

Welcome to your CDP Climate Change Questionnaire 2022

C0. Introduction

C0.1

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

Hyosung Advanced Materials Co., Ltd. (hereinafter HAMC) originated from the industrial yarn business of Donyang Nylon and Dongyang Polyester. HAMC started producing Korea's first nylon Tirecord as a business unit of Hyosung Group. HAMC was spun off from Hyosung Corporation as an independent corporation on June 1st, 2018. We have expanded our business to include high-strength technical yarn and textiles, and steel wire materials. HAMC's headquarters is in Mapo, Seoul, Korea with production sites in Ulsan, Jeonju, and Daejeon. As of 2021, HAMC employs a total of 955 employees with a revenue of 963.3 billion KRW(separate financial statements).

-Business Areas

In the polyester Tirecord sector, one out of two passenger cars in the world uses Tirecord produced by HAMC, demonstrating our unrivalled position in the sector. Our products are recognized as the world's best quality, and we provide various industrial materials ranging from high-performance carbon fiber successfully commercialized for the first time in Korea, industrial yarn, carpet, airbag fabric, and aramid yarn used in bulletproof vests. In particular, HAMC supplies global No.1 products such as Tirecord, seatbelt yarn, airbag fabric while developing and commercializing new materials that will lead sustainable growth.

-Climate Change Strategy

In 2021, Korea's 'FRAMEWORK ACT ON CARBON NEUTRALITY AND GREEN GROWTH FOR COPING WITH CLIMATE CRISIS(hereinafter the Carbon Neutrality Act)' was enacted in accordance with the 2050 Carbon Neutrality policy of the Republic of Korea. It was decided to significantly raise the Nationally Determined Contribution (hereinafter NDC) until 2030 from 26.3% to 40% reduction compared to 2018. (NDC of HAMC's industrial sector increased from 6.4% to 14.5%) Accordingly, HAMC has revised its 'Vision 2030' GHGs reduction target to 24.9% until 2030 compared to 2017 in line with the national industrial sector reduction goal. Especially, in 2022, HAMC newly set a target to reduce 16.02% of Scope 3 by 2030 compared to 2021 at all domestic sites. Accordingly, we have newly established a GHGs reduction plan for each business area, and applied an internal carbon price and execute reduction projects every year in order to meet the shortfall compared to the GHGs allocation under the Korea Emissions Trading System(hereinafter K-ETS). HAMC is a participant of the K-ETS, and is obligated to report GHGs emissions every year. Hyosung Chemical Fibers(Jiaxing) Co., Ltd., a subsidiary of HAMC, is voluntarily calculating greenhouse gas emissions in accordance with the Chinese government-led greenhouse gas emission management and reporting to the Chinese government from 2021. HAMC has been asked to participate in SBTi from various stakeholders due to changes in perceptions and requirements related to climate change response. In response, HAMC is in the course of verifying Scope 1, 2 and 3 emissions of all sites completing its GHGs inventory by 2022. In addition, in the second half of 2021, the CEO reported to the Board of Directors regarding Science-Based Target (hereinafter SBT) setting at the company level in 2023. HAMC will continue to make efforts to respond to climate change and have our SBT approved by SBTi in 2024.

-Sustainability Strategy

HAMC continues various activities to realize Creating Social Eco-system (hereinafter CSE) that enhance human sustainability through three green management goals: 'Zero Emission', 'Zero Waste' and 'Zero Impact'. We are constantly researching ways to develop lightweight products with high-strength properties that increase fuel efficiency of automobiles so that we can contribute to reducing GHGs and energy use in the mobility industry. HAMC identifies environmental impact of production across all stages – from procurement of raw materials, production, logistics, product usage and its disposal (Life Cycle Assessment, hereinafter LCA) and tries to minimize any negative impact. We will keep developing new measures that contribute to impact mitigation, and extend the scope of the existing improvement activities in order to respond to the needs of various stakeholders.

C0.2

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

	Start date	End date	Indicate if you are providing emissions data for past reporting years	Select the number of past reporting years you will be providing emissions data for
Reporting year	January 1, 2021	December 31, 2021	Yes	1 year

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

Polymers

Bulk inorganic chemicals

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	KR7004800009
Yes, a Ticker symbol	298050
Yes, another unique identifier, please specify D-U-N-S ® Number	695070923
Yes, another unique identifier, please specify LEI	988400AB2I8GPHXE0685
Yes, another unique identifier, please specify FIGI ID	(FIGI ID) BBG00JNJFSV9

C1. Governance

C1.1

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

Yes

C1.1a

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

Position of individual(s)	Please explain
Chief Executive Officer (CEO)	<p>The BOD is the highest governance body of HAMC, and consists of 5 directors in 2021. The Chief Executive Officer(hereinafter CEO), who is the Chairman of the BOD, also has the responsibilities of the Chairman of the Sustainability Steering Committee(hereinafter SSC), which is in charge of practical issues related to climate change. In other words, the CEO, as Chairman of the BOD and Chairman of the SSC, has final decision-making authority and responsibility to oversee strategic approaches to climate change response, minimize climate change risks and maximize opportunities. As the HAMC's highest governance body, the BOD discusses and votes on direct and indirect climate-related issues at least 4 times a year. The CEO has the authority to set sustainability management goals, secure new growth engines to respond to short/mid/long-term climate change, and make the final decision on new business investment.</p> <p>1.Voting for SBT setting by 2022(June 2021) and Voting for participating in SBTi by 2024(December 2021): HAMC received a request to participate in SBTi from our customer Michelin in February 2021. The sustainability management team reviewed and report to the CEO through the SSC in June 2021, the necessity for SBTi participation and building GHGs inventory in order to set a company-wide SBT. In July 2021, the BOD finally approved the investment of 35.16 million KRW according to the decision to participate in SBTi. Final approval contents by the BOD: By 2022, secure verified Scope 1, 2, and 3 emissions of all production facilities and complete the establishment of a greenhouse gas inventory system. In 2023, HAMC is going to set a company-wide SBT that limits the global temperature rise to within 1.5°C. Our target is to have our SBT approved by SBTi by 2024. As a result, the project for SBT setting in which all employees</p>

participate, was started from the end of 2021. The difficulty of climate change response-related agendas decided by the BOD is increasing.

2.Voting for implementation of using an internal price on carbon(October 2021): HAMC has set internal carbon price so that it can be used as a basis for judgment when making strategic decisions such as investment in energy facilities and expansion of new business sites. By doing so, we can reduce the risks and use them as opportunities in the process of transitioning to a low-carbon economy.

C1.1b

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

Frequency with which climate-related issues are a scheduled agenda item	Governance mechanisms into which climate-related issues are integrated	Please explain
Scheduled – some meetings	Reviewing and guiding strategy Reviewing and guiding major plans of action Reviewing and guiding annual budgets Reviewing and guiding business plans Overseeing major capital expenditures, acquisitions and divestitures	In accordance to the HAMC BOD Operation Policy article 6, regular meeting is held at least once each quarter, while temporary meetings are convened occasionally when necessary. Sustainability management agendas, including climate change response, are reported, and voted on. In particular, the BOD has the authority to make final decision on approval of new growth engines and financial investments for responding to climate change. In 2021, a total of 5 BOD meetings were held. 1. In October 2021, the sustainability management team and business management team reported to the Board the expected GHGs emissions and shortages/overflow in 2021. They also reported the revenue from sale of carbon credit through K-ETS. (Total revenue of 343.6 million KRW from the sale of 1.72 million tonCO2eq carbon credits) As it was the first year of the 3rd planning period of the K-ETS, the BOD provided guidance on the overall direction of K-ETS response and major action plans for this period. 2. In December 2021, the BOD received a report on investments being made to reduce energy use. The head of Hyosung Chemical Fibers(Jiaying) Co., Ltd., a subsidiary of HAMC, and GST Global President reported the investment made(equivalent to 6,951 million KRW) in 2021. In particular, they reported the reason for exceeding the planned budget for this energy transition to which the BOD reviewed its adequacy gave guidelines. (Details of this meeting: Status of major investment performances such as additional installation of ESS and photovoltaic equipment, new facilities to improve energy efficiency, and emissions of fossil fuel management system. The BOD reviewed the budget and actual spending for the investment and provided guidelines.)

C1.1d

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

Board member(s) have competence on climate-related issues	Criteria used to assess competence of board member(s) on climate-related issues

Row 1	Yes	<p>The top most business expert of the company assumes the role of CEO and participates in the BOD as the chairman. In order to represent various stakeholders, the board is composed of outside directors with experience in various specialized fields such as accounting, law, and science so that the BOD is not biased against a specific background.</p> <p>In accordance with the 'Operation Principles and Rules of the BOD & its Sub-committees, HAMC's Articles of association, and the 'Principles of Non-executive Director Candidate Recommendation Committee', BOD possesses knowledge and experience to make substantial contribution to corporate management. A distinguished outside director from the Department of Biochemical Engineering at KAIST is a specialist with competency and expertise and responsibility in climate change and biodiversity related issues regarding businesses of HAMC. In addition, his expertise for climate change and biodiversity-related issues is annually evaluated by the Audit Committee in accordance with paragraph 6-2 of Core Principles among the evaluation criteria for outside director activities as per the 'Operation Principles and Rules of the BOD & its Sub-committees HAMC Articles of association'. He is a bio-system engineer who developed the world's first technology to generate bio-degradable plastics from microorganisms. He advised HAMC to develop technology to respond to climate change through bio-degradable plastics which might help HAMC's biodegradable carpet production. He has the expertise to discuss HAMC's countermeasures against problems such as environmental pollution and eco-system destruction caused by waste plastics, health threats, and biodiversity because of food shortage.</p> <p>Reference. His study findings were published in a journal, PNAS as "Three-dimensional label-free visualization and quantification of polyhydroxyalkanoates in individual bacterial cell in its native state"</p>
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C1.2

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

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

C1.2a

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

The SSC is an organization under the BOD, and has the authority to approve action plans and monitor its status as well as make decisions on or key issues across sustainability management agendas, including climate change. The SSC is a committee consisting of a total of 12 people including the CEO, CSO, CFO, CAO, and the top management of each business area. Matters to be reflected in management plans, such as company-wide R&D strategy, technology and

equipment investment, and other environmental and climate change-related policies, are subject to the SSC's deliberation.

In December 2021, the SSC voted on the revision of HAMC's 'Vision 2030' GHGs reduction target in line with the national industrial sector reduction goal(24.9% reduction until 2030 compared to 2017). This was because in 2021, Korea's 'Carbon Neutrality Act' was enacted in accordance with the 2050 Carbon Neutrality policy of the Republic of Korea. It was decided to significantly raise the NDC until 2030 from 26.3% to 40% reduction compared to 2018. Accordingly the NDC of HAMC's industrial sector increased from 6.4% to 14.5%. Also the SSC voted in July 2021 to calculate LCA-based carbon emission information for all major products(i.e. Steelcord, carpets, airbag), which resulted in an investment of 340.2 million KRW for emission calculation and third party certification.

HAMC's Green Management Committee(hereinafter GMC) is chaired by the Chief Technical Officer/Chief Product Officer(hereinafter CTO/CPO). In order to continuously promote environmental safety management including climate change-related issues, the GMC is composed of people in charge of environmental safety and energy from various sectors - sustainability management team, business management team, environmental safety teams, power teams, and production management teams of each plant.

The GMC is a subcommittee of the SCC under the BOD and is a practical expert committee on climate change response, and is held regularly at least twice a year. The GMC monitors the annual GHGs reduction performance in accordance with the 'Vision 2030' reduction target and devises and promotes ways to substantially reduce energy use in the process. In addition, the sustainability management team and business management team regularly monitor the excess and shortage of GHGs and report to the GMC to handle related risks. Also, they respond to stakeholders' climate change-related requests.

The CTO/CPO, who is the chairman of GMC, is the chief engineer related to the business. Therefore he is capable to make practical approaches to minimize the impact of climate change-related risks related to our production. He can, through the GMC, respond to climate risks in a timely and efficient manner and with comprehensiveness. In order for the CTO/CPO to do this job, he has been given the decision-making authority to review agendas such as environmental impact reduction including response to climate change, eco-friendly activities, and etc. so that he and the GMC can manage climate change opportunities and implement HAMC climate strategies.

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	Please refer to C1.3a for details.

C1.3a

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

Entitled to incentive	Type of incentive	Activity incentivized	Comment
Other C-Suite Officer	Monetary reward	Energy reduction target	The CPO/CTO's KPIs (both performance and goals) include climate change factors such as energy usage and savings, GHGs emissions and reduction, and the completion rate of SBT setting project progress. His/her monetary incentive is determined depending on

			whether the goals are achieved. The incentive payment ratio is confidential and cannot be disclosed.
Management group	Monetary reward	Energy reduction target	For energy reduction that are controllable at production line-level, related KPIs are set in the plant managers' evaluation. We provide financial incentives as bonuses according to KPI achievement. In case of insufficient performance, the incentive payment ratio may decrease. The incentive payment ratio is confidential and cannot be disclosed.
Environment/Sustainability manager	Monetary reward	Energy reduction target	Environment/Sustainability managers at Sustainability Management or Business Management Teams are responsible for setting/monitoring of emission and energy reduction targets according to the K-ETS's 3rd period or SBT. The annual emission reduction target is included in their KPI. We provide financial incentives through salaries according to KPI achievement. In case of insufficient performance, the incentive payment ratio may decrease. The incentive payment ratio is confidential and cannot be disclosed.
Other, please specify Energy & Utility Teams at each plant	Monetary reward	Energy reduction project Energy reduction target Efficiency project Efficiency target	All the executives and employees of the Power Team and Production Support Team have set energy consumption & reduction, energy efficiency improvement rate, etc. as climate change-related KPIs. They are evaluated on their performance in relation to each KPI goal. We provide financial incentives through salaries according to KPI achievement. In case of insufficient performance, the incentive payment ratio may decrease. The incentive payment ratio is confidential and cannot be disclosed.
Chief Sustainability Officer (CSO)	Monetary reward	Energy reduction target	The CSO has set KPIs such as the result of 3rd party ESG evaluation, management rate of green management indicators, corporate greenhouse gas reduction rate, and the number of strategic CSR activities related to biodiversity. We provide financial incentives (biannual bonus) according to KPI achievement. In case of insufficient performance, the incentive payment ratio may decrease. The incentive payment ratio is confidential and cannot be disclosed.
All employees	Monetary reward	Energy reduction project	All employees can participate in an in-house contest for energy saving and greenhouse gas reduction ideas to achieve 'Vision 2030'. All executives and employees who applied for the in-house contest will receive a pre-determined prize, and the winners will receive monetary prizes - Grand prize (1st place) 10 million KRW, 1st Runner-up 5 million KRW, 2nd Runner-up 2 million KRW, and 3rd Runner-up 300,000 KRW.

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	
Medium-term	3	5	
Long-term	5	10	

C2.1b

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

In accordance to the financial impact to business and projects, each relative C-level executive is given responsibility and authority to determine the impact to climate change in order to take full advantage of the opportunities. Through this system, HAMC is managing the impact of climate change-related risks and opportunities on business strategy and finance in an integrated way. In order to identify risks and opportunities related to climate change, the Risk Management Committee(hereinafter RMC), chaired by the CSO, has overall responsibility and authority on the company-level. The RMC receive the results of climate change-related data collection and analysis from internal and external sources to monitor the business units' response to climate change-related issues. The identified climate change-related risks and opportunities, after thorough a materiality evaluation, is reported to the CEO, after which the risks and opportunities of the prime importance are decided by the CEO and BOD.

There are three criteria used to identify and evaluate climate change-related risks and opportunities according to the 'Risk Management Manual' and the 'Stakeholder Risk Management Standards'. The three criteria are ①Expected impact (positive or negative) according to the requirements, ②Probability of realization (measurement of probability based on period of time, frequency, likelihood, and consent by related employees), and ③Severity (evaluated into 5 grades for each category - production, quality, gaining customer, customer continuity, customer claim, customer loss, financial damages, business continuity, finance, regulation, enterprise image, safety, environment, and biodiversity). In particular, in terms of the chance of realization, if it is realized within 6 months, predicted to occur at least once a month, and the probability of occurrence is 80% or more and 80% or more of the related employees agree, it is classified as 'very high'.

Results evaluated according to these three criteria are regularly monitored according to the countermeasures, action, reporting, management, and supervision process (refer to C2.2 for details)'. In addition, the annual budget is planned in consideration of pre and post physical and transitional climate change-related risks and opportunities, and is reported, approved, and voted by the BOD, SSC, GMC, and RMC in accordance to importance.

When risks and opportunities are identified and evaluated in advance, the importance of financial impact is classified as low, medium, and high. The importance varies depending on the extent to which the cost is incurred, in the cases of less than 500 million KRW(low), between 500 million KRW and 1 billion KRW(medium), and over 1 billion KRW(high).

