

C0. Introduction

C0.1

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

[General Introduction]

Hyosung Chemical was established as the former Tongyang Nylon Co. in 1966, began the chemical division, developed chips for PET bottles and expanded into the PP and propylene business in 1979. Hyosung Co. merged it in 1998. The chemistry division of Hyosung Co. was spined off to be Hyosung Chemical Co. in 2018. The headquarter is located in Seoul and the local business sites consist of the R&D organization under Hyosung Co. and 4 plants in total.

[Business Division]

Hyosung Chemical is mainly involved in the chemical division.

The petrochemical division is a business cycle industry which is sensitive to oil prices and seriously affected by global economic, and supply and demand situations. It includes electron the materials and film industry and the special gas industry. The petrochemical industry predicts that the investment in product development will increase as the value of versatile products declines due to the growth in Chinese market. The electron material industry is expected to grow steadily because of the growth in large area display and OLED markets and increasing demand in IT products. Hyosung Chemical has proceeded with the expansion of export sales and development of commercializing technology by investing in Vietnam and constructing plants to expand overseas polypropylene markets and by establishing material laboratories to diversify gas businesses.

[Response to climate change]

Hyosung Chemical is a company subject to the allocation of ETS, the government GHG regulation, and is obligated to report its emissions every year. According to the 'Second National Climate Change Response Basic Plan' established in 2019, the Korean government set the national reduction target for 2030 at a 24.4% reduction (20.5% for industries) compared to the baseline in 2017. However, in 2021, the government revised the national greenhouse gas reduction target to a 40% reduction (14.5% for industries) compared to the baseline in 2018. Accordingly, at the end of 2021, Hyosung Chemical also adjusted its greenhouse gas reduction target, increasing it from a 12.2% reduction compared to the baseline in 2017 to a 14.5% reduction compared to the baseline in 2018. In addition, Hyosung Chemical established the green management vision 'realization of an eco-friendly company that leads a better life for mankind' and the 4 strategies 'reduction of greenhouse gas emissions, commercialization of low-carbon technology through development of eco-friendly technology, creation of an eco-friendly corporate culture, and establishment of stakeholder trust through environmental information disclosure ' to implement green management activities for all domestic business sites. The detailed promotion work is like the following, 'contribution to GHG emission reduction when using products, decline in subsidiary materials usage including water, utility, et cetera and expansion of recycling and reuse.'

Hyosung Chemical established an ESG management promotion committee headed by the CEO to meet social demands for ESG management participation, and the EHS committee established in 2020 has been changed and operated under the ESG management promotion committee. The ESG Management Promotion Committee operates a regular meeting once a quarter under the supervision of the CEO, reviews the progress of ESG management and agendas, and submits them to the board of directors if necessary.

C0.2

(C0.2) State the start and end date of the year for which you are reporting data and indicate whether you will be providing emissions data for past reporting years.

Reporting year

Start date

January 1 2022

End date

December 31 2022

Indicate if you are providing emissions data for past reporting years

Yes

Select the number of past reporting years you will be providing Scope 1 emissions data for

2 years

Select the number of past reporting years you will be providing Scope 2 emissions data for

2 years

Select the number of past reporting years you will be providing Scope 3 emissions data for

Not providing past emissions data for Scope 3

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

C-CH0.7

(C-CH0.7) Which part of the chemicals value chain does your organization operate in?

Row 1

Bulk organic chemicals

Lower olefins (cracking)
Polymers

Bulk inorganic chemicals

Other industrial gasses

Other chemicals

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	KR7298000001

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 or committee	Responsibilities for climate-related issues
Chief Executive Officer (CEO)	<p>[Individual responsibility]</p> <p>The CEO of Hyosung Chemical has the final decision-making authority in the green management operating system and also the chairperson of the board. In addition, as social demands for participation in ESG management increased, the ESG Management Promotion Committee was established, including the EHS Committee, which was previously implemented.</p> <p>The CEO attends as the chairperson, the highest decision maker of this committee, to report and evaluate the overall performance of ESG management, such as the sustainability report, response to carbon disclosure, and greenhouse gas reduction goals. The chief responsibility for responding to climate change lies with the CEO, who is the chairperson, links climate change issues to company-wide management activities, establishes standards and makes decisions for efficient execution of response plans according to a top-down approach.</p> <p>[Climate-related decision-making case]</p> <p>As a representative example of climate-related decision-making, the response to the emission trading system can be explained. The emission trading system is not only a regulation that must be complied with, but also has a significant financial impact, so it is classified as a significant risk. Therefore, the ESG Management Promotion Committee, chaired by the CEO, established short-term carbon reduction plans for each business site for 2022 and 2023 and carbon emission reduction plans for up to 30 years through carbon emission reduction TFT to respond to greenhouse gas risk management.</p> <p>In addition, the ESG Management Promotion Committee publicly declared its support for TCFD in October 2022 to continue to strengthen ESG management, which is a key element of companies' global competitiveness.</p>

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	Scope of board-level oversight	Please explain
Scheduled – some meetings	<ul style="list-style-type: none"> Reviewing and guiding annual budgets Overseeing and guiding employee incentives Reviewing and guiding strategy Overseeing value chain engagement Reviewing and guiding the risk management process 	<Not Applicable>	CEO is the final decision maker of the ESG Management Promotion Committee and the chairperson in the board. The ESG Management Promotion Committee finally approves activities such as climate change issues (establishing vision for sustainability management and strategy, setting GHG reduction targets, etc), business investment plans and budget establishment. ESG Management Promotion Committee was held 4 times and the board of directors was held 4 times in total in 2022.

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	Primary reason for no board-level competence on climate-related issues	Explain why your organization does not have at least one board member with competence on climate-related issues and any plans to address board-level competence in the future
Row 1	Yes	As a member of the board of directors of Hyosung Chemical, a member with expertise in climate change issues majored in chemical engineering and have a high understanding of greenhouse gases and energy. In addition, the member is a process technology-related expert who served as the head of an LCD manufacturing center for a specific electronics company and the CEO of a special gas and industrial gas manufacturing company and has a high understanding of carbon emission reduction technology. The member is currently managing climate change issues by Hyosung Chemical's carbon emission reduction TFT and ESG management promotion committee, and in particular, as a member of the direct investment committee on carbon emission reduction, the member is reviewing and determining its effectiveness. Therefore, Hyosung Chemical judged that the member had expertise in climate change issues based on knowledge, career, and work cases related to climate change.	<Not Applicable>	<Not Applicable>

C1.2

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

Position or committee

Chief Executive Officer (CEO)

Climate-related responsibilities of this position

- Managing annual budgets for climate mitigation activities
- Providing climate-related employee incentives
- Integrating climate-related issues into the strategy
- Managing value chain engagement on climate-related issues
- Assessing climate-related risks and opportunities
- Managing climate-related risks and opportunities

Coverage of responsibilities

<Not Applicable>

Reporting line

Reports to the board directly

Frequency of reporting to the board on climate-related issues via this reporting line

Quarterly

Please explain

CEO is the chairperson in the EHS Committee. The EHS Committee works for making decision for the green management implementation to comply with regulations inside and outside, to identify environmental issues and to conduct countermeasures to environmental risks. The green management of Hyosung Chemical includes responses to climate change, development of eco-friendly products as well as Korea ETS.

Hyosung Chemical reports on climate change related issues every 4 weeks at the PU (Performance Unit) meeting concerning the ones specified by plant managers, the persons in charge of environment, safety and health of all domestic business sites and the environmental safety team of each business site. The matters needing a decision making is reported to the EHS Committee, a consultative group for the primary decision making of green management at a lower level than the board. Some agendas need to be reflected in management plans such as company-wide strategy for R&D and decision makings. The EHS Committee considers the importance of each issue after reviewing those agendas and then receives the final approval from the board.

Since April 2021, Hyosung Chemical has expanded and restructured the EHS Committee, integrating it with the CSR Committee, to form the ESG Management Promotion Committee, with the CEO as the chairman. This committee drives not only environmental, safety, and health initiatives but also social and governance aspects. It holds quarterly meetings to select and present significant agenda items for consideration or reporting to the Board of Directors, including in 2022.

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	Hyosung Chemical reflects the accomplishment of GHG reduction target and energy reduction target in the Key Performance Index (KPI) and gives COO, Environmental / Sustainability Manager monetary incentives.

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

Chief Operating Officer (COO)

Type of incentive

Monetary reward

Incentive(s)

Bonus - % of salary
Bonus – set figure

Performance indicator(s)

Implementation of an emissions reduction initiative
Energy efficiency improvement

Incentive plan(s) this incentive is linked to

Short-Term Incentive Plan

Further details of incentive(s)

Among the ESG management KPIs of each plant manager at Hyosung Chemical, there are factors such as environmental investment and energy efficiency improvement. Hyosung Chemical provides monetary incentives in the form of financial incentives based on the results of goal achievement. This can be done through a proportional method, where a payment rate based on the evaluation grade is multiplied by the base monthly salary, or through a fixed amount method, where a predetermined sum is paid.

Explain how this incentive contributes to the implementation of your organization's climate commitments and/or climate transition plan

Hyosung Chemical's major greenhouse gas emissions occur at each plant's production facilities, and environmental investments and energy efficiency improvements are key performance indicators managed by the plant managers. Therefore, if the plant managers achieve their targets, they can receive incentives and earn bonus points in executive evaluations. This incentivizes them to play a significant role in reducing the overall greenhouse gas emissions and energy usage of Hyosung Chemical.

Entitled to incentive

Environment/Sustainability manager

Type of incentive

Monetary reward

Incentive(s)

Bonus - % of salary
Bonus – set figure

Performance indicator(s)

Reduction in absolute emissions

Incentive plan(s) this incentive is linked to

Short-Term Incentive Plan

Further details of incentive(s)

Among the ESG management KPIs of ESG management and Green Management executives at Hyosung Chemical, there is reducing carbon emissions through greenhouse gas reduction activities. Hyosung Chemical provides monetary incentives in the form of financial incentives based on the results of goal achievement. This can be done through a proportional method, where a payment rate based on the evaluation grade is multiplied by the base monthly salary, or through a fixed amount method, where a predetermined sum is paid.

Explain how this incentive contributes to the implementation of your organization's climate commitments and/or climate transition plan

The executive in charge of ESG management and green management at Hyosung Chemical is responsible for overseeing the overall ESG management of the company, and carbon emission reduction through greenhouse gas reduction activities is key performance indicator managed by the executive. Therefore, if the executive achieves their targets, they can receive incentives and earn bonus points in executive evaluations. This incentivizes them to play a significant role in reducing the overall greenhouse gas emissions and energy usage of Hyosung Chemical.

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	1	3	Hyosung Chemical considers 1~3 years as 'short-term'.
Medium-term	3	5	Hyosung Chemical considers 3~5 years as 'medium-term'.
Long-term	5	10	Hyosung Chemical considers 5~10 years as 'long-term'.

C2.1b

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

Hyosung Chemical company-widely operates the delegated decision-making regulations by granting responsibility and authority depending on the financial impact of each project including responses to climate change or using opportunities. The budgets and investment activities, including physical and transition risks and opportunities caused by climate change, are established every year, and when necessary, the Investment Review Subcommittee or the Investment Review Committee is held for a certain amount or more of budget at each PU (Performance Unit) and PG (Performance Group).

If the amount is more than KRW 1 billion for investments included in the budget, it should be dealt with at the management meeting. And if KRW 500 ~1,000 million for those not included in the budget, the CEO should make decision on them and if the amount is more than KRW 1 billion, it should be dealt with at the management meeting level. Therefore, the significant financial impact used to identify and assess climate change risks can be defined by the size of the project/investment budget, considering the authority and the highest-level decision-making stage, Hyosung Chemical defines critical financial impact which is worth more than KRW 500 million and this is applied equivalently to all projects including climate change.

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
Upstream
Downstream

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

(Strategic Risk Assessment, Evaluation, and Management Process)

Hyosung Chemicals manages risks such as market uncertainty, internal and external risks, and opportunities that can have a significant impact on its business activities. These risks are categorized as financial and non-financial (business continuity, management) risks, considering their impact and likelihood. The risk management process consists of "internal and external situation analysis - risk identification - risk evaluation - risk mitigation - risk monitoring and change management - reporting to the Board of Directors/Top Management." Each risk is managed by the ESG Management Committee under the supervision of the CEO, and key risks and response measures are reported to the Board of Directors. Climate change-related risks are also integrated into this comprehensive risk management process and managed through the following detailed processes.

(Direct Operation Facility Evaluation Process)

Hyosung Chemicals' direct operational facilities listen to the voice of the customer (VOC) in all areas of business operations, including sales, marketing, quality, and research and development, in order to reflect customer needs and market trends such as demand for environmentally friendly materials and low-carbon product development. To achieve this, all employees are engaged in C-Cube activities, which consist of a five-step process of collection, analysis, sharing, implementation, and result management, to gather and manage feedback through a system. C-Cube activities are conducted more than once a year and continuously respond to and address improvement suggestions based on receiving approximately 16,659 VOC cases in the short term, for example, in 2022. Additionally, each plant's environmental safety team and the head office's green management team identify regulations, trends, and issues related to climate change to incorporate them into long-term responses. If budgetary support is required, it is included in the annual financial plan and approved based on internal significance evaluation criteria. Through this identification and evaluation, the ESG Management Promotion Committee decides and responds to risks that need to be responded to. For example, in 2022, they received certifications such as GRS certification for PCR PP and PCR films produced using recycled materials and RCS certification for optical films through a risk management process.

(Upstream Evaluation Process)

The main targets of upstream risk evaluation at Hyosung Chemicals are intermediate material suppliers, who are suppliers of raw materials, which are essential components of their key chemical products. The risks associated with raw material suppliers can directly affect the company's risks. Therefore, upstream risks are included in the comprehensive risk management process. In the short to medium term, the purchasing team and relevant departments collaborate to identify and evaluate potential risks throughout the supplier selection and monitoring processes, minimizing negative impacts. For example, an increase in extreme weather events such as typhoons and heavy rainfall due to climate change becomes a risk factor for stable raw material supply from suppliers. Furthermore, Hyosung Chemicals conducts annual ESG management diagnostics and ESG education for suppliers to reduce risks associated with suppliers in the long term to respond these risks and provide them with opportunities to assess their own sustainability. For instance, in 2022, they added ESG behavioral norms to the supplier contracts through the risk management process.

(Downstream Evaluation Process)

The main targets of downstream risk evaluation at Hyosung Chemicals are major customers who purchase their products. Since producing and developing products that meet customer needs directly impacts the company's revenue, downstream risk management is included in the comprehensive risk management process. Particularly, due to ongoing climate change and changes in consumer behavior, customers demand continuous disclosure of climate-related information from Hyosung Chemicals, along with the use of environmentally friendly materials, greenhouse gas reduction in the production process, and low-carbon product development. In the short term, Hyosung Chemicals responds to these customer information requests, and in the medium to long term, they promote the development of environmentally friendly technologies. For example, in 2022, they received a total of 15 customer requests related to sustainable management and responded to all of them.

