Environmental Report 2024

Joy brings us together

KIRIN

2024.7

Contents

About this Environmental Report

Editorial Policy

The Kirin Group operates in Japan, Asia Pacific, North America and other regions across the areas of alcoholic beverages, non-alcoholic beverages, pharmaceuticals, and health sciences. In the fiscal year 2023 financial results, the former segments accounted for 59% for "Japan Beer and Spirits," "Japan Non-Alcoholic Beverages," and "Oceania Beer and Spirits," and 20% of the total for "Pharmaceuticals." The Kirin Group places CSV (co-creation of social and economic value) at the core of its business operations and aims to achieve sustainable growth by continuing the cycle of value creation. Among these, we have set the environment as one of the social issues we focus on. The editing of this report has taken into account the characteristics of the Kirin Group's business and the positioning of its environmental approaches.

Structure of Corporate Information Disclosure

Information on the corporate activities of the Kirin Group, including this reports, discloses a diverse range of information in the interests of shareholders and investors, as well as the interests of a wide range of stakeholders in our local communities, including our customers.

Kirin Holdings Co-creation of Value with Society (CSV) Website
https://www.kirinholdings.com/en/impact/

Kirin Holdings Investor Relations Information
https://www.kirinholdings.com/en/investors/

KIRIN CSV REPORT (Integrated Report)
https://www.kirinholdings.com/en/investors/library/integrated/

Kirin Holdings The Environment Website
https://www.kirinholdings.com/en/impact/env/

Lion Sustainability Website
https://lionco.com/force-for-good/

Kirin Group Environmental Report
https://www.kirinholdings.com/en/investors/library/env_report/

KYOWA KIRIN Sustainability Website
https://www.kyowakirin.com/sustainability/

Reporting Period

FY2023 (January–December 2023)
Where necessary, this report also contains historical data showing trends for the past 3 to 5 years.

Organizations Covered by this Report (FY2023)

Business	Company
Japan Beer and Spirits Businesses	Kirin Brewery,Kirin Distillery, SPRING VALLEY BREWERY, Eishogen, Kirin Brewery (Zhuhai), Brooklyn Brewery Japan
Japan Non-alcoholic Beverages Businesses	Kirin Beverage, Shinshu Beverage, Hokkaido Kirin Beverage, Kirin Maintenance Service,each site of Kirin Beverage Service (Hokkaido, Sendai, Tokyo, Chubu, Kansai) KIRINVIVAX, Tokai Beverage Service
Oceania Integrated Beverages Business	Lion, New Belgium Brewing
Pharmaceuticals Businesses	Kyowa Kirin, Kyowa Kirin Frontier, Kyowa Kirin plus, Kyowa Hakko Kirin China Pharmaceutical, Kyowa Kirin,Inc.
Other Businesses (all companies included)	Mercian, NIPPON LIQUOR, Daiichi Alcohol, Wine Curation, Interfood, Vietnam Kirin Beverage, Four Roses Distillery, Kyowa Hakko Bio, KYOWA PHARMA CHEMICAL,KYOWA Engineering, Biokyowa, Shanghai Kyowa Amino Acid,Thai Kyowa Biotechnologies, Kirin Holdings, Kirin Business Expert, KIRIN BUSINESS SYSTEM, Koiwai Dairy Products Company, Limited , Kirin Echo, Kirin and Communications, Kirin Engineering,Kirin City, KIRIN GROUP LOGISTICS

- All shares in Myanmar Brewery Limited held by our subsidiary Kirin Holdings Singapore Pte, Limited were transferred to Myanmar Brewery Limited on January 23, 2023, and are therefore excluded from the scope of this report.
- The Australian company Blackmores Limited has been a subsidiary since August 2023 and the U.S. company Coca-Cola Beverages Northeast, Inc. has been a subsidiary, but are excluded from this year's reporting on environmental data. Some of the initiatives are discussed in this report.

Detailed Environmental Data, Calculation Methodology, and Third-Party Assurance Report

For detailed Environmental Data, Calculation Methodology, and Third-Party Assurance Report, please refer to the ESG Data Book for detailed environmental data, calculation methods, and third-party assurance reports.

- Unless otherwise specified, environmental data is rounded to the nearest appropriate digit.

ESG Data Book https://www.kirinholdings.com/jp/investors/files/pdf/esgdatabook2024.pdf

Reference Guidelines

- GRI Standards
- Ministry of the Environment, Government of Japan's Environmental Reporting Guidelines (2018 version)
- Recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD Recommendations 2017)
- Implementing the recommendations of the Task Force on Climate-related Financial Disclosures (the 2021 TCFD Annex)
- TCFD Guidance on Metrics, Targets, and Transition Plans (2021)
- Task Force on Nature-related Financial Disclosures (TNFD) Recommendations v1.0 (2023 Edition)
- IFRS S1 "General Requirements for Disclosure of Sustainability-related Financial Information" and IFRS S2 "Climate-Related Disclosures"

Please refer to the ESG Data Book for the comparison table.

Forward-looking statements in this report, including forecasts, targets, and plans, are based on the current assessments by management at the time of preparation of the report. They contain inherent uncertainty that the outcomes will differ from the statements in this report due to changes in a variety of factors. Statements about risks and opportunities are also included in the report from the perspective of proactive information disclosure, even if they do not necessarily constitute risk factors that would have a material impact on investor decisions. The Kirin Group will, upon identification and acknowledgment of various risks associated with its business, strive to strengthen its risk management structure and to prevent and mitigate those risks, and will make its best efforts to respond to risks that become apparent.

Message from Top Management

Message from the COO

As stated in our management philosophy, the Kirin Group's businesses in the Food & Beverages domain, Health Science domain, and the Pharmaceuticals domain cannot exist without natural capital. Natural capital is not only affected by climate change, but is also regional, localized, and unevenly distributed in terms of resource amounts. I believe it is my responsibility to link environmental issues with business risks and opportunities, to have a positive impact on society through our business activities, and to lead the world in terms of environmental management.

The Kirin Group's Environmental Vision 2050 states that we can "Enrich the Earth with Positive Impact," and we have been actively disclosing the dependence on and effect of our business on the environment with the aim of having a positive impact on society as a whole through our business. We disclosed the TCFD in 2017 and have added the TNFD framework since 2022, reexamining our business from both climate change and natural capital perspectives, taking into account their interrelatedness. We believe that initiatives through our business, such as sales of products certified for biodiversity, conservation of water sources, reduction of GHG emissions, steady progress in packaging innovation, and products that contribute to maintaining immunity and combating heatstroke as an adaptive measure against climate change, will have a positive impact on the design, procurement, manufacturing, and distribution sites.

Looking at global trends, the 28th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP28, 2023) once again called for urgent action to limit global temperature rise to 1.5 degrees Celsius. The Emirates Declaration on Sustainable Agriculture was also released at the same time, clearly highlighting the importance of balancing climate change with strengthening agriculture and food systems. At the Kirin Group, we have long been addressing climate change and natural capital in an integrated manner. We recognize that there are differences in characteristics and impacts based on the cultural and economic backgrounds of each region, and that there are difficulties in achieving a "Just Transition" that takes these differences into account. In order to realize the mental and physical health (Well-being) of diverse people with various values and a sustainable society in which people can live with peace of mind, it is essential to correctly recognize the issues that arise in each "field," and work together with local people in each community to come up with optimal solutions.

I became president of Kirin Holdings at the end of March this year, and my motto is "go to the gemba or actual worksites, see the actual things happening, and know the actual situation," and I believe this is important in all aspects of business, and that this also applies to environmental management. The Kirin Group's environmental initiatives began 50 years ago with the reduction of external diseconomies caused by business activities such as pollution control at the factory sites. Going forward, we will continue to lead integrated environmental management as the world's leading CSV company, as set forth in our long-term management vision KV2027.

Kirin Holdings Company, Limited
Representative Director of the Board, President & COO
Group Business Execution Control
Takeshi Minakata

Message from the Officer in Charge of CSV Strategy

The development of global rules for the environment has made rapid progress in recent years. The final recommendations of the TNFD have been published, and the so-called Global Plastics Treaty is also under discussion. The EU has implemented the CSRD, which aims to strengthen the disclosure of sustainability information by companies, and in April of this year, the ISSB announced that it would launch a research project with the next topics being "biodiversity, ecosystems and ecosystem services" and "human capital." Based on these trends, society is moving toward integrated solutions to sustainability issues.

In the "Kirin Group Long-Term Environmental Vision" disclosed in 2013, we adopted an integrated approach based on the understanding that environmental issues are interrelated and must be resolved comprehensively. In response to the TCFD recommendations, we conducted a scenario analysis in 2018 which revealed that climate change would have a significant impact on the Group's raw agricultural products and water. Understanding the "risks and opportunities" based on the TNFD guidance also makes it clearer that the issues of raw agricultural products, climate change, and improper disposal of used containers and packaging are interrelated. This is why this year we are again not releasing separate TCFD or TNFD reports, but are disclosing information in an integrated manner through our Integrated Report and Environmental Report.

Last year, we began working with the Rainforest Alliance to develop the Regenerative Tea Scorecard, a tool that allows farmers to use their own judgment to promote environmentally sustainable agriculture. We conducted a pilot test on selected tea plantations in Sri Lanka, a major producer of tea leaves used in Kirin Gogo-no-Kocha. At the Château Mercian Mariko Vineyard, we started a study on the effects of carbon storage and further upgrading of biodiversity assessment of vineyards in collaboration with NARO (National Agriculture and Food Research Organization). The Vineyard has been officially certified as a "Nationally Certified Sustainably Managed Natural Sites" by the Ministry of the Environment. Through these efforts, we plan to accumulate knowledge about the potential of regenerative agriculture. Kirin has also been a member of the Japan Business Coalition for a Global Plastics Treaty, which makes policy recommendations to the Japanese government toward the development of an ambitious international treaty aimed at eradicating plastic pollution, since its inception. With regard to GHG reductions, Scope1 and 2 have been successfully reduced, and Scope 3 has been addressed by the Kirin Supply Chain Environmental Program launched in April 2024.

Going forward, through our integrated approach to water resources, climate change, containers and packaging, and biological resources, which are our four most important issues related to the global environment, we will continue to sustain our businesses that rely on the blessings of nature, while at the same time realizing Nature Positive and Circular Economy, and leading the world in contributing to carbon neutrality by 2050.

Kirin Holdings Company, Limited
Senior Executive Officer
(CSV Strategy, Public Relations Strategy,
General Manager of CSV Strategy Department)
Hiroshi Fujikawa

Corporate Data

Corporate Philosophy

KIRIN brings joy to society by crafting food and healthcare products inspired by the blessings of nature and the insights of our customers.

2027 Vision

A global leader in CSV, creating value across our world of Food & Beverages to Pharmaceuticals.

"One KIRIN"Values

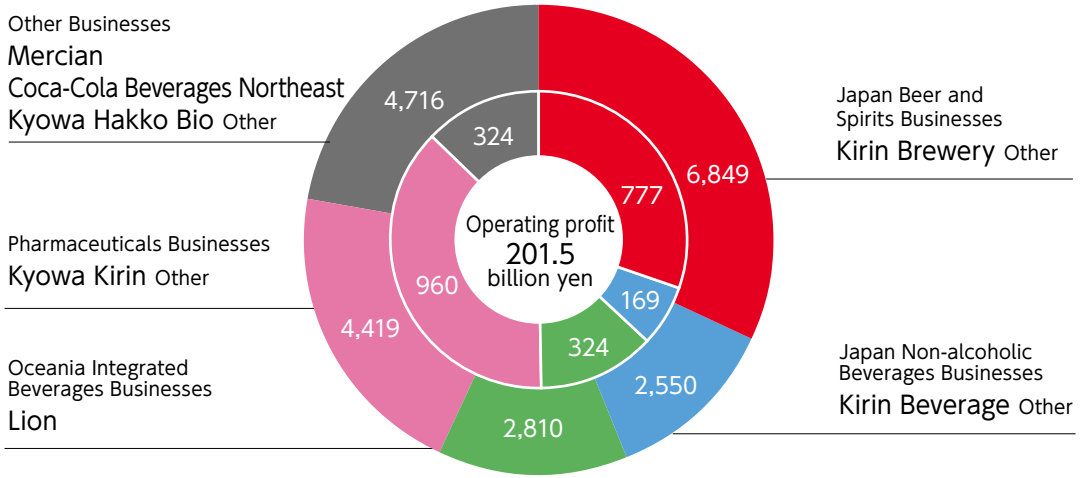
Passion
Our determination to continuously provide our customers and society with new value propositions based on innovative ideas, and our enthusiasm to meet goals with pride in the companies we work for and the brands we offer.

Integrity
Our gratitude to our stakeholders for always helping us move forward, and our promise to remain honest and humble in every business activity to serve them better.

Diversity
Our respect for different perspectives and values that enable constructive discussions, and our belief that the "differences" have the power to change the world and create better solutions.