When evaluating risks and opportunities after they occur, the importance varies depending on the extent to which the cost is incurred. In cases of less than 100 million KRW(low), 100 million to 500 million KRW(medium), 500 million to 1 billion KRW(medium-high), and more than 1 billion KRW(high). HAMC judges that the financial impact is the greatest when expenses of more than 1 billion KRW are incurred both pre and post. Furthermore, if there is a change of 100%, 50%, 30%, 10%, or more than 5% of the previous year's operating profit in the relevant business unit(hereinafter PU), it is essential that the PU establishes and implements strategies and plans to deal with the risks and opportunities. The adequacy of the strategy is determined in accordance to the importance - 'low' is decided by the head of PU, 'medium' and 'medium-high' are decided by the CEO, and 'high' is decided by the BOD.

The minimum standard for financial impact, 500 million KRW, is 1.5% of the average monthly operating profit based on the previous year's consolidated financial statements, which follow the items of acquisition and disposal of assets according to HAMC's 'Standard Power of Attorney and Authority for Decision'.

In response to customer need changes and demands for eco-friendly products in 2021, the sustainability management team identified and evaluated post-risk after recognizing that lack of ability to calculate LCA-based carbon emission information of major products was a climate change-related risk factor. Upon the report of the sustainability management team to the SSC regarding this issue, the SSC voted to have all key products' LCA-base carbon emission calculated and verified in July 2021.

In the second half of 2021, the SSC voted to conduct GHGs inventory for all sites to prepare SBTi approval of our reduction target. The investment for this was voted by the board because it had a 'medium' financial impact to build GHGs inventory for all business sites(340 million KRW), and it is expected that there will be a change of more than 10% in the future sales.

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

-process for identifying, assessing, and responding to climate-related risks and opportunities

All employees regularly review climate-related risks and opportunities in connection with business and reports the results to the CEO and PU presidents. We manage the entire value chain, including up-stream and down-stream, and check the response guidelines and readiness status, including partner companies, in particular for physical risks such as typhoons and heavy rain. In accordance with the 'Risk Management Operation Manual', we identify

risks and opportunities that may affect management in advance, take action, and systematically establish work procedures to prevent recurrence and minimize damage through timely responses in the event of risk occurrence.

① Understanding the situation: All teams, including the strategic planning team responsible for company-wide strategy, planning management team that manages the business planning of the PU, and sustainability management team supporting sustainable activities, identify both internal and external climate change-related risks and opportunities. After classification according to the requirements of various stakeholders, all of employees analyse with macro-environment, 3C, and SWOT methods. At this time, they consider internal issues, Voice of Customer (hereinafter VOC), Voice of Customer's Customer (hereinafter VOCC) and corrective actions, minutes of inter-departmental meetings, organizational changes, status of index and target management in the previous year, and strategic direction of the business.

② Identification and evaluation risks and opportunities according to three criteria explained in C2.1b: When evaluating risks and opportunities after they occur, the importance varies depending on the extent to which the cost is incurred, in the cases of less than 100 million KRW(low), 100 million to 500 million KRW(medium), 500 million to 1 billion KRW(medium-high), and more than 1 billion KRW(high). HAMC judges that the financial impact is the greatest when expenses of more than 1 billion KRW are incurred both pre and post. Furthermore, if there is a change of 100%, 50%, 30%, 10%, or more than 5% of the previous year's operating profit in the relevant PU, it is essential that the PU establishes and implements strategies and plans to deal with the risks and opportunities. The adequacy of the strategy is determined in accordance to the importance - 'low' is decided by the head of PU, 'medium' and 'medium-high' are decided by the CEO, and 'high' is decided by BOD. The minimum standard for financial impact, 500 million KRW, is 1.5% of the average monthly operating profit based on the previous year's consolidated financial statements, which follow the items of acquisition and disposal of assets according to HAMC's 'Standard Power of Attorney and Authority for Decision'.

③ Measures (establish specific plans: avoidance, elimination, change of likelihood or result, sharing, maintenance, supervision, adopting new improvement measures, launching new product, developing new markets, satisfying stakeholders): The person in charge, completion time, and outcome are mutually defined for the actions plan, and the sustainability management team periodically checks whether the actions are implemented.

④ Reporting and Management: Risks and opportunities with high priority are reported to the CEO who is the Chairman of the BOD and SSC, CTO/CPO who is the Chairman of the GMC, and CSO who is the Chairman of the RMC, so that they manage and supervise the risks and opportunities appropriately. In particular, it is evaluated by the GMC, RMC, and SSC whether the reported actions have been achieved. Changes and important details of climate change-related risks and opportunities management system are reported to the BOD through the CEO, who is the Chairman of the SSC.

-Direct operation case: In order to preemptively prepare for frequent localized heavy rains and typhoons due to global warming, HAMC is inspecting and maintaining facilities. In particular, Ulsan, Jeonju, and Daejeon conduct regular maintenance work to prevent damage to production facilities due to heavy rains and typhoons and malfunctions caused by water leakage. In 2021, the plants invested 0.57 billion KRW to minimize the related damage. Its financial impact was 'high', which was decided after reporting to the CEO and BOD.

-Upstream case: Stakeholder needs for materials that increase fuel efficiency of automobiles is increasing. Therefore, HAMC is constantly researching ways to develop sustainable materials - technical and lightweight products with high-strength properties that contribute to reducing GHGs and energy use in the mobility industry. The financial impact was found to be 'medium-high', and we took immediate actions to manage the supply chain by updating our Sustainable Procurement Policy and Sustainable Green Procurement Policy. In addition, we drew supplier lists which have eco-friendly certifications such as GRS, ISCC, low-carbon product, and etc. and made action plans for joint development with suppliers to produce sustainable materials in order for material conversion. Prototypes with sustainable raw materials have been evaluated for usability by our customers such as Michelin and Bridgestone in the 4Q 2021. HAMC is providing eco-friendly and competitive materials and solutions to our stakeholders.

-Downstream case: Sales teams and TMs of each business unit collect market and customer needs data through

regular customer-HAMC technical meetings and R&D meetings. HAMC received a request to participate in SBTi from our customer Michelin in February 2021. Accordingly, the sales team, TM, and sustainability management team recognized the state of no SBT in our plan as a risk, and identified and performed risk evaluation in advance. The financial impact was determined to be 'medium-high', and they reported to the GMC, SSC, and BOD. The SSC and BOD voted for SBT setting by 2022 and participating in SBTi by 2024. We are running a step-by-step tasks for setting up SBT. Setting SBT and was decided on it, and step-by-step work is being carried out to set SBT. In July 2021, the BOD finally approved the investment of 35.16 million won according to the decision to participate in SBTi. Also, project for SBT setting in which all employees participate, was started from the end of 2021. The process of assessing climate-related risks has enabled HAMC to maintain supply contracts in response to their needs, and have positive impact on supplier assessments.

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	<p>HAMC is a participant of the K-ETS, and has been obligated to report GHGs emissions every year since 2015. HAMC has reported GHGs emission being separated as an independent corporation since the spin-off in 2018, and is managing GHGs emission according to the allocation of the K-ETS 3rd planning period (2021~2025). As allocation criteria changes in accordance to the intensified government's regulation and new operational costs from activities such as GHGs inventory building, implementation of intrinsic reduction activities, HAMC is managing the K-ETS as a current regulation risk factor that promotes the application of climate change in business operations.</p> <p>(The financial impact of K-ETS risk factors is 'medium-high(100 million to 500 million KRW)', which is subject to regular risk assessment) In particular, as the allocation unit changed from facility to the workplace(site) in 2021, it became more difficult to receive pre-allocations or additional allocations due to the specificity of each facility such as expansion. In response, HAMC is carrying out various energy use improvement activities in line with the energy reduction and efficiency increase plan through the SSC, GMC, and Energy Cost Council. Also HAMC is preparing for the increase in management costs as the paid allocation ratio increased from 3% to 10%.</p> <p>In order to minimize the K-ETS risk, HAMC's sustainability management team and business management team quarterly calculated the expected GHGs emissions while the production support team, technology innovation team and power team continuously search for and implement GHGs reduction activities internally and externally. HAMC used the 'Carbon Asset Management System' to monitor GHGs emissions regularly during 2021. HAMC's allocation was 238,000 tonCO₂eq while expected emission was 203,000 tonCO₂eq. Considering the allowance carried over from 2020, total surplus of carbon assets will be about 40,000 tonCO₂eq. The hit rate of the system was over 80%, which demonstrate good coping with the K-ETS risk.</p>
Emerging regulation	Relevant, always included	<p>The Directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive(EU) (hereinafter the Directive), which is the legislative guidance to mandate supply chain due diligence related to sustainability management for mid to large-sized EU and non-EU companies, is expected to take effect in 2024 requiring companies to reinforce supply chain management systems. As a preemptive response, HAMC decided to reorganize and strengthen its supplier management system.</p> <p>Upon cases of Group 1-2 and EU/non-EU companies definitions in the Directive, the</p>

		<p>sustainability management team identified that HAMC global, GST Global GmbH, GST Romania may become the target of the Directive, and identified this as an emerging regulation risk. In addition, according to the Group 1 case study, the requirement for implementation of reduction 1.5°C level was identified as a risk factor. HAMC's major customers, such as Toyo, Pirelli Tire, Kordsa, Apollo, ZF, and Autoliv are also demanding HAMC of its current GHGs emissions and a reduction plan to respond to these emerging regulations.</p> <p>If HAMC fails to adequately respond to EU regulations or the increasing customer requirements, it could become a new barrier to trade, which could result in a decrease in revenue. The expected sales loss due to noncompliance to the Directive is about 50% (considering the customers' SOW that would be subject to the Directive) or more. Therefore, the importance of responding to this regulation is recognized as 'high'. Accordingly, HAMC established the Supply Chain Management Committee(hereinafter SCMC), chaired by the Chief Procurement Officer, in February 2022 and will closely manage suppliers through global purchasing managers.</p>
Technology	Relevant, always included	<p>Stakeholder needs for materials that increase fuel efficiency of automobiles is increasing. Therefore, we are constantly researching ways to develop sustainable materials - technical and lightweight products with high-strength properties that contribute to reducing GHGs and energy use in the mobility industry. If HAMC does not innovate or advance effectively to make products and technologies more sustainable, we will be left behind in the competitive world, which could negatively impact HAMC product sales and growth. TM and the Steel Wire Technical Center regularly identify the needs of high strength products and products that need to be converted to sustainable materials through VOC and VOCC channel, and conduct SWOT analysis. In case it is a key technology risk factor, we try to eliminate the risk factor by reporting the development goals, plan & performance to the R&D committee.</p> <p>-Case (Development of technology to produce Recycled-PET Tirecord) : TM of the Tire & Industrial Reinforcements PU conducted a technology risk evaluation as the demand for products that can preserve resources through resource usage reduction and recycling has rapidly increased. As a result, the financial impact of the technology risks was evaluated as 'high (more than 1 billion KRW)'. Therefore, HAMC has been collaborating with major raw material suppliers(i.e. Hyosung TNC) on screening and compressing mixed waste plastics including waste PET bottles in order to develop Recycled-PET Tirecord since 2019. Furthermore, in 2021, TM received the PU President's approval for the plan to convert all Tirecord(100%) to Recycled-PET Tirecord by 2050 in order to turn risk factors into opportunity factors. In addition, the PU invested 373 million KRW in 2021 to develop the Recycled-PET Tirecord.</p>
Legal	Relevant, always included	<p>All types of lawsuits associated to climate change can lead to sales loss due to negative reputations as well as direct financial loss.</p> <p>-Green washing lawsuit</p> <p>As Korean listed companies with assets of 2 trillion KRW or more are obliged to disclose ESG information from 2025, companies are voluntarily disclosing their plans to respond to climate change through various channels. However, due to the lack of clear disclosure standards, climate change-related lawsuits such as disclosure of inappropriate information, non-fulfilment of plans, and green washing are increasing in the private and public sectors. Accordingly, the Legal Compliance Team identified and evaluated the related legal risks, considering the 'green washing' lawsuit as a major the risk for litigation related to climate change in 2021. As a result of the financial evaluation of the legal risk, the estimated cost of the lawsuit was more than 1 billion KRW, and it was classified as 'high'. Also, it was expected that sales may decrease by more than 10% due to the fatal impact on HAMC image after the lawsuit. We aim to secure accurate and objective information through third-party verification when calculating GHGs emissions and LCA,</p>

		<p>and avoid the legal risk by pursuing marketing based on facts.</p> <p>-K-ETS fines</p> <p>Regarding major projects of HAMC, risks are identified and evaluated in advance according to internal investment review procedures, and the Legal Compliance Team conducts legal reviews if necessary. HAMC is a company subject to emissions allocations within the Korea ETS system and has an obligation to report carbon emissions every year. A fine of less than KRW 10 million will be imposed for each case that is found as omission in the emissions report or have other problematic issues. A fine of up to three times the average annual market price of the emission allowances of the respective year may be imposed. (Within the range of 100,000 KRW per ton of CO2).</p>
Market	Relevant, always included	<p>The transition to a low-carbon economy could lead to significant changes in customer demand for products and services, which pose risks of losing HAMC's business areas. Changes in consumer behaviour can be a major risk to the market. Following the market trend, customers continuously demand the use of eco-friendly materials, lightweight, emissions reduction during production process, and low-carbon products from HAMC that produces intermediate products used for end products. The HAMC management planning team, sales team, and TM identified and evaluated company's late response to these changes in consumer behaviour as market risks. In order to eliminate such risks, HAMC is marketing products that meet customer needs.</p> <p>A. Recycled Car-Mat(option mats) that reduces process waste : HAMC has developed and is selling Recycled Car-Mats using recycled Bulked Continuous Filament (hereinafter BCF). This product is made from recycled Nylon and PET chips not only from waste fishing nets or waste yarn, but also from process wastes of HAMC spinning procedure as well as our chip suppliers.</p> <p>B. Tirecord made from plant-derived Bio-PET : Customer needs for eco-friendly and renewable materials are growing rapidly, mainly in the EU market. In order to follow this trend of the market and help with resource depletion and environmental pollution issues, HAMC aims to develop Tirecord made with Bio Ethylene Glycol and Bio Teraphthalic acid both derived from a natural source.</p> <p>C. Light-weight material "TANSOME®" : TANSOME®, carbon fiber developed by HAMC boasts ultra-light and high-strength properties, and is four times lighter than steel but 10 times stronger. As it is used as a key material for lightening weight of cars, it contributes to reducing carbon emissions by improving fuel efficiency. TANSOME® also contributes to green energy industries such as CNG and hydrogen high pressure vessels due to its high strength properties. Accordingly, we expanded our production facilities for TANSOME® by 2,500 tons per year in response to market demand increase. When the expansion is completed in 2023, HAMC will have an annual capacity of 9,000 tons.</p>
Reputation	Relevant, always included	<p>Reputational risks related to climate change is one of the risk types being considered in HAMC climate-related risk assessments. The impact of reputational risks is growing because HAMC mostly deals with large global companies as customers, and they require disclosure of information on sustainability management as well as on climate change in accordance to global standards (i.e. GRI, SASB, TCFD, etc.). In response to the request of Michelin and Pirelli in 2012 to the Tire & Industrial Reinforcements PU, we have been participating in CDP every year and conducting evaluation of sustainability management and the strategies of climate change-related response through EcoVadis every other year. Over the years, other clients such as Goodyear, Continental and Bridgestone have increasingly requested confirmation on the overall sustainability evaluation including our climate change response. The management strategy team, sustainability management team, sales team, and TM make various efforts to enhance sustainability reputation of HAMC, such as regularly publishing a Sustainability Report and</p>

		disclosing certain climate change-related information through the Data Analysis, Retrieval and Transfer System(hereinafter DART), in order to communicate relevant information to various stakeholders. HAMC is also a member of UNGC since 2019, and is actively participating in UNGC Korea chapter’s sustainability activities including CoP(Communication on Progress). In 2021, we accelerated the integration of sustainable development goals by participating in UNGC's “SDGs Ambition program” discovering activities for the SDGs goal 13-Response to Climate Change. In addition, HAMC, as the Korea Hydrogen Business Summit member, we promised to invest a total of 1 trillion KRW over the next five years with the goal of promoting balanced development of the entire hydrogen economy and projects at the right time to revitalize hydrogen economy. HAMC's efforts to respond to climate change will contribute to the expansion of society's positive perception and increase the company's positive reputation, which can act as an important positive factor in customers' purchasing decisions.
Acute physical	Relevant, always included	Heavy rains, typhoons, and floods frequently occur due to global warming and the global increase in GHGs emissions. These acute physical risks are also risks that cause loss or damage to our physical assets operating in Korea. Regarding our product, 'Tirecord', for example, discoloration and low properties of adhesion due to flooding can lead to sales loss of the product. In order to remove these risks, the production management team of all HAMC sites invested a total of 567 million KRW for proper countermeasures like building repair and waterproofing, in 2021. As a result, there was no loss in 2021 due to acute physical risks.
Chronic physical	Relevant, always included	HAMC identified the problem of increased logistics and operating costs due to global abnormal temperature as chronic physical risks. Heat waves, sporadic large-scale wildfires and fires frequently occur in European countries near the Mediterranean Sea because of the abnormal climate. The abnormally high temperatures in southern Europe has been exacerbated by climate change and occurs more frequently every year. In 2021, a particularly extreme high temperature event occurred all over the world, and the global logistics supply chain near the Mediterranean Sea collapsed, requiring more ships to be put in to handle the same amount of logistics. This in turn intensified cargo congestion, resulting in the lowest efficiency of ship operation ever. HAMC, which has many clients in Europe, North America, South America and Asia to be supplied from Korea and Vietnam, reduced the freight transportation contract inducement rates in 2021 to eliminate these risks. Also, in order to increase the terminal container turnover, the free time was shortened from 6 months to 3 months, and we ran an emergency fund to account for the increase in shipping rates. (In 2021, 66% more emergency funds were operated compared to last year.) In addition, physical changes such as an increase in average temperature and extraordinary cold weather are directly linked to heating and cooling system of production sites, thus resulting in the increase of operation costs. At the HAMC's production sites, cooling or heating starts at a certain temperature in order to maintain a desirable quality of product and to operate facilities efficiently. As the heating or cooling time increases, the cost of electricity and city gas increases. Especially in the summer season, when the power supply is cut off in the area where our plant is located, extra losses may occur due to production disruptions and product defects. The annual cost of using electricity for HAMC in 2021 was 30.7 billion KRW, which is 3.2 percent of total sales. Operating costs are also expected to rise when the average temperature changes due to climate change. To turn these risks into opportunities, in 2021, HAMC invested in solar power use, which will save 27MWh of energy per year.