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	Hyosung Co. has been participating in Korea ETS since 2015 as it became a subject company to mandatory reporting of its GHGs emissions each year. After the spin-off in 2018, Hyosung Chemical was separated from the group-level and became a separate ETS subject. Accordingly, Hyosung Chemical separately reported its previous emissions (2014-2017) to the government, managed allowances according to the allocations of the second ETS planning phase (2018-2020). After the external verification of its GHG emissions, Hyosung Chemical generally performs emissions reports, allowances management and reduction activity implementation and emissions allowances purchase. It reflects the operating costs in the annual budget. In the case of the third planned period (2021-2025), the government demands continuous reduction of greenhouse gas through changes in the allocation adjustment coefficient. As GHG regulations get more enhanced, the management costs get more increased so that leads to the financial risks of Hyosung Chemical. Hyosung Chemical calculated the expected GHG emissions during the third planning phase and analyzes the annual deficiency and the financial impacts to minimize the risks due to GHG Korea ETS. It makes efforts to find out the possible reduction activities inside and outside business sites and implements them for steady GHG reduction and responses to the system.
Emerging regulation	Relevant, sometimes included	As climate change issues are visualized, environmental regulations gradually get enhanced in the global markets. EU enacted legislation to introduce CBAM(Carbon Border Adjustment Mechanism) which imposes carbon tax on imported products with high carbon emissions as part of 'Carbon Neutrality' policy from July 2021. This may negatively effect on Hyosung Chemical who sells its products mainly to major customers overseas, so that the demands for eco-friendly products could increase, too. The environmental regulations are gradually being enhanced in the global market. Due to the EU's Carbon Neutrality policy, there are the discussions of imposing carbon tax on imported products with more carbon emissions and of making water footprint certification obligatory as part of Product Environmental Footprint (PEF). Major customers like TC TransContinental, Fres-Co, Fujimori Kogyo, Toyoseikan request cooperative companies to manage carbon and GHG in the higher level. As EU regulations and customers' demands increase, they could play a role as new trade barriers. If it does not response to them properly, it may lead to decline in revenue. Hyosung Chemical monitors products and related regulation trends and established plans of some matters needing preemptive responses and implements them.
Technology	Relevant, sometimes included	The global demand for environmentally friendly products and materials is increasing, and there is a growing interest in eco-friendly and value-driven consumption. To meet customer needs and respond to these market changes, it is necessary to continually evolve towards environmentally friendly products through ongoing research and development (R&D). There is also a focus on securing credibility through the acquisition of international standard certifications. In line with this, Hyosung Chemical has implemented technologies for producing PCR PP, PCR Film, Optical Film, and General Film using recycled materials. In 2022, PCR PP and PCR Film obtained the international certification, Control Union's GRS (Global Recycle Standard), which requires a minimum of 20% recycled materials and compliance with social, environmental, and chemical criteria. For other products, they obtained the certification ECOCERT's RCS (Recycled Claim Standard), which requires a minimum of 5% recycled materials. Additionally, the Optical Film has been certified by the USDA (United States Department of Agriculture) through the BioPreferred program for being produced with bio-based materials.
Legal	Relevant, always included	The GHG Korea ETS (Emissions Trading System) has been implemented according to 'the Act on the Allocation and Trading of Greenhouse-Gas Emissions Permits (hereinafter referred to 'Framework Act')'. Hyosung Chemical has been a subject company since 2018 and has an obligation to report annually its GHG emissions. When calculating allocation, the competent authority may impose a penalty surcharge not exceeding three times the average market price of emission permits for the pertinent compliance year on the business entity within the maximum KRW 100,000 per ton of carbon dioxide for the shortfall. (Article 33 of the Framework Act). All types of lawsuits associated to climate change can lead to sales loss and new risks due to increasing negative reputations from stakeholders inside and outside as well as direct financial loss. In Hyosung Chemical, all types of decision-making including climate change-related lawsuits, decision-making responsibilities and authorization are imposed in accordance with the internal decision-making delegation regulations. In particular, for cases that cost more than KRW 300 million or the compensation after agreement is more than KRW 100 million, the final approval will be made at the level of the CEO or higher.
Market	Relevant, sometimes included	Customers' behavior change may become a major risk factor to the market and customer companies demand Hyosung Chemical, an intermediate material manufacturer, for using eco-friendly materials, lightening, GHG reduction in the product production and low carbon products according to market trends. Hyosung Chemical developed with the original technology and successfully commercialized an eco-friendly polymer new material, Polyketone (POKETONE). It is an eco-friendly material harmless to humans based on the stronger shock durability twice than PA (Polyamide) and PBT (polyethylene terephthalate) and the highest chemical durability among ENPLA (engineering plastics) materials and so finally obtained the global certifications like FDA (Food & Drug Administration), KTW (Kunststoffe und Trinkwasser). Polyketone is used in various component materials like automobile fuel lines, internal and external materials, electric and electronic components, pipes and etc and contributes to carbon emissions reduction by replacing existing materials into eco-friendly ones based on the excellent property of matter. It developed and has sold eco-friendly tableware with 'ESG and GK Co.' since September 2019. In addition, in 2022, Hyosung Chemical supplied 61.5 tons of polyketone product to the Korea National Railway as railway parts.
Reputation	Relevant, always included	The major customers of Hyosung Chemical are global companies, and they require disclosure of information on sustainability management as well as on responses to climate change in accordance with international standards. Hyosung Chemical annually identifies the issues of increasing requests for information about responses to climate change and supply of eco-friendly products and conducts response activities not to bring about negative risks on its reputation through active measures. In 2022, LG Display, BenQ Materials, Samsung Electronics, Samsung SDI, and other clients requested ESG supply chain evaluations and information, and we successfully responded to those requests. Additionally, the EcoVadis evaluations required by film PU customers, such as TC Transcontinental and TOYO SEIKAN, are essential criteria for purchasing decisions in the packaging and container industry. Therefore, we conducted evaluations in 2022 and obtained certification for our ratings. Furthermore, to provide comprehensive reports on these matters, we have been submitting CDP reports since 2021 and publishing annual sustainability reports.
Acute physical	Relevant, sometimes included	As the frequency of heavy rainfall and typhoon increases due to the accelerating climate change, Hyosung Chemical considers the possibility of losses to physical assets in local business sites as risks. Loss in production facilities may bring about certain problems to their operation and could cause losses in assets due to decrease in sales from lower production efficiency. In addition, in case of PET and Nylon films, product containment or production suspension due to inundation may cause additional loss in revenue of products. In practice, Yongyeon Plant experienced flood damage to some parts of the plant due to localized heavy rainfall. Hyosung Chemical monthly conducts company-wide safety inspections at the EHS Committee attended by CEO and CSO in domestic business sites, establishes and implements necessary measures hereon.
Chronic physical	Relevant, sometimes included	Physical changes like the increase in the average temperature or cold waves are directly related to the heating and cooling systems of domestic or overseas factories of Hyosung Chemical, which act as a factor in increasing operation costs. In the case of the Hyosung Chemical's plants, the heating and cooling systems turns on at the setting temperature to maintain the constant quality and to operate efficiently facilities in production. As the time of heating and cooling gets increased, the operating costs may grow due to the higher electricity and city gas consumption. Particularly, when the electricity supply is cut off in the region where the plant is located due to the increase in electricity use for cooling in the summer season, which may result in additional loss due to production disruptions or to increasing defective products. The total costs of annual electricity use in all Hyosung Chemical's business sites are KRW 139,167 million equivalent to 6.1 % of the sales. The operating costs are expected to increase when the fluctuation range of the average temperature due to climate change gets higher.

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
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Primary potential financial impact

Increased direct costs

Climate risk type mapped to traditional financial services industry risk classification

<Not Applicable>

Company-specific description

Hyosung Chemical is a company included in the allocation target of the emissions trading system, which is being implemented to achieve the national greenhouse gas reduction target (a 40% reduction by 2030 compared to 2018). Since its separate incorporation due to Hyosung's personnel division in 2018, Hyosung Chemical has been implementing the emissions trading system from the second planning period (2018-2020) onwards.

In the case of the third planned period (2021-2025), the government demands continuous reduction of greenhouse gas through changes in the allocation adjustment coefficient, which further increases the burden, and the continuously increasing operating costs and liabilities also exist as climate change risk factors.

Also, due to the ongoing growth of global plastic market and the increase in market demand for eco-friendly materials, the production volume of polyketone, nylon and PET films is increasing. Hyosung Chemical also continues to increase the production volume of corresponding products such as PP/DH, POKETONE and Films. As a result, an annual increase in emissions is expected.

Consequently, the Emission Trading System is classified as a significant risk and is reported to the ESG Management Promotion Committee through continuous monitoring every year. Hyosung Chemical reports emission allowance and emission debt as intangible assets and provisions for liabilities, respectively, in our financial statements and business report.

Time horizon

Long-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)

8377334552

Potential financial impact figure – minimum (currency)

<Not Applicable>

Potential financial impact figure – maximum (currency)

<Not Applicable>

Explanation of financial impact figure

Hyosung Chemical calculated the financial impact assuming an increase in direct costs for purchasing additional allowance through the prediction of GHG emissions and shortage of allowance during the third planning period, which are the current regulations directly affecting the operation of its facilities.

As the market demand increases, Hyosung Chemical expects that the GHG emissions additionally occur by 1,423 tons throughout the business sites due to, although the production decrease in PP/DH by 1.97%, Film by 1.47%, POK by 5.63%, the production increase in Neochem by 5.31% more and boiler operation for steam supply, compared to 2021. And corresponding allowances were purchased in 2023 and submitted to the government.

From 2023 to 2025, during the remaining third planned period, a shortage of 270,237 tons is expected due to continuous increase in production growth. If the internal carbon price of KRW 31,000 per ton in 2022 is applied, the financial impact will be KRW 8,377,334,552.

Cost of response to risk

756900000

Description of response and explanation of cost calculation

(S) Situation: Hyosung Chemical expects the financial impact of increased greenhouse gas emissions and the purchase of additional emission rights exceeding the emission trading system allowances.

(T) Task: Therefore, Hyosung Chemical should conduct facility replacement and energy efficiency activities to reduce greenhouse gas emissions in the long term, and also conduct third-party verification to calculate greenhouse gas emissions in 2022 to the government.

(A) Action: In 2022, three reduction activities related to operation optimization were completed at the Optical Oksan plant, KRW 600 million was invested to the PP/DH Yongyeon plant for the recovery of raw materials for the recovery process, and KRW 24 million was invested to improving the operation efficiency of the Optical Yongyeon plant and KRW 75 million was invested in management of load of the freezer. And KRW 40 million was invested in pump inverter installation at the Film Gumi plant, and power consumption reduction through load control is being tested at the Neochem plant.

(R) Result: GHG emissions and energy costs could be reduced through each reduction activity, and KRW 558 million of energy costs and 530 tCO₂eq of GHG reduction effects were derived annually through three cases related to optimizing the operation of the Optical Oksan plant. And, it is expected to reduce greenhouse gas emissions by 1,591 tCO₂eq per year through the initiatives such as PP/DH Yongyeon plant raw material recovery process and optical Yongyeon plant operation efficiency improvement. (Explanation of management cost calculation) In 2022, the total cost used to respond to risks is KRW 756.9 million, which is the sum of each activity.

- Emission Reporting Third Party Verification: KRW 17.9 Million

- Greenhouse gas reduction activities: KRW 739 million

(PP/DH raw material recovery KRW 600 million, optical Yongyeon plant operation efficiency improvement KRW 24 million, refrigerator load management KRW 75 million, film Gumi plant pump inverter installation KRW 40 million)

Comment**Identifier**

Risk 2

Where in the value chain does the risk driver occur?

Downstream

Risk type & Primary climate-related risk driver

Reputation	Increased stakeholder concern or negative stakeholder feedback
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Primary potential financial impact

Decreased revenues due to reduced demand for products and services

Climate risk type mapped to traditional financial services industry risk classification

<Not Applicable>

Company-specific description

In case of film PET of Hyosung Chemical, industrial materials, the major customers are global companies like TC Transcontinental, Amcor, Fres-co, Belmark and et cetera. Hyosung Chemical is equivalent to upstream for customer companies and has received CSR assessment through EcoVadis since 2020 to management of climate change risks of raw material producers according to the request from TOYO SEIKAN, FUJIMORI KOGYO (Japan). And then TC Transcontinental and Fres-co (USA) request for confirming the entire items of CSR assessment including the current situation of responding to climate change and it discloses the information about climate change by participating in CDP CC program in 2023. When Hyosung Chemical does not cope properly with customer companies' requests, disadvantages from deducted points can be anticipated and that cause decrease in sales.

Time horizon

Medium-term

Likelihood

Virtually certain

Magnitude of impact

High

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

<Not Applicable>

Potential financial impact figure – minimum (currency)

934570676

Potential financial impact figure – maximum (currency)

1308398749

Explanation of financial impact figure

Hyosung Chemical calculated the financial impact assuming a decrease in revenue due to the potential loss of reputation affecting downstream customers who have requested environmental information such as EcoVadis or CDP.

If Hyosung Chemical fails to provide the requested environmental information, it is assumed that there will be a decrease in demand from the two major customers (TC Transcontinental and 3 other companies) in the Film PU (Nylon, PET Film) sector, resulting in a revenue reduction of approximately KRW 18,691,413,522. Assuming a reputation risk resulting in a 5-7% decline in revenue, the financial impact is estimated to be in the range of KRW 934,570,676 to 1,308,398,947.

Cost of response to risk

84000000

Description of response and explanation of cost calculation

(S) Situation: Hyosung Chemical receives CSR evaluations through EcoVadis every year from major film PU customers.

(T) Task: EcoVadis issues a scorecard after being evaluated by EcoVadis' sustainability analysts through reports and evidence on the four areas of environment, labor and human rights, ethics, and sustainable procurement. And the CDP report should also be prepared through a similar process.

(A) Action: In 2022, approximately KRW 23 million in consulting costs and approximately KRW 1.1 million in evaluation costs were spent to respond to EcoVadis, and approximately KRW 30 million in consulting costs and approximately KRW 1.4 million in administrative expenses were spent to respond to the 2022 CDP Climate Change. Approximately KRW 26 million was spent on preparing and verifying the sustainability report for sharing.

(R) Result: Through each response, EcoVadis received the SILVER grade certification from the Gumi plant, and CDP received the Management B grade at the Climate Change, and Hyosung Chemical's ESG management performance was publicly shared with customers through the sustainability report.

(Explanation of management cost calculation) The total cost used to respond to risks in 2022 is KRW 84 million, which is the sum of each activity.

- EcoVadis response: KRW 24.1 million (consulting KRW 23 million + evaluation cost KRW 1.1 million)
- Scope 3 third party verification: KRW 2.5 million
- CDP response: KRW 31.4 million (consulting KRW 30 million + administrative expenses KRW 1.4 million)
- Sustainability report response: KRW 26 million (preparation and verification KRW 26 million)

Comment**Identifier**

Risk 3

Where in the value chain does the risk driver occur?

Direct operations

Risk type & Primary climate-related risk driver

Acute physical	Other, please specify (Heavy rain or typhoon)
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Primary potential financial impact

Decreased revenues due to reduced production capacity

Climate risk type mapped to traditional financial services industry risk classification

<Not Applicable>

Company-specific description

The frequency of heavy rains and typhoons is increasing around the summer season, which could lead to loss of physical assets of Hyosung Chemical, which has a business site in Korea. In particular, in the case of PP and film, which are major products of Hyosung Chemical, products may be damaged due to flooding, which may lead to additional sales losses. Therefore, Hyosung Chemical Yongyeon, Gumi, and Oksan workplaces periodically conduct preliminary facility inspections every year to minimize the impact that can cause losses on assets. Each plant of Hyosung Chemical analyzed heavy rain as a physical risk factor that requires a priority response in 2022 and based on the inspection results, necessary measures such as roof leak repair are established and implemented .

Time horizon

Short-term

Likelihood

Very likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

160180620000

Potential financial impact figure – minimum (currency)

<Not Applicable>

Potential financial impact figure – maximum (currency)

<Not Applicable>

Explanation of financial impact figure

Hyosung Chemical calculated the financial impact of its direct operating sites located in Korea assuming a drop in sales due to damage to products caused by heavy rains and flooding caused by typhoons, which are short-term physical environmental changes.

In 2022, the production of each product is 1,137,000 tons of PP and 69,000 tons of film, and the unit price is 2,605,200 KRW/tons of PP and 3,500,000 KRW/ton of film. If 5% of production is damaged by heavy rain and cannot be sold, a loss of about KRW 160,180,620,000 will occur as of 2022.

Cost of response to risk

160500000

Description of response and explanation of cost calculation

(S) Situation: Hyosung Chemical is exposed to abnormal climate caused by climate change, that is, flooding damage to domestic business sites caused by heavy rains and typhoons.

(T) Task: Therefore, physical risk management at each business site is necessary to prepare for physical environmental changes such as heavy rain, power outages, and flooding.