*Inside: Normalized Operating Profit, Outside: Revenue (Actual results for the year ended December 31, 2023)

Sales revenue 2,134.4billion yen



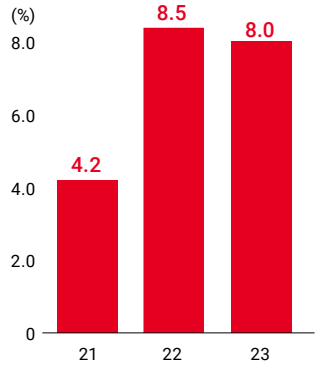
Segment	Food & Beverages	Pharmaceuticals	Health science	Company
Japan Beer and Spirits Businesses	●			Kirin Brewery
Japan Non-alcoholic Beverages Businesses	●			Kirin Beverage
Oceania Integrated Beverages Businesses	●			Lion
Pharmaceuticals Businesses		●		Kyowa Kirin
Other Businesses	●		●	Mercian Coca-Cola Beverages Northeast Kyowa Hakko Bio Other

Company Overview

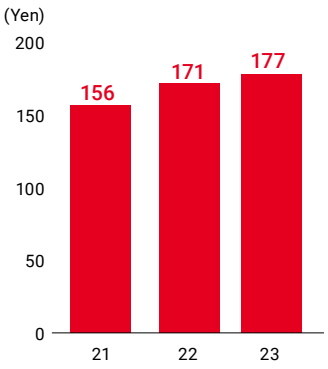
Trade Name	Kirin Holdings Company, Limited
Date of Incorporation	February 23, 1907 *Kirin Brewery Co., Ltd. changes its name to Kirin Holdings Co., Ltd. and becomes a holding company of the Kirin Group on July 1, 2007.
Head Office	NAKANO CENTRAL PARK SOUTH 10-2, Nakano 4-chome, Nakano-ku, Tokyo 164-0001, Japan
Paid-in Capital	102,045,793,357 yen
Number of Employees	30,183 employees on a consolidated basis (as of December 31, 2023)

Financial Key Performance Indicators

Capital efficiency indicator—Return on invested capital(ROIC)

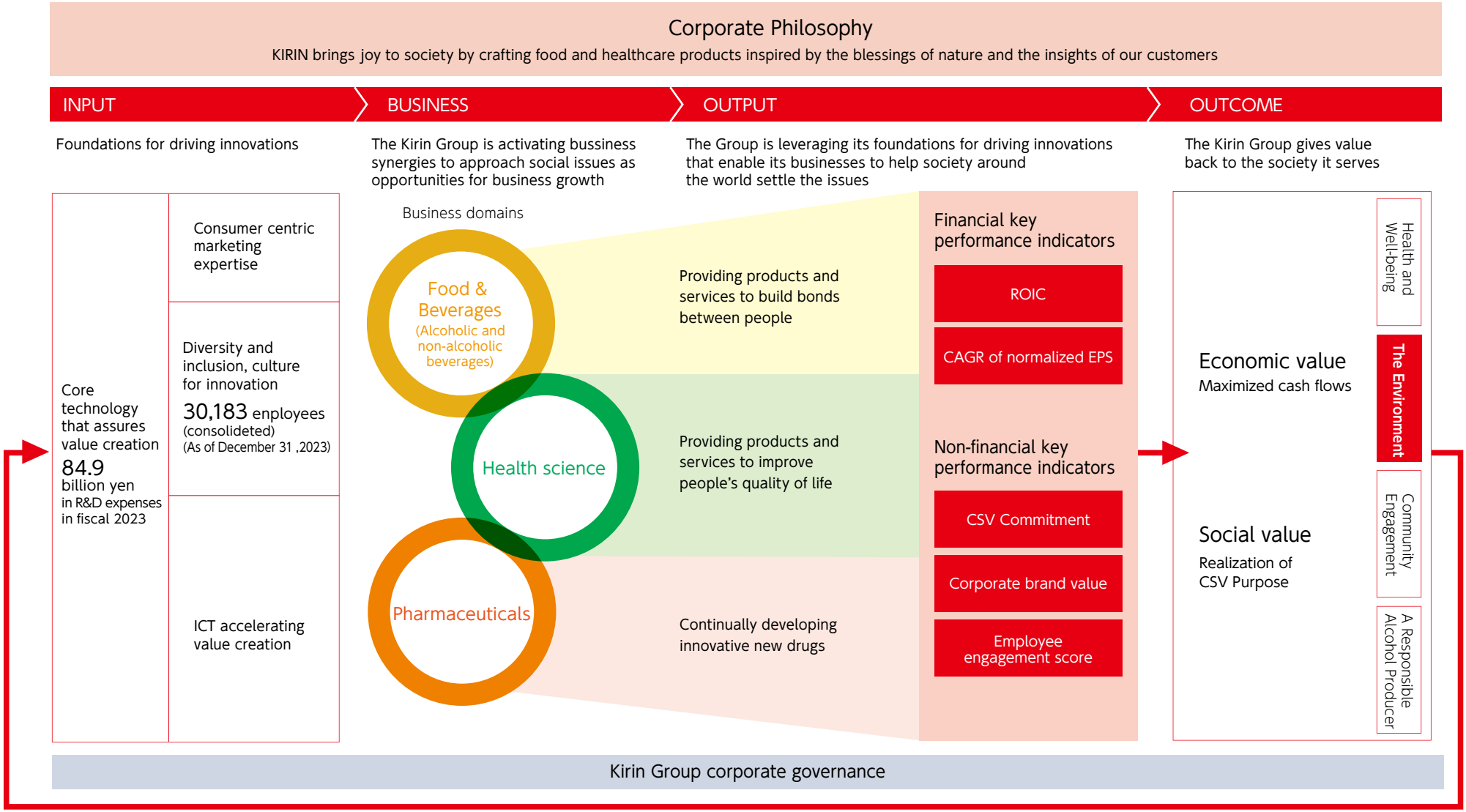


Profitability and growth performance—Normalized EPS



Value Creation Model

The Kirin Group places CSV (Shared Value Creation) at the core of its management. We will work to solve social issues through our business activities and achieve sustainable growth together with society by simultaneously creating social and economic value. The "value creation model" illustrates a sustainable mechanism for amplifying the two types of value creation by reinvesting the economic value gained in our organization's capabilities. Business development through the three domains of food, medicine, and health science requires the use of natural capital and the resolution of environmental challenges such as container packaging and climate change. Through the resolution of these issues and the sustainable use of natural capital, our business creates value that gives back to society. In the value creation model, the non-financial goal of the "environment" is shown as an important factor. Under "Kirin's Environmental Value Correlation," we explain how environmental issues relate to the Kirin Group's value creation model.



Identification of Materiality

The Kirin Group assessed the importance of sustainability issues in order to formulate the Kirin Group 2022-2024 Medium-term Business Plan, which marks the second stage toward realizing the Long-Term Management Vision, the Kirin Group Vision 2027, announced in 2022. Following the flow for identifying materiality, we updated our social environment analysis and, through dialogue with internal and external stakeholders, discussion at the senior management level, and deliberations by the Board, we updated our "Management Issues for Sustainable Growth (Group Materiality Matrix)" with a 10-year outlook. In addition, there is a separate explanation of materiality in the general requirements of the TCFD (Task Force on Climate-related Financial Disclosures)/TNFD (Task Force on Nature-related Financial Disclosures).

In this process, we identify the issues that are most important to the Kirin Group and its stakeholders and consider where the Kirin Group can have positive impacts. As a result, we reconfirmed that the following four important themes related to the environment that we set in the Kirin Group's Environmental Vision 2050 are highly material for Kirin Group management: "Sustainable use of biological resources," "Sustainable use of water resources," "Sustainable recycling of containers and packaging," and "Overcoming climate change."

The TNFD Guidance (Recommendations of the Task Force on Nature-related Financial Disclosures) v1.0, published in September 2023, recommends an integrated approach to climate and nature-related issues. In the 2013 Kirin Group Long-Term Environmental Vision, the Kirin Group adopted a holistic approach to address the four environmental issues of biological resources, water resources, containers and packaging, and climate change as "interrelated environmental issues" rather than independent ones. This is a philosophy and concept that the Kirin Group has consistently pursued ever since it shifted its focus to environmental activities with a global perspective. As a leading company that has adopted the integrated approach, the Kirin Group aims to contribute to the dissemination of this philosophy and the resolution of environmental issues.

Flow for the identification of materiality

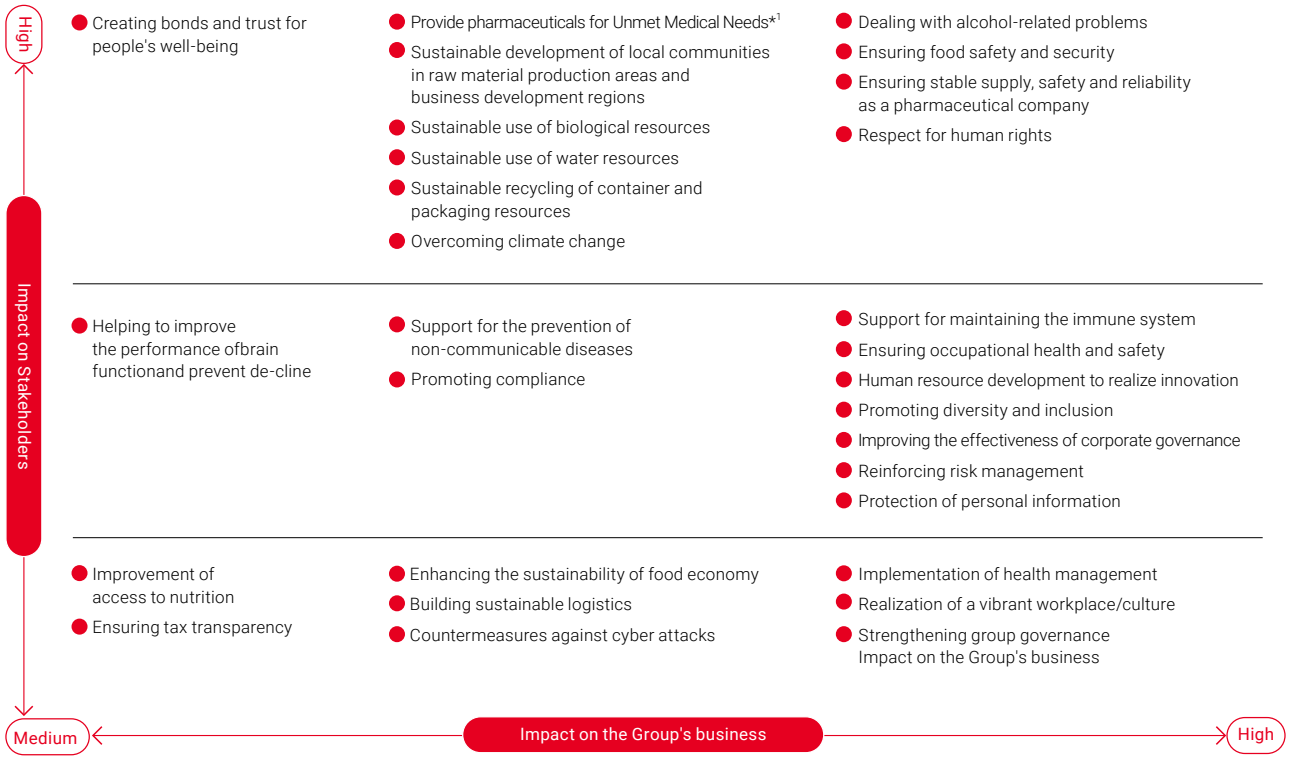
Step1
Social environment analysis
We identify issues that we need to address by referring to trends in discussions and policies surrounding the Kirin Group in Japan and overseas, the results of scenario analyses, and other factors

Step2
Stakeholder engagement
We reflect a diverse range of dialogue with external experts, NGOs, and various other stakeholders in discussions within the Kirin Group

Step3
Discussion at the senior management level
Based on the input information, senior management fully discusses and assesses risks and opportunities for our businesses and society

Step4
Deliberations by the Board
After discussions among senior management, the Board selects and makes resolutions concerning important themes for our sustainable survival and growth together with society in the future

Management Issues for Sustainable Growth (Group Materiality Matrix) (Updated in 2022)



*1 Provision of pharmaceuticals for diseases for which there are no effective treatments, including rare diseases

Global Trends and Kirin's Actions

The Kirin Group has stayed ahead of global trends and has raised the level of its environmental management by repeatedly implementing trial initiatives. In anticipation of the 1992 Earth Summit in Rio de Janeiro, the Kirin Group established its Basic Policy for Addressing Global Environmental Issues in 1991. The following year, in 1993, we revised our management philosophy to state that "we aim to be a corporate group that considers the global environment," and shifted our environmental management focus from pollution control to activities that take the entire planet into consideration. Since then, we have undertaken a number of industry-first initiatives, including making a corporate presentation at the Third Conference of the Parties to the United Nations Framework Convention on Climate Change held in Kyoto in 1997, starting our Water Source Forest Conservation Activities in 1999, making our returnable beer bottles the lightest in Japan in 2003, and making 100% of our paper containers FSC®-certified paper in 2020.

The Kirin Group has adopted an advanced disclosure framework to further raise the level of environmental management. Around 2008, we started responding to questionnaires from CDP (a non-governmental organization). At the time, ESG was not yet considered an important issue, but responding to CDP's questionnaire was seen as an effective way to deepen understanding of global environmental issues. Appropriate responses to CDP led to the Kirin Group having a multi-layered understanding of environmental issues and to the Kirin Group's Long-Term Environmental Vision, which was announced in 2013.