C2.3

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

Yes

C2.3a

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

Identifier

Risk 1

Where in the value chain does the risk driver occur?

Direct operations

Risk type & Primary climate-related risk driver

Current regulation

Carbon pricing mechanisms

Primary potential financial impact

Increased direct costs

Company-specific description

HAMC has reported GHGs emission to the government every year, and is managing GHGs emission according to the allocation of the K-ETS 3rd planning period (2021~2025). According to the planned expansion of the Jeonju plant by 2030 (total carbon fiber production of 9,000 tons per year by 2023), it is necessary to carry over as many carbon credits as possible to minimize the provision for a shortage of carbon credits in the future. In particular, in 2021, limited carryover was possible up to twice the amount of carbon credits sold, so HAMC sold carbon credits(17,200 tonCO₂eq) to enable carryover. In the future, if the free carbon credits are further reduced and carryover is no longer possible, HAMC will have to invest more in facilities to reduce GHGs emissions. The sustainability management team and business management team manage the K-ETS as a risk in regulations that promote the response to climate change in HAMC business operation. According to C2.1b as we explained, the financial impact of the carbon pricing mechanisms of K-ETS is 'medium(100 million to 500 million KRW)', which is a factor subject to regular risk evaluation.

Time horizon

Short-term

Likelihood

Virtually certain

Magnitude of impact

High

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

151,843,950

Potential financial impact figure – minimum (currency)**Potential financial impact figure – maximum (currency)****Explanation of financial impact figure**

HAMC's GHGs emissions are expected to increase by an average of 10.6% per year during the K-ETS 3rd planning period due to the expansion of Carbon Aramid PU. Based on this, HAMC forecasts, 7,389 tons of CO₂ to be insufficient(shortage) each year compared to the allocated annual free carbon credits. The estimated cost of purchasing additional carbon credits, the potential financial impact of the risk, is 151,843,950 KRW. The financial impact is based on the closing price, KAU21(20,500 KRW/tonCO₂) in K-ETS on December 31st, 2021. (151,843,950 KRW = Estimated shortfall amount of allowances according to risk 7,389 tons of CO₂ x emission price of 20,500 KRW/tons of CO₂)

Cost of response to risk

116,665,040

Description of response and explanation of cost calculation

HAMC operates SSC, GMC, and Energy Cost Council to mitigate the risks posed by K-ETS, and promotes various energy use improvement activities according to plans of the energy reduction and efficiency increase by stage. We are continuously discovering and investing in reducing the use of energy that is not renewable. In addition, we manage the risks of K-ETS by annual maintenance of the Carbon Asset Management System which was developed to permanently monitor GHGs emission and the price of K-ETS carbon credits.

The total related management cost is 116,665,040 KRW. (116,665,040 KRW = 19,908,100 KRW(a) + 79,856,940 KRW(b) + 16,900,000 KRW(c))

(a) In March 2021, the Jeonju plant increased the condensate recovery rate to reduce steam consumption: Energy consumption was reduced by recovering and reusing condensed water from steam used in our process. As a result, we were able to reduce energy cost by 50.4 million KRW every year, and we invested 19,908,100 KRW to change the facility for recovery in 2021 and completed the installation. (19,908,100 KRW = pipe insulation work 6,500,000 KRW + steam condensate tank production 4,900,000 KRW + other equipment and installation 8,508,100 KRW)

(b) In June 2021, Jeonju plant reduced LNG consumption by recovering and reusing waste heat from the heat exchanger of Regenerative Thermal Oxidizer(hereinafter RTO) : By improving the waste heat recovery system for RTO heat exchanger, LNG consumption was reduced and 3,611Mwh energy was saved. We invested 79,856,940 KRW for this improvement and completed the installation.

(c) In December 2021, we invested 16,900,000 KRW to upgrade the Carbon Asset Management System : It is the sum of consulting fee for the emission factor DB and system manual update and user education (14,800,000 KRW) and supplementary cost for extracting necessary data from the internal system(2,100,000 KRW).

Comment

N/A

Identifier

Risk 2

Where in the value chain does the risk driver occur?

Direct operations

Risk type & Primary climate-related risk driver

Acute physical

Heavy precipitation (rain, hail, snow/ice)

Primary potential financial impact

Increased indirect (operating) costs

Company-specific description

Heavy rains, typhoons, and floods are frequently occurring due to global warming and the global increase in GHGs emissions. These acute physical risks are also risks that cause loss or damage to our physical assets operating in Korea. Regarding our product, 'Tirecord', for example, discoloration and low properties of adhesion due to flooding can lead to additional sales loss of the product. HAMC strives to minimize the impacts of rain, hail, snow/ice risks by conducting regular inspection of all operating sites twice a year in May(monsoon season) and November(winter season).

In 2021, typhoon OMAIS affected Ulsan, Daejeon, and Jeonju, where HAMC operating sites are located. In order to minimize the production stoppage and property loss due to flooding, HAMC additionally conducted special emergency scenario training in July 2021. In addition, on the eve of the typhoon OMAIS's forecast, a special on-site inspection was conducted upon which a total of 11 improvement measures were identified and was completed in advance. On the day of the typhoon (August 23rd, 2021), HAMC established an emergency contact system to respond immediately in case of emergency in accordance with the 'Emergency Action Plan Regulations'. As a result, all of our sites didn't suffer any loss of property or sales due to the typhoon OMAIS.

Time horizon

Short-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)**Potential financial impact figure – minimum (currency)**

1,274,249,315

Potential financial impact figure – maximum (currency)

2,548,495,630

Explanation of financial impact figure

If HAMC didn't conduct special on-site inspections and take measures in preparation for the typhoon OMAIS, Our products, 'Tirecord, ALKEX®, TANSOME®, and etc.', would have been discolored and/or have lower properties of adhesion due to flooding. Such products, half-finished products, and work-in-processes cannot be sold and need to be discarded. Potential financial impact for such losses are minimum 1,274,294,315 KRW and at maximum

2,548,498,630 KRW. The losses has been calculated as the following: Inventories* amount in 2021(66,443,000,000 / 365days) x inventory in stock(7 days for minimum, 14 days for maximum)

*Only products, half-finished products, and work-in-processes were included. We didn't include raw materials, sub-materials, packaging materials, and other inventories.

Cost of response to risk

566,771,215

Description of response and explanation of cost calculation

May and November are months when natural disasters are frequent, so in order to minimize the property loss that may occur due to natural disasters such as heavy rain and typhoons, HAMC manages its all sites based on the 'Disaster Management Master Plan'. In particular, Ulsan, Jeonju, and Daejeon conduct regular maintenance work to prevent damage to production facilities due to heavy rains and typhoons and malfunctions caused by water leakage. In 2021, maintenance work was done on the wall of KUAF-4 Project(Aramid line expansion) in Ulsan Plant. As a result, we were able to quickly respond to the typhoon OMAIS, which occurred in August 2021, and minimize the related damage. (566,771,215 KRW = 427,271,215 KRW for investment in the leakage areas such as roof, wall, and building to prevent products flooding + 139,500,000 KRW for waterproofing work of the buildings)

Comment

N/A

Identifier

Risk 3

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

Primary potential financial impact

Decreased revenues due to reduced demand for products and services

Company-specific description

HAMC's major clients, such as Michelin, Pirelli, Bridgestone, Autoliv, ZF, and Continental Tire, are demanding the disclosure of sustainability management and climate change-related information in accordance to global standards (i.e. GRI, SASB, TCFD). Accordingly, over the years, our clients have increasingly requested confirmation on the overall sustainability evaluation including our climate change response. If HAMC does not adequately respond to these demands, it may suffer disadvantages to supplier evaluation, penalties, and a fall in sales. Furthermore, more and more customers are requesting the GHGs emissions of HAMC products with the LCA concept, particularly when we market Recycled-PET and Bio PET products with comparisons to conventional (non-recycled or petroleum-based) products.

In particular, in 2021, as HAMC was requested to participate in SBTi by Michelin, the sustainability management team reported the necessity of SBTi participation and SBT setting review to the GMC, SSC, and BOD. The SSC and BOD decided to participate in SBTi and finally voted on the investment to build the carbon inventory required for the participation. If HAMC does not prepare properly as customers' demands for climate change response are intensifying, it may lead to reputational risk as well as a decrease in sales. In 2021, at least 14% and up to 39% of annual sales of the Tire & Industrial Reinforcements PU and the Technical Yarn PU are generated from major

customers such as Michelin, Pirelli, Bridge Stone, Continental, ZF, and Autoliv. Therefore, the decrease in sales can act as a fatal risk to continuous HAMC business operations.

Time horizon

Short-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)

Potential financial impact figure – minimum (currency)

2,751,732,962

Potential financial impact figure – maximum (currency)

7,665,541,822

Explanation of financial impact figure

In 2021, at least 14% and up to 39% of total operating profits of the Tire & Industrial Reinforcements PU and the Technical Yarn PU are made up from major customers who requested to HAMC to participate SBTi, set SBT, and calculate LCA of our products. If HAMC fails to comply with the requirements of these customers, it can lead to significant losses in operating profit as a result of reduced purchasing power and a decline in reputation of HAMC. The operating profit of both PUs make up approximately 25% of operating profit (19,655,235,442 KRW in 2021 based on separate financial statements). The minimum potential financial impact is 2,751,732,962 KRW and the maximum is 7,665,541,822 KRW. Therefore, major customers' requirements are considered as top priority issues that require our sincere response. (Min 2,751,732,962 KRW = 78,620,941,766 KRW x 25% x 14%, Max 7,665,541,822 KRW = 78,620,941,766 KRW x 25% x 39%)

Cost of response to risk

638,861,527

Description of response and explanation of cost calculation

Since the request from Michelin in 2012, HAMC has been continuously participated in EcoVadis evaluation. The customer request has now broadened to customers such as Pirelli, Bridgestone, Autoliv, ZF, and Continental Tire. In 2021, HAMC obtained a gold medal, which is awarded to the top 5% of the all participating companies, from EcoVadis. Our score in 2021 corresponds to the top 3% level. HAMC was able to improve its rating in 2021 through improvement activities in various fields such as environment and fair trade as well as response to climate change, and successfully mitigate reputation risks. To officially participate and openly communicate our support for SDGs as well as promote sustainable management, HAMC has joined the UNGC in 2019 and has submitted our second COP (Communication on Progress) in 2021. Through this program, we were able to establish a roadmap for SDGs 'No.13(climate change response)'. Also, we have been participating in the CDP Climate Change and CDP Supply Chain program since 2010 upon requests of customers such as Michelin, Bridgestone and Pirelli. Since 2012, emissions from PET, Nylon66, Nylon6, and Lyocell Tircord have been calculated in accordance to PAS 2050 and certification has been maintained and renewed every year through the process of certification review and the

renewal review by third-party external agencies. (638,861,527 KRW = consulting fee for SBT setting 191,400,000 KRW + CDP response consultation costs 39,137,000 KRW + CDP Climate Change participation fee 1,364,115 KRW + UNGC membership costs 8,250,000 KRW + SDG Ambition program participation fee 0 KRW + EcoVadis participation costs 2,471,826 KRW + PAS 2050-based carbon labelling calculation consulting costs 359,400,000 KRW + Climate change response expert training participation costs 1,200,000 KRW + Eco-friendly certification costs 35,638,586 KRW)

Comment

N/A

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

Products and services

Primary climate-related opportunity driver

Development and/or expansion of low emission goods and services

Primary potential financial impact

Increased revenues resulting from increased production capacity

Company-specific description

With the stricter regulation on carbon emissions around the world and advent of the electric vehicle(hereinafter EV) era, the importance of light-weighting strategies of HAMC that can simultaneously improve the fuel efficiency of the vehicles and reduce GHGs emissions is growing bigger. We are constantly researching ways to develop lightweight products with high-strength properties that increase fuel efficiency of automobiles so that we can contribute to reducing GHGs and energy use in the mobility industry. The continuous expansion of HAMC production could be also an important climate change-related opportunity. In addition, we are putting more effort into the developing products that can preserve resources by reducing resource usage and reinforcing recycling. Being able to respond to material light-weighting of automotive OEMs, which is the downstream of HAMC, can act as a strength of HAMC. -An Ultra-light-weight materials, HAMC's carbon fiber "TANSOME®" is four times lighter than steel but 10 times stronger. As it is used as a key material for lightening weight of cars, it contributes to reducing carbon emissions by improving fuel efficiency. TANSOME® also contributes to green energy industries such as CNG and hydrogen high

pressure containers due to its high strength properties.

-HAMC is contributing to reducing emissions by improving automobile fuel efficiency through developing high-strength Tirecord to reduce the amount of rolling rubber used and by calculating emissions in terms of the entire life cycle of Tirecord. The Steel Wire Technical Center succeeded in developing a high-strength steel cord that will contribute to fuel efficiency improvement, which we have sold since 2021. In an attempt to further expand clients' application of this product, approval is under progress with more than 10 clients.

-Various divisions of HAMC are developing not only recycled yarns produced using discarded plastics, but also Bio-PET yarns using plant-based raw materials to further reduce environmental impact. Successfully developed products (i.e. Bio-PET carpets) have been applied to eco-friendly vehicles such as Hyundai Motor's EV "IONIQ," and hydrogen car "NEXO". In 2021, it was installed in Hyundai Motor's luxury SUV "GV80", and etc.

Time horizon

Long-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)

Potential financial impact figure – minimum (currency)

260,000,000,000

Potential financial impact figure – maximum (currency)

520,000,000,000

Explanation of financial impact figure

According to Bloomberg NEF, a global research firm, more than 500 different EV will be launched by 2022, and EV sales are expected to increase from 1.7 million in 2020 to 26 million by 2030. About 23% of EV fuel consumption is related to vehicle weight, and thus it is very important to reduce the weight even a little to increase the fuel efficiency. HAMC plans to invest KRW 1 trillion (including R&D and facility extension) in carbon fiber by 2028 to expand it to reach the capacity of 24,000 tons per year. Assuming that HAMC manages to gain the third largest market share which according to current market share distribution is 10%, sales is expected to increase by at largest KRW 520 billion in 2035. And assuming 5% of market share achieved, a sales increase of at least KRW 260 billion is expected. According to KIWOOM Securities which is a typical securities firm in Republic of Korea, it has been analysed that the capex per ton of the TANSOME® plant will be reduced by 20-40% compared to the existing plant by 18.76 million KRW due to the expansion, and the investment economics will be greatly improved. When the TANSOME® production capacity reaches 9,000 tons, it is predicted that the cost will be improved by more than \$2 per kg.

Cost to realize opportunity

113,800,000,000

Strategy to realize opportunity and explanation of cost calculation

As carbon fiber is used as a key material for automotive lightening, it not only contributes to reducing carbon emissions by improving fuel efficiency thanks to vehicle lightening, but also enhances the growth of eco-friendly energy industries as it is used in high-pressure vessels for CNG and hydrogen. Meanwhile, ALKEX®, aramid yarn developed as another new growth engine of Hyosung Advanced Materials, is a high function fiber that is incombustible and five times stronger than steel. Demand for aramid is gradually increasing with the advent of 5G telecommunication technology which requires installation of optical fiber cables that uses aramid as a reinforcement at the core. Aramid enables the cable comprised of a bunch optical fibers to transmit data stably by reinforcing the vulnerability of optical fibers to external shock. Therefore, HAMC is investing in increasing production capacity of both carbon fiber and aramid as demand increases. The company plans to invest KRW 1 trillion by 2028 to expand annual production of carbon fiber to 24,000 ton/year (10 production lines). HAMC invested 93.6 billion KRW by 2021 to build Jeonju plant's TANSOME® production lines. HAMC Ulsan plant's ALKEX® production lines were expanded with a total investment cost of 18.1 billion KRW in 2021. We also invested a total of 2.1 billion KRW* to continuously research and developed properties of these products in 2021. In this way, HAMC has strategies to realize opportunities to increase revenue resulting from increased TANSOME® and ALKEX® production capacity with a total investment cost of 113.8 billion KRW. (*R&D costs 2,023 million KRW: development of carbon fiber properties, strengthening of carbon fiber tenacity, development of new application(i.e. automobile, structure, wind, aircraft, etc.), large-tow carbon fiber, etc.)