(A) Action: In 2022, KRW 137.3 million was spent on office building wall repair work, drainage improvement work, etc. to prepare for abnormal weather, and KRW 23.2 million was spent on typhoon damage restoration work, totaling KRW 160.5 million for directly operated business sites.

(R) Result: The investment has been able to repair the damage caused by abnormal weather that occurred in FY22 and is expected to prevent future damage caused by physical risks.

(Explanation of management cost calculation) In 2022, the total cost used to respond to the risk is KRW 160.5 million, the sum of each activity.

- PPDH PU: KRW 80.7 million (KRW 6.3 million for roof parapets and walls repair work in General Office Building, Plant 1)
- NEOCHEM PU: KRW 14.1 million (neochem ECF-1 roof panel replacement work KRW 7.4 million, etc.)
- TPAPU: KRW 13.3 million (In addition to the repair of rainwater basins in the 2nd factory logistics container office, KRW 2.4 million, etc.)
- POK PU: KRW 6 million (such as KRW 0.5 million for sealing the crack part of the POK adjustment wall)
- OPTICAL PU: KRW 22.8 million (Optical typhoon damage recovery work, KRW 2 million, etc.)
- FILM PU: KRW 23.6 million (PET Film typhoon damage recovery work, KRW 2.9 million, etc.)

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?

Direct operations

Opportunity type

Markets

Primary climate-related opportunity driver

Other, please specify (Creating surplus profit by participating in Korea ETS (Emissions Trading Scheme))

Primary potential financial impact

Other, please specify (Creating surplus profit by participating in Korea ETS (Emissions Trading Scheme))

Company-specific description

Hyosung Chemical has been a company subject to the allocation of emission allowances and has implemented the allocated allowances from the second ETS planning phase (2018~2020). During the second phase, the total emissions of Hyosung Chemical was larger than the allocations, some deficiency in allowances occurred so that additionally purchased allocations. However, it has simultaneously made efforts to be recognized its performance through the steady reduction activities and to get reduce the additional purchasing cost of allowances.

As the production increases, Hyosung Chemical was properly allocated the expected allowances during the third ETS planning phase. As the results of the lessening export due to COVID-19, it is expected to have opportunities to sell its remaining allocations based on the performance of energy reduction activities. When the '2030 reduction target (14.5 % reduction by 2030)' of Hyosung Chemical is based on the allocated allowances for the third ETS planning phase (2021~2025), the GHG emissions are expected to be reduced by 228,652 tons.

Hyosung Chemical calculated the expected emissions reflecting the allocated allowances and the reduction rate target during the third ETS planning phase (2021~2025). It is predicted that the annual average emissions are 45,730 tons based on the expected emissions from 2021 to 2025. At the same time, Hyosung Chemical supposes that it could create surplus profits through the participation in the ETS during the third ETS planning phase when it actively performs the GHG reduction activities.

Time horizon

Short-term

Likelihood

Very likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

1417630000

Potential financial impact figure – minimum (currency)

<Not Applicable>

Potential financial impact figure – maximum (currency)

<Not Applicable>

Explanation of financial impact figure

Hyosung Chemical calculated the financial impact by assuming the creation of surplus revenue from the sale of emission allowances generated from greenhouse gas reduction during the 3rd plan period in relation to the domestic emissions trading system market that may occur at directly operated business sites.

As a result of Hyosung Chemical's allocation of the 3rd planning period for the emission trading scheme and internal calculation of estimated emissions, if the greenhouse gas reduction target is achieved, it is expected that about 228,652 tons of extra emissions will be created for 5 years from 21 to 25. As of 2022, about 45,730 tons of emission allowances will be created, and additional emission allowances are expected to occur if additional allocations and active reduction activities are carried out due to changes in workplace facilities. Applying Hyosung Chemical's internal carbon price of KRW 31,000 per ton in 2022, the potential financial impact is calculated as KRW 1,417,630,000.

Cost to realize opportunity

756900000

Strategy to realize opportunity and explanation of cost calculation

(S) Situation: Hyosung Chemical applied for the allocation of GHG emission allowances in August 2020 as it participated in the third planning period of the emission trading system.

(T) Task: Accordingly, it is necessary to maximize the allocation of the allowances during the 3rd planning period and to reduce the emissions to take advantage of opportunities arising from the sale of surplus emission allowances.

(A) Action: Hyosung Chemical conducted consulting for the allocation of the 3rd planning period (strategic analysis of revised allocation guidelines and application for GHG reduction results) and conducts external verification of monitoring plans and statement on GHG emissions for each business site every year under the Emissions Trading Act. In addition, facility replacement and energy efficiency activities are underway to reduce GHGs. In 2022, 3 reduction activities related to operation optimization were completed at the Optical Oksan plant, KRW 600 million was invested to the PP/DH Yongyeon plant for the recovery of raw materials for the recovery process, and KRW 24 million was invested to improving the operation efficiency of the Optical Yongyeon plant and KRW 75 million was invested in management of load of the freezer. And KRW 40 million was invested in pump inverter installation at the Film Gumi plant, and power consumption reduction through load control is being tested at the Neochem plant.

(R) Result: The appropriate emissions were calculated through third-party verification and the emissions of the ETS were submitted in 2022. And GHG emissions could be reduced through each reduction activity, and 530 tCO₂eq of GHG reduction effects were derived annually through three cases related to optimizing the operation of the Optical Oksan plant. And it is expected to reduce emissions by 1,591 tCO₂eq per year through the initiatives such as PP/DH Yongyeon plant raw material recovery process and optical Yongyeon plant operation efficiency improvement.

(Explanation of management costs) In 2022, the total cost used to take advantage of the opportunity is KRW 756.9 million, which is the sum of each activity.

- Emission Reporting Third Party Verification: KRW 17.9 Million

- Greenhouse gas reduction activities: KRW 739 million

(PP/DH raw material recovery KRW 600 million, optical Yongyeon plant operation efficiency improvement KRW 24 million, refrigerator load management KRW 75 million, film Gumi plant pump inverter installation KRW 40 million)

Comment**Identifier**

Opp2

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Products and services

Primary climate-related opportunity driver

Development of new products or services through R&D and innovation

Primary potential financial impact

Increased revenues resulting from increased demand for products and services

Company-specific description

As the hydrogen economy globally took the core axis of the Green New Deal, in Hyosung, 4 Hyosung companies have mutually created the synergy effects mutually through the key value chain of the hydrogen economy from 'production to storage, transportation, supply, and use'. Among them, Hyosung Chemical and Hyosung Heavy Industries decided to construct a liquid hydrogen plant at the site of Yongyeon Plant of Hyosung Chemical with the size of approximately 30,000 m² and the annual production volume of 13,000 tons through the investment of KRW 200 billion by 2023 with cooperation with Linde Group, a global chemistry group, under the construction plan of a liquid hydrogen plant equivalent to 'production'. It produces liquid hydrogen using byproduct hydrogen generated in the production process of high purity propylene, a key material of polypropylene in Hyosung Chemical. The liquid hydrogen can be used for the various mobility industries like drones, ships, forklifts as well as for vehicles and seem to contribute to the development of related industries.

The domestic market has used only hydrogen so that needs more costs in storage and transportation. The higher costs resulted in the lower business possibility. Hydrogen is liquefied at -253 °C, the liquefied hydrogen shrinks the volume by 1/800 compared to hydrogen gas so that it is easy to store and transport. Hydrogen gas can be transported 250 kg by a tank truck, but liquefied hydrogen can be done 3500 kg equivalent to 14 times as much as the former. In addition, the liquefied hydrogen is safer than high-pressure hydrogen gas because it is a low-pressure hydrogen.

Hyosung Chemical has the PDH (propane dehydrogenation) facilities, chemical facilities to generate byproduct hydrogen, to produce and to sell annually 12,000 tons. The PDH facilities separate hydrogen from propane to produce propylene and generates byproduct hydrogen in the production process. As the analysis results, it is expected a reduction effect of approximated 330,000 tons CO₂ when 40,000 tons of byproduct hydrogen replaces fossil fuel (gasoline) vehicles so that policies and systems for

promoting byproduct hydrogen utilization would be established in the future.

Time horizon

Long-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)

45064000000

Potential financial impact figure – minimum (currency)

<Not Applicable>

Potential financial impact figure – maximum (currency)

<Not Applicable>

Explanation of financial impact figure

Hyosung Chemical calculated the financial impact on the development of new products and services through R&D and innovation that may occur at the direct operation site, assuming increased sales due to improved access to emerging markets through hydrogen production and sales. The production and sales of hydrogen, one of Hyosung Chemical's new growth engines, have something in common with the 'Road map for Invigorating Hydrogen Economy' presented by the government in January 2019, makes large commitments to vitalize the domestic hydrogen economy. In 2050, hydrogen will account for 18 % of the final energy usage and it is expected to utilize 400 million passengers and 20 million commercial vehicles. This is about 20% of the global automobile market. The global market size reaches USD 2.5 trillion (about KRW 2,940 trillion), and the market size is expected to be KRW 70 trillion in Korea . According to McKinsey' prospect, the domestic hydrogen uses in 2050 will reach to approximately 16.9 million tons, 5.4 million tons equivalent to 31 % of the uses are expected to be used for transportation. In 2022, the annual demand for hydrogen is expected to be 470,000 tons and for byproduct hydrogen to increase as the volume of hydrogen market expands. In 2022, Hyosung Chemical's by-product hydrogen sales were 12,395 tons, with KRW 45.064 billion in sales.

Cost to realize opportunity

200000000000

Strategy to realize opportunity and explanation of cost calculation

(S) Situation: Hyosung Chemical is seizing opportunities for the hydrogen economy and hydrogen market, which are positioned as the core pillars of the Green New Deal.
(T) Task: Therefore, Hyosung Chemical must preoccupy the hydrogen market by developing new products and services related to hydrogen.

(A) Action: Hyosung Chemical, along with Hyosung Heavy Industries, participated in the government's "Hydrogen Economy Private Investment Plan" by 2030 to invest a total of 1.2 trillion won in the hydrogen economy industry and build a 10,000-ton hydrogen production liquefaction plant and charging station annually to expand hydrogen supply. Hyosung Chemical signed an MOU with Hyosung Heavy Industries and Linde Group to establish a liquid hydrogen plant at a Yongyeon plant with an investment cost of 200 billion won in 2020.

(R) Result: In preparation for the hydrogen economy industry, we are building a 13,000-ton liquefied hydrogen plant first by early 2023, and commercial production will begin after January 2024 through a trial run from December 2023.

(Explanation of management costs) The cost used to take advantage of the opportunity is about KRW 200 billion, which is from 2021 to 2023.

- Hyosung Chemical's Yongyeon Plant Liquefied Hydrogen Plant Construction Cost: KRW 200 billion (construction cost for 21 to 23 years)

Comment

Identifier

Opp3

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Products and services

Primary climate-related opportunity driver

Development of new products or services through R&D and innovation

Primary potential financial impact

Increased revenues through access to new and emerging markets

Company-specific description

As customer companies request Hyosung Chemical, an intermediate manufacturer of final products, for eco-friendly material use, GHG reduction in product production and low carbon products according to market trends.

Hyosung Chemical developed with the original technology and successfully commercialized an eco-friendly polymer new material, Polyketone (POKETONE). It is an eco-friendly material harmless to humans based on the stronger shock durability twice than PA (Polyamide) and PBT (polybutylene terephthalate) and the highest chemical durability among ENPLA (engineering plastics) materials and so finally obtained the global certifications like FDA (Food & Drug Administration), KTW (Kunststoffe und Trinkwasser). Polyketone is used in various component materials like automobile fuel lines, internal and external materials, electric and electronic components, pipes et cetera and contributes to carbon emissions reduction by replacing existing materials with eco-friendly ones based on the excellent property of matter. It developed and has sold eco-friendly tableware with 'ESG and GK Co.' since September 2019. In addition, in 2022, Hyosung Chemical supplied 61.5 tons of polyketone product to the Korea National Railway as railway parts. Hyosung Chemical has manufactured a variety of eco-friendly material products through continuous development and investment applied product invests in the development and investment of products using eco-friendly materials.

Time horizon

Long-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)

1980000000000

Potential financial impact figure – minimum (currency)

<Not Applicable>

Potential financial impact figure – maximum (currency)

<Not Applicable>

Explanation of financial impact figure

Hyosung Chemical calculated the financial impact on the development of new products and services through R&D and innovation that may occur at the direct operation site, assuming sales increase due to the introduction of polyketone, an eco-friendly material of Hyosung Chemical.

The size of global market of engineering plastics was KRW 66 trillion in 2015 and is predicted to grow steadily by 5 % more every year. It is predicted to reach KRW 159 trillion in 2026. In 2026, Hyosung Chemical set '30 % more in the global market share' as the goal and spurs the technology development. When Hyosung Chemical achieved the goal of market share, its sales are expected to be approximately KRW 19.8 trillion.

Cost to realize opportunity

594000000

Strategy to realize opportunity and explanation of cost calculation

(S) Situation: There is an increasing demand for eco-friendly materials, greenhouse gas reduction in product production, and low-carbon products in the material industry, which is the main business area of Hyosung Chemical.

(T) Task: Therefore, Hyosung Chemical must develop eco-friendly-low-carbon polymer products with its own technology to respond to these demands.

(A) Action: Hyosung Chemical will develop eco-friendly tableware in 2019, develop a polyketone-applied water meter in 2020, and develop a polyketone-applied power meter and supply it to the construction site from November 2020. Polyketone products made using carbon monoxide as raw materials are eco-friendly green technology certified products and are expanding their application to industrial materials, household goods, and leisure goods, and plan to improve products through continuous R&D and actively participate in the government's carbon reduction policy.

(R) Result: In 2022, KRW 594 million was invested in R&D expenses, and intellectual property rights are secured by applying for and registering patents such as "polyketone composition with improved flame retardancy and economic feasibility (2022.04.12)".

(Explanation of management costs) In 2022, the total cost used to take advantage of the opportunity is KRW 594 million, the sum of each activity.

- Eco-friendly R&D cost: 594 million won

Comment

C3. Business Strategy

C3.1

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

Row 1

Climate transition plan

No, but our strategy has been influenced by climate-related risks and opportunities, and we are developing a climate transition plan within two years

Publicly available climate transition plan

<Not Applicable>

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

<Not Applicable>

Description of feedback mechanism

<Not Applicable>

Frequency of feedback collection

<Not Applicable>

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

<Not Applicable>

Explain why your organization does not have a climate transition plan that aligns with a 1.5°C world and any plans to develop one in the future

Hyosung Chemical holds a quarterly ESG management promotion committee to improve ESG expertise every year and plans to present the low-carbon transition plan as a resolution item at the annual general meeting of shareholders within two years. Hyosung Chemical utilizes qualitative climate change scenario NDCs analysis when establishing business strategies and plans to additionally introduce and utilize quantitative analysis along with qualitative scenario analysis within the next two years.