Furthermore, in order to respond to the TCFD guidance published in 2017, the Kirin Group began conducting scenario analysis early on. As a result, the need to approach the environmental themes of "biological resources," "water resources," "containers and packaging," and "climate change" as interrelated issues in an integrated manner rather than as separate issues has spread to everyone from management to employees. This common understanding became the foundation for the improvement of environmental management. Another common understanding within the company that complying with advanced disclosure frameworks had contributed to improving environmental management, and led us to become the first in the world to attempt trial disclosure based on the beta version v0.1 of the TNFD (Task Force on Nature-related Financial Disclosures) framework.

Although trial disclosure involves risks, we believe that it enable us to obtain a great deal of feedback, deepen our understanding of environmental issues, clarify our vision, and advance our environmental management. The Kirin Group will lead the way in building a decarbonized society, Nature Positive, and a recycling-oriented society by continuing its pioneering efforts to address global environmental challenges.

Earth Summit 1992

- Formulation of the Kirin Group Basic Policy on Initiatives Targeting Global Environmental Issues (1991)
- "Consideration for the global environment" specified in our Corporate Philosophy (1993)

Kyoto Protocol 1997

- Kirin Brewery's Kobe Plant, an advanced model brewery for low-carbon and water-saving production, completed (1997)

- 100% recycling achieved at all breweries (1998)
- Start of "Water Source Forestation Activities" (1999)

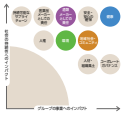
- Reduced weight for all large bottles (2003)

The Tenth meeting of the Conference of the Parties (COP10) to the Convention on Biological Diversity 2010

- Action Plans for Becoming a Low-Carbon Corporate Group announced (2009)
- Declaration of Support for Biodiversity Conservation announced (2010)
- Guidelines for the Procurement of Sustainable Biological Resources and an Action Plan announced (2013)
- Start of support for tea farms in Sri Lanka to acquire Rainforest Alliance certification (2013)
- Start of development and deployment of lightweight medium bottles (2014)
- Use of 100% recycled PET bottles started (2014)

Paris Agreement; SDGs 2015

- Survey of water risks to natural capital and major global business sites (2014)
- Group Materiality Matrix announced (2016)



TCFD 2017

- CSV Commitment announced as SDGs Initiative (2017)
- Became the first food and beverage manufacturer in Japan to be approved by SBT (2017)
- First Japanese food and beverage company to support the TCFD recommendations (2018)
- Start of water source conservation activities in Sri Lankan tea farms (2018)

IPCC Special Report on Global Warming of 1.5°C 2019

- Announcement of CSV long-term and non-financial targets "Kirin Group CSV Purpose" (2019)

- Kirin Group Plastic Policy announced (2019)

2021

- Achieved use of FSC-certified paper in 100% of paper containers at Kirin Brewery, Kirin Beverage, and Mercian (2020)

FSC® C137754

- Joined RE100 (2020)
- Upgraded SBT to1.5℃ (2020)
- Joined the Alliance to End Plastic Waste (2021)
- Expressed support and commitment to the United Nations Food Systems Summit 2021 (2021)
- Successfully developed mass plant propagation technology for hops (2022)
- Expanded R100 PET bottles to cover the *Nama-cha*series (2021)
- Launched year-round products using tea leaves from certified farms in Sri Lanka (2021)
- 100% renewable energy purchased at Kirin Brewery's Nagoya Plant (2021)
- Kirin Group Action Plan for the Sustainable Use of Biological Resources (2021)

The Fifteenth meeting of the Conference of the Parties (COP15) to the Convention on Biological Diversity 2021

- Became the first global food and beverage company to obtain approval for an SBT Net-Zero (2022)
- Invested in offshore wind power generation (three sites) through participation in a consortium (2022)

- Began continuous support for donations of surplus inventory to local governments and food banks (2022)

TNFD recommendations v. 1.0 2023

- First food and beverage company in Japan to execute a transition-linked loan (2023)
- Kirin Brewery used 100% renewable energy for all electricity purchased at all its factories and sales offices (2024)
- 100% of electric power purchased at two Kyowa Kirin plants and three research laboratories converted to renewable energy (2023)
- Joined the Business Coalition for a Global Plastics Treaty (Japan) (2023)
- Mariko Vineyard selected as an approved site for biodiversity by the Ministry of the Environment (2023)
- Mariko Vineyard was approved as a site for biodiversity by the Ministry of the Environment (2023)
- Development of Sri Lanka Tea Leaf Scorecard started (2023)

- Responded to the CDP questionnaire (from 2008)
- Kirin Group's Long-Term Environmental Vision announced (2013)
- Trial disclosure based on the TCFD recommendations (2018)
- Kirin Group's Environmental Vision 2050 announced (2020)
- Trial disclosure based on the LEAP approach (2022)
- Further enhancing the level of environmental management

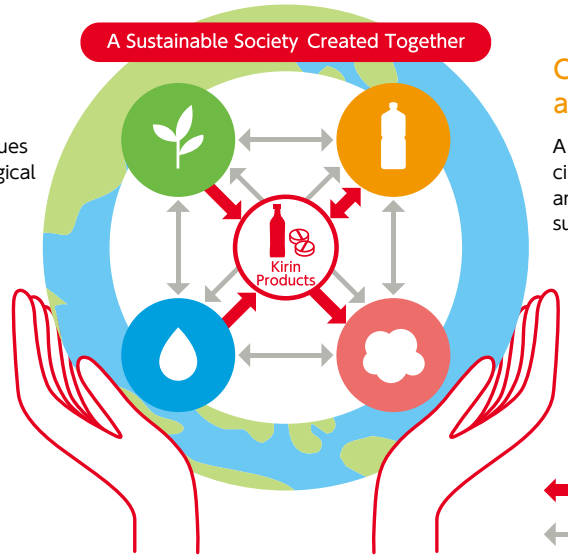
Kirin Group's Environmental Vision 2050

Enrich the Earth with Positive Impact

Society has reached a major turning point against the backdrop of growing global environmental problems, including the climate crisis, the ongoing loss of biodiversity, and plastic pollution of the oceans. Industries such as the Kirin Group, which rely on natural bounty such as water and agricultural products, are susceptible to environmental problems and there is need to address such issues urgently.
Through scenario analysis based on the TCFD recommendations, which has been conducted since 2017, the Kirin Group has grasped the seriousness of the impact that climate change have on agricultural products and water resources. We have learned that in order to pass on a sustainable Earth to future generations, it is not enough to simply minimize negative impacts and achieve neutrality. Furthermore, corporate environmental policies are expected to evolve from being self-contained within a company to having a positive impact on society as a whole.
In order to respond to such societal demands, the Kirin Group has further developed the idea of an "integrated" approach that holistically addresses complex and interrelated environmental issues (biological resources, water resources, containers and packaging, and climate change) into our revised "Kirin Group's Environmental Vision 2050" and "Positive Impact" approach, which were discussed and resolved by the Board in 2020.
Under this new Vision, together with the young people who will lead the future, we will create a prosperous world for the next generation.

Kirin Group's Environmental Vision 2050

Enrich the Earth with Positive Impact



Biological Resources
A society that values sustainable biological resources.

Water Resources
A society that values sustainable water resources.

Containers and Packaging
A society that circulates containers and packaging in a sustainable way.

Climate Change
A society that has overcome climate change.

Input to and Output from Kirin Products
Environmental Interactions

Kirin and its broad stakeholders enrich society and the Earth for future generations through positive impact on people and the environment.

Approach

Holistic

Environmental Materiality

Biological Resources / Water Resources / Containers and Packaging / Climate Change

These are interrelated and individual responses will result in trade-offs, so they must be resolved in an integrated manner.

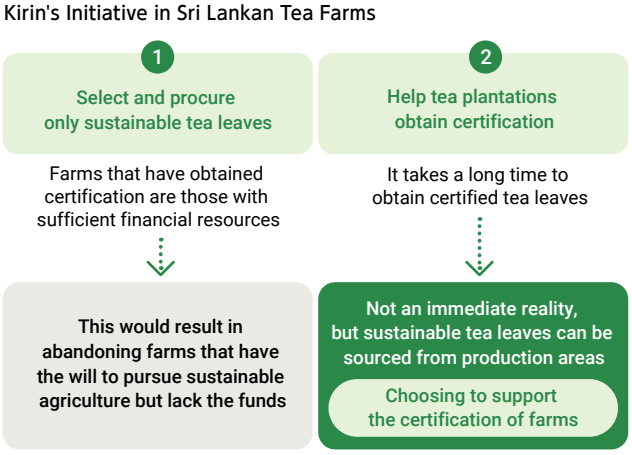
Important Message

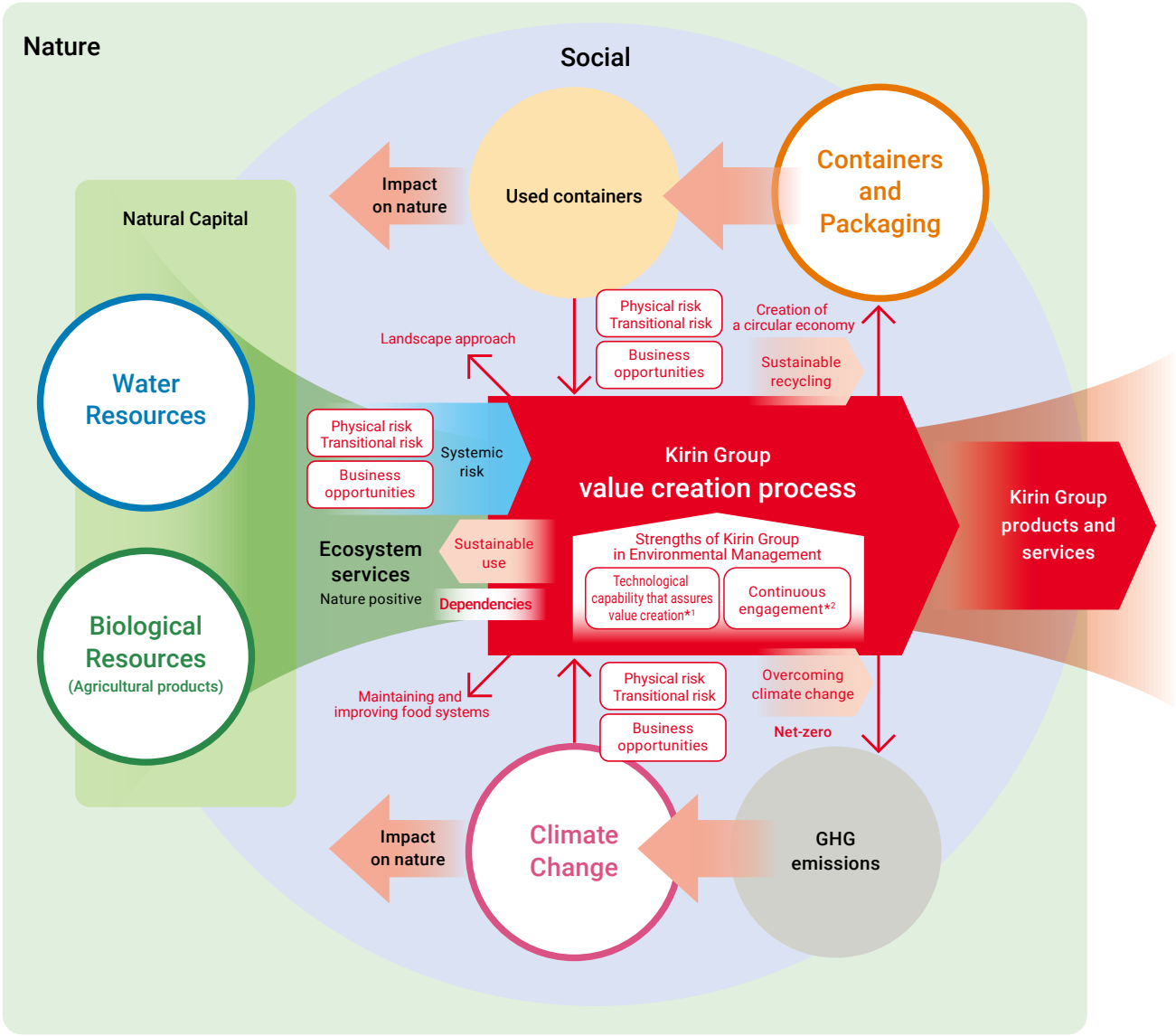
Positive Impact

Going beyond the scope of self-contained efforts and initiatives, we will expand the scope of our efforts to include society as a whole, and build the future together with society, including the young people who will lead future generations.