Comment

N/A

Identifier

Opp2

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Products and services

Primary climate-related opportunity driver

Shift in consumer preferences

Primary potential financial impact

Increased revenues resulting from increased demand for products and services

Company-specific description

Due to intensifying global warming, it is expected that there will be increased consumer awareness around sustainability and increased demand for sustainable products. In addition, it is expected that the stricter regulation and policy requiring companies to reduce carbon emissions will also increase demand for sustainable products. According to a report by Cowen, a US financial investment firm, Generation MZ consumers(those born in the 1980s and early 2000s and are willing to devote part of their purchasing power to sustainable products.) currently make up 50% of the world's population, and this proportion will increase to about 68% by 2028. The report also predicted if the purchasing power of the MZ generation increases through income growth and asset inheritance, their consumption patterns can change the current business model.

HAMC identifies environmental impact of production across all stages(LCA, Life Cycle Assessment) – from procurement of raw materials, production, logistics, product usage and its disposal and tries to minimize such impact. We continuously develop new measures that could contribute to impact mitigation, extend the scope of the

existing improvement activities and boost development and application of new technologies. Especially, Tirecord is a major reinforcement material which determines the form and performance of tires, and is used in the rubber-rolling process of tire production. High-strength Tirecord have an intensity 10-20% higher than that of regular Tirecord, which lower cord thickness contributing to less rubber usage during calendaring. The lightening of tires results from weight saving of Tirecord as well as rubber, which improves fuel efficiency and reduces GHGs emission through decreased rolling resistance of tires. Since 2012, emissions from the PET, Nylon66, Nylon6, and Lyocell Tirecord have been calculated in accordance to PAS2050 certification is maintained and renewed every year through the process of certification review and the renewal review by third-party external agencies.

Time horizon

Medium-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)

113,450,957,504

Potential financial impact figure – minimum (currency)
Potential financial impact figure – maximum (currency)
Explanation of financial impact figure

HAMC is contributing to reducing emissions by improving automobile fuel efficiency through developing high-strength Tirecord to reduce the amount of rolling rubber used in tires and by calculating emissions in terms of the entire lifecycle of Tirecord products. Also, the increased awareness for eco-friendly products has stimulated the need to manage LCA-based emissions. Since 2012, we have calculated the emissions from the PET, Nylon66, Nylon6, and Lyocell Tirecord in accordance to PAS2050 whose results are certified by 3rd party. The certification is renewed every year through the process of certification review and the renewal review by third-party external agencies. HAMC is providing the LCA emission data to its key customers such as Michelin, Pirelli, and Continental. According to the “Markets and Markets” estimation, the market size of tire reinforcement materials is expected to grow at an annual average rate of about 5.6% from in 2018 to in 2023. Sales of the four HAMC products that have been certified with Lloyd's Register Group Limited(hereinafter LR) based on PAS2050 amounted to KRW 101.7 billion in 2021, accounting for 76% of total sales. Therefore, it is expected that potential financial impact would be KRW 113.5 billion in 2023.

Cost to realize opportunity

1,279,900,000

Strategy to realize opportunity and explanation of cost calculation

HAMC identifies customers' needs through a customized VOC management system so that we may provide them optimized solutions. Using the 4A+1A process, we identify the real VOC and establish optimal strategy to reflect the customers' needs to our business, which is then executed accordingly. Additionally, the process requires thorough

analysis of the execution results so that points for improvements are derived. In particular, we are striving to enhance customer value by launching new products suitable for new mobility and eco-friendly vehicles. In addition, HAMC invests in research and innovation to retain the technological required to meet the changing customer demands.

Our high-strength Tirecord developed for lightweight tires contributes to a 2.3% weight reduction in the case of a 16 inch-tire(9.1kg). The weight reduction results in a reduction in the rolling resistance of tires, thus, improves the fuel economy of automobiles and reduces GHGs emissions. HAMC has invested 1,263 million KRW for R&D on the high-strength Tirecord. The Carbon Asset Management System was developed in 2019 to directly manage and statistically analyse activity data for Ulsan, Jeonju, and Daejeon sites. It helps to understand data trend of energy consumption, targets, carbon assets, compliance to related regulations as well as respond to K-ETS. In December 2021, we invested 16,900,000 KRW to upgrade the Carbon Asset Management System. (1,279,900,000 KRW = 1,263,000,000 KRW + 16,900,000 KRW)

Comment

N/A

Identifier

Opp3

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Resource efficiency

Primary climate-related opportunity driver

Use of recycling

Primary potential financial impact

Reduced direct costs

Company-specific description

As the importance of sustainability is rising around the world, the polyester fiber industry has followed this trend successfully developing and commercializing recycled polyester fibers. Polyester fiber made from recycling PET bottles is attracting attention in the context of eco-friendliness. For example, 40% of PET bottles are re-processed into textiles each year in Europe. According to the Swiss Federal Environment Agency (Bundesamt für Umwelt), recycled polyester fibers are almost identical in quality to freshly produced polyester fibers, but the energy required during production is reduced by 59%. In addition, it is estimated that CO2 emissions is reduced by 32% compared to conventional polyester fiber.

The use of recycled polyester yarn is increasing as pollution caused by excessive use of plastic products has emerged as a social problem. HAMC has developed high-strength recycled polyester yarn using raw materials extracted from waste plastics and obtained Global Recycle Standard (hereinafter GRS) certification. We are expanding the products with GRS certification – successful products that have acquired GRS certification are PET technical yarn, PET Tirecord, and PET carpet yarn. Responding to the customers' needs of products using recycled PET, we developed an automotive carpet(option mat) using recycled BCF (Bulked Continuous Filament). Also sales of recycled Tirecord has started in 2021 upon the completion of R&D. HAMC's recycled yarn is made using recycled chips from not only waste PET bottles, but also fish nets that have been discarded as well as spinning

process waste and the process waste generated by our suppliers(i.e. recycled chip companies). R&D is underway to expand recycling products.

Time horizon

Medium-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)

23,196,000,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

According to the 'Global Polyester Market', published by ReportsnReports.com, the polyester market, which was about USD 102.0 billion in 2018, is expected to increase by more than 8% annually, reaching USD 193.3 billion in 2026. According to the Textile Exchange, a U.S. non-profit textile organization, the size of the recycled polyester market is expected to account for 20% of the total market by 2030. Assuming that the recycling market size will be at least 15% of the total market in 2026, a mere 0.01% increase in this market share of HAMC will enable the company to generate about 23.2 billion KRW(equivalent to USD 19.3 million) in additional revenue.

Cost to realize opportunity

4,444,000,000

Strategy to realize opportunity and explanation of cost calculation

There is business risks arising from industrial changes such as the possibility of recycled materials and eco-friendly materials technologies to become the mainstream as the importance of eco-friendly consumption gradually increases. As a chemical company, HAMC is making systematic efforts to minimize negative environmental impact by recycling limited global resources through researching and developing eco-friendly products while participating in global crisis over global warming. HAMC is determined to minimize negative impact on the environment throughout its value chain by changing raw materials to eco-friendly materials, recycling resources, minimizing environmental impact during production, increasing efficiency through weight reduction, and reusing waste. In this way, HAMC has strategies to realize opportunities to reduce direct costs resulting from development of recyclable car mats(option mats) and recycling process waste which requires a total investment of 4,444 million KRW. (GRS certification costs 36 million KRW, R&D costs of recycled PET technical yarn development 4,408 million KRW)

Comment

N/A

C3. Business Strategy

C3.1

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

Row 1

Transition plan

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

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

Under the level of GHGs management in 2021, which calculated scope 1 and 2 emissions for domestic and major overseas sites of HAMC and domestic Scope 3 emissions of the Tire & Industrial Reinforcements PU, HAMC cannot participate in SBTi and set SBT to limit the global temperature within 1.5°C. In order to join SBTi, it is necessary to set reduction targets for 95% of global Scope 1 and 2 emissions and 2/3 of Scope 3 emissions, but HAMC is not able to participate because it cannot meet this requirement and these conditions. HAMC is in the course of calculating Scope 1, 2 and 3 emissions of all global sites completing its global GHGs inventory by 2022. In addition, in the second half of 2021, the CEO reported to the Board of Directors regarding SBT setting at the company level in 2023. HAMC will continue to make efforts to respond to climate change and have our SBT approved by SBTi in 2024. Since suppliers’ participation in essential for the SBTi approved target setting, HAMC established the SCMC, chaired by the Chief Procurement Officer, in February 2022 and will closely manage suppliers through global purchasing managers. The SCMC will discuss and check the progress of the Scope 3 SBT establishment and report regularly to the CEO, who is the chairman of the BOD. Through the execution of the SBTi approval plan, HAMC can actively respond to meet the changing customer demands. The number of major customers who are SBTi members such as ZF, Autoliv, Michelin, Continental, and Continental increased 62.5% from 8 in 2021 to 13 in 2022. In particular, more customers such as Hankook Tire, Bridgestone have newly announced their participation. At this time, HAMC’s SBT setting and plans for SBTi approval are considered to be active measures of important risks in business operation.

C3.2

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

Use of climate-related scenario analysis to inform strategy	
Row 1	Yes, qualitative, but we plan to add quantitative in the next two years

C3.2a

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

Climate-related scenario	Scenario analysis coverage	Temperature alignment of scenario	Parameters, assumptions, analytical choices
Transition scenarios Customized	Company-wide	1.6°C – 2°C	In December 2021, the sustainability management team analysed transition scenarios using two national 2050 carbon-neutral scenarios to respond to K-ETS regulatory risks and downstream demands. The scope

publicly available transition scenario		<p>of analysis is Korea, which is the scope of HAMC business, business unit wise, the Tire & Industrial Reinforcements PU, the Technical Yarn PU, Interior PU, and the Carbon Aramid PU business area. In both scenarios, the domestic net emissions are aimed at zero, and Plan A is to completely suspend thermal power generation, while Plan B is a plan to actively utilize technologies such as CCUS with some remaining thermal power generation. Based on the IPCC 1.5°C special report, we assumed 2050 without overseas reductions under the premise that all countries would promote carbon neutrality in 2050. The scenario analysis period is set up to 2050. When estimating GHGs emissions, HAMC made the assumption that there was no change in the current level of energy and facility use, and no change in the business structure. In addition, future reduction measures were calculated by limiting only those feasible as of 2021. In particular, GHGs emissions were calculated according to 12 production scenarios of the manufacturing sites in 2050, and only the maximum and minimum production scenarios were selected for scenario analysis. Since it is assumed that there will be no change in the country where the headquarters and manufacturing sites are located, the carbon-neutral scenario of Korea has been used. In addition, production scenarios were applied to reflect the business structure operated by HAMC.</p>
Physical climate scenarios RCP 8.5	Company-wide	<p>In October 2021, the sustainability management team conducted a quantitative and qualitative analysis based on the RCP 8.5 scenario of the IPCC Guide targeting Seoul, where the HAMC headquarters is located, and Ulsan, Daejeon, and Jeonju, where HAMC's manufacturing sites are located, in order to establish a company-wide climate change response strategy. A total of 11 physical risk parameters were used. (number of heatwave days, summer days, tropical night days, heat index, discomfort index, cooling degree, cold wave, cold day, heating degree, precipitation intensity, heavy rain) For the scenario analysis period, 1981~2020, 2021~2040, 2041~2070, and 2071~2100, dividing the current climate application and the 21st century into the pre/middle/late period, were considered. The Climate Projection provided by the Korea Meteorological Administration's (hereinafter KMA) climate information portal was referenced. In order to establish a company-wide strategy according to the most conservative scenario, HAMC selected the RCP 8.5 scenario to maximize the parameters of heat index, discomfort index, cooling degree, and heating degree. It is also assumed that there is no change in the region where the headquarters and manufacturing sites are located, and there is no material change in the business portfolio, but only changes in capacity mix of among the business units.</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

HAMC is at the early stages of implementing scenario analysis as part of its TCFD implementation. As one of the first steps, HAMC chose to use the IPCC's RCP scenarios and two 2050 carbon-neutral scenarios presented by the Korean government in 2011 as per its NDC. The RCPs provide a uniform framework for exploring and analysing climate impact and adaptation to such changes, and vulnerability. RCP scenarios are widely used in academic circles to perform and develop climate simulation modelling data giving it a certain level of reliability as well as likelihood of actual usage. By using RCP scenarios, HAMC's sustainability team is given the opportunity to access and use a large range of standardized climate simulation data in order to find the answers to HAMC's focal questions. HAMC asked the following three focal questions: 1) How can we design our production processes and/or energy transition towards net-zero emissions in 2050?, 2) What if the carbon price in Korea rises to the level of international markets(i.e. EU) in 2025? What can be done to minimize the negative financial impact this will have?, 3) What if the temperature increases above 2°C in the next 5 years in the regions where we source critical raw-materials PET or Nylon 66 chips?

Through these 3 focal questions, HAMC tried to discover practically implementable GHGs emissions reduction activities are difficult to do at plant level, such as the introduction of new renewable energy at the company level. For transition scenario analysis, we tried to compare various cases using different independent variables such as price of carbon credit and production changes that would impact the financial performance of HAMC. We also considered scenarios that could identify the risks of delay in HAMC products delivery due to problems related to climate change, supply and demand of raw materials used to produce our products(Tirecord, Industrial Yarn, Airbag, OPW, Airbag Flat Fabric, and etc.).

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

We identified climate change physical risks according to the RCP 8.5 scenario. As a result, it was confirmed that the number of heatwave days in Ulsan increased by 33.7 days compared to the second half of 2021 (2071~2100) compared to 2021, 50.6 days in Jeonju, and 50.0 days in Daejeon. This is an average increase of about 2 times compared to the increase of 23.2 days in Korea. It means that the variability of climate change in the specific region where HAMC's manufacturing sites are located is greater than the average of Korea as a whole. Accordingly, HAMC will suffer from physical and financial negative impacts such as difficulties in sourcing and storing raw materials due to heat waves, increased costs due to reduced productivity, increased heat management costs such as energy costs used to operate air conditioners, and lack of water resources. Therefore, it is necessary for HAMC to prepare a process to determine whether the Focal Question problem has been resolved when making decisions for energy consumption and efficiency management and investment decision making, and HAMC is working in stages to establish such a process by 2025.

HAMC will expand Jeonju plant by April 2023 to reinforce HAMC's growth engine. So, the sustainability management team predicted annual GHGs emissions by 2030 following the expansion of the Jeonju plant. The prediction result is a figure that exceeds the reduction target decided by the SSC in the second half of 2021, and it is analysed that the emission is expected to exceed 260% more than the SBT to be approved by the SBTi. The expected amount of excess emission is at least 30,300 tons of CO₂ and up to 321,100 tons of CO₂. If the internal carbon price of 31,000 KRW in 2021 is applied, it was confirmed that it could adversely affect HAMC's financial plan by at least 939 million KRW and up to 9,954 million KRW. According to the national 2050 carbon-neutral scenario and the HAMC production scenarios, HAMC predicted that GHGs emissions must be reduced 37.8% by 2040 compared to the 2021 base year to be limited to 1.5°C or less. Accordingly, we are working step-by-step with the goal of setting an SBT that can be restricted to within 1.5°C and obtaining approval from the SBTi.