Explain why climate-related risks and opportunities have not influenced your strategy

<Not Applicable>

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	Primary reason why your organization does not use climate-related scenario analysis to inform its strategy	Explain why your organization does not use climate-related scenario analysis to inform its strategy and any plans to use it in the future
Row 1	Yes, quantitative	<Not Applicable>	<Not Applicable>

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
Physical climate scenarios	RCP 8.5	Company-wide	<Not Applicable>	<p>[Parameters and assumptions]</p> <p>The physical scenario assumes an expected disaster if efforts to respond to climate change are insufficient and the achievement of reduction targets and strategies fails. Hyosung Chemicals, headquartered in South Korea, used the RCP 8.5 high-carbon scenario provided by the Korea Meteorological Administration to analyze the physical impact of climate change across the company. The Korea Meteorological Administration calculated future climate change forecast data from 2006 to 2100 according to the IPCC's RCP scenario after past climate reproduction experiments (1979-2005) based on the Korean Peninsula area. As a result of the analysis, it was confirmed that the global temperature is continuously rising, and the magnitude of the impact on the company may vary depending on the difference in temperature increase. RCP 8.5 assumes that the temperature on the Korean Peninsula will rise 4.7°C by 2100 considering various variables, and RCP 8.5 predicts that the climate index will change, such as a 93.4 day increase (36.5 days → 129.9 days) in Korea and an average precipitation increase of 14% (±12%) compared to the present.</p> <p>[Analysis]</p> <p>Extreme climate change in RCP 8.5 can cause various accidents and problems in Hyosung Chemicals's business sector, such as property and human damage, loss and loss of products, and deterioration in the quality of products produced. In particular, due to the nature of the 'engineering plastics' product producing process, active responses based on scenario analysis are needed because problems such as poor quality of the product due to flooding and leakage. To actively respond to the expected damage under the RCP 8.5 scenario, the company recognized climate change as a major issue and set a goal of reducing greenhouse gases by 14.5% by 2030 compared to 2018 to contribute to curbing global warming. In the future, we will monitor continuous greenhouse gas emissions and national greenhouse gas reduction scenarios, apply them to the establishment of reduction goals for 2030-2050, and actively participate in global greenhouse gas reduction.</p>
Transition scenarios	Customized publicly available transition scenario	Company-wide	1.5°C	<p>[Parameters and assumptions]</p> <p>Hyosung Chemical intends to analyze the publicly transition scenario of the Republic of Korea, where its business is located, to prevent risks derived from the analysis of physical climate change scenarios and incorporate them into its business strategy. To comply with the NDC reporting obligations under the Paris Agreement and respond to climate change, the Republic of Korea has established the "2030 NDC" and the "2050 Carbon Neutral Scenario," aligning with the 1.5°C scenario presented by the IPCC.</p> <p>The key parameters used in the scenario include population trends, GDP growth rate trends, international oil prices, and industrial structure outlooks, which have been used to project energy demand and greenhouse gas emissions until 2050. It is expected that energy demand will decrease by 5.0% in 2050 compared to 2018 and an increase in energy demand is expected from new technologies such as CCUS and hydrogen. In terms of final energy, consumption of fossil fuels that emit greenhouse gases is expected to decrease significantly, and demand for electricity, renewable energy, and hydrogen is expected to increase significantly. In the case of greenhouse gas emissions, the net emissions in 2050 were set to 0 in the scenario in consideration of energy projections and the introduction of reduction measures.</p> <p>[Analysis]</p> <p>Hyosung Chemical analyzed the 2030 NDC and 2050 carbon neutral scenarios in the Republic of Korea. According to the scenarios, the projected energy demand in the industrial sector, to which Hyosung Chemical belongs, is expected to be 139.3 million TOE, similar to 148.7 million TOE in 2018. In addition, during the process of achieving carbon neutrality, a significant portion of fossil fuel consumption in the industrial sector is expected to be replaced by electricity, resulting in a projected overall greenhouse gas emissions reduction to 51.1 million tons, an 80.4% reduction compared to 260.5 million tons in 2018.</p> <p>Hyosung Chemical also predicted future BAU emissions through regression analysis of factors such as its energy use, sales trends, and economic growth rate, and set the existing target of 14.5% reduction by 2030 compared to 2018 as an company-wide goal. And we plan to achieve its 2050 carbon neutral scenario industry sector goals by analyzing additional scenarios and establishing a transition plan.</p>

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 that provided directions for climate change scenario analysis]

In line with the international community's response to climate change, the Korean government first announced "2050 Carbon Neutral" in October 2020, and later declared the "2050 Carbon Neutral Vision" in December 2020. Since then, in December 2021, the government submitted Korea's raised "2030 National Greenhouse Gas Reduction Goals (NDC+)" to the secretariat of the UNFCCC. The emission trading system operated by the government in relation to the establishment of the government's greenhouse gas reduction goal is expected to be directly linked to the 2050 carbon neutral goal and to be an effective means of implementation to achieve the national greenhouse gas reduction targets. Hyosung Chemical has established the 2030 GHG reduction target (14.5% reduction by 2030 compared to 2018).

[The basis for choosing a scenario to deal with the focal question]

As Hyosung Chemical has been included in the emission trading system allocation target since 2018, it is obligated to report its emissions every year. However, in the emission trading system, emission credits are allocated every year, and if Hyosung Chemical emits more greenhouse gas than the allocated emission credits, there is a cost risk of purchasing emission credits for the shortfall. The government has continuously increased the paid allocation ratio (3% for the 2nd planning period, 10% for the 3rd planning period) to achieve the raised national NDC target (14.5% reduction in 2030 compared to 2018), and there is concern that it will increase further and expand the paid allocation targets. Therefore, it is expected that Hyosung Chemical will need to solve the problem of insufficient emission allowances by achieving the goal of reducing greenhouse gas through low-carbon product development, etc. as it establishes a reduction goal in line with the national NDC goal.

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

Hyosung Chemical has been obligated to report and reduce emissions as a company subject to the allocation of the emission trading system since 2018. Currently, Hyosung Chemical is implementing the emission trading system for the third planned period, and as the petrochemical and electronic materials sectors, which are business areas of Hyosung Chemical, continue to grow and develop, it is expected that there will be a shortage of allowances. The estimated number of credits allocated for the 3rd planned period is 4,457,013 tons, but the estimated emission amount for the same period is expected to be 4,703,582 tons. The amount of reduction due to the planned reduction activities during the same period is 44,392 tons, and it is expected that an additional 437,192 tons of emission credits will be ultimately required. In this case, it is estimated that the debt from the purchase of emission credits will be added by about KRW 13,553,000,000 (assuming KRW 31,000/ton) for the entire period of the 3rd plan. Therefore, Hyosung Chemical has established an internal greenhouse gas reduction target that is at the level of the national NDC target and is carrying out greenhouse gas reduction activities to achieve a 14.5% reduction compared to 2018 by 2030 and plans to continue its activities in the future. Hyosung Chemical established a mid- to long-term roadmap for responding to climate change according to the scenario analysis results, and in 2022, it first established a greenhouse gas inventory centered on manufacturing subsidiaries and parent company. By 2025, it aims to expand this effort to include Scope 1 to 3 emissions of major subsidiaries by 2025 to enhance the company-wide greenhouse gas inventory management.

C3.3

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

	Have climate-related risks and opportunities influenced your strategy in this area?	Description of influence
Products and services	Yes	Hydrogen economy has globally become the important axis in the Green New Deal and Hyosung Chemical has continued the key value chain of the hydrogen economy from 'production to storage, transportation, supply, and use' through the synergy effects mutually created by 4 Hyosung companies. Among them, Hyosung Chemical and Hyosung Heavy Industries decided to construct a liquid hydrogen plant in Yongyeon Plant of Hyosung Chemical through the investment of KRW 300 billion by 2023 with cooperation with Linde, a global chemistry group, under the construction plan of a liquid hydrogen plant equivalent to 'production'. The production and sales of hydrogen, one of Hyosung Chemical's new growth engines, have something in common with the 'Road Map for Invigorating Hydrogen Economy' presented by the government in January 2020, are prospected to make large commitments to vitalize the domestic hydrogen economy and are expected to reach to KRW 25 trillion in 2030. Hyosung Chemical and Hyosung Heavy Industries planned to expand the hydrogen supply by participating in 'the Private Investment Plan in Hydrogen Economy,' and investing a total of KRW 1.2 trillion in the hydrogen economy industry to construct a liquid hydrogen plant with the capacity of 10,000 tons per year and charging stations. Hyosung Chemical decided to invest a total of KRW 200 billion in the new construction of a liquid hydrogen plant at the site of Yongyeon Plant with Hyosung Heavy Industries and Linde.
Supply chain and/or value chain	Yes	Hyosung Chemical is a company manufacturing intermediary products like TPA, PP, and special gases used in the LCD and semiconductor manufacturing process, and need to manage subsidiaries material supply networks and common risks with customer companies selling the end products. It annually checks the management of energy usage and the reduction activities in business sites by diagnosing social responsibility management of cooperative companies and gives additional points when assessing excellent cooperative companies. Hyosung Chemical calculated carbon emissions through the assessment of the entire production processes of polyketone products supplied to customers and has provided the information on carbon emissions since 2019. Among the requests of information disclosure on climate change, EcoVadis began to respond from 2020 and CDP started to do in the CDP report 2021. The information disclosure on environment, climate change, safety inspection and carbon certification of products targeted at cooperative companies are annually included in the relevant department work and budget.
Investment in R&D	Yes	Hyosung Chemical steadily implements R&D to secure a new growth engine as well as to strengthen ability of the existing business. It promotes the localization of hydrogen liquefaction technology through the technical cooperation with Linde in accordance with market trends to expand continuously eco-friendly mobility as well as with the government roadmap to extending hydrogen use by invigorating the hydrogen economy in 2020. It approved the new establishment plan for a liquid hydrogen plant by investing a total of KRW 200 billion (Hyosung Heavy Industries, Linde included) in Yongyeon Plant in 2020 and promotes the completion of construction by 2023.
Operations	Yes	Every year Hyosung Chemical practices the responding works to ETS such as reporting emissions and submitting emission calculation plans and submits them to the government after the verification from external expertise agencies. It also makes the annual investment budget for GHG emissions reductions and energy efficiency in order to implement the obligation of GHG reduction. GHG emissions from electricity use account for 64 % and ones from fuel use does 36 % of the total emissions. It implements activities to reduce electricity and fuel use simultaneously. Hyosung Chemical yearly spent more than KRW 10 million as the verification costs of GHG emissions only. In 2022, three reduction activities related to operation optimization were completed at the Optical Oksan plant, KRW 600 million was invested to the PP/DH Yongyeon plant for the recovery of raw materials for the recovery process, and KRW 24 million was invested to improving the operation efficiency of the Optical Yongyeon plant and KRW 75 million was invested in management of load of the freezer. And KRW 40 million was invested in pump inverter installation at the Film Gumi plant, and power consumption reduction through load control is being tested at the Neochem plant.

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	<p>Direct costs</p> <p>Indirect costs</p> <p>Acquisitions and divestments</p> <p>Access to capital</p> <p>Assets</p>	<p>1) Direct costs :</p> <p>Hyosung Chemical manages the financial plan by purchasing additional allocations when they are deficient and carries over them during the third ETS planned phase (2021~2025). After the spin-off of Hyosung in 2018, due to the increase in sales of Hyosung Chemical, 1,423 tons were insufficient based on the allowances allocated in 2022, so about 14.8 million won was paid to purchase the allowances. The costs of allowance purchase and GHG reduction activities are reflected in the budget planning of Hyosung Chemical. It reflects the budget for reducing 14.5 % GHG emissions by 2030 compared to 2018 every year.</p> <p>2) Indirect costs</p> <p>Of the indirect costs for Hyosung Chemical's product production, the energy costs are KRW 165,119 million occupying 6.9 % of the total operating costs. Due to the climate change, globally the average temperature gets higher, and the days of heat and cold waves increase. Those situations may directly lead to the increase in heating and cooling costs because it needs to manage the temperature within the certain range to manufacture products with the constant quality in business sites. Hyosung Chemical manages the electricity usage not to exceed the certain level by monitoring electric power peak and establishes the financial planning and the annual budget considering energy costs due to heat and cold waves.</p> <p>3) Acquisitions and divestments</p> <p>Hyosung Chemical was spined off from Hyosung Co. in 2018 and currently has no plan for acquisitions or divestments. If acquisitions or divestments occur, it will review the risk due to climate change from the opportunity perspective from the initial phase. The critical decision about investments and divestment will be made in the board.</p> <p>4) Access to capital</p> <p>Under the ETS system, if Hyosung Chemical has problems in emission reports or passively copes with the GHG emissions target (14.5 % reduction by 2030 compared to 2018) externally disclosed, the reputation risk would negatively affect the enterprise value. If so, it would suffer from accessing to capital to expand its climate change related investment in the future. However, its possibility is supposed to be so low. Hyosung Chemical has no financial planning for access to capital to cope with climate change risks or for using opportunities but plans to establish it, if necessary.</p> <p>5) Assets</p> <p>Hyosung Chemical annually reduces GHG emissions through facilities replacement and energy efficiency projects and the necessary financial sources are reflected in the annual budget of PU and PG. In 2022, three reduction activities related to operation optimization were completed at the Optical Oksan plant, KRW 600 million was invested to the PP/DH Yongyeon plant for the recovery of raw materials for the recovery process, and KRW 24 million was invested to improving the operation efficiency of the Optical Yongyeon plant and KRW 75 million was invested in management of load of the freezer. And KRW 40 million was invested in pump inverter installation at the Film Gumi plant, and power consumption reduction through load control is being tested at the Neochem plant.</p> <p>GHG emissions and energy costs could be reduced through each reduction activity, and KRW 558 million of energy costs and 530 tCO2eq of GHG reduction effects were derived annually through three cases related to optimizing the operation of the Optical Oksan plant. And it is expected to reduce greenhouse gas emissions by 1,591 tCO2eq per year through the initiatives such as PP/DH Yongyeon plant raw material recovery process and optical Yongyeon plant operation efficiency improvement.</p>

C3.5

(C3.5) In your organization's financial accounting, do you identify spending/revenue that is aligned with your organization's climate transition?

	Identification of spending/revenue that is aligned with your organization's climate transition	Indicate the level at which you identify the alignment of your spending/revenue with a sustainable finance taxonomy
Row 1	No, but we plan to in the next two years	<Not Applicable>

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

Is this a science-based target?

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

Target ambition

<Not Applicable>

Year target was set

2021

Target coverage

Company-wide

Scope(s)

Scope 1

Scope 2

Scope 2 accounting method

Location-based

Scope 3 category(ies)

<Not Applicable>

Base year

2018

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

316146.249

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

546520.937

Base year Scope 3, Category 1: Purchased goods and services emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 2: Capital goods emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 4: Upstream transportation and distribution emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 5: Waste generated in operations emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 6: Business travel emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 7: Employee commuting emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 8: Upstream leased assets emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 9: Downstream transportation and distribution emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 10: Processing of sold products emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 11: Use of sold products emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 12: End-of-life treatment of sold products emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 13: Downstream leased assets emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 14: Franchises emissions covered by target (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 15: Investments emissions covered by target (metric tons CO2e)

<Not Applicable>

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

<Not Applicable>

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

<Not Applicable>

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

<Not Applicable>

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

862667.186

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, Category 1: Purchased goods and services emissions covered by target as % of total base year emissions in Scope 3, Category 1: Purchased goods and services (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 2: Capital goods emissions covered by target as % of total base year emissions in Scope 3, Category 2: Capital goods (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions covered by target as % of total base year emissions in Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 4: Upstream transportation and distribution covered by target as % of total base year emissions in Scope 3, Category 4: Upstream transportation and distribution (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 5: Waste generated in operations emissions covered by target as % of total base year emissions in Scope 3, Category 5: Waste generated in operations (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 6: Business travel emissions covered by target as % of total base year emissions in Scope 3, Category 6: Business travel (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 7: Employee commuting covered by target as % of total base year emissions in Scope 3, Category 7: Employee commuting (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 8: Upstream leased assets emissions covered by target as % of total base year emissions in Scope 3, Category 8: Upstream leased assets (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 9: Downstream transportation and distribution emissions covered by target as % of total base year emissions in Scope 3, Category 9: Downstream transportation and distribution (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 10: Processing of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 10: Processing of sold products (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 11: Use of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 11: Use of sold products (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 12: End-of-life treatment of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 12: End-of-life treatment of sold products (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 13: Downstream leased assets emissions covered by target as % of total base year emissions in Scope 3, Category 13: Downstream leased assets (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 14: Franchises emissions covered by target as % of total base year emissions in Scope 3, Category 14: Franchises (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Category 15: Investments emissions covered by target as % of total base year emissions in Scope 3, Category 15: Investments (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Other (upstream) emissions covered by target as % of total base year emissions in Scope 3, Other (upstream) (metric tons CO2e)

<Not Applicable>

Base year Scope 3, Other (downstream) emissions covered by target as % of total base year emissions in Scope 3, Other (downstream) (metric tons CO2e)

<Not Applicable>

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

<Not Applicable>

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 (%)

14.5

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

737580.44403

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

317185.309

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

574879.19

Scope 3, Category 1: Purchased goods and services emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 2: Capital goods emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 4: Upstream transportation and distribution emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 5: Waste generated in operations emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 6: Business travel emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 7: Employee commuting emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 8: Upstream leased assets emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 9: Downstream transportation and distribution emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 10: Processing of sold products emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 11: Use of sold products emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 12: End-of-life treatment of sold products emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 13: Downstream leased assets emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 14: Franchises emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

Scope 3, Category 15: Investments emissions in reporting year covered by target (metric tons CO2e)

<Not Applicable>

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

<Not Applicable>

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

<Not Applicable>

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

<Not Applicable>

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

892064.499

Does this target cover any land-related emissions?