Expanding the Scope of Positive Impact

We have made some revisions to the "Environmental Value Correlation Chart," which shows the Kirin Group's integrated approach, to clarify that we will expand the scope of our positive impacts, which is a key message of our Environmental Vision.
What we added was the "Landscape Approach" and the concept of "food systems."
In Sri Lanka, we decided that the procurement of certified tea leaves alone would not ensure the sustainability of our production areas, so we chose to support tea plantations in obtaining certification. The Kunming-Montreal Global Biodiversity Framework (GBF) refers to the "Landscape Approach" as a method that comprehensively addresses the diverse human activities and natural environments of raw material production areas and leads to sustainable solutions to problems. The Sri Lankan case is also a solution to the problem through the concept of a "food system," which considers food not as an individual issue such as agriculture, but as a single system involving food production, processing, distribution, consumption, and waste. A one-dimensional view that looks only upstream and downstream, with the company at the center, could fail to realize that there are negative trade-offs for others outside the value chain, even if there seems to be a positive impact on the company. Although the landscape approach and the approach treating food as a systems take time and effort, they have a positive impact on raw material producing areas and contribute to stable procurement of raw materials and brand improvement. So, we have decided to clearly recognize and work on them as part of the Kirin Group's integrated approach.





*1 Engineering and R&D capabilities (Kirin Central Research Institute, Institute of Health Sciences, Institute for Packaging Innovation)
*2 Engagements: Contributions to rulemaking and policy recommendations (TCFD, SBTN, TNFD pilot test participation), various organizations (NGO: Rainforest Alliance), FSC Japan, WWF Japan, Earthwatch Japan, etc. Consortiums: Consortium for Sustainable Paper Use, Rainforest Alliance Consortium, etc. Communities: Sri Lanka Tea Plantation, areas around Mercian's own managed fields, etc. Next generation: Kirin School Challenge, Japan Environmental Youth Network, etc.

Progress (2023)

Part of the "Initiatives to Achieve" of the Environmental Vision is reflected in the "CSV Commitment", a medium- to long-term action plan that each business is working on to achieve the "CSV Purpose".

The status of their implementation is monitored on a quarterly basis and reported to the Kirin Holdings Board of Directors. Current progress, including qualitative elements, is as follows.

Theme	Initiatives to Achieve	Major Item	Minor Item	Targets	2021	2022	2023
Biological Resources A society that values sustainable biological resources	Cultivate, expand and procure sustainable agricultural raw materials	Raw materials	Use of FSC-certified paper or recycled paper for office paper KB KBC ME	100% (2020)	100%	100%	100%
			Response to sustainable palm oil *Except palm kernel oil KB KBC ME KIW	100% (2020)	100%	100%	100%
		Commodities and By-Products	Reduction of food waste (Compared with 2015 levels) KB KBC ME	-75% (2025)	-81%	-92%	-90%
	Stand by the side of farmers to make raw material production areas sustainable	Supporting Sri Lankan tea farms to obtain Rainforest Alliance certification	Number of large farms assisted to obtain Rainforest Alliance certification (Number of farms trained) KBC	Total: 15 farms (2022 to 2024)	– Total number of certified large farms: 94 (2013 to 2022)	Total 4 farms	Total 4 farms
			Number of small farms assisted to obtain Rainforest Alliance certification (Number of farms trained) KBC	Total: 5,350 farms (2022 to 2025)	– Cumulative total of 120 small farms(2018 to 2022)	Total 9 farms	Total 629 farms
Water Resources A society that values sustainable water resources	Bring water, used as a raw material, to a sustainable state	Water source conservation activities at Sri Lankan tea farms	Number of water source conservation sites KBC	5 sites (2020)	12 sites	15 sites	24 sites
	Solve water issues according to the watershed characteristics of business locations	Water reduction	Reduction of water consumption rate LN	2.4kl/kl (2025)	3.5kL/kL	3.6kL/kL	3.6kL/kL
			Rate of reduction of water use volumes (Compared with 2019 levels) KKC	-40% (2030)	-25%	-33%	-36%
			Rate of reduction of water use volumes (Compared with 2015 levels) KHB	-32% (2030)	-52%	-52%	-61%
Containers and Packaging A society that circulates containers and packaging in a sustainable way	Develop and disseminate sustainable containers and packaging	PET bottles	Ratio of usage of recycled resin for PET bottles KB KBC ME	50% (2027)	4.9%	8.3%	28.0%
		Paper container	Use of FSC-certified paper for 6-can packs KH KB KBC ME	100% (2020)	100%	100%	100%
			Use of FSC-certified paper for gift boxes KH KB KBC ME	100% (2020)	100%	100%	100%
			Use of FSC-certified paper for drink boxes KH KB KBC ME	100% (2020)	100%	100%	100%
			Use of FSC-certified paper for cardboard cartons for products KH KB KBC ME	100% (2020)	100%	100%	100%
	Build a resource-recycling system to make containers and packaging sustainable	Building a social system	AEPW (Alliance to End Plastic Waste) Japan Business Coalition for a Global plastics Treaty		2021: First Japanese food company to join Participation since inception in November 2023		
Climate Change A society that has overcome climate change	Realize Net-Zero GHG emissions from the entire value chain	Reduction in GHGs	GHG emissions from the entire value chain KG	Net-Zero (2050)	4,010ktCO₂e	4,110ktCO₂e	3,942ktCO₂e
			GHG emission reduction rate – Scope 1 + Scope 2 (Compared with 2019 levels) KG	-50% (2030)	-14%	-18%	-31%
			GHG emission reduction rate – Scope 3 (Compared with 2019 levels) KG	-30% (2030)	-12%	-8%	-10%
		Renewable energy	Ratio of renewable energy in plant purchased electric power KG	100% (2040)	17%	27%	42%
	Lead to build a decarbonized society	Reduction of GHGs from agriculture	Measurement of GHG emissions from agricultural land, GHG fixation by biochar from pruning waste		2024: Joint research begins at Château Mercian Mariko Vineyard		

KG Kirin Group KH Kirin Holdings KB Kirin Brewery KBC Kirin Beverage ME Mercian KKC Kyowa Kirin KHB Kyowa Hakko Bio LN Lion KIW Koiwai Dairy Products

Holistic Environmental Management Information Disclosure Based on the TCFD and TNFD Recommendations, etc.

In this part (→P.13~P.31), we explain how the Kirin Group analyzes and assesses the impacts of climate change and issues related to natural capital and containers and packaging, and promotes transition strategies such as mitigation and adaptation, in order to appropriately and continuously create value. The Kirin Group recognizes the need for a holistic approach to important environmental material themes such as biological resources, water resources, containers and packaging, and climate change, and strives to provide a holistic explanation to the extent possible because there is a risk of trade-offs in resolving individual issues.

When preparing the information in this section, we have complied with the TCFD recommendations (June 2018), the new TCFD guidance (October 2021), and the TNFD recommendations v1.0 (September 2023). In addition, we have referred to the S1 and S2 standards published by the International Sustainability Standards Board (ISSB) in parts.

The general requirements of the TCFD, TNFD, and other frameworks are as follows.

		Content
Material information to be disclosed		●"Management issues for sustainable growth (Group Materiality Matrix (GMM)" identified in accordance with the "identification of materiality" ●Four material environmental themes identified in the GMM: "biological resources," "water resources," "containers and packaging," and "climate change" ●In climate change, the risks and opportunities that were subject to scenario analysis, and the results of the assessment of resilience ●In natural capital, material issues identified individually by the LEAP approach proposed by the TNFD
Scope of disclosure	Climate change	●The impact on and from the regions in which business sites are located and the upstream and downstream portions of the value chain for Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, Kyowa Hakko Bio, Koiwai Dairy Products, and all businesses for which we have set targets in accordance with SBT standards
	Natural capital	●The scope of disclosure and impact determined based on our analysis and assessment of risks and opportunities related to natural capital based on effects, dependencies, and impacts, and identification of material issues in accordance with v1.0 of the TNFD guidance, mainly for Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, Kyowa Hakko Bio, and Koiwai Dairy Products (however, since there are limited methods for obtaining direct information and there are still many issues related to the tools provided, the information we are able to disclose is limited)
	Containers and packaging	●Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, Kyowa Hakko Bio, and Koiwai Dairy Products ●Although not included in this disclosure, we intend to add information obtained through the "Kirin Supply Chain Environmental Program," which we launched in April 2024 to capture direct environmental data from suppliers, in due course
Location for related issues	Climate change	●Kirin sites emitting GHGs, upstream and downstream of the value chain ●Kirin sites, regions in the upstream and downstream of the value chain, transport routes, etc. affected by droughts, floods, natural disasters, and other events caused by climate change
	Natural capital	●Raw materials covered by the "Action Plan for the Sustainable Use of Biological Resources (→P.97)" and their suppliers ●Priority locations identified through risk and opportunity analysis assessments in accordance with TNFD guidance v1.0
	Containers and packaging	●All processes until the product is delivered to the customer ●Processes such as the collection and recycling of used containers, as well as sites where used containers are disposed of improperly and areas affected by that pollution
Holistic disclosure of other sustainability-related matters		●The Kirin Group's important material themes of biological resources, water resources, containers and packaging, and climate change are interrelated, and there is a risk of trade-offs in resolving individual issues. Accordingly, we have adopted a holistic approach that aims to resolve issues in a holistic manner ●In the same report, we disclosed information in accordance with the individual disclosure guidance of the TCFD and TNFD, including matters concerning interrelatedness and trade-offs
Target period		●Periods when risk materializes: we have generally defined the short term as from the present to 2024 (the period of the Medium-Term Business Plan), the medium term as from 2025 to 2030 (the period of KV2027 and the SDGs target period), and the long term as 2031 to 2050 (the target year for the Kirin Group's Environmental Vision 2050) ●These time horizons are not necessarily consistent with the sources of information used for risk assessment or scenario analysis. In such cases, we have used the time horizons set for those specific references
Engagement		●The Kirin Group refers to regulations covering indigenous peoples and local community stakeholders, such as the FSC and Rainforest Alliance certifications. ●For regions where we can adopt a landscape approach, we have not simply analyzed and assessed disclosure data that we have obtained, but have also actually visited the regions and engaged with people from the local community.

Governance

Supervisory structure

In the Kirin Group, the Board of Directors deliberates and resolves on basic policies for CSV, including environment-related issues, medium- and long-term strategies, annual plans, and important non-financial targets and KPIs, including environmental targets. The board also monitors the execution of the Group's environmental operations and important risks, including climate change, natural capital, and the circular economy, on a quarterly basis through monitoring the progress of non-financial targets.