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	<p>As it is used as a key material for lightening weight of cars, carbon fiber contributes to reducing carbon emissions by improving fuel efficiency. TANSOME® also contributes to green energy industries such as CNG and hydrogen high pressure vessels due to its high strength properties. Accordingly, we expanded our production facilities for TANSOME® by 2,500 tons per a year in response to market demand increase. When the expansion is completed in 2023, HAMC will have an annual capacity of 9,000 tons. HAMC plans to invest KRW 1 trillion (including R&D and facility extension) by 2028 to expand the site's capacity to 24,000 tons per year.</p> <p>Another product group that contributes to emissions reduction during usage is tire cord. They are used as reinforcements of tires through pressured rolling processes after being adhered to rubber. High-strength tire cords are 10~20% stronger than regular Tirecord, which enables the reduction of Tirecord fabric width which in return can reduce the amount of rubber used for the pressured rolling process. This reduction of rubber usage enables weight reduction of tires which reduce the rolling resistance contributing to automotive fuel efficiency and emissions reduction. HAMC has been collaborating with major raw material suppliers(i.e. Hyosung TNC) on screening and compressing mixed waste plastics including waste PET bottles in order to develop Recycled-PET Tirecord since 2019. Furthermore, in 2021, TM received the PU President's approval for the plan to convert all Tirecord(100%) to Recycled-PET Tirecord by 2050 in order to turn risk factors into opportunity factors. In addition, the PU invested 373 million KRW in 2021 to develop Recycled-PET Tirecord.</p>
Supply chain and/or value chain	Yes	<p>HAMC is an intermediate-industrial materials manufacturer whose major products are supplied to the automotive industry. Therefore, we need to jointly manage risk along our supply chain – from our customers who sell final products to our partners supplying raw materials. GHGs emissions from raw materials, transportation and distribution, and disposal are significant and account for almost all of Scope 3, excluding the stages of use and disposal of products and services. Therefore, HAMC annually inspects the energy use management and implementation of energy use reduction activities through regular diagnosis of its key business partners' social responsibility management. We also conduct on-site audits through which high performers are given incentives.</p> <p>Meanwhile, we have been providing our customers with certificated carbon emission information of four Tirecords supplied to customers since 2012. In 2021, according to the resolution of the BOD and the SSC, calculation of product GHGs emissions for 2 products (Steel Cord and Bead Wire) was newly completed, and we are underway to complete product carbon footprint calculations for major products in all business areas. (Related investment cost: 340.2 million KRW)</p> <p>Additionally, HAMC also has participated in CDP Supply Chain since 2010 and Ecovadis since 2012 among the information disclosure related to climate change requested by customers. Inspection, guidance, carbon certification of products, and disclosure of climate change information for business partners are reflected</p>

		in the work plan and budget of related departments every year. In 2021, HAMC invested 4.54 million KRW in advisory activities to support the improvement of energy efficiency in the supply chain and induce the reduction of their GHGs.
Investment in R&D	Yes	HAMC continues to carry out R&D in order to secure new growth engines and strengthen capabilities of the present businesses. In particular, in order to mitigate climate change-related risks and take advantage of opportunities, R&D investment to develop products and services that reduce GHGs emissions is essential. In order to follow this trend of the market and help with resource depletion and environmental pollution issues, HAMC is developing the Tirecord made from Bio Ethylene Glycol and Bio Teraphthalic acid both derived from a natural source. Various divisions of HAMC are developing not only recycled yarns produced using discarded plastics, but also Bio-PET yarns using plant-based raw materials to reduce environmental impact. Successfully developed products have been applied to eco-friendly vehicles such as Hyundai Motor's electric vehicle(EV) "IONIQ," and hydrogen car "NEXO". Such efforts is to keep up with the business direction of global textile companies that are promoting the use of recycled eco-friendly yarn as well as the market trend of continuously expanding eco-friendly mobility. HAMC invested about 598 billion KRW in 2021 to develop eco-friendly products such as Chemical Recycled PET Tirecord and Recycled-PET webbing.
Operations	Yes	Changes in regulations related to climate change, rising energy costs, and societal expectations for increased application of renewable resources have had a significant impact on HAMC's operations. HAMC has been responding to the government's GHGs regulations by reporting emissions and submitting monitoring plans every year. The emissions report is verified by a third party agency before submission to the government. During 2021~2025, at least KRW 64.77 million KRW will be spent on this verification in Korea. It will be much more expensive to include overseas. Moreover, the company also plans an investment budget for emissions reduction and energy efficiency enhancement every year to fulfil the obligation to reduce GHGs. Because emissions from electricity use account for 76% against the total emissions of HAMC, the company is carrying out activities to reduce power use. Hyosung Chemical Fibers(Jiaying) Co., Ltd., a subsidiary of HAMC, has acquired ISO 50001(energy management system) in 2019, and has reduced 27MWh in 2021 by using solar energy generation.

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	Revenues Direct costs Indirect costs Capital expenditures	1. Revenue(short-term): HAMC is a B2B company that produces and sells intermediate goods, and climate change-related risks and opportunities can have a significant impact on its profitability. TANSOME® and ALKEX® are considered to be new growth engines of HAMC, and their demand is increasing due to the expansion of hydrogen cars and the foreseen development

<p>Acquisitions and divestments Access to capital Assets Liabilities</p>	<p>of the 5G communication. HAMC plans to increase its production capacity by expanding its TANSOME® production lines centered at Jeonju plant and ALKEX® expansion at Ulsan plant. Considering the expected capacity expansion in the future, and historical sales of TANSOME® and ALKEX® in 2019, sales of TANSOME® has doubled and ALKEX® has tripled by 2021, which is worth KRW 210 billion .</p> <p>2. Direct and indirect costs (short, mid to long term): If HAMC fails to properly respond to the implementation of the GHGs emission reduction target and the allocation of carbon credits according to the K-ETS, it may have a negative impact on business operation. Therefore, HAMC's direct cost means the investment cost incurred during (1)the Carbon Aramid PU expansion, (2)the site relocation of the Tire & Industrial Reinforcements PU and the Technical Yarn PU, (3)the fines incurred according to the K-ETS, and the carbon tax. The indirect costs include energy costs among production overheads and additional energy costs caused by heat waves and cold waves.</p> <p>(i.e. 1) HAMC plans to introduce additional facilities to produce TANSOME® and ALKEX® production in response to increasing market demand. HAMC plans to invest KRW 1 trillion (including R&D and facility extension) by 2028 expanding the production capacity of TANSOME® to 24,000 tons per year. The second line(2,000 ton/year) was completed in 2021 with a total of 46.8 billion KRW. HAMC Ulsan plant's ALKEX® production lines are under expansion with a total investment cost of 18.1 billion KRW since 2021. (i.e. 2) Energy costs of HAMC(KRW 27,285 million) account for 4.25% of the total operating costs in 2021. Because heat waves and cold waves occur more frequently due to climate change-related cost increase is expected at Ulsan, Jeonju, Daejeon sites since maintaining temperature at a certain level is required to produce products of constant product quality. HAMC ensures that power consumption amount does not exceed a certain limit in preparation for power peak policy implemented in Korea. Moreover, we also include energy costs from heat wave and cold wave in the financial plan and annual budget.</p> <p>3. Capital expenditures (short and mid to long term): HAMC operates an internal carbon price system to respond to costs that may be incurred in case of excess emission(credit shortage) compared to the carbon credits allocated to K-ETS target companies. We can estimate HAMC's capital expenditure through internal carbon prices. The internal carbon price was 31,000 KRW in 2021 and is regularly reviewed based on external carbon price trend analysis.</p> <p>4. Acquisitions and divestments (mid to long term): HAMC was spun off from Hyosung Corporation in 2018, and currently, there is no significant plan for divestment of the current business portfolio that focuses on various technical textiles for the automotive industry. If an acquisition or sale takes place in the future, risks and opportunities regarding climate change of such a change will be reviewed from the initial stage. Decisions on the important investment and divestures of HAMC will be made by the BOD.</p> <p>5. Access to capital (short and mid to long term): This is a financial planning element affected when shareholders give negative feedback to the HAMC climate change response strategy. HAMC provides information on HAMC's sustainability management activities through regular shareholders' meetings to shareholders and potential investors. Since various information is disclosed through MSCI or CDP as well as HAMC's ESG performance results evaluated by external financial evaluation agencies, even when access to capital is controlled, we have taken measures to ensure that they are always accessible through various channels. (i.e. 1) We use ESG evaluations as opportunities. It is a short-term financial planning component affected by the risk of negative shareholder feedback on the HAMC climate change strategy. In addition, if there is a problem in reporting emissions in the emission trading system or is passive in achieving the emission reduction target (24.9% reduction by 2030 as of 2017), it may negatively affect</p>
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		<p>corporate value as a reputational risk in the mid- to long-term. In this case, the company may have difficulties in raising funds for future climate change investments. However, this probability is expected to be very low.</p> <p>6. Assets (short and mid to long term): HAMC is reducing emissions through facility replacement and energy efficiency projects every year, and the necessary financial resources are reflected in the annual budget of each PU-level Investment Review Subcommittee (hereinafter IRSC) or the Corporate-level Investment Review Committee(hereinafter IRS). (i.e.) Jeonju Plant reduced energy use by 1,944MWh in 2021 through reducing steam consumption and by improving the condensate recovery process with a total cost of 73.154 million KRW.</p> <p>7. Liabilities (short term): Promotion of active R&D to secure future growth engines as well as facility expansion in HAMC may require large-scale investments, and the company debt may increase or decrease depending on the implementation of the investment plan. (Example) As of year-end 2021, other provisions of 140 million KRW has been booked and disclosed in the Annual Report.</p>
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C4. Targets and performance

C4.1

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

Absolute target

C4.1a

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

Target reference number

Abs 1

Year target was set

2019

Target coverage

Company-wide

Scope(s)

Scope 1
Scope 2

Scope 2 accounting method

Location-based

Scope 3 category(ies)

Base year

2017

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

45,803.81

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

212,128.72

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

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

257,925

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

17.76

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

82.24

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

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

100

Target year

2030

Targeted reduction from base year (%)

24.9

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

193,701.675

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

44,441.53

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

158,076.44

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

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

202,517.97

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

86.2724407371

Target status in reporting year

Revised

Is this a science-based target?

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

Target ambition**Please explain target coverage and identify any exclusions**

HAMC sets a target to reduce 24.9 % of GHGs emission by 2030 compared to 2017 at all domestic sites.

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

HAMC raised its GHGs quantitative target of its "Vision 2030" from 19.7% to 24.9% compared to 2017 in order to meet the industrial sector target of the National Greenhouse Gas Reduction Target (NDC) announced in 2021. The major reduction projects implemented in 2021 reduced 319 tCO₂ of GHGs by recovering waste heat and 201 tCO₂ of reduction by recovering condensate water. In addition, we are reviewing a reduction project at Jeonju's expansion line that integrates operation and recovers waste heat resulting in reduction of approximately 1,578 tCO₂. If activities such as process improvement and energy/productivity improvement that are not numerically counted, are included, the absolute value of the reduction is expected to be greater. As such, HAMC is establishing a facility investment plan for energy saving with the goal of linear reduction of 4,939tCO₂ annually.

List the emissions reduction initiatives which contributed most to achieving this target**Target reference number**

Abs 2

Year target was set

2022

Target coverage

Company-wide

Scope(s)

Scope 3

Scope 2 accounting method**Scope 3 category(ies)**

Category 1: Purchased goods and services

Category 10: Processing of sold products

Base year

2021

Base year Scope 1 emissions covered by target (metric tons CO₂e)**Base year Scope 2 emissions covered by target (metric tons CO₂e)****Base year Scope 3 emissions covered by target (metric tons CO₂e)**

475,405.94

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

475,405.94

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

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

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

77.3

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

77.3

Target year

2030

Targeted reduction from base year (%)

16.02

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

399,245.908412

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

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

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

475,405.94

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

475,405.94

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

0

Target status in reporting year

New

Is this a science-based target?

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

Target ambition

Please explain target coverage and identify any exclusions

HAMC newly set a target to reduce 16.02% of Scope 3 by 2030 compared to 2021 at all domestic sites. (In 2021, Korea's 'FRAMEWORK ACT ON CARBON NEUTRALITY AND GREEN GROWTH FOR COPING WITH CLIMATE CRISIS(hereinafter the Carbon Neutrality Act)' was enacted in accordance with the 2050 Carbon Neutrality policy of the Republic of Korea. It was decided to significantly raise the NDC until 2030 from 26.3% to 40% reduction compared to 2018. (NDC of HAMC's industrial sector increased form 6.4% to 14.5%) Accordingly, HAMC newly has set Scope 3 reduction target to 16.02% until 2030 compared to 2021. It is related with the Scope 1, 2 reduction target, 'Vision 2030' GHGs reduction target to 24.9% until 2030 compared to 2017.

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

In 2021, we reported to the GMC, and the SSC the necessity to engage suppliers. The plan to engage with suppliers to participate in our scope 3 calculation by provided primary data, and also sharing with them our plan to reduce scope 3 emissions have been approved. We plan to officially request our suppliers for product emission data as well as reduction plans in the next two years.

We have been working with Hyosung TNC(our key raw material supplier) to develop recycled PET chips. Successful transition to recycled PET chips will reduce our scope 3 emissions-raw materials(category 1) by about 40%.

On the side of our customers(category 10), many of our key customers including Michelin, Pirelli, Continental, ZF, Autoliv, Coats, etc. have already had their SBT approved by SBTi as of 2021, and are in the course of reduction. We will collaborate with them to reduce our scope 1, 2 (their scope 3).

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

C4.2

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

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	2	1,578
To be implemented*	4	626
Implementation commenced*	3	614
Implemented*	3	577

Not to be implemented	0	0
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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)

319

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

Scope 1

Voluntary/Mandatory

Voluntary

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

91,091,468

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

30,000,000

Payback period

<1 year

Estimated lifetime of the initiative

11-15 years

Comment

Reduce energy use through waste heat recovery

Initiative category & Initiative type

Energy efficiency in production processes
Process optimization

Estimated annual CO2e savings (metric tonnes CO2e)

201

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

Scope 1

Voluntary/Mandatory

Voluntary

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

57,544,704

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

20,000,000

Payback period

<1 year

Estimated lifetime of the initiative

11-15 years

Comment

Investment in steam condensate recovery facility

Initiative category & Initiative type

Energy efficiency in production processes
Waste heat recovery

Estimated annual CO2e savings (metric tonnes CO2e)

57

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

Scope 1

Voluntary/Mandatory

Voluntary

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

16,409,232

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

15,000,000

Payback period

<1 year

Estimated lifetime of the initiative

11-15 years

Comment

Investment in water softener improvement

C4.3c

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

Method	Comment
Dedicated budget for energy efficiency	HAMC establishes a budget solely dedicated from the improvement of energy efficiency every year. In order to improve the energy efficiency of existing processes, we continuously explore activities such as process optimization, equipment replacement, and heat/steam recovery. In addition, when reviewing the expansion process, we strive to improve energy efficiency by applying equipment with higher energy efficiency compared to the existing processes and integrate existing equipment and processes.

When making investment decisions for in reduction activities, the internal carbon price is applied to the amount of GHGs reduction and so that it can be used alongside the actual investment cost for investment decision making.

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

Group of products or services

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

Low-Carbon Investment (LCI) Registry Taxonomy

Type of product(s) or service(s)

Chemicals and plastics

Other, please specify

Environment friendly product

Description of product(s) or service(s)

Tirecord is a reinforcing material constituting the inside of a tire, and is a key material that maintains the shape of the tire and provides a comfortable ride. In particular, HAMC is developing and producing Lyocell Tirecord to replace nylon tire cords used as reinforcing materials for high-speed driving tires that require high durability. Lyocell Tirecord does not use sulfuric acid in the manufacturing process, so there is almost no generation of harmful substances, and it is eco-friendly because it is made of cellulose extracted from wood. In addition, as a result of calculating the greenhouse gas emission by product according to the scenario of PAS 2050, the greenhouse gas emission is about 20% lower than that of the general nylon tire cord, so it is regarded as a low-carbon product. (With an attribution estimation approach, we measure the difference in total life cycle GHGs emissions between a low-carbon product line (Lyocell Tirecord) and a reference product line (conventional Nylon66 Tirecord) that provides equivalent functionality)

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

PAS2050

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

Cradle-to-gate

Functional unit used

kgCO₂eq per 1kg of Lyocell tire cord (product sale unit)

Reference product/service or baseline scenario used

The reference product is conventional Nylon66 Tirecord. (kgCO₂eq per 1kg of Nylon66 Tirecord) The scenario used in the calculation is PAS 2050. Also we follow the rules and recommendations indicated in the UL Product Category Rules for Tire developed by Program Operator UL for LCA studies used in the creation of EPDs. HAMC is calculating the data according to HAMC's key customer requirements. Also it has the advantage of being able to calculate as a product group.

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

0.0017

Explain your calculation of avoided emissions, including any assumptions

- 1) Avoided emission calculation method: According to the attribution estimation approach and the PAS 2050 standard, the low-carbon product, Lyocell Tirecord, emits 7.19E+00 kgCO₂eq per kg of greenhouse gas, and the existing product, the conventional Nylon66 Tirecord, has a greenhouse gas emission of 8.89E+00 kgCO₂eq per kg. Therefore, if calculated using the life cycle emission of reference product - life cycle emission of low carbon product equation, it is 1.70E+00 kgCO₂eq per kg, which is a positive number, and divided by 1,000 for conversion to tonCO₂eq is 0.0017 tonCO₂eq per kg.
- 2) Emission factors: Calculation of greenhouse gas emission factors
- 3) Allocation method: Open Loop Recycling allocation (in the case of open loop recycled materials, the method that includes the upstream recycling process among the Cut Off Method is applied.) and Multi input-output allocation (allocated by production volume ratio) is applied.
- 4) LCI DB: Impact assessment methodology is based on the 2006 IPCC Guidelines, and the characterization factor of IPCC 2013 5th AR report GWP 100 has been applied.
- 5) Uncertainty: Since field data was collected and applied and verification of the data was completed, it was evaluated with high precision. As a result of quantitative precision/uncertainty evaluation of the field data unit of major substances, it has a range of about 5.66% compared to the mean at a 95% confidence interval and shows low uncertainty. (Less than 7% is rated as Very Good in EU ILCD dataset uncertainty requirements)
- 6) Conclusion: General Product Emissions (Nylon66 Tirecord 8.89E+00 kgCO₂eq per kg) - Low-Carbon Product Emissions (Lyocell Tirecord 7.19E+00 kgCO₂eq per kg) = Avoided Emissions Positive 1.70E+00 kgCO₂eq per kg - > 0.0017 tonCO₂eq per kg in unit conversion

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

0.28

C5. Emissions methodology

C5.1

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

No

C5.1a

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

Row 1

Has there been a structural change?