No, it does not cover any land-related emissions (e.g. non-FLAG SBT)

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

-23.5015418397023

Target status in reporting year

Underway

Please explain target coverage and identify any exclusions

Hyosung Chemical has established the Scope 1+2 absolute amount target, and there are no emission sources exception for the scopes. In addition, land-related emissions were not included in the target boundary. However, in the 2022 Sustainability Report, emissions and reduction targets were reported based on the allocation of emission trading system, excluding emissions from waste gas incineration facilities. Therefore, there is a difference from the values in the CDP report.

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

In the reporting year, Hyosung Chemical is carrying out activities to achieve the reduction target. Fuel conversion, process improvement, and energy efficiency, and increased use of recycle raw materials will be carried out to achieve more reduction.

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

<Not Applicable>

C4.2

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

No other climate-related targets

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*	7	916
Implementation commenced*	3	675
Implemented*	3	530
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	Process optimization
---	----------------------

Estimated annual CO2e savings (metric tonnes CO2e)

69

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)

107000000

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

10000000

Payback period

<1 year

Estimated lifetime of the initiative

Ongoing

Comment

Reduction of steam usage by optimizing the concentration of wastewater and the flow rate of reflex of the distillation column of the optical film Oksan plant in November 2022

Initiative category & Initiative type

Energy efficiency in production processes	Process optimization
---	----------------------

Estimated annual CO2e savings (metric tonnes CO2e)

92

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)

108000000

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

0

Payback period

<1 year

Estimated lifetime of the initiative

Ongoing

Comment

Reduction of steam usage by optimizing steam consumption according to the product of the adsorption column of the optical film Oksan plant in January 2022

Initiative category & Initiative type

Energy efficiency in production processes	Process optimization
---	----------------------

Estimated annual CO2e savings (metric tonnes CO2e)

369

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)

432000000

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

0

Payback period

<1 year

Estimated lifetime of the initiative

Ongoing

Comment

Reduction of steam usage by optimizing steam usage due to improvement of concentration ratio of solvent flowing into the distillation column of the optical film Oksan plant in January 2022

C4.3c

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

Method	Comment
Dedicated budget for energy efficiency	Hyosung Chemical annually makes an investment budget for GHG reduction and energy efficiency investment. The budget contains all energy efficiency projects including facilities replacement, change of energy source and process improvements. Of the total emissions, greenhouse gas emissions from direct emissions account for 36% and indirect emissions account for 64%, so activities are being carried out to reduce fuel use and power consumption together.

C4.5

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

Yes

C4.5a

(C4.5a) Provide details of your products and/or services that you classify as low-carbon products.

Level of aggregation

Product or service

Taxonomy used to classify product(s) or service(s) as low-carbon

No taxonomy used to classify product(s) or service(s) as low carbon

Type of product(s) or service(s)

Chemicals and plastics	Other, please specify (POKETONE(polyketone polymer for engineering plastic))
------------------------	--

Description of product(s) or service(s)

Hyosung Chemical's low-carbon product is the world's first commercialized Polyketone, and POKETONE is used as a raw material for engineering plastics. POKETONE is a material produced using carbon monoxide and olefin or carbon monoxide and ethylene and propylene. It has obtained FDA and green certifications and has excellent performance such as high chemical resistance, high impact resistance, and high abrasion resistance. Hyosung Chemical carried out LCA for POKETONE in 2020 and LCA Critical Review in 2021 to secure the reliability of carbon emission in the entire process of POKETONE.

Have you estimated the avoided emissions of this low-carbon product(s) or service(s)

Yes

Methodology used to calculate avoided emissions

Other, please specify (Life Cycle Assessment(LCA) according to ISO14040, ISO14044 and Eco-profiles and Environment Declarations Version 2.0 Methodology and PCR of Plastic Europe)

Life cycle stage(s) covered for the low-carbon product(s) or services(s)

Cradle-to-gate

Functional unit used

Production of 1t of POKETONE pellets

Reference product/service or baseline scenario used

Production of 1t of PA6

Life cycle stage(s) covered for the reference product/service or baseline scenario

Cradle-to-gate

Estimated avoided emissions (metric tons CO2e per functional unit) compared to reference product/service or baseline scenario

3.62

Explain your calculation of avoided emissions, including any assumptions

POKETONE of Hyosung Chemical confirmed greenhouse gas emissions of 3.08 kg CO2e/kg in the Cradle-to-gate life cycle through LCA and LCA Critical Review. PA6 was used as the most used of the five general-purpose engineering plastics, and according to Plastic Europe's Eco-profiles and Environment Declarations Version 2.0, which was also applied to POKETONE LCA, PA6 produced 6.70 kgCO2e/kg of carbon emissions in the same life cycle. Accordingly, the difference between the two emission coefficients, 3.62tCO2e/t (=6.70-3.08), was calculated as the expected avoidance emission. However, since PA6 emission is the industry average data, it may vary by manufacturer, and when comparing the carbon emission of POKETONE with other engineering plastics other than PA6, the avoided emission may be reduced.

Revenue generated from low-carbon product(s) or service(s) as % of total revenue in the reporting year

2.931

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

Name of organization(s) acquired, divested from, or merged with

<Not Applicable>

Details of structural change(s), including completion dates

<Not Applicable>

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 methodology Yes, a change in boundary	In 2022, in Scope 3 Category 3, emissions were calculated in addition to considering the power loss rate, and in Category 4, overseas upstream transportation was included, and the emission coefficient for Category 6 business trips was updated with EPA's latest emission coefficient. In Category 9, emissions were calculated for all downstream transportation regardless of whether transportation costs were paid, and accordingly, the number of items calculated in Category 12 also increased. In addition, Hyosung Chemical reported emissions based on the allocation of the domestic emission trading system for Scope 1 and Scope 2 emissions by CDP in 2022, but emissions by Flare stack, a waste gas incineration facility, were omitted. For carbon neutrality from the perspective of the Paris Agreement and transparency in greenhouse gas emissions, the absolute amount of emissions from the facility was also included in the report from the 2023 CDP.

C5.1c

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

	Base year recalculation	Scope(s) recalculated	Base year emissions recalculation policy, including significance threshold	Past years' recalculation
Row 1	Yes	Scope 1	Hyosung Chemical reported emissions for Scope 1 and Scope 2 up to the 2022 CDP based on domestic emission allowance trading criteria. However, the emissions from the Flare stack, which is a waste gas incineration facility, were omitted accordingly. When including the absolute emissions from this facility, the reported emissions for the baseline year increased from 824,937 tons to 862,663 tons, showing an increase rate of 4.573%, which is below the critical threshold of 5% for materiality. Nevertheless, to ensure carbon neutrality and transparency of greenhouse gas emissions from the perspective of the Paris Agreement, the baseline emissions was recalculated. Similarly, the emissions from previous years starting from the first year of CDP reporting in 2021 were also recalculated.	Yes

C5.2

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

Scope 1

Base year start

January 1 2018

Base year end

December 31 2018

Base year emissions (metric tons CO2e)

316146.249

Comment

Hyosung Chemical reported emissions for Scope 1 and Scope 2 up to the 2022 CDP based on domestic emission allowance trading criteria. However, the emissions from the Flare stack, which is a waste gas incineration facility, were omitted accordingly. When including the absolute emissions from this facility, the reported emissions for the baseline year increased from 824,937 tons to 862,663 tons, showing an increase rate of 4.573%, which is below the critical threshold of 5% for materiality. Nevertheless, to ensure carbon neutrality and transparency of greenhouse gas emissions from the perspective of the Paris Agreement, the baseline emissions was recalculated. Similarly, the emissions from previous years starting from the first year of CDP reporting in 2021 were also recalculated.

Scope 2 (location-based)

Base year start

January 1 2018

Base year end

December 31 2018

Base year emissions (metric tons CO2e)

546520.938

Comment

Hyosung Chemical reported emissions for Scope 1 and Scope 2 up to the 2022 CDP based on domestic emission allowance trading criteria. However, the emissions from the Flare stack, which is a waste gas incineration facility, were omitted accordingly. When including the absolute emissions from this facility, the reported emissions for the baseline year increased from 824,937 tons to 862,663 tons, showing an increase rate of 4.573%, which is below the critical threshold of 5% for materiality. Nevertheless, to ensure carbon neutrality and transparency of greenhouse gas emissions from the perspective of the Paris Agreement, the baseline emissions was recalculated. Similarly, the emissions from previous years starting from the first year of CDP reporting in 2021 were also recalculated.

Scope 2 (market-based)

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 1: Purchased goods and services

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 2: Capital goods

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

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

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 4: Upstream transportation and distribution

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 5: Waste generated in operations

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 6: Business travel

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 7: Employee commuting

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 8: Upstream leased assets

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 9: Downstream transportation and distribution

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 10: Processing of sold products

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 11: Use of sold products

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

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

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 13: Downstream leased assets

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 14: Franchises

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

Scope 3 category 15: Investments

Base year start

Base year end

Base year emissions (metric tons CO2e)

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.

Environment Canada, Base Metals Smelting/Refining, Guidance Manual for Estimating Greenhouse Gas Emissions

IPCC Guidelines for National Greenhouse Gas Inventories, 2006

ISO 14064-1

Korea GHG and Energy Target Management System Operating Guidelines

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

The Greenhouse Gas Protocol: Scope 2 Guidance

The Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Standard

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)

317185.309

Start date

January 1 2022

End date

December 31 2022

Comment

Past year 1

Gross global Scope 1 emissions (metric tons CO2e)

319813.072

Start date

January 1 2021

End date

December 31 2021

Comment

Hyosung Chemical reported emissions for Scope 1 and Scope 2 up to the 2022 CDP based on domestic emission allowance trading criteria. However, the emissions from the Flare stack, which is a waste gas incineration facility, were omitted accordingly. Accordingly, to ensure carbon neutrality and transparency of greenhouse gas emissions from the perspective of the Paris Agreement, the baseline emissions was recalculated. Similarly, Scope 1 emissions in 2021, the reporting year of the CDP in 2022, were recalculated from 297,687 tons to 319,813.072 tons to the third decimal place.

Past year 2

Gross global Scope 1 emissions (metric tons CO2e)

318816.272

Start date

January 1 2020

End date

December 31 2020

Comment

Hyosung Chemical reported emissions for Scope 1 and Scope 2 up to the 2022 CDP based on domestic emission allowance trading criteria. However, the emissions from the Flare stack, which is a waste gas incineration facility, were omitted accordingly. Accordingly, to ensure carbon neutrality and transparency of greenhouse gas emissions from the perspective of the Paris Agreement, the baseline emissions was recalculated. Similarly, Scope 1 emissions in 2020, the reporting year of the CDP in 2021, were recalculated from 298,499 tons to 318,816.272 tons to the third decimal place.

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

The Korean power market is a single regional-based market supplied by KEPCO, and there is no private power market.

C6.3

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

Reporting year

Scope 2, location-based

574879.19

Scope 2, market-based (if applicable)

<Not Applicable>

Start date

January 1 2022

End date

December 31 2022

Comment

Past year 1

Scope 2, location-based

567421.953

Scope 2, market-based (if applicable)

<Not Applicable>

Start date

January 1 2021

End date

December 31 2021

Comment

Hyosung Chemical reported emissions for Scope 1 and Scope 2 up to the 2022 CDP based on domestic emission allowance trading criteria. However, the emissions from the Flare stack, which is a waste gas incineration facility, were omitted accordingly. Accordingly, to ensure carbon neutrality and transparency of greenhouse gas emissions from the perspective of the Paris Agreement, the baseline emissions was recalculated. Similarly, Scope 2 emissions in 2021, the reporting year of the CDP in 2022, were recalculated from 567,418 tons to 567,421.953 tons to the third decimal place.

Past year 2

Scope 2, location-based

563009.483

Scope 2, market-based (if applicable)

<Not Applicable>

Start date

January 1 2020

End date

December 31 2020

Comment

Hyosung Chemical reported emissions for Scope 1 and Scope 2 up to the 2022 CDP based on domestic emission allowance trading criteria. However, the emissions from the Flare stack, which is a waste gas incineration facility, were omitted accordingly. Accordingly, to ensure carbon neutrality and transparency of greenhouse gas emissions from the perspective of the Paris Agreement, the baseline emissions was recalculated. Similarly, Scope 2 emissions in 2020, the reporting year of the CDP in 2021, were recalculated from 563,009 tons to 563,009.483 tons to the third decimal place.

C6.4

(C6.4) Are there any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1, Scope 2 or Scope 3 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)

1366792

Emissions calculation methodology

Average data method

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

0

Please explain

In the reporting year (2022), annual emissions were calculated including major raw materials and waterworks, industrial water used at all domestic business sites. For activity data (product purchase amount), actual product purchase amount data managed through the system is applied. For emission factors, the Ministry of Environment's national LCI DB(Carbon labeling evaluation factor) for each raw and subsidiary material purchased is first applied. If there is no domestic DB, the overseas LCI DB(Ecoinvent) is used as follows, and items that were difficult to determine emission factors were excluded from the calculation.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (annual raw material purchase (kg) X greenhouse gas emission factor by raw material (kgCO₂-eq))

1. Carbon monoxide/Propane/Acetic acid/Methanol Chloride/Terephthalic acid GHG EF: Swiss Ecoinvent LCI DB

2. Methanol/Ethylene/Acetone/Propylene/p-Xylene/Hydrogen fluoride/Ammonia/Ethylene Glycol/Polycaprolactam/Water GHG EF: Ministry of Environment LCI DB

Capital goods

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

4

Emissions calculation methodology

Average data method

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

0

Please explain

Emissions related to purchase of 'personal computer, monitor, PC main body and printer' purchased in the reporting year (2022) were calculated. For activity data, actual product purchase amount data managed through internal purchase and capital system registration data was applied. Emission factors were calculated using emission factors of 'pre-manufacturing and manufacturing steps' in each product life cycle stage. If there is no carbon emission factor for some purchased products, the emission factor of a similar model was applied.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (individual computer & laptop & monitor & printer purchase amount (ea) X individual greenhouse gas emission coefficient (kgCO₂/ea))

1. Laptops/PCs/Monitors/Printers GHG EF: Ministry of Environment LCI DB

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

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

84362

Emissions calculation methodology

Average data method

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

100

Please explain

Emissions from production process of fuels which were purchased and used in 2022. For activity data, third-party verified greenhouse gas emission specification data were applied to all domestic business sites, and emission factors for each raw material production stage were applied for emission factors.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (annual fuel consumption X greenhouse gas emission factor by fuels)

1. Fuels : Purchased fuels(kg) X GHG Emission Factor by fuels in production(kgCO₂-eq/kg) (Ministry of Environment LCI DB)

2. Electricity : Electricity Consumption(kWh) X Upstream Emission Factor of purchased Electricity(kgCO₂-eq/kWh) (Korea Electric Power Statistics)

Upstream transportation and distribution

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

939

Emissions calculation methodology

Distance-based method

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

0

Please explain

Emissions generated during the transportation of raw materials purchased for production in the reporting year (2022) were calculated. For the activity data, data on the amount of each raw material used in the production, transportation distance from suppliers, and the transportation means were used, and the emission factor per unit distance by transportation was applied.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (annual raw material transportation distance (km) X raw material purchase amount (ton) X greenhouse gas emission factor by means of transportation (kgCO₂/ton.km)

