trading, cracking the ammonia within hydrogen value chain of Hanwha Group.

C12.2

(C12.2) Do your suppliers have to meet climate-related requirements as part of your organization’s purchasing process?

No, but we plan to introduce climate-related requirements within the next two years

C12.3

(C12.3) Does your organization engage in activities that could either directly or indirectly influence policy, law, or regulation that may impact the climate?

Row 1

Direct or indirect engagement that could influence policy, law, or regulation that may impact the climate

Yes, we engage directly with policy makers

Does your organization have a public commitment or position statement to conduct your engagement activities in line with the goals of the Paris Agreement?

Yes

Attach commitment or position statement(s)

C12.3_SR29.jpg

Describe the process(es) your organization has in place to ensure that your engagement activities are consistent with your overall climate change strategy

Our organization established 2040 carbon neutral goal roadmap and plan to achieve Net Zero of all GHG emission. We set up climate-related response system and disclosed carbon information according to TCFD recommendations for climate-related

financial impacts as per corporation's activity promotion. To achieve 2040 carbon neutral goals, we established response strategy to raise the efficiency and circulation of various resources including energy as well as managing GHG emission of workplaces, and our safety environment department manages all climate-change response work as well as carrying out the engagement activities.
The safety environment department has affiliated offices in each division to review and improve the climate-change risk factors. To ensure the climate-change strategy established by safety environment offices is performed, we are managing climate-change performance indicator. ESG consultative group monitors the climate-change strategy and its performance result and any significant issue are reported to ESG Committee quarterly to be examined.
Through significance evaluation of all workplaces, we identify major risks of all workplaces and the strategy/ESG committees will examine and conduct final ESG promotion plans and activities that are important for operation/management and reflect it to medium- and long-term strategy direction if necessary. As explained, organization's climate-related strategy are managed to maintain consistency company-wide through significance evaluation of all workplaces and discussion by management team including CSO.

C12.3a

(C12.3a) On what policy, law, or regulation that may impact the climate has your organization been engaging directly with policy makers in the reporting year?

Focus of policy, law, or regulation that may impact the climate

Mandatory climate-related reporting

Specify the policy, law, or regulation on which your organization is engaging with policy makers

Supporting TCFD recommendation

Policy, law, or regulation geographic coverage

Global

Country/region the policy, law, or regulation applies to

Your organization's position on the policy, law, or regulation

Support with no exceptions

Description of engagement with policy makers

Disclosure of climate-related issues In pursuant to TCFD

Details of exceptions (if applicable) and your organization's proposed alternative approach to the policy, law or regulation

Have you evaluated whether your organization's engagement is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

C12.4

(C12.4) Have you published information about your organization's response to climate change and GHG emissions performance for this reporting year in places other than in your CDP response? If so, please attach the publication(s).

Publication

In voluntary sustainability report

Status

Complete

Attach the document

C12.4_Gorvenance_SR_P32.jpg
C12.4_Emission targets_SR_P34.jpg
C12.4_Risks & opportunities_SR_P34.jpg
C12.4_Strategy_SR_P33.jpg
C12.4_Gorvenance_SR_P26.jpg
C12.4_Emissions figures_SR_P75.jpg
C12.4_Emissions figures_SR_P34.jpg

Page/Section reference

Governance P26, P32
Strategy P33
Risks & opportunities P34
Emissions figures P34 P75
Emission targets P34

Content elements

Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets

Comment

Sustainability Management Report 2021
https://www.hanwhacorp.co.kr/hanwha/sustainability/introduction.jsp

Publication

In mainstream reports

Status

Complete

Attach the document

C12.4_Gorvenance_BR_P745.jpg

C12.4_Emissions figures_BR_P830.jpg

Page/Section reference

1. Governance : p.745
2. Strategy : p. 87 ~ 94 / p.107
3. Emissions figures : p.830
4. Other metrics(Allocation of Greenhouse Gas Emission Permits / Energy consumption) : p.379
5. Other, please specify(Accounting for greenhouse gas emission rights / Reduction of greenhouse gases) : p.308, p.379, p.662 / p.829

Content elements

Governance
Strategy
Emissions figures
Other metrics

Comment

https://dart.fss.or.kr/dsaf001/main.do?rcpNo=20220324000140

C15. Biodiversity

C15.1

(C15.1) Is there board-level oversight and/or executive management-level responsibility for biodiversity-related issues within your organization?

	Board-level oversight and/or executive management-level responsibility for biodiversity-related issues
Row 1	No, but we plan to have both within the next two years

C15.2

(C15.2) Has your organization made a public commitment and/or endorsed any initiatives related to biodiversity?

	Indicate whether your organization made a public commitment or endorsed any initiatives related to biodiversity	Initiatives endorsed
Row 1	Yes, we have endorsed initiatives only	SDG

C15.3

(C15.3) Does your organization assess the impact of its value chain on biodiversity?

	Does your organization assess the impact of its value chain on biodiversity?
Row 1	Yes, we assess impacts on biodiversity in our upstream value chain only

C15.4

(C15.4) What actions has your organization taken in the reporting year to progress your biodiversity-related commitments?

	Have you taken any actions in the reporting period to progress your biodiversity-related commitments?
Row 1	No, we are not taking any actions to progress our biodiversity-related commitments, but we plan to within the next two years

C15.5

(C15.5) Does your organization use biodiversity indicators to monitor performance across its activities?

	Does your organization use indicators to monitor biodiversity performance?	Indicators used to monitor biodiversity performance
Row 1	No, we do not use indicators, but plan to within the next two years	State and benefit indicators

C15.6

(C15.6) Have you published information about your organization's response to biodiversity-related issues for this reporting year in places other than in your CDP response? If so, please attach the publication(s).

Report type	Content elements	Attach the document and indicate where in the document the relevant biodiversity information is located
In voluntary sustainability report or other voluntary communications	Impacts on biodiversity	1

[1]C15.6_SR_P39.jpg

C16. Signoff

C-FI

(C-FI) Use this field to provide any additional information or context that you feel is relevant to your organization's response. Please note that this field is optional and is not scored.

C16.1

(C16.1) Provide details for the person that has signed off (approved) your CDP climate change response.

	Job title	Corresponding job category
Row 1	CEO	Chief Executive Officer (CEO)

Submit your response

In which language are you submitting your response?

English

Please confirm how your response should be handled by CDP

	I understand that my response will be shared with all requesting stakeholders	Response permission
Please select your submission options	Yes	Public

Please confirm below

I have read and accept the applicable Terms