No

C5.1b

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

	Change(s) in methodology, boundary, and/or reporting year definition?	Details of methodology, boundary, and/or reporting year definition change(s)
Row 1	Yes, a change in methodology Yes, a change in boundary	The scope of Scope 3 emissions reported in the 2021 CDP CC was categories 1 to 6, 9, 10, and 12, but in the reporting year, Scope 3 categories 7 (employee commuting), 8 (upstream rental property), and 13 (downstream rental property) were added. Thus, a total of 12 categories of emissions were calculated.

C5.1c

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

	Base year recalculation	Base year emissions recalculation policy, including significance threshold
Row 1	No, because the operations acquired or divested did not exist in the base year	<p>HAMC is a company regulated by Korean ETS. It should comply with ‘the Administrative Guideline for the Greenhouse gas Target Management System’. Guideline defined the criteria of emissions recalculation in a base year as the following.</p> <p>(Base year emission recalculation criteria)</p> <ul style="list-style-type: none"> - when cause of rights and duties succession occurs such as merge, division and operating assets transfer - when change in GHG emission source or absorption source occurs inside and outside the organizational boundaries - change in calculation methodology for GHG emissions <p>When conforming to the relevant guideline, HAMC calculated emissions in a base year and then reported it to Ministry of Environment. But emissions were not recalculated because it did not conform to the recalculation criteria in a base year.</p> <p>HAMC added Scope 3 emission calculation category to calculate emissions in the reporting year. For CDP 2021 we calculated 9 categories but, 3 additional categories were calculated in the reporting year. HAMC calculated emissions for 12 categories in total and implemented the CDP reporting. Scope 3 emission data, however, is not fully managed yet so HAMC plans to set Scope 3 base year through more reliable data management in the future.</p>

C5.2

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

Scope 1

Base year start

January 1, 2017

Base year end

December 31, 2017

Base year emissions (metric tons CO2e)

45,803.808

Comment

HAMC sets the target for all domestic workplaces to reduce 24.9 % by 2030 compared to 2017.

Scope 2 (location-based)

Base year start

January 1, 2017

Base year end

December 31, 2017

Base year emissions (metric tons CO2e)

212,128.715

Comment

HAMC sets the target for all domestic workplaces to reduce 24.9 % by 2030 compared to 2017.

Scope 2 (market-based)

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

The Korean power market is a single regional-based market supplied by Korea Electric Power Corporation (hereafter referred to as the KEPCO), and there is no private power market.

Scope 3 category 1: Purchased goods and services

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO₂e)

355,610.45

Comment

In this category, HAMC sets the target for all domestic workplaces to reduce 16.02 % by 2030 compared to 2021.

Scope 3 category 2: Capital goods

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO₂e)

109.38

Comment

N/A

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

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO₂e)

22,018.44

Comment

N/A

Scope 3 category 4: Upstream transportation and distribution

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO₂e)

3,846.27

Comment

N/A

Scope 3 category 5: Waste generated in operations

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

3,637.96

Comment

N/A

Scope 3 category 6: Business travel

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

98.8

Comment

N/A

Scope 3 category 7: Employee commuting

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

179.63

Comment

N/A

Scope 3 category 8: Upstream leased assets

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

13.99

Comment

N/A

Scope 3 category 9: Downstream transportation and distribution

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

20,851.9

Comment

N/A

Scope 3 category 10: Processing of sold products

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

119,795.49

Comment

In this category, HAMC sets the target for all domestic workplaces to reduce 16.02 % by 2030 compared to 2021.

Scope 3 category 11: Use of sold products

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

N/A

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

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

88,894.12

Comment

N/A

Scope 3 category 13: Downstream leased assets

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0.19

Comment

N/A

Scope 3 category 14: Franchises

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

N/A

Scope 3 category 15: Investments

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

N/A

Scope 3: Other (upstream)

Base year start

Base year end

Base year emissions (metric tons CO2e)

Comment

N/A

Scope 3: Other (downstream)

Base year start

Base year end

Base year emissions (metric tons CO₂e)

Comment

N/A

C5.3

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

Korea GHG and Energy Target Management System Operating Guidelines

C6. Emissions data

C6.1

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

Reporting year

Gross global Scope 1 emissions (metric tons CO₂e)

44,441.529

Start date

January 1, 2021

End date

December 31, 2021

Comment

HAMC's total scope 1 emissions in the reporting year were calculated as '44,441.529 tCO₂eq'.

Past year 1

Gross global Scope 1 emissions (metric tons CO₂e)

43,956.43

Start date

January 1, 2020

End date

December 31, 2020

Comment

HAMC's total scope 1 emissions in 2020 were calculated as '43,956.43 tCO2eq'. This data is same as we disclosed last year.

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

158,076.445

Start date

January 1, 2021

End date

December 31, 2021

Comment

HAMC's total scope 2 emissions in the reporting year were calculated as '158,076.445 tCO2eq'.

Past year 1

Scope 2, location-based

147,100.6

Start date

January 1, 2020

End date

December 31, 2020

Comment

HAMC's total scope 2 emissions in 2020 were calculated as '147,100.60 tCO2eq'. This data is same as we disclosed last year.

C6.4

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

No

C6.5

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

Purchased goods and services

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

355,610.45

Emissions calculation methodology

Hybrid method

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

36

Please explain

- 1) Fuel Combustion Emissions: Emissions were calculated based on the energy consumption of partners/suppliers that could be collected. The energy consumption of suppliers whom we failed to information was estimated based on our purchase amount of such material.
- 2) Emissions from fuel extraction: We calculated the emission from extraction of fuel to produce purchased products by applying HAMC's sales ratio among Category 1 emissions of Hyosung TNC, which was 9%.
- 3) Emissions from water use: GHGs emissions due to water use was calculated by applying the emission factor of Environmental Labelling(certified by KEITI) to the water consumption of HAMC's headquarters and each business site.

Capital goods

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

109.38

Emissions calculation methodology

Average data method

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

0

Please explain

HAMC calculated emissions from purchase of 'printers, all-in-one printers, personal computers, monitors and main computers' in the reporting year (2021)

Activity data adopted the real purchase amount data managed by the internal capital goods purchase data system, and emission coefficient was calculated by using the result value of carbon emissions in 'the preproduction stage,' and 'production stage' of all stages by each product

- Emission calculation: \sum (purchase amounts of printers, all-in-one printers, personal computers, monitors (ea) X respective individual GHGs emission coefficient (kgCO₂/ea) by product)

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

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

22,018.44

Emissions calculation methodology

Average data method

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

0

Please explain

HAMC calculated emissions in the production process using purchased fuel in the reporting year (2021) and emissions due to electricity losses (electricity transmission and distribution) during the distribution process

Activity data was adopted from the detailed statement data verified by third party for all domestic sites and emission coefficient employed upstream emission coefficient by material.

- Emission calculation: \sum (annual fuel usage X GHGs emission coefficient by fuel type)

Upstream transportation and distribution**Evaluation status**

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

3,846.27

Emissions calculation methodology

Distance-based method

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

0

Please explain

HAMC calculated the emissions from transportation of purchased products by considering the distance and means of transportation where purchased raw and subsidiary materials were transported from partner companies to HAMC in the reporting year(2021).

- Emission calculation: \sum (annual raw material transportation distance (km) X raw material supply and demand (ton) X greenhouse gas emission coefficient of respective means of transportation (kgCO₂/ton.km))

Waste generated in operations

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

3,637.96

Emissions calculation methodology

Waste-type-specific method

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

0

Please explain

The waste generated at the head office and all business sites is entrusted to a third party, and the amount of greenhouse gas generated by waste is calculated in consideration of the waste treatment method.

Activity data was adopted from the reported waste amount (waste emission) which each workplace reported to the government's reporting system. Emission coefficient was used by waste type and processing method from LCI DB of the Ministry of Environment.

- Emission calculation: \sum (annual waste emission (kg) X GHGs emission coefficient by waste processing method (kgCO₂/kg))

Business travel

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

98.8

Emissions calculation methodology

Distance-based method

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

0

Please explain

HAMC calculated emissions in the overseas and domestic business travels of executives and staff members in the reporting year (2021).

The activity data was adopted from the overseas and domestic business trip history data from the internal system for each business site, and the greenhouse gas emissions from business trips were calculated by applying emission coefficients to the business trip distance and means of transportation.

- Emission calculation: \sum (Total business trip distance(km) X GHGs emission coefficient(kgCO₂/km) of employees by transportation means.)

Employee commuting

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

179.63

Emissions calculation methodology

Distance-based method

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

0

Please explain

1) Headquarters employees commuting to work: Assuming the ratio of the actual transportation means as the scenario, we calculated the emissions by considering the number of head office employees and the number of working days.

- Emission calculation \sum (daily round-trip commuting distance per employee (person km/day)) X annual working days (day) X GHGs emission coefficient (kg-CO₂/person km))

2) Business sites: Emissions were calculated by considering the commuter bus route, number of operations, and number of days of operation.

- Emission calculation = \sum (Operating distance by route (km/times) X Daily route operation times (times/day)) X Annual working days (day) X GHGs emission coefficient (kg-CO₂/km))

Upstream leased assets**Evaluation status**

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

13.99

Emissions calculation methodology

Average data method

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

0

Please explain

HAMC calculated emissions from long-term rent vehicles in the reporting year (2021).

For activity data, the number and type of rental vehicles in long-term rental contract was used. Emission coefficient used was the result value of carbon emission in 'the preproduction stage' and 'the production stage' from the LCA of the product. In case we could not acquire coefficients for certain purchased products, we applied emission coefficient of a similar model.

- Emission calculation: \sum (long-term rent vehicles (ea) X GHGs emission coefficient by vehicle type (kgCO₂/kg))

Downstream transportation and distribution**Evaluation status**

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

20,851.9

Emissions calculation methodology

Distance-based method

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

0

Please explain

HAMC calculated emissions in the transportation process of all products sold in the domestic workplaces in the reporting year (2021).

For activity data, product sales volume and the distance transported from the manufacturing site to customers were applied, and the emission factor per unit distance for each means of transportation for environmental labelling was applied to the emission factor.

- Emission calculation: \sum (Annual transportation distance of products sold (km) X product sales volume (ton) X GHGs emission coefficient by transportation method (kgCO₂/ton.km))

Processing of sold products

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

119,795.49

Emissions calculation methodology

Average data method

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

0

Please explain

Emissions were calculated by applying the tire rolling process ratio (8%), which is the processing process of applying Tirecord to the rubber, which is the main product of HAMC as well as the weight ratio of Tirecord among rolled products (27%) to the tire emission factor.

- Emission calculation: yearly tirecord sales volume/average consumption of tirecord per tire (ea) X Tire weight (kg/ea) 27% X 8% X GHG emission coefficient (kgCO₂/kg)

Use of sold products

Evaluation status

Not relevant, explanation provided

Please explain

Since HAMC' products are intermediate goods, the emission from the use of sold products cannot be calculated.

End of life treatment of sold products

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

88,894.12

Emissions calculation methodology

Waste-type-specific method

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

0

Please explain

Emissions were calculated by calculating the number of tires that can be produced based on the amount of our products sold and by applying the emission factor at the tire disposal stage.

- Emission calculation: \sum (yearly Tirecord product sales volume (kg) X greenhouse gas emission factor by waste treatment method (kgCO₂/kg))

Downstream leased assets

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO₂e)

0.19

Emissions calculation methodology

Average data method

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

0

Please explain

Emissions from electricity used at the Gyeongju plant(currently not operated by Hyosung Advanced Materials, and leased to third party) were calculated.

- Emission calculation: \sum (annual electricity consumption X power emission factor)

Franchises

Evaluation status

Not relevant, explanation provided

Please explain

Not applicable, since Hyosung Advanced Materials does not own franchises.

Investments

Evaluation status

Not relevant, explanation provided

Please explain

There are no emissions generated from investment by Hyosung Advanced Materials.

Other (upstream)

Evaluation status

Please explain

Other (downstream)

Evaluation status

Please explain

C6.5a

(C6.5a) Disclose or restate your Scope 3 emissions data for previous years.

Past year 1

Start date

January 1, 2020

End date

December 31, 2020

Scope 3: Purchased goods and services (metric tons CO2e)

278,429.63

Scope 3: Capital goods (metric tons CO2e)

15.59

Scope 3: Fuel and energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e)

21,343.53

Scope 3: Upstream transportation and distribution (metric tons CO2e)

3,119

Scope 3: Waste generated in operations (metric tons CO2e)

2,803.23

Scope 3: Business travel (metric tons CO2e)

235.18

Scope 3: Employee commuting (metric tons CO2e)

164.4

Scope 3: Upstream leased assets (metric tons CO2e)

7.91

Scope 3: Downstream transportation and distribution (metric tons CO2e)

18,742.85

Scope 3: Processing of sold products (metric tons CO2e)

76,041.88

Scope 3: Use of sold products (metric tons CO2e)

0

Scope 3: End of life treatment of sold products (metric tons CO2e)

60,512.36

Scope 3: Downstream leased assets (metric tons CO2e)

0

Scope 3: Franchises (metric tons CO2e)

0

Scope 3: Investments (metric tons CO2e)

0

Scope 3: Other (upstream) (metric tons CO2e)

0

Scope 3: Other (downstream) (metric tons CO2e)

0

Comment

The 2020 scope 3 emissions reported last year were recalculated based on the 2021 scope 3 calculation method. Detailed scope3 calculation method can be found in C6.5.

C6.7

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

No

C6.10

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

Intensity figure

0.0000002

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

202,518

Metric denominator

unit total revenue

Metric denominator: Unit total

963,266,179,554

Scope 2 figure used

Location-based

% change from previous year

20.5

Direction of change

Decreased

Reason for change

The unit of sales decreased by 20.5% compared to the previous year. Sales increased by 33% compared to the previous year, while emissions increased by only 6%. This is thought to be the result of Hyosung Advanced Materials' ongoing activities to improve energy efficiency. In 2021, as indicated in C4.3a and C4.3b, 577 tCO₂e was reduced through investment activities to save energy, and 614 tCO₂e is being reduced through process improvement activities. In addition, Hyosung Advanced Materials is continuously adding new reduction activities - 4 reduction activities are scheduled to be carried out and 2 activities are under review.

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 CO ₂ e)	GWP Reference
CO ₂	44,388.475	IPCC Second Assessment Report (SAR - 100 year)
CH ₄	27.32	IPCC Second Assessment Report (SAR - 100 year)
N ₂ O	25.734	IPCC Second Assessment Report (SAR - 100 year)
HFCs	0	IPCC Second Assessment Report (SAR - 100 year)
PFCs	0	IPCC Second Assessment Report (SAR - 100 year)
SF ₆	0	IPCC Second Assessment Report (SAR - 100 year)

C7.2

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

Country/Region	Scope 1 emissions (metric tons CO ₂ e)
Republic of Korea	44,441.529

C7.3

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

By activity

C7.3c

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

Activity	Scope 1 emissions (metric tons CO ₂ e)
Stationary Sources	34,712.64

Mobile Combustion	131.53
Process Emissions	0
Gaseous Waste	9,597.36

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 CO ₂ e	Comment
Chemicals production activities	44,081.855	Based on the Ulsan, Daejeon, and Jeonju factories where Hyosung Advanced Materials' production activities take place, the scope 1 emissions are '44,081.855 tCO ₂ eq'.

C7.5

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

Country/Region	Scope 2, location-based (metric tons CO ₂ e)	Scope 2, market-based (metric tons CO ₂ e)
Republic of Korea	158,076.445	0

C7.6

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

By activity

C7.6c

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

Activity	Scope 2, location-based (metric tons CO ₂ e)	Scope 2, market-based (metric tons CO ₂ e)
Electricity	155,560.112	0
Steam	2,516.333	0

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 CO ₂ e	Scope 2, market-based (if applicable), metric tons CO ₂ e	Comment
Chemicals production activities	155,641.822	0	The Korean power market is a single regional-based market supplied by KEPCO, and there is no market-based system. Hyosung Advanced Materials is purchasing electricity and

			<p>steam from outside the company.</p> <p>Based on the Ulsan, Daejeon, and Jeonju factories where Hyosung Advanced Materials' production activities take place, the scope 2 emissions are '155,641.822 tCO₂eq'.</p>
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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 tCO ₂ e from purchased feedstock	Explain calculation methodology
Other (please specify) PET (polyethylene terephthalate) CHIP, NYLON CHIP (Polyamide)	62	HAMC's main products, PET Chip and Nylon Chip, which are raw materials for tire cords, are purchased from Hyosung TNC. Emissions were calculated by taking into account the amount of energy consumed by Hyosung TNC to produce PET Chip and Nylon Chip and the proportion of Hyosung TNC's sales of raw and subsidiary materials.
Other (please specify) TPC (Terephthaloyl dichloride)	5	TPC, one of the main raw materials for producing aramid yarn, is purchased from BENZO. Emissions were calculated by collecting energy consumption to produce TPC purchased from BENZO.