1. Truck : Purchased raw material X transportation distance(km) X GHG Emission Factor by transportation type(kgCO₂/ton.km)(Ministry of Environment LCI DB)
2. Tank Lorry : Purchased raw material X transportation distance(km) X GHG Emission Factor by transportation type(kgCO₂/ton.km)(Ministry of Environment LCI DB)
3. Inland ship(bulk) : Purchased raw material X transportation distance(km) X GHG Emission Factor by transportation type(kgCO₂/ton.km)(Ministry of Environment LCI DB)
4. Oversea ship(container) : Purchased raw material X transportation distance(km) X GHG Emission Factor by transportation type(kgCO₂/ton.km)(Ministry of Environment LCI DB)
5. Oversea ship(tanker) : Purchased raw material X transportation distance(km) X GHG Emission Factor by transportation type(kgCO₂/ton.km)(Ministry of Environment LCI DB)

Waste generated in operations

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

4447

Emissions calculation methodology

Waste-type-specific method

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

100

Please explain

In the reporting year (2022), waste generated in the operation process and emissions generated in the waste treatment process were calculated. For activity data, data on the amount of waste reported through the system at all business sites (waste emission) was used, and emission factors according to the type of waste and disposal method were applied.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (annual waste emission(kg) X greenhouse gas emission factor by waste treatment method(kgCO₂/kg)

1. Landfill(General Waste by landfill, Household waste by sanitary landfill, inert material waste by sanitary landfill) : Waste by landfill(kg) X landfill GHG Emission Factor(General Waste, Household waste, inert material waste) (Ministry of Environment LCI DB)
2. Recycling(mixed waste plastic, waste ferrous metal, waste wood, waste oil, waste glass, waste concrete) : Waste by Recycle(kg) X recycle GHG Emission factor(Ministry of Environment LCI DB)
3. Incineration (designated waste, mixed waste plastic) : Waste by incineration(kg) X incineration GHG Emission factor(Ministry of Environment LCI DB)

Business travel

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

344

Emissions calculation methodology

Distance-based method

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

0

Please explain

Emissions from domestic and overseas business trips of all employees in the reporting year (2022) were calculated. For activity data, data on domestic and overseas business trip records (number of business trips, business trip locations, and means of transportation) managed through the system at all business sites were used. For the emission factor, the emission factor (per person.km) according to the means of transportation was applied during business trips.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (\sum (Overseas/domestic business trip distance by employee(person.km) X GHG emission factor (kg-CO₂/person.km))

1. Domestic business trip : \sum (\sum (Domestic business trip length per employee(km/person)) X GHG emission factor(EPA GHG Emission Factor Hub, April 2022)
2. Overseas business trip : \sum (\sum (Overseas business trip length per employee(km/person)) X GHG emission factor(EPA GHG Emission Factor Hub, April 2022)

Employee commuting

Evaluation status

Not relevant, explanation provided

Emissions in reporting year (metric tons CO2e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

Most of Hyosung Chemical's domestic business sites operate commuter buses for employees, which are already included in Scope 1 emissions. Therefore, there is no need for a separate calculation of emissions in this category.

Upstream leased assets

Evaluation status

Not relevant, explanation provided

Emissions in reporting year (metric tons CO2e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

Hyosung Chemical does not operate our own upstream leased assets, so it is impossible to calculate emissions for this category.

Downstream transportation and distribution

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

52911

Emissions calculation methodology

Distance-based method

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

0

Please explain

Emissions generated during the transportation of products produced in the reporting year (2022) were calculated.

For activity data, data on sales volume, transportation distance (distance from each business site to customer) and transportation means were used. Emission factors per unit distance for each transportation means were applied.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (annual product transportation distance (km) X product sales volume (ton) X greenhouse gas emission factor by means of transportation (kgCO₂-eq/ton.km)

1. Truck : Product sales volume(kg) X transportation distance X GHG Emission Factor by transportation type(kgCO₂-eq/ton.km)(Ministry of Environment LCI DB)

2. Oversea ship : Product sales volume(kg) X transportation distance X GHG Emission Factor by transportation type(kgCO₂-eq/ton.km)(Ministry of Environment LCI DB)

Processing of sold products

Evaluation status

Not relevant, explanation provided

Emissions in reporting year (metric tons CO2e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

Hyosung Chemical's products are PP, TPA, PET and Nylon film etc. which are intermediate materials, and are made into final materials (Medical, special film, advanced materials, etc.) through several steps. The additional processing process for the sold products is diverse, and the processing process that each partner company goes through is different. Therefore, it is difficult to assume emissions for that category.

In addition, the additional processing process of the sold products has relatively little relevance as it is judged that it is difficult for Hyosung Chemical to exercise its influence in the future, and it is difficult to proceed with greenhouse gas reduction activities.

Use of sold products

Evaluation status

Not relevant, explanation provided

Emissions in reporting year (metric tons CO₂e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

Hyosung Chemical produces PP, TPA, PET and Nylon film etc. which are intermediate materials, which are used as raw materials for various products such as Medical, special film, advanced materials. Products sold go through several stages downstream in the value chain, and are thus made into various final goods. Depending on the case of the greenhouse gas protocol, this can be considered to be included in the 'In certain cases, the eventual end use of sold intermediate products may be unknown.', in which case it is impossible to reasonably predict the emission to the end user. Therefore, since the final products are diverse and the usage time and lifespan of each product are different, it cannot but be excluded from the calculation of the greenhouse gas generated during the use stage for each product.

End of life treatment of sold products

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

811223

Emissions calculation methodology

Average data method

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

0

Please explain

Emissions generated in the process of treating plastic waste from products, used as raw materials for plastics among products sold in the reporting year (2022), were calculated. For activity data, data on the sales volume of manufactured products was used, and for domestic sales, the ratio and emission factor according to the disposal treatment method for each type of domestic plastic waste were applied, and for overseas sales, the emission factor according to Ecoinvent's global mixed waste plastic treatment was applied.

Emissions for each item were calculated based on the emission calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification was carried out of GHG emissions calculated through the process.

- Emission calculation: \sum (annual plastic raw material sales(kg) X Statistical ratio by domestic plastic waste treatment method X greenhouse gas emission factor by waste treatment method(kgCO₂/kg))

1. Domestic Landfill (mixed waste plastic) : Annual plastic raw material sales (kg) X Statistical ratio of plastic waste treatment method(Korean Statistical Information Service) X mixed waste plastic landfill GHG Emission Factor(Ministry of Environment LCI DB)
2. Domestic Recycling (mixed waste plastic) : Annual plastic raw material sales (kg) X Statistical ratio of plastic waste treatment method(Korean Statistical Information Service) X mixed waste plastic recycle GHG Emission factor(Ministry of Environment LCI DB)
3. Domestic Incineration (mixed waste plastic) : Annual plastic raw material sales (kg) X Statistical ratio of plastic waste treatment method(Korean Statistical Information Service) X mixed waste plastic incineration GHG Emission factor(Ministry of Environment LCI DB)
4. Oversea mix treatment (mixed waste plastic): Annual plastic raw material sales (kg) X mixed waste plastic treatment GHG Emission factor(Ecoinvent LCI DB)

Downstream leased assets

Evaluation status

Not relevant, explanation provided

Emissions in reporting year (metric tons CO₂e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

Hyosung Chemical does not operate downstream leased assets, so it is impossible to calculate emissions for this category.

Franchises

Evaluation status

Not relevant, explanation provided

Emissions in reporting year (metric tons CO₂e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

Due to the characters of the business, we do not own franchises, so cannot calculate emissions for this category.

Investments

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

553601

Emissions calculation methodology

Average data method

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

100

Please explain

Scope 1 and 2 emissions of other corporations invested by Hyosung Chemical in the reporting year (2022) were calculated. For activity data, the emission trading system data of the invested corporation or the energy consumption data of the invested corporation were applied, and the emission factor for each fuel was applied. Emissions for each item were calculated based on the calculation methodology, and the final total was calculated as the emission of the relevant category. In addition, third-party verification of greenhouse gas emissions calculated through the process was conducted.
- Emission calculation: \sum (total emissions in the reporting year of other corporations X shareholding ratio of Hyosung Chemical) + \sum (annual fuel consumption of other corporations X GHG emission factor by fuel X shareholding ratio of Hyosung Chemical)

1. Annual total GHG emissions of corporation invested X Shareholding ratio of Hyosung Chemical
2. Fuels : Purchased fuels(kg) of corporation invested X GHG Emission Factor by fuels(kgCO2-eq/kg) (Ministry of Environment LCI DB) X Shareholding ratio of Hyosung Chemical
3. Electricity : Electricity Consumption(kWh) of corporation invested X Emission Factor of purchased Electricity(kgCO2-eq/kWh) (Electric Power Statistics for each country) X Shareholding ratio of Hyosung Chemical

Other (upstream)

Evaluation status

Emissions in reporting year (metric tons CO2e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

Other (downstream)

Evaluation status

Emissions in reporting year (metric tons CO2e)

<Not Applicable>

Emissions calculation methodology

<Not Applicable>

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

<Not Applicable>

Please explain

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

3.9e-7

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

892064.49

Metric denominator

unit total revenue

Metric denominator: Unit total

2287412310278

Scope 2 figure used

Location-based

% change from previous year

7.3

Direction of change

Decreased

Reason(s) for change

Other emissions reduction activities

Please explain

Hyosung Chemical set 'emissions (numerator) and revenue (denominator)' as the factors to affect GHG intensity. In 2022, the CO2e per unit currency total revenue decreased 7.30% from the previous year due to efforts to improve the energy efficiency and reduce GHG emissions.

*2022 intensity figure (tCO2e/total revenue (KRW)) = 892,064.499 /2,287,412,310.278 = 0.0000003900

*2021 intensity figure (tCO2e/total revenue (KRW)) = 887,235.025/2,108,872,039,217 = 0.0000004207

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	316811.604	IPCC Second Assessment Report (SAR - 100 year)
CH4	173.792	IPCC Second Assessment Report (SAR - 100 year)
N2O	199.913	IPCC Second Assessment Report (SAR - 100 year)

C7.2

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

Country/area/region	Scope 1 emissions (metric tons CO2e)
Republic of Korea	317185.309

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
Hoehyeon AK Tower	0.893	37.559669	126.979606
Yongyeon Plant 1	220542.844	35.480051	129.35405
Yongyeon Plant 2	85409.896	35.483027	129.353503
Yongyeon Plant 3	10.541	35.480263	129.358267
Tank terminal	217.159	35.442866	129.357293
Oksan Plant	5763.15	36.698924	127.371329
Daegeon Plant	0	36.442725	127.4033
Gongdeok building_Hyosung Chemical	125.269	37.545557	126.951733
Banpo building_Hyosung Chemical	25.1	37.500622	127.003351
Gumi Plant	5090.458	36.088742	128.408304

C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4

(C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4) Break down your organization's total gross global Scope 1 emissions by sector production activity in metric tons CO2e.

	Gross Scope 1 emissions, metric tons CO2e	Net Scope 1 emissions , metric tons CO2e	Comment
Cement production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Chemicals production activities	317185.309	<Not Applicable>	
Coal production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Electric utility activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Metals and mining production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Oil and gas production activities (upstream)	<Not Applicable>	<Not Applicable>	<Not Applicable>
Oil and gas production activities (midstream)	<Not Applicable>	<Not Applicable>	<Not Applicable>
Oil and gas production activities (downstream)	<Not Applicable>	<Not Applicable>	<Not Applicable>
Steel production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Transport OEM activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Transport services activities	<Not Applicable>	<Not Applicable>	<Not Applicable>

C7.5

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

Country/area/region	Scope 2, location-based (metric tons CO2e)	Scope 2, market-based (metric tons CO2e)
Republic of Korea	574879.19	

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)
Hoehyeon AK Tower	5.183	
Yongyeon Plant 1	360424.088	
Yongyeon Plant 2	62894.975	
Yongyeon Plant 3	108792.633	
Tank terminal	1319.505	
Oksan Plant	15399.535	
Daegeon Plant	4722.002	
Gongdeok building_Hyosung Chemical	30.125	
Banpo building_Hyosung Chemical	395.074	
Gumi Plant	20896.07	

C7.7

(C7.7) Is your organization able to break down your emissions data for any of the subsidiaries included in your CDP response?

Not relevant as we do not have any subsidiaries

C-CE7.7/C-CH7.7/C-CO7.7/C-MM7.7/C-OG7.7/C-ST7.7/C-TO7.7/C-TS7.7

(C-CE7.7/C-CH7.7/C-CO7.7/C-MM7.7/C-OG7.7/C-ST7.7/C-TO7.7/C-TS7.7) Break down your organization’s total gross global Scope 2 emissions by sector production activity in metric tons CO2e.

	Scope 2, location-based, metric tons CO2e	Scope 2, market-based (if applicable), metric tons CO2e	Comment
Cement production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Chemicals production activities	574879.19		
Coal production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Metals and mining production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Oil and gas production activities (upstream)	<Not Applicable>	<Not Applicable>	<Not Applicable>
Oil and gas production activities (midstream)	<Not Applicable>	<Not Applicable>	<Not Applicable>
Oil and gas production activities (downstream)	<Not Applicable>	<Not Applicable>	<Not Applicable>
Steel production activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Transport OEM activities	<Not Applicable>	<Not Applicable>	<Not Applicable>
Transport services activities	<Not Applicable>	<Not Applicable>	<Not Applicable>

C-CH7.8

(C-CH7.8) Disclose the percentage of your organization’s Scope 3, Category 1 emissions by purchased chemical feedstock.

Purchased feedstock	Percentage of Scope 3, Category 1 tCO2e from purchased feedstock	Explain calculation methodology
Other (please specify) (Carbon monoxide)	2.25	Purchased Carbon monoxide (kg) * Carbon monoxide Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Methanol	0.03	Purchased Methanol (kg) * Methanol Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Ethylene)	3.82	Purchased Ethylene (kg) * Ethylene Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Acetone)	0.02	Purchased Acetone (kg) * Acetone Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Propane liquid	54.55	Purchased Propane (kg) * Propane Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Propylene (FCC)	6.34	Purchased Propylene (kg) * Propylene Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Other (please specify) (p-Xylene)	17.55	Purchased p-xylene (kg) * p-xylene Emission Factor (kgCO2eq /kg, Ecoinvent LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Acetic acid)	2.65	Purchased Acetic acid (kg) * Acetic acid Emission Factor (kgCO2eq /kg, Ecoinvent LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Hydrogen fluoride)	0.19	Purchased Hydrogen fluoride (kg) * Hydrogen fluoride Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Ammonia	0.08	Purchased Ammonia (kg) * Ammonia Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Methanol chloride)	0.17	Purchased Methanol chloride (kg) * Methanol chloride Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Terephthalic acid)	6.39	Purchased Terephthalic acid (kg) * Terephthalic acid Emission Factor (kgCO2eq /kg, Ecoinvent LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Ethylene glycol)	1.46	Purchased Ethylene glycol (kg) * Ethylene glycol Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)
Other (please specify) (Polycaprolactam)	4.39	Purchased Polycaprolactam (kg) * Polycaprolactam Emission Factor (kgCO2eq /kg, Ministry of Environment LCI DB) / (Category 1 total tCO2e)

C-CH7.8a

(C-CH7.8a) Disclose sales of products that are greenhouse gases.

	Sales, metric tons	Comment
Carbon dioxide (CO2)	0	Hyosung Chemical does not sell carbon dioxide
Methane (CH4)	0	Hyosung Chemical does not sell methane
Nitrous oxide (N2O)	0	Hyosung Chemical does not sell nitrous oxide
Hydrofluorocarbons (HFC)	0	Hyosung Chemical does not sell hydrofluorocarbons
Perfluorocarbons (PFC)	0	Hyosung Chemical does not sell perfluorocarbons
Sulphur hexafluoride (SF6)	0	Hyosung Chemical does not sell sulphur hexafluoride
Nitrogen trifluoride (NF3)	0	Hyosung Chemical sells NEOCHEM, a NF3 product, but the sales volume is not disclosed because it is a business secret

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?