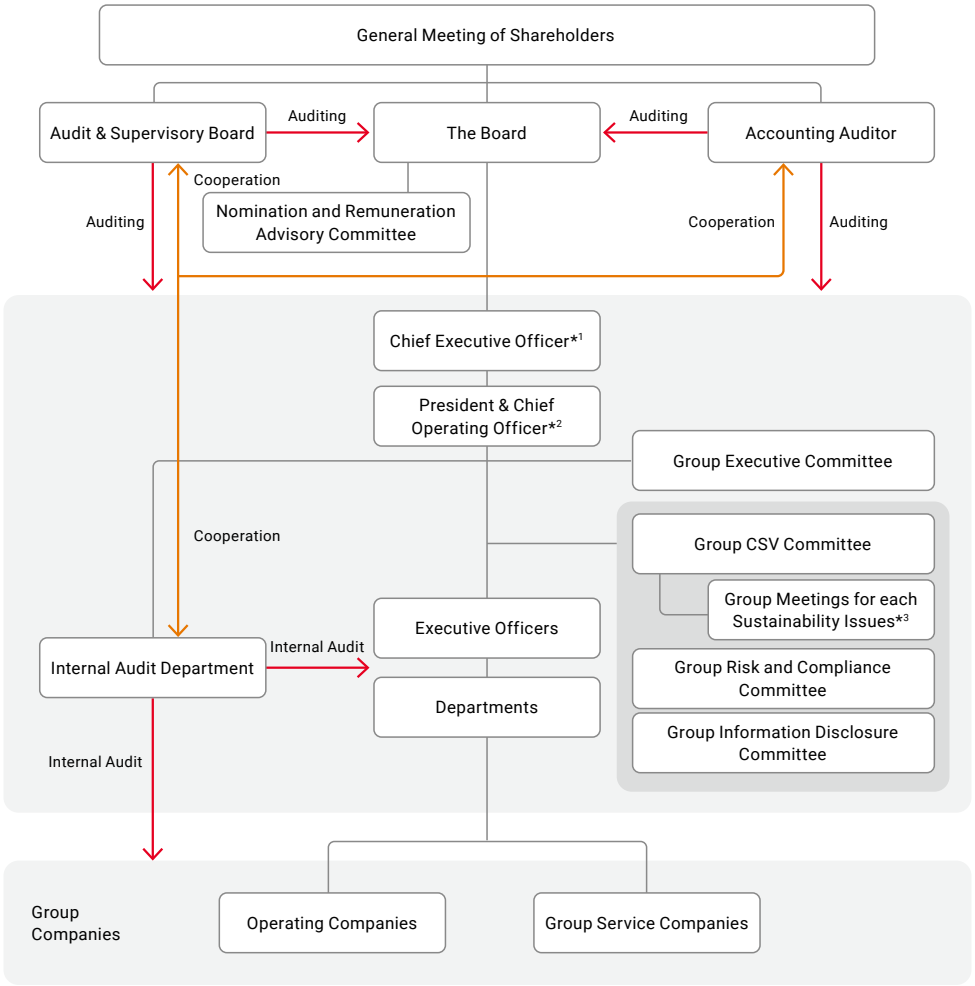
Executive structure

In the Kirin Group, the Group Executive Committee deliberates and makes resolutions concerning the setting and revision of important targets, as well as investment plans, related to climate and environmental issues as a whole, such as natural capital and the circular economy. The Group Executive Committee receives reports from operating companies and divisions on the status of achievement of targets and risks, and supervises these operating companies and divisions.
The senior executive officer in charge of CSV strategy oversees environmental issues such as climate change, natural capital, and a circular economy.
The Kirin Group has established the Group CSV Committee (meets three times a year). The committee is an advisory body to the CEO and COO that discusses environmental and other CSV issues across the Kirin Group. The committee is co-chaired by the CEO and COO of Kirin Holdings, with its members being the CEOs of major Kirin Group companies and senior executive officers of Kirin Holdings. With the participation of outside experts from a multi-stakeholder perspective, as necessary, this committee engages in in-depth discussions on matters such as current and future sustainability issues, the degree of dependence, and the degree of impact, as well as risks and opportunities associated with these issues. The committee then reports its decisions to the Board.
The Kirin Group has established the Group Environmental Meeting (meets twice a year) under the Group CSV Committee. This meeting has the officer in charge of CSV strategy as the chair and the relevant senior executive officers and department heads as members. The meeting mainly monitors progress related to roadmaps set for climate change issues and environmental issues such as natural capital and the circular economy, as well as exchanging opinions on related policies, strategies, and plans. At meetings of the Group CSV Committee and the Board, there are agenda items and reports concerning the results of deliberations by the Group Environmental Meeting, as necessary.
Through the establishment and operation of the Group Environmental Meeting, we have strengthened our initiatives targeting sustainability-related issues, as required by Japan's Corporate Governance Code following revisions in 2021.
Environmental management, including responding to climate change, is part of our CSV management system.
The Kirin Group has established the Group Risk and Compliance Committee (meets twice a year and as necessary). This committee consists of executive officers from Kirin Holdings, and makes resolutions concerning Group-wide risk management policies and the identification of important risks, and reports the results to the Board of Directors as necessary. This committee also controls environmental risk management activities.
Starting from the 2022 Medium-Term Business Plan, performance-linked remuneration for senior executive officers reflects the target achievement rate for non-financial indicators, as an incentive to promote the medium- to long-term business plan. With regard to climate change, we have set a mid-term target of a "23% reduction in GHG emissions by 2024" to achieve our "SBT for 1.5°C" target. Additionally, in relation to both climate change and natural capital, we have set targets for the efficiency of water use at production sites and breweries with high levels of water stress, and in relation to the circular economy, we have set a target of "38% usage of recycled resins in PET bottles in Japan," as KPIs linked to remuneration.
We incorporate other environmental targets into our CSV Commitment, our non- financial KPI targets, and reflect them in management plans by setting them as performance indicators for each operating company. The status of achievement of the CSV Commitment serves as a metric for assessing the performance of the CEOs of group companies.

	Roles and authorities	Members	Frequency	Achievements
The Board	●Supervision of execution of environmental operations within the Group ●Resolutions related to medium- and long-term strategies and fiscal year plans ●Resolutions related to important non-financial targets and KPIs, including those concerning the environment ●Monitoring the degree of dependence and impact on natural capital, as well as environmental risks and opportunities	●Chair: non-executive director ●Non-executive 7, Executive 5	4 times a year + as needed (monthly for risk monitoring)	●Quarterly monitoring of important risks and the execution of business operations, including environmental ●Resolutions concerning plans for fiscal 2024, including environmental targets, KPIs, and important risks
Group Executive Committee	●Deliberation of environmental policies, medium- and long-term strategies, and fiscal year plans ●Resolutions related to general non-financial targets and KPIs, including those concerning the environment ●Deliberation of the degree of dependence and impact on natural capital, as well as environmental risks and opportunities ●Supervision of the environmental operations of operating companies and divisions	●Convened and chaired by the CEO, Kirin Holdings Company, Limited. ●Executive officers of Kirin Holdings	Approximately 30 times a year	●Quarterly monitoring of the execution of environmental operations by operating companies ●Deliberation of plans for fiscal 2024, including environmental targets and KPIs, and important risks
Group CSV Committee	●Discussion of CSV policies, strategies, plans, targets, KPIs, and materiality across the Kirin Group, including those related to the environment	●Chair: CEO of Kirin Holdings ●Executive officers of Kirin Holdings ●CEOs of the Group's major operating companies in Japan and overseas	Three times a year	●Discussion of non-financial disclosure policies, strategies, and plans, including those related to the environment ●Reviews of ESG assessments and deliberation of enhancements
Group Environmental Meeting (Working Group on the Environment under the Group CSV Meeting)	●Formulation of policies, strategies, plans, targets and draft KPIs for the four environmental issues (climate change, water, containers and packaging, and biological resources)	●Chair: Executive officer in charge of CSV of Kirin Holdings ●Executive officer in charge of SCM strategy, General Manager of CSV Strategy Department, General Manager of Corporate Strategy Department, General Manager of Finance Department, General Manager of Procurement Department, General Manager of Corporate Communication Department, General Manager of IR Section, General Manager of Research & Development Division, and General Manager of Technology Development Department*1	Twice a year	●Formulation of draft plans for fiscal 2024 concerning the four environmental issues
Group Risk and Compliance Committee	●Deliberation of fiscal year policies concerning group risk management, including risks related to the environment, and important risks for the Kirin Group ●Monitoring risk and compliance projects and responding to sudden incidents	●Chair: Executive officer in charge of risk management of Kirin Holdings ●Executive officers of Kirin Holdings	Twice a year + as needed	●Deliberation of basic policies for plans for fiscal 2024 and important risks for the Kirin Group

*1 Kirin Brewery technical manager. Other affiliations not specified belong to Kirin Holdings.

Status of Governance for Environmental Issues



*1 Chief Executive Officer (CEO): The Executive Officer responsible for overseeing the overall management of the Group
*2 Chief Operating Officer (COO): The Executive Officer responsible for overseeing the business operations of the Group
*3 Group Environmental Meeting, Group Business and Human Rights Meeting, Group Health and Safety Meeting, etc.

Skills and competencies

The company appoints persons who possess the required experience, advanced insight, and a high level of expertise in order to ensure that directors of the board, audit and supervisory board members, and executive officers effectively engage in Group decision-making and perform supervision and execution aimed at achieving CSV, which is at the core of the company's management. See below for a skill map of senior management.

https://www.kirinholdings.com/en/purpose/governance/provisions/

Incorporating non-financial KPIs in performance-linked remuneration

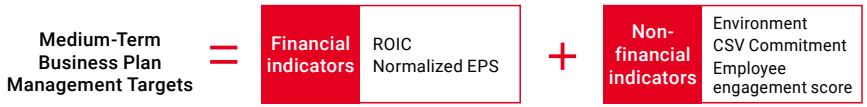
Please refer to the following for information about the relationship between executive remuneration and non-financial indicators in our Medium-Term Business Plan.

https://www.kirinholdings.com/en/purpose/governance/conpensation/

For the period from 2022 to 2024, our CSV Commitments, which is incorporated into the management plans of the Kirin Group, is shown below.

https://www.kirinholdings.com/en/impact/csv_management/commitment/

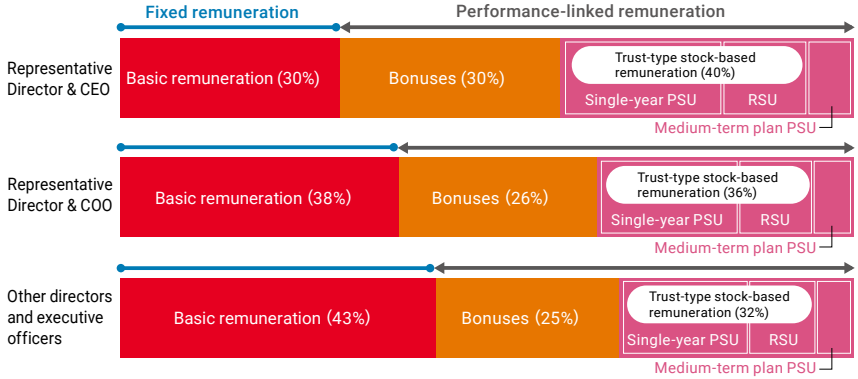
Structure of executive remuneration



Indicators

Item	Theme	Non-financial targets
Environment	Climate Change	Rate of reduction in GHG emissions Rate of reduction in Scope 1 + 2 emissions compared with 2019
	Containers and Packaging	Recycling rate of resin for PET bottles
	Water Resources	Water consumption rate at production sites and breweries with high levels of water stress

Linked



Strategy

Results of financial impact assessment

We assessed the financial and asset impacts of climate change, natural capital, and containers and packaging. We have summarized the interrelated impacts of climate change, natural capital, and containers and packaging.
We assume that it is unlikely that fuel for boilers and trucks will be replaced with hydrogen and electricity before the service life of equipment is reached as a result of laws and regulations. For reference, we disclose the "residual value of related facilities."
Estimates of the financial impact related to climate change and natural capital are limited, and we cannot determine risk from financial impact estimates alone. Accordingly, we have combined these estimates with qualitative analysis and assessments from scenario analysis for reflection in our strategies. For detailed analysis results and estimate methodology, as well as specific environmental risks and opportunities, business impact, and strategic resilience analysis, see "Holistic Analysis of Risks and Opportunities, Business Impact, and Strategies in Environmental Management." (→P.68)

Estimated financial and asset impact

Environmental themes	Risk types	Business risks / social issues	Financial impacts
Climate change	Physical risk*1	Decline in yields of agricultural products*2	2℃ scenario: Approx. 1.3 billion yen to 3.4 billion yen (2050) 4℃ scenario: Approx. 3.6 billion yen to 13.7 billion yen (2050)
	Transitional risk*1	Financial impact of energy due to carbon pricing	1.5℃ scenario: Approx. 10.2 billion yen (2030) 2℃ scenario: Approx. 9.4 billion yen (2030) 4℃ scenario: Approx. 5.1 billion yen (2030)
		Financial impact of agricultural products due to carbon pricing*2	RCP2.6/SSP1: Approx. 0.9 billion yen to 4.4 billion yen (2050) RCP8.5/SSP3: Approx. 2.4 billion yen to 8.8 billion yen (2050)
Climate change and natural capital	Physical risk	Disruptions to operations owing to floods	Wind and flood damage simulation results: Approx. 1 billion yen Actual data from past disasters (1 billion yen to 5 billion yen)
		Disruptions to operations owing to droughts	Approx. 0.03 billion yen to 0.6 billion yen
Natural capital and containers and packaging	Physical risk	Negative impact of PET bottles	Approx. 1.1 billion yen
	Transitional risks	Procurement of certified products	Approx. 0.06 billion yen
Climate change	Business opportunity	Increase in infectious diseases	Market for immunity and health supplements: Approx. 28,961.4 million US dollars (2030)
		Increase in heatstroke	Market for non-alcoholic beverages that prevent heatstroke: Approx. 94 billion yen to 188 billion yen (2100, 4℃ scenario)
Natural capital	Business opportunity	Reducing food waste	Approx. 0.9 billion yen
		Financial impact from the reduction of chemical fertilizers and pesticides for coffee farms in Vietnam*3	0.11 billion yen

Environmental themes	Risk types	Business risks / social issues	Financial impacts
Climate change	Transitional risks	Exposure of production sites to floods	Approx. 1.0 billion yen to 5.0 billion yen
		Residual value of related facilities due to strengthening of energy-saving legislation	Approx. 0.11 billion yen

* The calculation method for each financial impact is as follows.
- Reduced yields of agricultural products due to climate change: Estimated from standard prices for beer by country as shown in the results of research using the economic models of Xie et al., and the research results of Hasegawa et al., as presented in the IPCC "Special Report on Climate Change and Land (SRCCL)."
- Energy prices due to carbon pricing: Estimated from Current Policies Scenario and Sustainable Development Scenario in Annex A of the IEA "World Energy Outlook 2019," and the IPCC Special Report on Global Warming of 1.5℃, etc.
- Carbon pricing and prices of agricultural products: Estimated from the research results of Hasegawa et al., as presented in the IPCC "Special Report on Climate Change and Land (SRCCL)."
- Flood risk: The sum of the results of estimations for 200-year disasters for 20 locations in Japan using the wind and flood damage model flood simulation. In addition, the actual amount of damage caused by past disasters in the cases of Lion's Castlemaine Perkins Brewery (approx. 1 billion yen) and Kirin Brewery's Sendai Plant (approx. 5 billion yen).
- Drought risk: Hypothetical situation where production is affected by a drought for a certain period of time
- Negative impact of PET bottles: Estimated the financial impact in the event of a negative influence on natural capital from improperly disposed of used PET bottles that leak into the ocean from available statistics based on the company's own production volume ratios.
- Risk from transition to certified products: Estimation of expenses from switching to tea and coffee procured from certified sustainable farms to the extent currently possible.
- Infectious diseases: Estimated from WHO "Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s" and "Dengue and severe dengue," January 10 2022.
- Heatstroke: Estimated from a S-8 2014 Report by Project Team of Comprehensive Study on Impact Assessment and Adaptation for Climate Change.
- Food waste reduction: Estimated from the cost reduction effect if the target is achieved (Kirin Brewery, Kirin Beverage, Mercian, Koiwai Dairy).
- Reduction in agricultural chemicals and fertilizers: Estimated reduction in costs associated with the reduction of chemical fertilizers and pesticides for coffee farms in Vietnam
- Flood exposure: Estimated from wind and flood damage model flood simulations and actual data
- Residual value of related facilities due to strengthening of energy-saving legislation: Residual value of boilers and trucks (for both of which, we have assumed that it is very unlikely that we will discontinue the use of before the end of their service lives are reached if fuel conversion is required by laws and regulations. We have determined that there will be no financial impact, but for reference purposes, we disclose the residual value)

Resilience Assessment

Scenario analysis related to climate change and resilience assessment using the LEAP approach for natural capital are as follows.