C-CH7.8a

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

	Sales, metric tons	Comment
Carbon dioxide (CO ₂)	0	HAMC does not sell Carbon dioxide (CO ₂).
Methane (CH ₄)	0	HAMC does not sell Methane (CH ₄).
Nitrous oxide (N ₂ O)	0	HAMC does not sell Nitrous oxide (N ₂ O).
Hydrofluorocarbons (HFC)	0	HAMC does not sell Hydrofluorocarbons (HFC).
Perfluorocarbons (PFC)	0	HAMC does not sell Perfluorocarbons (PFC).
Sulphur hexafluoride (SF ₆)	0	HAMC does not sell Sulphur hexafluoride (SF ₆).
Nitrogen trifluoride (NF ₃)	0	HAMC does not sell Nitrogen trifluoride (NF ₃).

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	Emissions value (percentage)	Please explain calculation
Change in renewable energy consumption	2.71	Decreased	0.0014	HAMC produced and consumed 5.9 MWh of electricity through its solar power plant. Emissions from renewable energy consumption calculated by applying the Korea Electric Power Emissions Factor (0.4594 tCO2eq/MWh) is 2.71 tCO2eq. As the total greenhouse gas emission in 2020 (Scope 1+2) was 191,050 tCO2eq, the emission change rate is 0.0014%. (2.71/191,050*100=0.0014%)
Other emissions reduction activities	577	Decreased	0.3	HAMC reduced 577 tCO2eq through greenhouse gas reduction activities in 2021 (C4.3b). The total greenhouse gas emission in 2020 (Scope 1+2) was 191,050 tCO2eq, so the rate of change in emissions is 0.3%. (577/191,050 = 0.3%)
Divestment	0	No change	0	No change due to divestment in 2020 and 2021.
Acquisitions	0	No change	0	No change due to acquisitions in 2020 and 2021.
Mergers	0	No change	0	No change due to mergers in 2020 and 2021.
Change in output	10,600	Increased	5.5	The production of carbon aramid PU has increased due to the expansion of the production process for aramid yarn and carbon fiber. In 2021 compared to 2020, carbon fiber emissions increased by 3,742 tCO2eq, and aramid yarn emissions increased by 6,858 tCO2eq. As the total greenhouse gas emission in 2020 is 191,050 tCO2eq, the emission change rate is 5.5%. (3,742+6,858)/191050 = 5.5%
Change in methodology	0	No change	0	No change due to calculation methodology change in 2020 and 2021.
Change in boundary	0	No change	0	No change due to change in boundary in 2020 and 2021.
Change in physical operating conditions	0	No change	0	No change due to change in physical operating conditions in 2020 and 2021.
Unidentified	0	No change	0	There has been no changes
Other	0	No change	0	No change due to other activities in 2020 and 2021.

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 5% but less than or equal to 10%

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	183,711.71	183,711.71
Consumption of purchased or acquired electricity		0	338,608.02	338,608.02
Consumption of purchased or acquired steam		0	84,337.57	84,337.57
Consumption of self-generated non-fuel renewable energy		5.9		5.9
Total energy consumption		5.9	606,657.29	606,663.19

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)

181,839.55

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

181,839.55

Consumption of purchased or acquired electricity

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)

333,308.57

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

333,308.57

Consumption of purchased or acquired steam

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)

84,337.57

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

84,337.57

Consumption of self-generated non-fuel renewable energy

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)

0

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

0

Total energy consumption

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)

599,485.69

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

599,485.69

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	No
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 heat

0

MWh fuel consumed for self-generation of steam

0

Comment

HAMC does not use sustainable biomass.

Other biomass

Heating value

HHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

HAMC does not use biomass.

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 heat

0

MWh fuel consumed for self-generation of steam

0

Comment

HAMC does not use renewable fuels.

Coal

Heating value

HHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

HAMC does not use coal.

Oil

Heating value

HHV

Total fuel MWh consumed by the organization

503.29

MWh fuel consumed for self-generation of heat

503.29

MWh fuel consumed for self-generation of steam

0

Comment

HAMC uses oil(Gasoline, Diesel, kerosene) to generate heat.

Gas

Heating value

HHV

Total fuel MWh consumed by the organization

183,208.42

MWh fuel consumed for self-generation of heat

61,648.33

MWh fuel consumed for self-generation of steam

121,560.09

Comment

HAMC uses gas(LPG, LNG, propane gas) to generate heat and steam

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 heat

0

MWh fuel consumed for self-generation of steam

0

Comment

HAMC does not use other non-renewable fuels.

Total fuel

Heating value

HHV

Total fuel MWh consumed by the organization

183,711.71

MWh fuel consumed for self-generation of heat

62,151.62

MWh fuel consumed for self-generation of steam

121,560.09

Comment

HAMC uses oil and gas to generate heat and steam.

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	338,619.82	338,608.02	5.9	5.9
Heat	62,151.62	62,151.62	0	0
Steam	205,897.66	205,897.66	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)

333,308.57

Generation that is consumed inside chemicals sector boundary (MWh)

333,308.57

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

Heat

Total gross generation inside chemicals sector boundary (MWh)

60,867.78

Generation that is consumed inside chemicals sector boundary (MWh)

60,867.78

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)

205,309.34

Generation that is consumed inside chemicals sector boundary (MWh)

205,309.34

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 of your non-fuel energy consumption by country.

Country/area

Republic of Korea

Consumption of electricity (MWh)

338,608.01

Consumption of heat, steam, and cooling (MWh)

84,337.56

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

422,945.57

C-CH8.3

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

No

C9. Additional metrics

C9.1

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

Description

Other, please specify

0

Metric value

Metric numerator

Metric denominator (intensity metric only)

% change from previous year

Direction of change

Please explain

HAMC has no additional indicators.

C-CH9.3a

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

Output product

Polymers

Production (metric tons)

120,184

Capacity (metric tons)

194,400

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

0.3698

Electricity intensity (MWh per metric ton of product)

2.8174

Steam intensity (MWh per metric ton of product)

0.7017

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

0

Comment

HAMC manufactures various industrial yarn - polyester and nylon for Tirecord and other industrial uses, aramid yarn, carbon fiber, and BCF(Bulk-continuous filament) for carpet.

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	HAMC is conducting R&D to secure properties and process applicability equivalent to that of the existing products by applying eco-friendly chips such as Chemical/Mechanical Recycled Chip and Chip from bio-based EG instead of conventional PET chips or by developing eco-friendly dip recipes. In 2021, HAMC invested KRW 1,359 million in research on developing low-carbon, eco-friendly products and high-strength products compared to existing products.

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	Stage of development in the reporting year	Average % of total R&D investment over the last 3 years	R&D investment figure in the reporting year (optional)	Comment
Product redesign	Pilot demonstration	≤20%		HAMC has secured mass production technology as well as product physical properties and process capability for tirecord using Chemical Recycled PET Chip, and sample evaluation is in progress.
Bio technology	Applied research and development	≤20%		Using eco-friendly Bio Nylon material, applicability to tirecord was evaluated.
Product redesign	Small scale commercial deployment	≤20%		By applying the eco-friendly recipe of PET tirecord, we have achieved the physical property target required by our customers. We plan to produce additional samples and provide them to customers for sample testing

C10. Verification

C10.1

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

	Verification/assurance status
Scope 1	Third-party verification or assurance process in place

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

C10.1a

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

Verification or assurance cycle in place

Annual process


Status in the current reporting year

Complete

Type of verification or assurance

Reasonable assurance

Attach the statement

 AS_GHG_Hyosung Advanced Materials_Scope1,2_EN2021.pdf

Page/ section reference

page 1 (Ref. Scope 1 and 2 emissions for 2020 are the same as those reported through CDP in the previous year. Therefore, we only attach reasonable assurance of Scope 1, 2 for 2021.)

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

 AS_GHG_Hyosung Advanced Materials_Scope1,2_EN2021.pdf

Page/ section reference

page 1 (Ref. Scope 1 and 2 emissions for 2020 are the same as those reported through CDP in the previous year. Therefore, we only attach reasonable assurance of Scope 1, 2 for 2021.)

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: Employee commuting
- Scope 3: Upstream leased assets
- Scope 3: Downstream transportation and distribution
- Scope 3: Processing of sold products
- Scope 3: End-of-life treatment of sold products
- Scope 3: Downstream leased assets

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

 AS_GHG_효성첨단소재_Scope3_En_2020,2021.pdf

Page/section reference

page 1~2

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?

 Hyosung Advanced Materials_Carbon Foot Print_AS_Y2020_verification_PAS2050_20210830.pdf

Disclosure module verification relates to	Data verified	Verification standard	Please explain
C4. Targets and performance	Product footprint verification	PAS 2050:2011	HAMC has had its tirecord fabric's carbon footprint calculated and verified in accordance with PAS2050:2011.

C11. Carbon pricing

C11.1

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

Yes

C11.1a

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

Korea ETS

C11.1b

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

Korea ETS

% of Scope 1 emissions covered by the ETS

100

% of Scope 2 emissions covered by the ETS

100

Period start date

January 1, 2021

Period end date

December 31, 2021

Allowances allocated

238,079

Allowances purchased

0

Verified Scope 1 emissions in metric tons CO₂e

44,442

Verified Scope 2 emissions in metric tons CO₂e

158,076

Details of ownership

Facilities we own and operate

Comment

N/A

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

HAMC is participating in the K-ETS from 2018. HAMC is conducting various activities according to its climate change response & sustainability management strategies to effectively respond to the allocations of the 3rd K-EST planning period (2021-2025). Emission permits are allocated on an annual basis to business sites that emit GHGs and emissions are managed within the allocated range. Actual GHGs emissions are evaluated every year upon which excess or insufficient emission credit is freely traded. HAMC is inducing the company's GHGs reduction activities and respond to climate change.

-Climate Change Strategy

In 2021, HAMC revised its 'Vision 2030' GHGs reduction target to 24.9% until 2030 compared to 2017 in line with the national industrial sector reduction goal. Especially, in 2022, HAMC newly set a target to reduce 16.02% of Scope 3 by 2030 compared to 2021 at all domestic sites. Accordingly, we have newly established a GHGs reduction plan for each business area. Internal carbon price has been set and reduction projects are executed every year in order to meet the shortfall compared to the GHGs allocation under the K-ETS. HAMC has been asked to participate in SBTi from various stakeholders due to changes in perceptions and requirements related to climate change response. In response, HAMC is in the course of calculating Scope 1, 2 and 3 emissions of all sites, and plan to complete its GHGs inventory by 2022. In addition, in the second half of 2021, the CEO reported to the Board of Directors regarding Science-Based Target (hereinafter SBT) setting at the company level in 2023. HAMC will continue to make efforts to respond to climate change and have our SBT approved by SBTi by 2024.

-Monthly monitoring of GHGs emissions and market price of carbon credits: The business management team, power team, and environment safety team use the Carbon Asset Management System to monitor GHGs emissions regularly and to review the current issues of the K-ETS and market price of carbon credits. We were able to prevent a 4.2% loss during the sales of surplus carbon credit by analysing when to sell -predicting when the price of emission permits would not decline compared to that assessed by the carbon asset management system.

-Reduction of GHGs emissions by reducing the use of non-renewable energy: HAMC manages all energy data at Ulsan, Jeonju, and Daejeon plants to derive measures to reduce GHGs emissions and reduce energy consumptions. In 2021, the Jeonju plant saved 1,677MWh of non-renewable energy(LNG)by recovering and reusing waste heat from the RTO heat exchanger.

-Monitoring government policy: Sustainability management team and the business management team participate in K-ETS related government briefings and conferences, and provides opinions through various associations(i.e. UNGC, The Korea Chemical Fiber Association, H2 Business Summit Fund, and etc.) enabling HAMC to better respond to K-ETS. The main contents of the policy changes are reported to the GMC, the SSC, and the BOD.

2) Sustainability Strategy

In order to contribute to the reduction of GHGs and energy use in the mobility industry, including automobiles, we are constantly researching ways to develop products with lightweight and high-strength properties that make fuel-efficient automobiles. In addition, by using conventional(petrochemical) raw materials, we are focusing to develop products using sustainable materials to help solve issues such as resource depletion and environmental pollution. In addition, HAMC is making various efforts to minimize negative environmental impacts that may occur in the entire process, from raw materials to product production, product use, and post-use treatment.

-Advancing the Carbon Asset Management System: The Carbon Asset Management System was developed in 2019 to directly manage and statistically analyse activity data for Ulsan, Jeonju, and Daejeon sites. It helps to understand data trend of energy consumption, targets, carbon assets, compliance to related regulations as well as respond to K-ETS. In December 2021, we invested 16,900,000 KRW to upgrade the Carbon Asset Management System.

C11.2

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

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.

Objective for implementing an internal carbon price

- Navigate GHG regulations
- Change internal behavior
- Drive energy efficiency

GHG Scope

- Scope 1
- Scope 2

Application

HAMC sets provisions in advance when establishing a management plan in preparation for the risk of insufficient K-ETS credits. When HAMC sells or purchases carbon credits due to surplus or shortage, it is reflected in books as

the cost according to the contribution of each performance unit for the expected shortage. This has an impact on the performance unit's GHGs emissions reduction activities. In the case of surplus carbon credits, they are booked as other revenue at the point of the sale of emission permits. Also, internal carbon price is used for economic analysis(valuation) when establishing a business site energy use plan and investment in energy facilities. In addition, HAMC is using the internal carbon pricing system for strategic decision-making, such as business direction and investment, to prepare for climate change risk management needs and to seek risks and opportunities in the process of transitioning to a low-carbon economy.

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

31,000

Variance of price(s) used

HAMC applies the same internal price on carbon to investment decisions for all regions and business units(PU). In general, the internal carbon price applied is the closing price of the current year's K-ETS trading day, but exceptional cases with high financial impact according to the C2.2 risk assessment process, a variable price considering the passage of time and market volatility is applied.

The management team announces the internal price on carbon every year before establishing the business plan for the next year. That price for 2021 was 31,000 KRW/ton based on the K-ETS trading closing price of the first week of October 2021.

(Examples of exceptional cases) According to the risk assessment process described in C2.2, if the financial impact is 'high', such as customer demand for GHGs emission reduction following the NDC upgrade and institutional risk factors, the internal price on carbon was set at 46,500 KRW/ton. For example, HAMC used the internal price on carbon 46,500 KRW/ton (this was equivalent to 150% volatility applied to 31,000 KRW/ton in 2021) when GMC received a report on the impact on HAMC from the NDC increase in December 2021 and decided on the increased GHGs emission reduction target. When calculating the cost of carbon credits, 150% volatility was reflected in order to prepare for the risk of a reduction in the free carbon credits in K-ETS and the realization of carbon credits price in Korea, which was at that time 1/3 of that of EU.

Type of internal carbon price

Shadow price

Impact & implication

1. Carbon cost analysis using internal carbon pricing system for strategic decision-making

The carbon cost calculated using the internal carbon pricing system is reviewed in addition to the existing economic analysis when reviewing facility investment(i.e. replacement of old facilities, high-efficiency facility investment, etc.) and investment in fuel conversion and new plant expansion. In particular, HAMC distributed the carbon cost calculation process to all employees in December 2021 so that all employees can calculate economic feasibility and carbon emissions using internal carbon prices.

In December 2021, the sustainability management team calculated the carbon cost of 6,420 million KRW when reviewing the expansion of the Ulsan and Jeonju plants of Carbon Aramid PU at the internal carbon price announced in October 2021(31,000 KRW/ton) and reported it to the SSC. Based on the reported carbon cost, the SSC discussed the need for a specialized organization capable of carrying out practical work, installing facilities with improved energy efficiency and constructing utilities use renewable energy, for the expansion at Ulsan and Jeonju plants of Carbon Aramid PU. As a result, the SSC voted to form a specialized organization (the name of the organization is 'Carbon Emission Reduction TFT') to manage GHG reduction in the expansion lines.

2. Introduction of an internal carbon pricing system as a tool for predicting achievement of climate change-related goals

HAMC has revised its 'Vision 2030' GHGs reduction target to 24.9% until 2030 compared to 2017 in line with the national industrial sector reduction goal. HAMC considered the results of analysis of excess and shortage of carbon

credit under the influence of K-ETS. As a result of analysing on a basis of 46,500 KRW/ton in consideration of the volatility according to the financial evaluation results, HAMC predicted that 26,165,000 KRW would be necessary as environmental costs in 2025, which would be a negative financial impact to HAMC. Therefore, HAMC identified additional energy use and reduction activities that could be implemented in the production process other than the utility sector. (2021 Jeonju Plant reduced energy use by 1,944MWh by reducing steam consumption and by improving the condensate recovery process)

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

Run an engagement campaign to educate suppliers about climate change

% of suppliers by number

73

% total procurement spend (direct and indirect)

95

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

36

Rationale for the coverage of your engagement

HAMC is striving to have close relationships with its key suppliers based on the recognition that strengthening their competitiveness is essential for our sustainable future. HAMC is making various efforts such as establishing close relationships with suppliers through continuous communication, collecting their opinions, and providing support such as safety inspection and education, and sustainability management consulting. In addition, we are cooperating as a win-win partner that manages various risks together so that suppliers can promote sustainable growth beyond enhancing cost and quality competitiveness. We try to cover all key suppliers. The definition for key suppliers subject to the engagement explained above are suppliers that make up 95% of purchase amount. Key suppliers are subject to regular audits and evaluations in accordance with HAMC's supplier management based on IATF 16949.