Increased

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 in emissions	Emissions value (percentage)	Please explain calculation
Change in renewable energy consumption	4.5	Increased	0.0005	Change in greenhouse gas emissions caused by changes in renewable energy consumption in 2022 compared to 2021 was caused by a decrease in its own solar power generation. Power generated by solar power decreased by 9.736MWh in 2022, and when multiplied by the national electricity emission factor (0.45941tCO2eq/MWh), greenhouse gas emissions increased by 4.500tCO2eq. Total emissions (Scope1+Scope2) in 2021 are 887,235.025tCO2eq, so the rate of change in emissions is $4.5/887,235.025 \times 100 = 0.0005\%$.
Other emissions reduction activities	292.8	Increased	0.033	Change in greenhouse gas emissions caused by other emissions reduction activities in 2022 compared to 2021 was caused by changes in reduction activities. The greenhouse gas reduction caused by reduction activities in 2022 was 530.000 tCO2eq, which is a decrease of 292.800 tCO2eq in greenhouse gas emissions compared to last year. Total emissions (Scope1+Scope2) in 2021 are 887,235.025 tCO2eq, so the rate of change in emissions is $292.800/887,235.025 \times 100 = 0.0330\%$.
Divestment		<Not Applicable >		
Acquisitions		<Not Applicable >		
Mergers		<Not Applicable >		
Change in output	4532.174	Increased	0.5108	Change in greenhouse gas emissions caused by changes in output in 2022 compared to 2021 was an increase of 4,532.174 tCO2eq. Total emissions (Scope1+Scope2) in 2021 are 887,235.025 tCO2eq, so the rate of change in emissions is $4,532.174/887,235.025 \times 100 = 0.5108\%$.
Change in methodology		<Not Applicable >		
Change in boundary		<Not Applicable >		
Change in physical operating conditions		<Not Applicable >		
Unidentified		<Not Applicable >		
Other		<Not Applicable >		

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	1755632.36	1755632.36
Consumption of purchased or acquired electricity	<Not Applicable>	0	1251340.72	1251340.72
Consumption of purchased or acquired heat	<Not Applicable>	<Not Applicable>	<Not Applicable>	<Not Applicable>
Consumption of purchased or acquired steam	<Not Applicable>	0	126599.17	126599.17
Consumption of purchased or acquired cooling	<Not Applicable>	<Not Applicable>	<Not Applicable>	<Not Applicable>
Consumption of self-generated non-fuel renewable energy	<Not Applicable>	166.9	<Not Applicable>	166.9
Total energy consumption	<Not Applicable>	166.9	3133572.25	3133739.15

C-CH8.2a

(C-CH8.2a) Report your organization's energy consumption totals (excluding feedstocks) for chemical production activities in MWh.

Consumption of fuel (excluding feedstocks)

Heating value

HHV (higher heating value)

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

1746897.65

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

8734.71

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

1755632.36

Consumption of purchased or acquired electricity

Heating value

<Not Applicable>

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

1251340.72

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

1251340.72

Consumption of purchased or acquired steam

Heating value

<Not Applicable>

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

126599.17

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

126599.17

Consumption of self-generated non-fuel renewable energy

Heating value

<Not Applicable>

MWh consumed from renewable sources inside chemical sector boundary

166.9

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

166.9

Total energy consumption

Heating value

<Not Applicable>

MWh consumed from renewable sources inside chemical sector boundary

166.9

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

3124837.53

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

8734.71

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

3133739.15

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

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

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

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

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

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

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

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

Comment

Oil

Heating value

HHV

Total fuel MWh consumed by the organization

2711.61

MWh fuel consumed for self-generation of electricity

3.94

MWh fuel consumed for self-generation of heat

2707.67

MWh fuel consumed for self-generation of steam

0

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

Comment

Gas

Heating value

HHV

Total fuel MWh consumed by the organization

1752920.76

MWh fuel consumed for self-generation of electricity

8734.71

MWh fuel consumed for self-generation of heat

1539686.42

MWh fuel consumed for self-generation of steam

213234.34

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

Comment

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

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

Comment

Total fuel

Heating value

HHV

Total fuel MWh consumed by the organization

1755632.36

MWh fuel consumed for self-generation of electricity

8738.65

MWh fuel consumed for self-generation of heat

1542394.09

MWh fuel consumed for self-generation of steam

213234.34

MWh fuel consumed for self-generation of cooling

<Not Applicable>

MWh fuel consumed for self- cogeneration or self-trigeneration

<Not Applicable>

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	8429.94	8429.94	166.9	166.9
Heat	0	0	0	0
Steam	0	0	0	0
Cooling	0	0	0	0

C-CH8.2d

(C-CH8.2d) Provide details on electricity, heat, steam, and cooling your organization has generated and consumed for chemical production activities.

Electricity

Total gross generation inside chemicals sector boundary (MWh)

8429.94

Generation that is consumed inside chemicals sector boundary (MWh)

8429.94

Generation from renewable sources inside chemical sector boundary (MWh)

166.9

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

8263.04

Heat

Total gross generation inside chemicals sector boundary (MWh)

0

Generation that is consumed inside chemicals sector boundary (MWh)

0

Generation from renewable sources inside chemical sector boundary (MWh)

0

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

0

Steam

Total gross generation inside chemicals sector boundary (MWh)

0

Generation that is consumed inside chemicals sector boundary (MWh)

0

Generation from renewable sources inside chemical sector boundary (MWh)

0

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

0

Cooling

Total gross generation inside chemicals sector boundary (MWh)

0

Generation that is consumed inside chemicals sector boundary (MWh)

0

Generation from renewable sources inside chemical sector boundary (MWh)

0

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

0

C8.2g

(C8.2g) Provide a breakdown by country/area of your non-fuel energy consumption in the reporting year.

Country/area

Republic of Korea

Consumption of purchased electricity (MWh)

1251340.72

Consumption of self-generated electricity (MWh)

8429.94

Is this electricity consumption excluded from your RE100 commitment?

<Not Applicable>

Consumption of purchased heat, steam, and cooling (MWh)

126599.17

Consumption of self-generated heat, steam, and cooling (MWh)

0

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

1386369.83

C-CH8.3

(C-CH8.3) Does your organization consume fuels as feedstocks for chemical production activities?

Yes

C-CH8.3a

(C-CH8.3a) Disclose details on your organization's consumption of fuels as feedstocks for chemical production activities.

Fuels used as feedstocks

Propane liquid

Total consumption

189097

Total consumption unit

metric tons

Inherent carbon dioxide emission factor of feedstock, metric tons CO2 per consumption unit

2.99

Heating value of feedstock, MWh per consumption unit

12.86

Heating value

LHV

Comment

The carbon dioxide emission factor and the heating value of feedstock were calculated using the Tier 2 national heating value and emission factor of Korea's "Guidelines for Reporting and Certification of Emissions of the Greenhouse Gas Emissions Trading System" [Attachment 12].

C-CH8.3b

(C-CH8.3b) State the percentage, by mass, of primary resource from which your chemical feedstocks derive.

	Percentage of total chemical feedstock (%)
Oil	0
Natural Gas	0
Coal	0
Biomass	0
Waste (non-biomass)	0
Fossil fuel (where coal, gas, oil cannot be distinguished)	100
Unknown source or unable to disaggregate	0

C9. Additional metrics

C9.1

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

C-CH9.3a

(C-CH9.3a) Provide details on your organization's chemical products.

Output product

Other, please specify (polypropylene)

Production (metric tons)

608384

Capacity (metric tons)

600000

Direct emissions intensity (metric tons CO2e per metric ton of product)

0.14

Electricity intensity (MWh per metric ton of product)

0.36

Steam intensity (MWh per metric ton of product)

0

Steam/ heat recovered (MWh per metric ton of product)

0

Comment

Output product

Other, please specify (Terephthalic Acid)

Production (metric tons)

401079

Capacity (metric tons)

420000

Direct emissions intensity (metric tons CO2e per metric ton of product)

0.13

Electricity intensity (MWh per metric ton of product)

0.26

Steam intensity (MWh per metric ton of product)

0

Steam/ heat recovered (MWh per metric ton of product)

0

Comment

C-CE9.6/C-CG9.6/C-CH9.6/C-CN9.6/C-CO9.6/C-EU9.6/C-MM9.6/C-OG9.6/C-RE9.6/C-ST9.6/C-TO9.6/C-TS9.6

(C-CE9.6/C-CG9.6/C-CH9.6/C-CN9.6/C-CO9.6/C-EU9.6/C-MM9.6/C-OG9.6/C-RE9.6/C-ST9.6/C-TO9.6/C-TS9.6) Does your organization invest in research and development (R&D) of low-carbon products or services related to your sector activities?

	Investment in low-carbon R&D	Comment
Row 1	Yes	A total of KRW 594 million was invested in R&D for such as product recycling in 2022.

C-CH9.6a

(C-CH9.6a) Provide details of your organization's investments in low-carbon R&D for chemical production activities over the last three years.

Technology area

Unable to disaggregate by technology area

Stage of development in the reporting year

<Not Applicable>

Average % of total R&D investment over the last 3 years

4.74

R&D investment figure in the reporting year (unit currency as selected in C0.4) (optional)

594000000

Average % of total R&D investment planned over the next 5 years

6.89

Explain how your R&D investment in this technology area is aligned with your climate commitments and/or climate transition plan

Hyosung Chemical is a company that produces various chemical raw materials such as engineering plastics, and uses complex processes to produce products and also uses a lot of heat. Therefore, R&D investments are being made in technologies in various areas, such as waste heat recovery for thermal energy efficiency, process step integration to reduce energy use through process efficiency, and production of low-carbon products by product redesign. Hyosung Chemical expects that these investments will reduce its own greenhouse gas emissions and provide customers with greenhouse gas reduction effects in terms of the life cycle, contributing not only to internal climate-related goals but also to global climate transformation.

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

첨부1_ AS_GHG_Hyosung Chemical_EN2022_rev1.1.pdf
AS_GHG_효성화학_KR2022_(최종) 230710.pdf

Page/ section reference

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Relevant standard

Korean GHG and energy target management system

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

첨부1_ AS_GHG_Hyosung Chemical_EN2022_rev1.1.pdf
AS_GHG_효성화학_KR2022_(최종) 230710.pdf

Page/ section reference

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Relevant standard

Korean GHG and energy target management system

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: Upstream transportation and distribution
- Scope 3: Waste generated in operations
- Scope 3: Business travel
- Scope 3: Investments
- Scope 3: Downstream transportation and distribution
- Scope 3: End-of-life treatment of sold products

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

첨부2-2_ AS_GHG_효성화학_En_2022.pdf

Page/section reference

p. 1

Relevant standard

ISO14064-3

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?

Disclosure module verification relates to	Data verified	Verification standard	Please explain
C1. Governance	Other, please specify (The governance structure related to climate change of Hyosung Group and Hyosung Chemical)	AA1000AS(v3), AA1000AP(2018)	Hyosung Chemical officially declared its support for TCFD in October 2022, and in the 2022 Sustainability Report, it specified the governance structure related to climate change in accordance with the TCFD recommendation and received third-party verification.
C2. Risks and opportunities	Other, please specify (The risk management related to climate change of Hyosung Group and Hyosung Chemical)	AA1000AS(v3), AA1000AP(2018)	Hyosung Chemical officially declared its support for TCFD in October 2022, and in the 2022 Sustainability Report, it specified the risk management related to climate change in accordance with the TCFD recommendation and received third-party verification.
C3. Business strategy	Other, please specify (The strategy for responding to climate change of Hyosung Group and Hyosung Chemical)	AA1000AS(v3), AA1000AP(2018)	Hyosung Chemical officially declared its support for TCFD in October 2022, and in the 2022 Sustainability Report, it specified the strategy for responding to climate change in accordance with the TCFD recommendation and received third-party verification.
C4. Targets and performance	Progress against emissions reduction target	AA1000AS(v3), AA1000AP(2018)	Hyosung Chemical officially declared its support for TCFD in October 2022, and in the 2022 Sustainability Report, it specified the reduction target related to climate change in accordance with the TCFD recommendation and received third-party verification.
C5. Emissions performance	Other, please specify (Base year emissions)	ISO14064-3	Hyosung Chemical is a participant in the Korean emissions trading scheme, and the greenhouse gas emissions and energy usage of each business site and emission facility were verified by a third party based on the verification criteria of the Korean emissions trading scheme, following ISO 14064-3.
C6. Emissions data	Year on year change in emissions (Scope 1 and 2)	ISO14064-3	Hyosung Chemical is a participant in the Korean emissions trading scheme, and the greenhouse gas emissions and energy usage of each business site and emission facility were verified by a third party based on the verification criteria of the Korean emissions trading scheme, following ISO 14064-3.
C7. Emissions breakdown	Year on year change in emissions (Scope 1 and 2)	ISO14064-3	Hyosung Chemical is a participant in the Korean emissions trading scheme, and the greenhouse gas emissions and energy usage of each business site and emission facility were verified by a third party based on the verification criteria of the Korean emissions trading scheme, following ISO 14064-3.
C8. Energy	Energy consumption	ISO14064-3	Hyosung Chemical is a participant in the Korean emissions trading scheme, and the greenhouse gas emissions and energy usage of each business site and emission facility were verified by a third party based on the verification criteria of the Korean emissions trading scheme, following ISO 14064-3.

첨부2-2_ AS_GHG_효성화학_En_2022.pdf
 첨부1_ AS_GHG_Hyosung Chemical_EN2022_rev1.1.pdf
 SR_2022_kr.pdf

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

90.59

% of Scope 2 emissions covered by the ETS

100

Period start date

January 1 2022

Period end date

December 31 2022

Allowances allocated

860811

Allowances purchased

1423

Verified Scope 1 emissions in metric tons CO₂e

317185.3

Verified Scope 2 emissions in metric tons CO₂e

547879.19

Details of ownership

Facilities we own and operate

Comment

The free allocation of emission allowances for Hyosung Chemical in 2022 amounted to 860,811 tons for all domestic facilities and emission sources excluding the flare stack. The emissions, excluding the flare stack, were 287,356.943 tons for Scope 1 and 574,879.190 tons for Scope 2. According to the allocation criteria of the emission trading system, the total allocation was 862,233 tons, exceeding the allocated emissions by 1,423 tons. To account for this excess, 1,423 tons of emission allowances were purchased at a price of KRW 10,400 per ton.

However, it should be noted that the total emissions, including the flare stack, were 317,185.309 tons for Scope 1, 574,879.190 tons for Scope 2, and a combined total of 892,064.499 tons. All emission quantities have been verified by third-party without exception. The total emissions were calculated by summing up the Scope 1 and Scope 2 emissions for each facility and rounding the result to the nearest integer. Therefore, there may be discrepancies between the emissions reported for each scope and the total emissions.

C11.1d

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

Hyosung Chemical's response strategy to Korea ETS carbon pricing system is as follows.

1) Establishing strategy for GHG reduction and enhancing governance

Hyosung Chemical made the strategic system for green management to comply with the national NDCs in 2019. And in 2021, the existing greenhouse gas reduction target was raised to the goal of reducing greenhouse gas emissions by 14.5% compared to 2018 by 2030 and the strategic direction was set as the following: 'reduction of greenhouse gas emissions, commercialization of low-carbon technology through development of eco-friendly technology, creation of an eco-friendly corporate culture, and establishment of stakeholder trust through environmental information disclosure '. And it implements company-widely green management in all domestic workplaces. The detailed promotion works include commitment to GHG emission reduction when using products, expansion of recycling and reuse and decline in subsidiary materials use such as water and utility.

2) Monitoring and sharing of K-ETS trends

The green management team of Hyosung Chemical participates in the government's explanation meetings and discussions, meanwhile, and suggests opinions to run ETS smoothly through the industry association. The K-ETS related major contents are reported to the EHS Committee as well as shared with environmental safety teams of each plant.

Hyosung Chemical reports on emissions every year and makes the responding measures after analyzing the allocation deficiency according to the ETS. It also regularly monitors the price trend in the emission market and supports the purchase, if necessary.