Scenario analysis related to climate change

Physical risk

We verified water risk, water stress, and other information for manufacturing sites (plants and breweries) using the latest data (Aqueduct 4.0), and found that the overall level of risk is rising. Additionally, in relation to agricultural products, we believe that if we do not take sufficient measures to address climate change, it will be impossible to avoid a significant impact on the yields of key agricultural raw materials, as well as water risk and water stress by 2050 (2100 in some cases).

At present, the Kirin Group is focusing on initiatives such as the diversification of suppliers, support for the acquisition of sustainable farm certification, and the development of mass plant propagation technology, and we believe that we are resilient to physical risks to some extent. Even if the Kirin Group achieves our "SBT 1.5˚ C" target and the "SBT Net-Zero" target, however, it is becoming increasingly likely that it will be difficult to completely avoid the effects of global warming. Therefore, we intend to consider appropriate adaptation measures and include them in transition plans.

Transitional risks

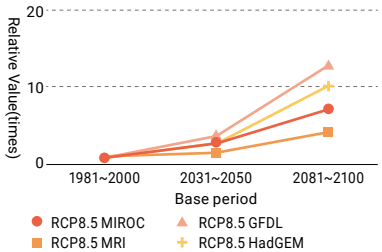
With regard to the financial impact of carbon pricing on energy costs, we estimate that achieving the "SBT 1.5˚ C" target early will reduce energy costs by approximately 4.7 billion yen (2˚ C scenario) in 2030. If, however, we do not achieve net-zero by 2050, the impact of carbon pricing on energy prices could be at a level that we cannot ignore. We also estimate that the financial impact of carbon pricing on agricultural prices will be similar to the financial impact of agricultural prices due to the physical effects of climate change.

*1 This is not a financial impact assessment that takes into account both carbon pricing and global warming impacts.

Business opportunity

In response to the impact of climate change on society, we believe there are business opportunities related mainly to the spread of infectious diseases and heatstroke in the "Health & Well-being domain," which we have identified as a key area in our Long-Term Management Vision for 2027.

Excess deaths related to heat stress in Japan

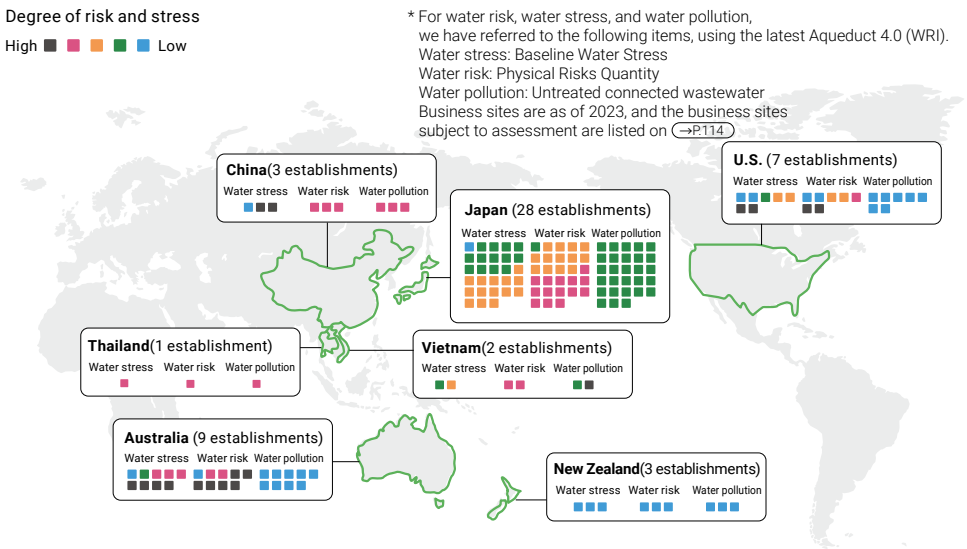


Forecast population exposed to risk of dengue fever under the 4℃ scenario
(Upper: Ten thousand persons; Lower: Difference from not taking GDP into consideration)

Region	2030		2050	
	Without GDP consideration	With GDP consideration	Without GDP consideration	With GDP consideration
Asia-Pacific high-income countries	81	56 (▲31%)	92	69 (▲25%)
East Asia	31,093	37,559 (+21%)	28,574	21,679 (▲24%)
Southeast Asia	71,335	71,338 (0%)	75,666	75,669 (0%)

Created by Kirin based on A-PLAT Projections for the Future: S-8 Research Results, published in 2016, Chart of Excess Deaths Related to Heat Stress
https://adaptation-platform.nies.go.jp/map/national/index.html

Water risk and stress at production sites

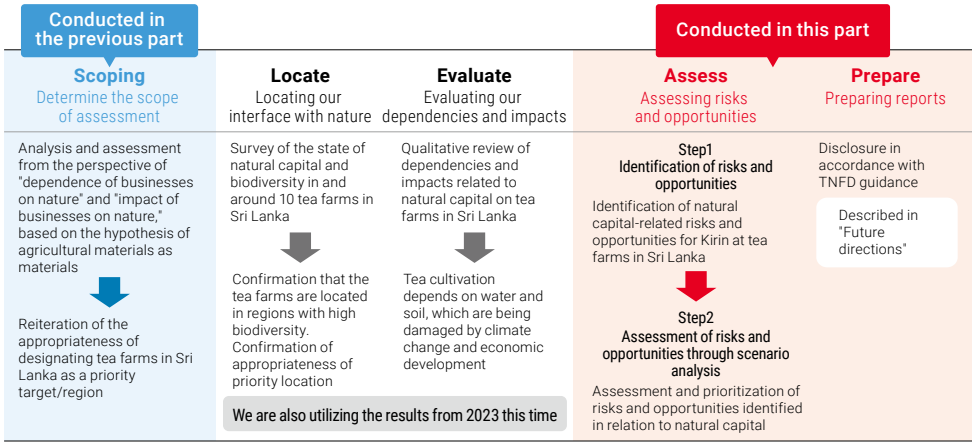


Impact of climate change on yields of key agricultural products and water stress in agricultural production areas around 2050

Materiality analysis of natural capital

Based on v1.0 of the TNFD recommendations and the updated LEAP approach, the Kirin Group reassessed issues and assessments related to natural capital.
In the scoping phase of the LEAP approach, we conducted a comprehensive assessment of the level of dependency and impact, and we are prioritizing coffee beans, hops, tea leaves, and soybeans as a result. We selected tea farms in Sri Lanka as a field where we can perform concrete activities, and analyzed and assessed risks and opportunities using the LEAP approach. The results show that Sri Lanka's natural capital is affected in various ways, not only by climate change, but also by economic development.
The Kirin Group has identified that there is high possibility of reducing risks associated with natural capital in Sri Lanka by supporting the acquisition of certification, which we have been doing since 2013, and by implementing the "Regenerative Tea Scorecard (referred to below as the "Scorecard")" in order to promote regenerative agriculture, which we began in 2023.
The analysis and assessment procedures are as follows.

Analysis and assessment procedures



Scoping implementation

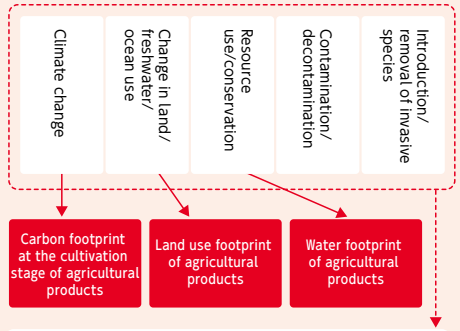
Based on an overview of the business domains and value chain of the Kirin Group as a whole, we have established the hypothesis that there is a high degree of dependence and impact on nature at the stage of procuring agricultural raw materials. For this reason, we analyzed and assessed "black tea leaves, paper/printed materials, palm oil, coffee beans, and soybeans" which are covered by the "Kirin Group Action Plan for Sustainable Use of Biological Resources," as well as "barley, hops, and wine grapes," of which we procure large amounts, on the two axes of "impact of our businesses on nature" and "nature-related dependencies of our businesses." We then used the LEAP approach for scoping of the agricultural products to be analyzed in detail.
For the "nature-related dependencies of our businesses," in order to assess our dependence on "provisioning services" for agricultural raw materials, as indicated in the TNFD recommendations, we used the following original assessment indicators: "procurement volume," "impact on Group sales revenue," "possibility of substituting raw material production areas," and "bias toward particular import destinations."
Concerning the "impact of our businesses on nature," we assessed the following indicators: "carbon footprint at the cultivation stage," "land use footprint," and "water footprint," for which data is available on a per-crop basis, and which are among the impact factors listed by IPBES*1 that the TNFD recommendations state should be considered. We also confirmed whether agricultural products are listed as high risk by the SBTN and the European Regulation on Deforestation Free Products (EUDR).

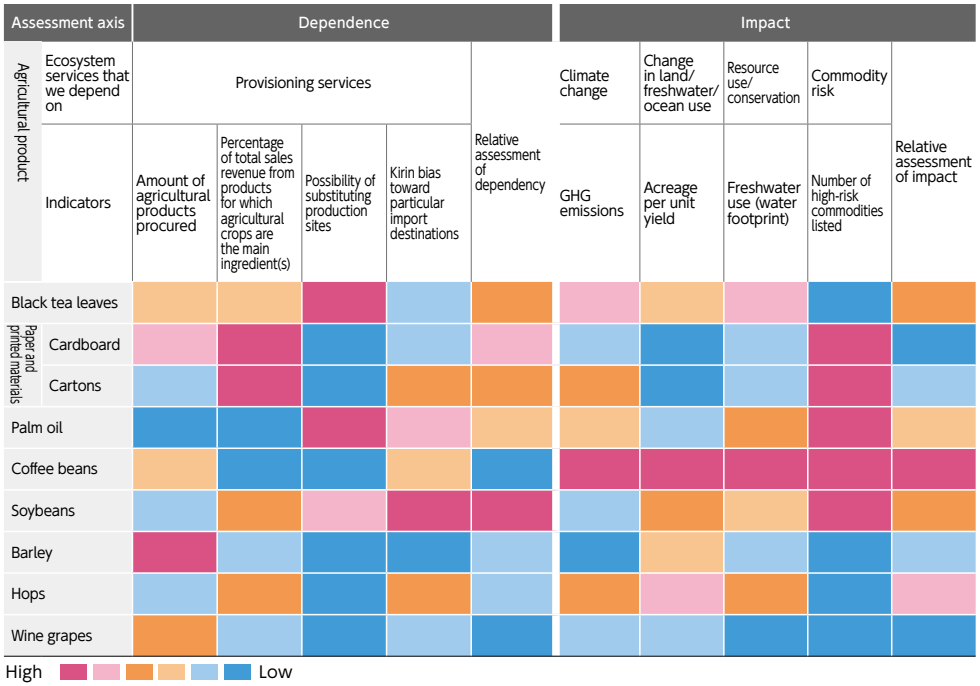
Heat map of impact and dependency analysis and assessment results*2

Assessment of the dependence of businesses on nature

Amount of agricultural raw materials procured	Calculated from procurement data
Percentage of total sales revenue from products for which agricultural raw materials are the main ingredient(s)	Calculate the percentage of overall sales revenue of a for typical brands used
Possibility of substituting raw material production areas	Established based on the judgment of procurement departments, taking into account the knowledge of natural capital in the CSV Strategy Department
Bias toward particular import destinations	We have estimated and assessed our bias for agricultural raw materials procured by the Kirin Group by applying the "Herfindahl-Hirschman index," which is an indicator for measuring the competitive status of companies in an industry.