Impact of engagement, including measures of success

HAMC identified issues related to energy management and operation of suppliers in Ulsan and Jeonju plants through an advisory on energy management innovation (hereinafter the Energy Advisor). The project was carried

out to provide technical guidance and strengthen management capabilities of our suppliers through energy usage diagnosis.

From April 2021 to November 2021, HAMC provided technical education through the Energy Advisor. Especially, the technical training was divided into two steps: (1) energy diagnosis and measures to improve management and operational efficiency of energy. (2) improvements for management and technical training r based on their energy diagnosis results. Also, by sharing the HAMC performance in energy management improvement activities, we supported their improvement activities to build capacity and increase awareness. Through on-site diagnosis, five improvement themes were derived in their air compressor part of the boiler and dust collector. The energy improvement have a potential savings of 5.24 toe/year and an estimated savings of 4.78 million KRW/year. These engagements are reflected in HAMC Regular Supplier Evaluation, and the results are managed and reported by the Supply Chain Management Committee (hereinafter SCMC). Through various engagement activities, the average of supplier ESG evaluation was improved one step from D grade in 2020 to M grade in 2021.

Comment

N/A

C12.1b

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

Type of engagement & Details of engagement

Collaboration & innovation

Run a campaign to encourage innovation to reduce climate change impacts

% of customers by number

41

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

83

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

HAMC, as an intermediate goods company, is striving to engage with all B2B customers without discrimination. The selected group of customers for engagement such as Nokian, Michelin, Bridgestone, Goodyear, Pirelli, Hankook Tires, Nexen Tires, Wonpyong, Dongwon Industrial Materials, and Hyundai Motors account for 70~81% of sales based on separate financial statements.

Michelin, Bridgestone, Goodyear, Pirelli, Hankook Tires and Nexen Tires who are major leaders in engagement and response to climate change are major customers of Tire & Industrial Reinforcements PU. Hyundai Motors is a major customer of Interior PU. In this case, HAMC and the customers closely collaborate to encourage innovation to reduce climate change impacts and collaborate to develop low carbon products such as Recycled or Bio products. On the other hand, Wonpyong and Dongwon Industrial Materials are medium-scale enterprises. They are customers of Technical Yarn PU. They have less information and resources. So, in this case, HAMC share information on our climate change performance and strategy, and they share information about their products and relevant certification schemes. HAMC and they also cooperate in finding ways to reduce energy uses.

HAMC implements engagement in three ways: 1) Share information on strategies and performance in response to climate change through regular technical meetings. 2) Share GHGs emission information of products sold to customers utilizing carbon labeling certification. 3) In terms of Scope 3, we regularly hold technical meetings to reduce the impact of climate change and carry out short-term projects to interactively share climate change information.

For instance, at the regular technical meeting engagement with Pirelli & C. S.p.A. in May 2021, the two companies reviewed GHGs emission reduction plans for the products we supply by business site. At the time we were not able to deeply discuss about our steel reinforcements due to carbon information shortage. As a result, in December 2021, the HAMC sustainability management team prioritize the acquisition of new carbon labeling certifications for Steel Cord and Bead Wire as part of the company-wide project to acquire product carbon emissions certification.

Impact of engagement, including measures of success

HAMC climate change response, such as managing GHGs emissions from products and business sites and switching to renewable energy, is also very important in terms of Scope 3 reduction for HAMC's major customers, such as Michelin, Pirelli Tire, Continental Tire, ZF, and Autoliv. If we fail to reduce greenhouse gas emissions to the level required by these major customers, or if it is impossible to provide information such as the impact of climate change, this may lead to reduction in sales which will have a negative impact on our business. Assuming a 10% loss for the top 5 major customers revenue in 2021(2,751,732,962 KRW), would be a risk of losing at least 275,173,296 KRW in sales. Therefore, HAMC is conducting various engagements with customers to mitigate such risks. The indicator for monitoring engagement with customers is the number of stakeholder responses, with a total of 31 cases in 2021, achieving 141% compared to the annual target of 22 cases. Through various engagements, we found that the number of customers who are considering activities to reduce GHGs emissions in the stages of product use and disposal will increase to 13 in 2021 compared to 3 in 2020 This increase displays successful engagement with customers -; HAMC's climate change strategy is clearly and well shared.

In particular, in July 2021, Bridgestone required HAMC to calculate the LCA of products supplied to their EU plant to reduce climate change impacts. As a result of third-party cooperation among Bridgestone, a consulting company, and HAMC, the LCA calculation of a specific product(i.e. PET Tirecord) has been completed. Bridgestone and HAMC were able to understand in more detail the impact of our product which may be used as a baseline to reduce negative impact of that product in the future.

Through customer engagement, the number of Voice of Customer(hereinafter VOC) increased by about 73% from 3,249 in 2020 to 5,624 in 2021, providing an opportunity for key customers to recognize that our products have an advantage over competitors' products.

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

Climate-related disclosure through a non-public platform

Description of this climate related requirement

In 2021, provisions related to general sustainability information and call on upstream to make reasonable efforts to address climate change-related issues were further reinforced to the upstream contract itself to further emphasize the their efforts even if it is less legally. The contract was applied from new contracts of major upstream such as raw and subsidiary materials, and defined sustainable purchasing to minimize the negative environmental, social

and economic impacts of HAMC business activities.

In addition, HAMC will select upstream companies that have the capability and will to implement sustainability activities including climate change by signing the supplier code of conduct. HAMC will ask suppliers to not only respond to climate change but also prevent negative environmental impacts such as water pollution, soil pollution, and air pollution. In accordance with the Labor Code of the International Labor Organization(hereinafter ILO), HAMC will select suppliers that fulfils its social responsibilities such as working conditions, diversity protection, human rights protection, and ethical management.

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

95

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

100

Mechanisms for monitoring compliance with this climate-related requirement

Supplier self-assessment

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

Retain 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

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

Yes, we engage indirectly through trade associations

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

No, but we plan to have one in the next two years

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

To ensure that our climate change engagement is consistent to our overall climate change strategy, we have established the 'Process for ESG-related requests from external stakeholders(hereinafter ENGAGEMENT PROCESS)' through which all stakeholders including customers, suppliers, shareholders, organizations are covered.

The ENGAGEMENT PROCESS was made because our engagement may directly or indirectly influence policy or regulations regarding climate change. Our ENGAGEMENT PROCESS prevents personnel's incorrect or inaccurate reply by discretionary judgment and reinforces stakeholders trust through transparency and accuracy of the responses.

1. General practice; The process is usually carried out in 6 steps although exact process may differ depending on the details of the request - 1)REQUEST received, 2)Submit REQUEST to the ESG team including its purpose and requirements, 3)Designate responsible personal, 4)Collect data and draft response, 5)Review and internal approval, 6)Submit REQUEST and share result. When collecting data, the ESG team works with the personal to sensor whether the engagement data is consistent. In 2021, 31 engagements were made of which 1 request wasn't

fully responded – Michelin’s request for LCA calculation. We engaged with customers regarding SBT setting, product GHGs among others in 2021.

2. For engagement with government and associations(i.e. The Federation of Korean Industries, ISSB, etc.), each related business unit prepares the corresponding opinion, and the climate change response officer checks its consistency to HAMC’s climate change roadmap and response strategy. HAMC is part of Korea Chemical Fiber Association, KOREA H2 BUSINESS SUMMIT and receives requests to submit opinions on ESG and climate change.

3. For engagement with shareholders or investors, there is an additional screening by the CFO and the IR manager. In October 2021, our shareholder Shinhan Asset Management inquired about our climate change response status including our strategy for the 3rd planning period of the K-ETS and our governance system. The ESG team drafted the response upon which the IR team and Finance Office reviewed the appropriateness and coherency.

C12.3b

(C12.3b) Provide details of the trade associations your organization engages with which are likely to take a position on any policy, law or regulation that may impact the climate.

Trade association

Other, please specify

The Korea Chemical Fiber Association

Is your organization’s position on climate change consistent with theirs?

Mixed

Has your organization influenced, or is your organization attempting to influence their position?

We publicly promote their current position

State the trade association’s position on climate change, explain where your organization’s position differs, and how you are attempting to influence their position (if applicable)

The Korea Chemical Fiber Association (hereinafter KCFA) expressed that it would do its best to focus its capabilities to achieve the 2050 carbon-neutral goal and to create a basis for a recycled fiber ecosystem, and to promote technological advancement for sustainable development. Accordingly, HAMC agrees with the KCFA’s position on the 2050 carbon-neutral goal, and is conveying consensus opinions through the association to align HAMC’s GHGs reduction goals with those of the Paris Climate Change Accord and to substantially reduce GHGs. For example, in January 2021, HAMC received an inquiry about difficulties we are facing in reducing GHGs from the KCFA to which we provided the following reply: 'most of the reduction activities (use of waste heat, fuel conversion, replacement of high-efficiency equipment) that can be introduced in the workplaces have already been implemented, so additional efforts are needed to achieve the 2050 carbon neutrality goal. Also corporate growth would mean an increase in production, and therefore we would need to additionally reduce emissions from the newly added line intensifying the difficulty even further. HAMC’s opinion was unified with that of the same industry, and was delivered to the Ministry of Environment. We received feedback that certain details regarding the free quota of carbon emissions for the 4th K-ETS planning period was moderated to reflect our opinion. As another example, in April 2021, HAMC shared its opinion through a survey on the demand for practical support consulting for reducing GHGs at sites. As a result, HAMC was able to receive ideas for reducing GHGs that could be benchmarked. The opinions of HAMC delivered at the time were that consulting support was needed on a method to be recognized as a reduction project at a level consistent with external projects, installation of measuring

instruments to monitor emissions before and after the project, and durable education to be recognized for economic additionally. As a final example, in October 2021, we were asked for opinions by the Ministry of Trade, Industry and Energy on the review of the 2050 carbon-neutral policy plan in relation to the 2030 NDC upgrade plan. As a result, we infer that our opinion was partially recognized for policy reflection, since we follow the relatively relaxed reduction target considering that the reduction target for each industry is 14.5% compared to the overall industry average of 40.0% reduction plan.

Funding figure your organization provided to this trade association in the reporting year, if applicable (currency as selected in C0.4) (optional)

41,091,000

Describe the aim of your organization's funding

In 2021, HAMC contributed 41 million KRW to the KCFA's funds. The funds were raised with the aim of contributing to the promotion of the industry and the sound development of related industries by promoting friendship and common interests among member companies. In order to represent the common interests of the HAMC and KCFA members and to strengthen the competitiveness of Korean chemical fiber industry, HAMC received various data for market trends, industrial statistics and R&D etc. from KCFA. The funds would be used in coping with global issues such as free trade agreements, trade friction, and climate change etc. in a mutually beneficial way and tries its best to reinforce reciprocal cooperation between industrial streams and to enhance international collaboration among countries. We hope climate change-related opinions of HAMC and KCFA members will have a larger influence in decision-making.

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

Yes, we have evaluated, and it is aligned

C12.4

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

Publication

In mainstream reports

Status

Complete

Attach the document

 C12.4_1_HAMC Mainstream report_2021.pdf

Page/Section reference

p20-22 : Info on Strategy

p22-25, 61-66 : Info on Risks & Opportunities

p200 : Info on Emission figures and targets

p235-243 : Info on our Governance and R&R

p266-268 : Info on Strategy, Emissions figures and other metrics such as green technology

Content elements

Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets

Comment

N/A




Publication

In other regulatory filings

Status

Complete

Attach the document

-  C12.4_2_HAMC headquarters' environmental information report.pdf
-  C12.4_2_HAMC Jeonju's environmental information report.pdf
-  C12.4_2_HAMC Ulsan's environmental information report.pdf

Page/Section reference

p2-3 : Info on our Strategies
p3-5 : Info on our Governance and R&R
p3, 8 : Info on our target of Emission
p8-9 : Info on our Emission figures
other pages : Info on our activities and other metrics such as Energy consumption, Air pollution emissions, and etc.

Content elements

Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets
Other metrics

Comment

As HAMC is a company subject to public environmental information disclosure, it submits a report on environmental information of its headquarters, Ulsan plant, and Jeonju plant every year.


Publication


Other, please specify
Sustainability Report

Status

Complete

Attach the document

 C12.4_3_HAMC Sustainability rpeort_2021_Kor.pdf

 C12.4_3_HAMC Sustainability report_2020_English.pdf

Page/Section reference

p7, 17 : Info on our Strategies

p8, 16, 33-34 : Info on our Governance

p9-11 : Info on our SBT road map, target of Emission

p17 : Info on our activities

p19, 35, 39-40 : Info on our Risks & Opportunities

p54-55 : Info on our Emission figures

Content elements

Governance

Strategy

Risks & opportunities

Emissions figures

Emission targets

Comment

Since the 2021 Sustainability Report has not yet been published in English, the Korean version is attached, and the English version of 2020 Sustainability Report is attached.

Publication

Other, please specify

2021 HAMC Climate Change report

Status

Underway – this is our first year

Attach the document

Page/Section reference

It is on progressing. It will be published mid-August in 2022. It will be uploaded our website. (link : http://www.hyosungadvancedmaterials.com/kr/csr/csr_report.do)

Content elements

Governance

Strategy

Risks & opportunities

Emissions figures

Emission targets

Comment

As stakeholder interest in climate change is increasing worldwide, customers are demanding that businesses actively respond to the climate crisis. In response to these changes, HAMC recognizes the threat of climate change as an important issue. While climate change poses risks to current business models, it also presents opportunities for companies that are flexible in their competitive landscape and are determined to pursue improvement. Therefore, in 2022, HAMC decided through the BOD to publish a climate change report(TCFD report) in addition to the sustainability report in order to transparently communicate on the key activities of 2021 and the progress towards achieving the goals for the future.

C15. Biodiversity

C15.1

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

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

C15.2

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

	Indicate whether your organization made a public commitment or endorsed any initiatives related to biodiversity	Biodiversity-related public commitments
Row 1	Yes, we have made public commitments only	Commitment to No Net Loss Commitment to respect legally designated protected areas Commitment to avoidance of negative impacts on threatened and protected species

C15.3

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

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

C15.4

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

	Have you taken any actions in the reporting period to progress your biodiversity-related commitments?	Type of action taken to progress biodiversity-related commitments
Row 1	Yes, we are taking actions to progress our biodiversity-related commitments	Land/water protection Species management Education & awareness




C15.5


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

	Does your organization use indicators to monitor biodiversity performance?	Indicators used to monitor biodiversity performance
Row 1	Yes, we use indicators	State and benefit indicators


C15.6


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

Report type	Content elements	Attach the document and indicate where in the document the relevant biodiversity information is located
In voluntary sustainability report or other voluntary communications	Content of biodiversity-related policies or commitments Other, please specify The current status and outcome of activities for biodiversity conservation and promotion.	p8,19-HAMC's declaration to actively support and participate in biodiversity conservation and promotion activities, the current status, and outcome of activities for biodiversity conservation and promotion.  1
Other, please specify HAMC Website	Content of biodiversity-related policies or commitments	We disclose our biodiversity policy through our website as well as the distribution of the HAMC Biodiversity Policy Poster. (our website link : http://www.hyosungadvancedmaterials.com/kr/csr/green_management.do)  2, 3
Other, please specify The One Company, One River Activity Report	Details on biodiversity indicators	The employees of HAMC Ulsan Plant carried out activities to remove plants that destroy the ecosystem. You can find out how many harmful plants have been removed through the 2021 One Company, One River Activity Report.  4

 1C15.6_1_HAMC Sustainability rpeort_2021_Kor.pdf

 2C15.6_2_HAMC Website.jpg

 3C15.6_2_HAMC Biodiversity Policy.pdf

 4C15.6_3_HAMC The One Company, One River Activity Report_Ulsan.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.

In C4.1a, total base year emissions covered by target in all selected scopes(metric tons CO2e, column 11) is not equal to the sum of base year Scope 1, 2, 3 emissions covered by target(metric tons CO2e, the sum of the figures reported in column 8, 9, and 10). It is different because of the difference in rounding off the decimal point. HAMC follows the Korean GHG and energy target management system and provide further details of the verification undertaken for HAMC's Cope 1, 2, 3 emissions and attach the relevant statements in C10.1a.

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, who is the chairperson of a Board and SSC which oversight HAMC initiative of climate related issues.	Board chair

Submit your response

In which language are you submitting your response?

Please confirm how your response should be handled by CDP

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

Please confirm below