3) Implementing GHG reduction activities and measuring performance

Hyosung Chemical established the 2030 GHG reduction plan (14.5 % reduction compared to 2018) to comply with vision for 2030 green management and implements detailed reduction activities to realize it. It monitors the current status of emissions from each plant, specifies the current status and also establishes and implements activity plans for GHG reduction (replacement of facilities, improvement of processes, et cetera).

C11.2

(C11.2) Has your organization canceled any project-based carbon credits within the reporting year?

No

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.

Type of internal carbon price

Shadow price

How the price is determined

Alignment with the price of allowances under an Emissions Trading Scheme

Objective(s) for implementing this internal carbon price

Identify and seize low-carbon opportunities

Scope(s) covered

Scope 1

Scope 2

Pricing approach used – spatial variance

Uniform

Pricing approach used – temporal variance

Evolutionary

Indicate how you expect the price to change over time

Hyosung Chemical is currently included in the 3rd planning period (2021-2025) as a participant in the Korean Emissions Trading Scheme (K-ETS) and is subject to its regulations. Therefore, Hyosung Chemical has set an internal carbon price reflecting the price of the allowances of K-ETS.

To align with the Korean government's strengthened "2030 National Greenhouse Gas Reduction" target and declaration of "2050 Carbon Neutrality," the allocation ratio for paid allowances in the 3rd planning period has been increased from 3% in the 2nd planning period to 10%. It is anticipated that this ratio will be further expanded in the 4th planning period. Consequently, it is expected that the allocated emission allowances for K-ETS participants will become insufficient, leading to a rise in permit prices due to decreased supply.

Actual price(s) used – minimum (currency as specified in C0.4 per metric ton CO2e)

31000

Actual price(s) used – maximum (currency as specified in C0.4 per metric ton CO2e)

31000

Business decision-making processes this internal carbon price is applied to

Capital expenditure

Risk management

Opportunity management

Mandatory enforcement of this internal carbon price within these business decision-making processes

Yes, for all decision-making processes

Explain how this internal carbon price has contributed to the implementation of your organization's climate commitments and/or climate transition plan

Hyosung Chemical aims to reduce risks and capitalize on opportunities in the transition to a low-carbon economy by incorporating an internal carbon price based on greenhouse gas emissions, in addition to traditional cost-benefit analyses. The internal carbon price is actively used as a foundation for strategic decision-making, particularly in evaluating options such as replacing aging facilities, investing in high-efficiency equipment, switching to alternative fuels, and considering new facility investments.

Hyosung Chemical plans to include the internal carbon price in future management planning guidelines, distributing it as part of the overall strategic plan. Additionally, the Strategy Department will announce the carbon price on an annual basis. Through the application of the internal carbon price, we are able to assess the impact of climate change risks and opportunities on the company's financial performance and make predictions regarding costs in the event of a shortfall in emission allowances.

In 2022, internal carbon prices were applied to analyze the possibility of introducing greenhouse gas and energy reduction activities at each workplace, and reduction measures with practical reduction effects and appropriate recovery periods were introduced. Three reduction activities related to operation optimization were completed at the Optical Oksan plant, KRW 600 million was invested to the PP/DH Yongyeon plant for the recovery of raw materials for the recovery process, and KRW 24 million was invested to improving the operation efficiency of the Optical Yongyeon plant and KRW 75 million was invested in management of load of the freezer. And KRW 40 million was invested in pump inverter installation at the Film Gumi plant, and power consumption reduction through load control is being tested at the Neochem plant. Accordingly, GHG emissions and energy costs could be reduced through each reduction activity, and KRW 558 million of energy costs and 530 tCO2eq of GHG reduction effects were derived annually through three cases related to optimizing the operation of the Optical Oksan plant. And it is expected to reduce greenhouse gas emissions by 1,591 tCO2eq and costs by about KRW 50 million per year through the initiatives such as PP/DH Yongyeon plant raw material recovery process and optical Yongyeon plant operation efficiency improvement.

C12. Engagement

C12.1

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

Yes, our suppliers

Yes, our customers/clients

C12.1a

(C12.1a) Provide details of your climate-related supplier engagement strategy.

Type of engagement

Engagement & incentivization (changing supplier behavior)

Details of engagement

Climate change performance is featured in supplier awards scheme

% of suppliers by number

5.37

% total procurement spend (direct and indirect)

1.47

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

Rationale for the coverage of your engagement

Hyosung Chemical's partners include suppliers of raw materials for chemical production, packaging materials for chemical products, and suppliers of auxiliary materials. To address the climate change crisis beyond its organizational boundaries and throughout the value chain, Hyosung Chemical has incorporated ESG-related compliance obligations into the supplier contract conditions. Among the raw material suppliers, Hyosung Chemical has selected suppliers for social responsibility management diagnosis based on the consideration of the purchase amount and impact. In 2022, the selected suppliers accounted for 1.47% of the total procurement cost and represented 40 out of 745 total suppliers, which is approximately 5.37%. These suppliers were subjected to the diagnosis process.

Impact of engagement, including measures of success

The criteria for measuring the success of supplier engagement at Hyosung Chemical is based on the social responsibility management diagnosis. The number of selected excellent suppliers that meet the internal climate change-related conditions at Hyosung Chemical is considered the measure of success. The target is to achieve more than 50 excellent supplier designations by 2025. In the evaluation results for 2022, a total of 40 suppliers were selected. To achieve the supplier engagement target by 2025, an annual budget of approximately 25 billion Korean won has been allocated.

Hyosung Chemical provides an opportunity for suppliers to assess their sustainability and reduce risks through the annual social responsibility management diagnosis. The evaluation, conducted annually for the suppliers, consists of six parts. In the environmental part, compliance with energy sources, environmental practices, and waste management activities are assessed. After document evaluation, on-site inspections are conducted to verify the facts and provide bonus points in the supplier evaluation. When excellent suppliers are selected based on the evaluation by the procurement team, improvement in payment terms is implemented, and monetary rewards are given for outstanding supplier awards. In 2022, an energy partnership project was conducted with one supplier, resulting in the identification of four improvement measures through benchmarking, technical education, and on-site assessments. These measures yielded energy savings of 53.68 toe and greenhouse gas reductions of 107.69 tCO₂eq, representing the potential for emissions reduction.

Comment

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)
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% of customers by number

3.1

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

1.87

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

Due to climate change and changes in consumer behavior, customers of Hyosung Chemical are requesting the development of environmentally friendly materials and low-carbon products, as well as the disclosure of climate change-related information. Considering the business impact, Hyosung Chemical has selected these customers as targets for engagement. In 2022, out of the total number of customers, which is 1,385 companies, Hyosung Chemical responded to ESG information requests from 11 companies, including LG Display and 3M Korea. For POK customers, which is 28 companies, carbon emission information was provided, and for FILM customers, which is 44, information was shared after obtaining EcoVadis certifications. As a result, information on products and related certifications was shared with a total of 43 companies, representing 3.10% of the customer base.

Impact of engagement, including measures of success

The criteria for measuring the success of customer engagement at Hyosung Chemical is based on the response rate to climate change-related information requests from customers, and achieving a 100% response rate is considered successful. In 2022, Hyosung Chemical achieved a 100% response rate to 15 ESG information requests from 14 companies, including LG Display and 3M Korea, as part of ESG supply chain evaluations. Furthermore, Hyosung Chemical provided Life cycle carbon emission information for POK customers, totaling 28 companies, with a 100% response rate. In addition, to address the requests from customers in each business unit, Hyosung Chemical obtained a new evaluation for EcoVadis certification in April 2022, achieving a Silver medal rating, and also conducted GRS and RCS certifications. Through customer engagement targeting ESG information requests, Hyosung Chemical was able to maintain ongoing collaborative relationships with these customers. Particularly, for the low-carbon product POK, which sold 18,000 tons in 2022, applying an emission avoidance rate of 3.62 CO₂eq/ton would result in a reduction of 65,160 tons of greenhouse gas emissions in customer Scope 3 emissions.

C12.2

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

Yes, climate-related requirements are included in our supplier contracts

C12.2a

(C12.2a) Provide details of the climate-related requirements that suppliers have to meet as part of your organization's purchasing process and the compliance mechanisms in place.

Climate-related requirement

Complying with regulatory requirements

Description of this climate related requirement

Hyosung Chemical, through its Supplier Code of Conduct policy, ensures that all collaborating suppliers who engage with Hyosung Chemical uphold their social responsibilities, aiming to become a trusted company by the public. When progressing purchasing contracts with suppliers, Hyosung Chemical requires a commitment to comply with the Supplier Code of Conduct.

The Supplier Code of Conduct includes various aspects such as ethical management, human rights and labor, safety and health, as well as environmental standards. The environmental standards pledge that suppliers meet the environmental criteria for all products and services provided, while minimizing environmental impact. The specific implementation measures are as follows:

1. Comply with all mandatory legal permits and stay updated on the latest regulatory revisions.
2. Make efforts to reduce the use of resources and energy in the processes.
3. Thoroughly manage hazardous substances that may be harmful to human health or the environment.
4. Manage air pollutants emitted from the processes and maintain preventive facilities.
5. Minimize water usage in the processes and manage discharge within the set limits.

% suppliers by procurement spend that have to comply with this climate-related requirement

99.39

% suppliers by procurement spend in compliance with this climate-related requirement

99.39

Mechanisms for monitoring compliance with this climate-related requirement

Supplier scorecard or rating

Response to supplier non-compliance with this climate-related requirement

Suspend and engage

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

External engagement activities that could directly or indirectly 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)

SR_2022_kr.pdf

Describe the process(es) your organization has in place to ensure that your external engagement activities are consistent with your climate commitments and/or climate transition plan

In order to respond to K-ETS efficiently, Hyosung Chemical has strengthened the cooperation with the government and supply networks, customer companies in the entire value chain.

To achieve the government's greenhouse gas reduction goals, it is necessary to continuously improve the efficiency of the Korean Emissions Trading Scheme (K-ETS). Hyosung Chemical actively participates in the activity data survey and public hearings conducted by the government to develop a new methodology for allocating Benchmark (BM) allowances in the upcoming 4th planning period. Hyosung Chemical's participation aims to contribute to the establishment of BM allocation coefficients and ensure that the allocation methodology is effectively designed.

Internally, Hyosung Chemical establishes strategies for GHG reduction and enhances governance by monitoring K-ETS trends and each part implements activities for GHG reduction. As the climate change related risk management of the networks gets more important, it adds the item such as energy use and recycling waste in the environment part of the assessment of cooperative companies and gives additional points to those companies who reinforce their ability of climate change through the assessment. It annually provides the reliable information based on the PAS 2050 as film customers demand for the information on carbon emissions by a product unit and participates in EcoVadis program to answer sincerely.

The results of the above activities are reflected in Hyosung Chemical's climate change response strategy, and in 2021, to meet the industrial sector target of the Nationally Determined Contributions (NDC), the greenhouse gas quantitative target of 'Green Management Vision 2030' was updated from 20.5% emission reduction compared to 2017, to 14.5% compared to 2018. The engagement activity with the government, supply networks and customers is a crucial factor for the green management of Hyosung Chemical so that Hyosung Chemical reflects them in the internal green management depending on changes in policies and markets.

Primary reason for not engaging in activities that could directly or indirectly influence policy, law, or regulation that may impact the climate

<Not Applicable>

Explain why your organization does not engage in activities that could directly or indirectly influence policy, law, or regulation that may impact the climate

<Not Applicable>

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?

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

Emission trading schemes

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

Carbon pricing, taxes, and subsidies

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

Emissions trading schemes

Policy, law, or regulation geographic coverage

National

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

Republic of Korea

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

Support with no exceptions

Description of engagement with policy makers

Hyosung Chemical supports national greenhouse gas reduction plans and the greenhouse gas reduction policy through emissions trading. As a producer of polypropylene (PP) within the petrochemical industry, Hyosung Chemical is included within the scope of the new Benchmark (BM) allocation targets being prepared for the 4th planning period of the Korean Emissions Trading Scheme. In line with this, activities such as data surveys and public hearings are being conducted to establish a new methodology for BM allocation. Hyosung Chemical actively participates in all relevant surveys and public hearings to contribute to the determination of BM allocation coefficients.

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

<Not Applicable>

Have you evaluated whether your organization's engagement on this policy, law, or regulation is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Please explain whether this policy, law or regulation is central to the achievement of your climate transition plan and, if so, how?

<Not Applicable>

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 mainstream reports

Status

Complete

Attach the document

[효성화학]사업보고서(2023.03.09).pdf

Page/Section reference

P. 259~261

Content elements

Strategy

Emissions figures

Comment

Publication

In voluntary sustainability report

Status

Complete

Attach the document

SR_2022_kr.pdf

Page/Section reference

P. 20~25

Content elements

Governance

Strategy

Risks & opportunities

Emissions figures

Emission targets

Comment

C12.5

(C12.5) Indicate the collaborative frameworks, initiatives and/or commitments related to environmental issues for which you are a signatory/member.

	Environmental collaborative framework, initiative and/or commitment	Describe your organization's role within each framework, initiative and/or commitment
Row 1	Task Force on Climate-related Financial Disclosures (TCFD) UN Global Compact	<p>The UNGC (United Nations Global Compact) is an international initiative under the auspices of the UN Secretary-General. It encourages businesses to internalize the ten principles in the areas of human rights, labor, environment, and anti-corruption as core values within their operations and business strategies, thereby promoting sustainable management and enhancing corporate citizenship. The UNGC also plays a role in managing and advancing sustainable business practices.</p> <p>By joining the UNGC, Hyosung Chemical gains access to the latest trends and information related to the UNGC and sustainable management. It can receive invitations to SDGs (Sustainable Development Goals) programs focusing on human rights, labor, environment, anti-corruption, and more. Additionally, Hyosung Chemical can benefit from employee capacity building and training, guidelines for CSR (Corporate Social Responsibility) in global supply chains and procurement markets. As a member, the company is also obligated to submit an annual Communication on Progress (COP) report to fulfill its responsibilities.</p> <p>TCFD is a credible global framework supported by government agencies, financial institutions and companies that provides recommendations for the disclosure of information on climate change. Hyosung Chemical supports TCFD and its recommendations and seeks to increase transparency in climate-related risks and opportunities by publicly declaring support for TCFD.</p>

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	Description of oversight and objectives relating to biodiversity	Scope of board-level oversight
Row 1	No, but we plan to have both within the next two years	<Not Applicable>	<Not Applicable>

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	Biodiversity-related public commitments	Initiatives endorsed
Row 1	Yes, we have made public commitments only	Commitment to avoidance of negative impacts on threatened and protected species	<Not Applicable>

C15.3

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

Impacts on biodiversity

Indicate whether your organization undertakes this type of assessment

No, but we plan to within the next two years

Value chain stage(s) covered

<Not Applicable>

Portfolio activity

<Not Applicable>

Tools and methods to assess impacts and/or dependencies on biodiversity

<Not Applicable>

Please explain how the tools and methods are implemented and provide an indication of the associated outcome(s)

<Not Applicable>

Dependencies on biodiversity

Indicate whether your organization undertakes this type of assessment

No, but we plan to within the next two years

Value chain stage(s) covered

<Not Applicable>

Portfolio activity

<Not Applicable>

Tools and methods to assess impacts and/or dependencies on biodiversity

<Not Applicable>

Please explain how the tools and methods are implemented and provide an indication of the associated outcome(s)

<Not Applicable>

C15.4

(C15.4) Does your organization have activities located in or near to biodiversity- sensitive areas in the reporting year?

No

C15.5

(C15.5) 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?	Type of action taken to progress biodiversity- related commitments
Row 1	Yes, we are taking actions to progress our biodiversity-related commitments	Species management Education & awareness

C15.6

(C15.6) 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	Please select

C15.7

(C15.7) 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	Content of biodiversity-related policies or commitments	p. 17, 50 SR_2022_kr.pdf

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 & President, Hyosung Chemical Corp.	Chief Executive Officer (CEO)

SC. Supply chain module

SC0.0

(SC0.0) If you would like to do so, please provide a separate introduction to this module.

SC0.1