Assessment of the impact of our businesses on nature



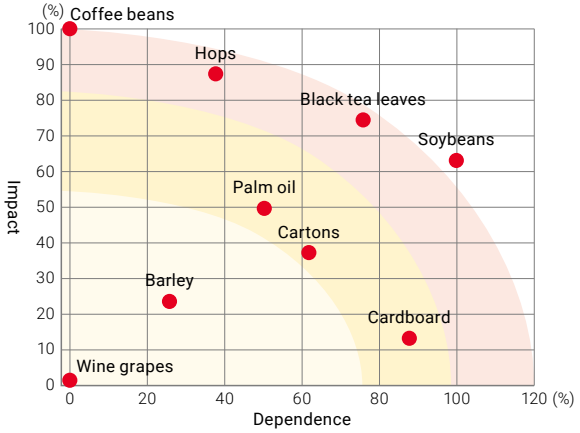


*1 IPBES: An intergovernmental organization that scientifically assesses trends related to biodiversity and ecosystem services and strengthens links between science and policy
*2 For GHGs, we used the ClimateHub database; for land use, we used data for 2022 disclosed by the FAO; for freshwater, we used Mekonnen-Hoesktra (2011)

Materiality analysis and assessment results in scoping

We conducted analysis and assessment of the "impact of our businesses on nature" and the "nature-related dependencies of our businesses." The horizontal axis indicates dependency, and the vertical axis indicates impact. Based on this "materiality analysis of main raw materials," we are prioritizing four raw materials: coffee beans, hops, tea leaves, and soybeans. Although we have not yet fully considered some factors, such as the weighting of assessment items, we believe that the results are consistent with knowledge gained from our initiatives targeting natural capital over many years and are credible.

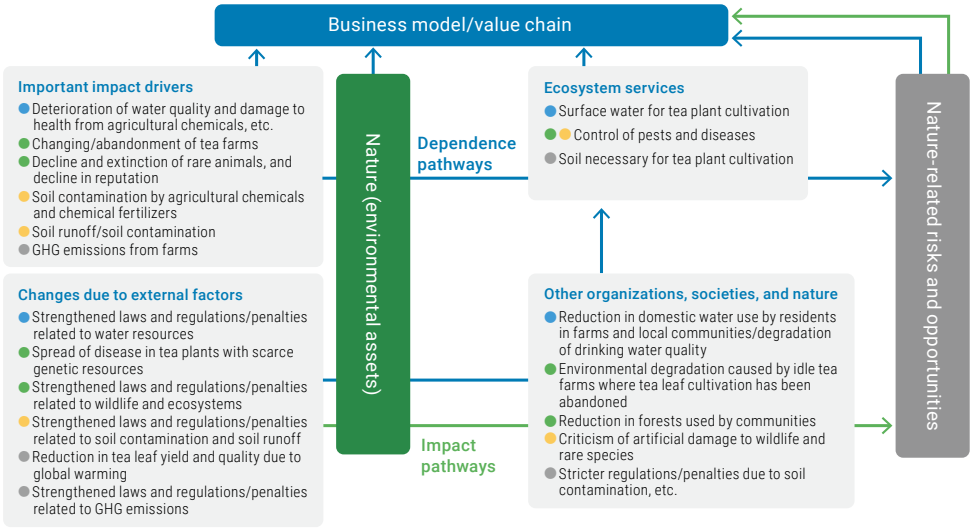
Materiality analysis of main raw materials



Analysis and assessment of risks and opportunities based on the LEAP approach

We analyzed and evaluated our dependence and impact, and risks and opportunities for tea leaves from Sri Lanka, which we have designated as a priority target and priority location in the scoping described in the preceding paragraph. For the Locate and Evaluate stages, we used data from when we conducted these processes and disclosed them in our environmental report in 2023.

Relationship between dependency and impact pathways



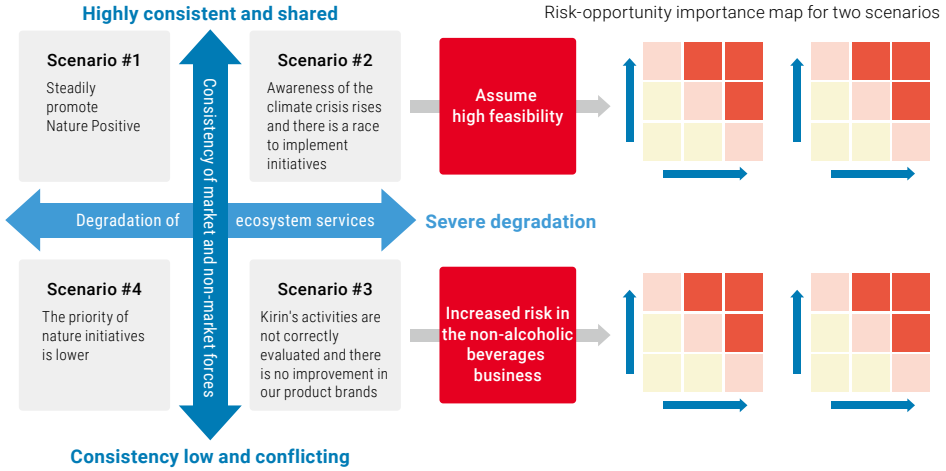
* Impact drivers and external factors are color-coded for each of the four environmental assets (water resources, land ecosystems, land, and air). In fact, we have analyzed and assessed each risk and opportunity in detail, but we have only provided the key points here.

Assess (assess risks and opportunities)

Based on lists of important impact drivers and ecosystem services compiled during the Evaluate phase, we created a diagram showing the relationships between dependency and impact pathways for each of the four environmental assets: water resources, land ecosystems, land, and air. We also identified external factors and external stakeholders for each important natural capital and determined risks and opportunities.

We then conducted scenario analysis. We put "ecosystem services" on the horizontal axis of the scenario, with the status quo level of natural capital on the right and the degradation of natural capital on the left. On the vertical axis, we put "market forces," with the state of strict regulation and high awareness among consumers and investors at the top, and the state of loose regulation and low interest among consumers and investors on the bottom. Within this framework, we selected "nature degradation" scenarios #2 and #3 as the most realistic scenarios. Based on the risks and opportunities identified at the previous stage, as well as the magnitude of the financial impact, we created risk maps and conducted assessments.

And based on the "important implications" obtained in this way, we have summarized our future directions (Prepare: preparing reports) as follows.



Future directions (Prepare: preparing reports)

In response to important implications gained from the Assess stage, we have summarized our future activities at Sri Lankan tea farms as follows.

We plan to incorporate these activities into our medium- to long-term roadmap in the future.

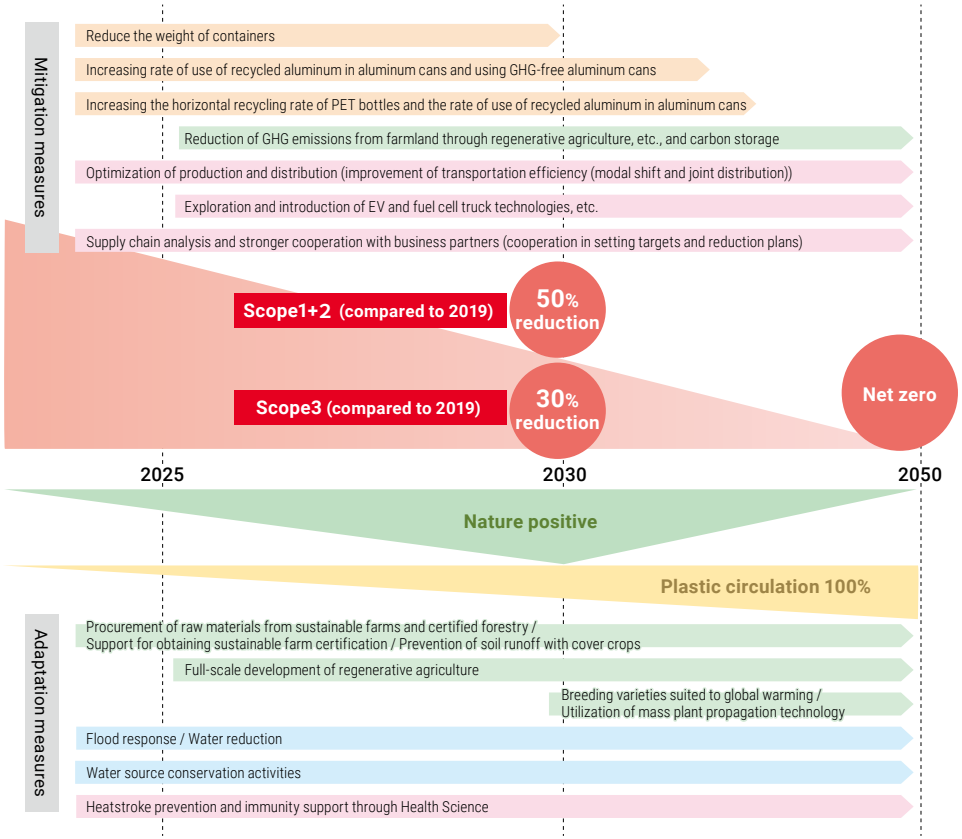
Important implications gained from risk and opportunity assessment

Summary of assessment of physicals risks	Opportunities, scenario #2, and scenario #3
Physical risks and opportunities	●Natural disasters due to climate change, fall in yields, and decline in tea leaf quality ●Erosion of topsoil due to land use changes associated with economic development ●Low genetic diversity and potential for the spread of disease in tea plants ●Improvements to farm resilience with certification training
Policy and regulatory risks	●Stronger regulations are unlikely because the aggressive shift to excessive organic farming significantly impacted agriculture
Market and valuation risks (consumers)	●It is unlikely that there will be an expansion in ethical consumption in Japan anytime soon ●Future generations are highly interested in sustainability
Market and valuation risks (investors)	●Investors are highly interested in Nature Positive and regenerative agriculture
Liability risk (community)	●The likelihood of facing penalties for legal violations is assumed to be low

- In addition to certification training, we are also using the "scorecard" to spread regenerative agriculture at tea farms
- Improvements to soil moisture retention at tea farms through weed management, as well as water source conservation activities on farms
- As necessary, expand the landscape approach adopted in Sri Lanka to those production areas

Transition Plans

We have formulated holistic business transition plans which aim to simultaneously realize a decarbonized society, Nature Positive, and Circular Economy, ensuring business continuity.
Our transition plans from the perspective of climate change mitigation and adaptation are shown in the figure below.



Investment plans and financing plans

Investment and financing plans for "Scope 1+2 GHG emissions reduction" and "expansion of the use of recycled PET resin" are as follows.

	Investment plans	Financing plans
Scope 1+2 GHG emissions reduction	●Plan to reduce GHG emissions on a profit - and - loss neutral basis by balancing energy cost reductions by saving energy and transition costs (e.g. CAPEX of projects and cost premium of renewables). ●In order to promote environmental investments, we will use the Net Present Value (NPV) as an indicator for environmental investments aimed mainly at reducing GHG emissions, and we have also introduced ICP (Internal Carbon Pricing) as a method for making investment decisions ●Plan to consider strategies for 2030 and beyond, based on the assumption that there will be infrastructure and technological innovation	●In 2020, we issued a green bond (10 billion yen) to finance the procurement of recycled PET resin and the installation of a heat pump system at plants ●In December 2022, we became the first food and beverage company in Japan to develop a framework that complies with transition finance-related guidelines, etc., and to have obtained a second party opinion from an independent third party in order to promote transition initiatives on the finance side ●In January 2023, we became the first food and beverage company in Japan to raise funds with a transition-linked loan (50 billion yen), which is aimed at financing energy conservation and renewable energy-related projects that contribute to reducing Scope 1 and Scope 2 emissions
Expansion of the use of recycled PET resin	●Enhance manufacturing facilities for small PET bottles at the Kirin Beverage Shonan Plant (investment of approximately 10 billion yen) ●Plan to formulate investment roadmaps with a view to developing practical applications for chemical recycling	

We make investment decisions based on annual plans to address issues related to containers and packaging other than expanding the use of recycled PET resin.
The cost for Nature Positive-related measures is around 20 million yen per year. This is the total amount, which is broken down into current support for obtaining certification for tea farms in Sri Lanka, development and pilot testing of the Scorecard for regenerative agriculture, and joint research with NARO, including carbon storage at Mariko Vineyard. We anticipate that it will still take several years to fully implement regenerative agriculture, and that additional costs will be required. Further expenses for research and implementation will also be necessary for our next targets, such as soybeans, hops, and barley.
The main targets for the reduction of Scope 3 emissions are containers and packaging and agricultural raw materials. We envisage that regenerative agriculture will be a key adaptation and mitigation measure for climate change related to agricultural raw materials. In light of this background, when considering “Scope 3 transition plans” in the future, we plan to consider transition strategies related to "Nature Positive" and “Circular Economy,” and thus formulate holistic plans that also incorporate investments and costs.

Plan to transition to a decarbonized society

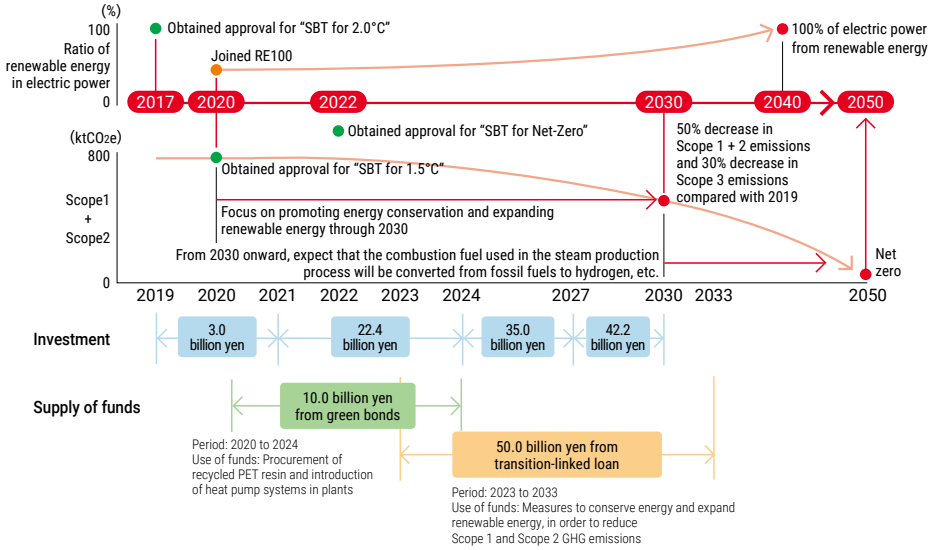
The Kirin Group is working to reduce GHG emissions based on a roadmap consistent with the "SBT 1.5° C" target for 2030 and the "SBT Net-Zero" target for 2050. We plan to create concrete measures, not only to reduce GHG emissions, but also to mitigate and adapt to climate change.

Scope 1+2 emissions reduction

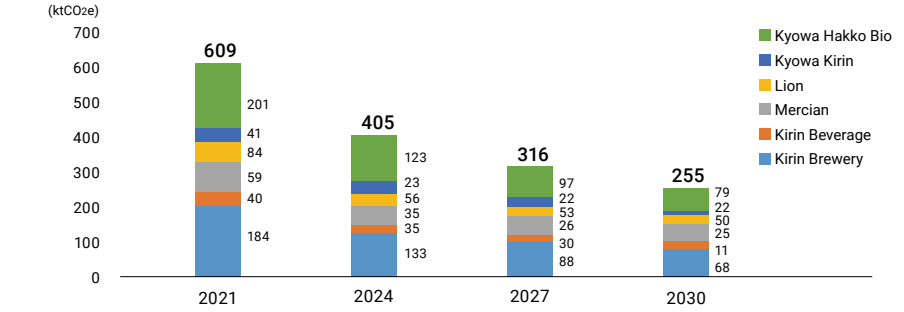
Our roadmap for reducing Scope 1 and Scope 2 emissions by 2030, as well as our investment and financing plans, is shown on the right. We will take a three-pronged approach to reducing Scope 1 and Scope 2 emissions, namely: "promotion of energy conservation," "expansion of renewable energy," and "energy transition," and will also develop ways to optimize production and logistics, etc. Our actions in each area are as follows.

	Action
Promotion of energy conservation	●Kirin Brewery introduced heat pump systems at the wastewater treatment facilities of six plants in 2019 ●At Shinshu Beverage, we reuse waste heat, which is difficult to use directly in rinsing processes for bottles and caps, through a heat pump unit ●At the Kirin Brewery Okayama Plant, we reuse waste heat in hot water sterilization equipment for cans and heat in the air
Expansion of renewable energy	●At Kirin Brewery, we have installed large-scale solar power generation facilities at all nine plants (PPA model at eight plants excluding the Yokohama Brewery) ●Mercian introduced solar power generation using a PPA model at the Fujisawa Plant ●Kyowa Kirin introduced a large-scale solar power generation facility (1.47MW) using a PPA model at the Ube Plant ●Kyowa Hakko Bio introduced solar power generation using a PPA model at the Hofu Plant ●Lion acquired carbon neutral certification in Australia, as well as Toitū carbon zero certification in New Zealand ●Lion installed solar power generation facilities at Castlemaine Perkins Brewery and Little Creatures Geelong
Energy transition	●Completed the transition of fuel to natural gas at all Kirin Brewery and Kirin Beverage plants, as well as the Mercian Yatsushiro plant ●Lion plans to install an electric boiler at a brewery in New Zealand. The company plans to expand its use of electric power generated from renewable energy

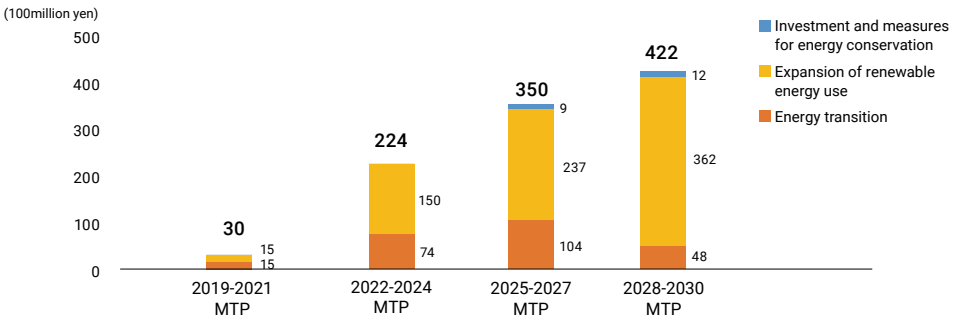
Roadmap to Net-Zero



Reduction of Scope 1 and Scope 2 emissions



Investment



Scope 3 emissions reduction

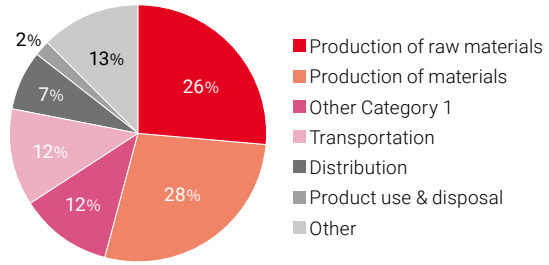
Of the categories in the "Scope 3 Standard" of the GHG Protocol, Category 1 (purchased goods and services) emissions from "containers and packaging" and "agricultural raw materials" account for approximately 70% of the Kirin Group's Scope 3 emissions. Category 4 (upstream transportation and distribution) emissions from "transportation" make up approximately 10% of the total. These two categories are the main targets of the Kirin Group's efforts to reduce Scope 3 emissions.

We will continue working to reduce Scope 3 emissions through the two approaches of the "reduction of our own independent emissions" and "encouragement of reduction at suppliers." Transportation and containers and packaging are the targets for reducing our own independent emissions. We will leverage the Institute for Packaging Innovation, which develops containers and packaging in-house, and which is the only institute of its scale for a food and beverage company in the world.

We encourage suppliers to reduce GHG emissions from the production of containers and packaging and their materials, and GHG emissions during the production of agricultural raw materials. We have determined that regenerative agriculture is effective way to reduce GHG emissions from agricultural products. Our key actions are as follows.

	Action
Containers and packaging (28% of Scope 3 emissions)	●In addition to reducing the weight of cans, we will also increase the rate of CAN to CAN recycling, reducing the use of virgin materials and increasing the rate of use of recycled materials as much as possible ●For aluminum cans, in response to the start of the development of practical applications for GHG-free aluminum refined using renewable energy, we will research GHG-free aluminum ●For PET bottles, in order to increase the PET to PET horizontal recycling rate, we will increase the use of mechanically and chemically recycled materials, while also reducing GHG emissions from the manufacturing process ●We will contribute to the reduction of GHG emissions from transportation by reducing the weight of containers and packaging
Agricultural raw materials (26% of Scope 3 emissions)	●Initiation of joint research on the accurate measurement of GHG emissions from soil at Mariko Vineyard and carbon storage using biochar from pruning debris ●New Belgium Brewing (U.S.) has begun procuring barley through regenerative agriculture
Transportation (12% of Scope 3 emissions)	●Optimization of production and distribution, joint distribution, and modal shift ●Consideration of conversion to fuel cell trucks and EV trucks

Proportion of Scope 3 emissions

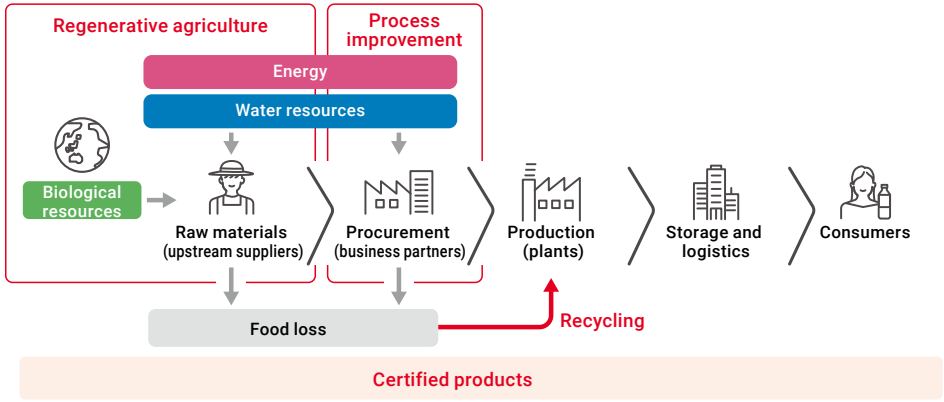


* Emissions other than the above (emissions from the manufacture and transportation of capital goods, fuel, etc., waste from business operations, travel and commuting of employees, etc.)

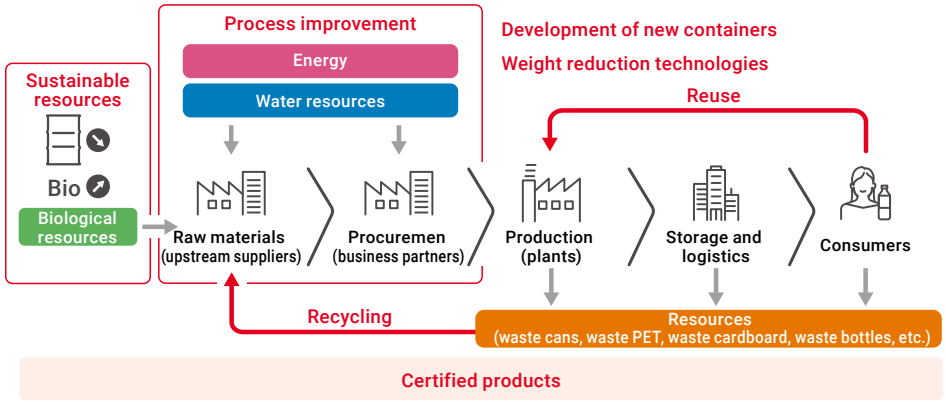
As part of our efforts to resolve issues related to Scope 3 emissions, we launched the "Kirin Supply Chain Environmental Program" to deepen cooperation with suppliers that account for large amounts of emissions, in areas such as containers and packaging, agricultural raw materials, and manufacturing contractors. Under science-based approach, we will call for the mutual disclosure of emissions data and the setting of targets in accordance with SBTi standards, provide support for the establishment of targets, and jointly formulate and implement highly feasible measures to reduce GHG emissions.

We have positioned Mariko Vineyard in Japan and tea farms in Sri Lanka as model cases to accumulate knowledge on climate change mitigation and adaptation through regenerative agriculture. This knowledge gained will be applied to other agricultural products and production areas.

Approach to reducing GHG emissions from agricultural raw materials



Approach to reducing GHG emissions from containers and packaging



Plan to transition to Nature Positive

We will organize our transition to Nature Positive using the AR3T framework for natural capital proposed by the SBTN (SBTs for Nature).

	Action
Avoid	●Achieve and maintain 100% use of FSC-certified paper and expand this initiative globally ●Achieve and maintain 100% RSPO certified credits for palm oil as primary and secondary raw materials (excluding palm kernel oil), and avoid procurement from countries and regions at risk of deforestation ●Continue development of applications for bag-type culture vessel technology that enables mass plant propagation with minimal water ●Education on wildlife conservation for young people living on farms in Sri Lanka
Reduce	●Support the acquisition of Rainforest Alliance certification by tea farms in Sri Lanka and coffee farms in Vietnam ●Reducing food loss and waste ●Introduction and continued operation of advanced water treatment using reverse osmosis membranes at breweries in Australia, where there is a high level of water stress
Restore & regenerate	●Utilization of derelict farm land as Japan Wine vineyards. Restore ecosystems through hedgerow-style cultivation ●Conserve water sources on farms in Sri Lanka ●Water source conservation activities at production sites in Japan
Transform	●Participate in the development of guidance for the disclosure of financial information related to natural capital, such as the TNFD and SBTs for Nature ●Contribute to the expansion of the supply of FSC-certified paper by establishing a consortium for sustainable paper use with other companies and NGOs ●Establish the Rainforest Alliance Consortium and contribute to raising awareness of sustainable agriculture

On March 29, 2024, the Ministry of the Environment, the Ministry of Agriculture, Forestry and Fisheries, the Ministry of Economy, Trade and Industry, and the Ministry of Land, Infrastructure, Transport and Tourism jointly announced the "Transition Strategies toward Nature Positive Economy," reflecting discussions by the Ministry of the Environment's "Study Group on Nature Positive Economies," in which the Kirin Group participated. One of the three points of view presented in this report is the "necessity of transition to Nature Positive management and contribution to the conservation of natural capital and value creation."

Projects in Sri Lanka and at vineyards in Japan are examples of "Nature Positive through business," in which we will restore and maintain "secondary nature" through business activities, and we believe that these examples fall under the "contribution to the conservation of natural capital and value creation" in the Ministry of the Environment's transition strategies.

In accordance with the results of materiality analysis (→P.18) at the product level for agricultural raw materials, we plan to consider our roadmap for soybeans, hops, and other products listed in the future.

We have adopted a landscape approach, which is "a method for sustainably solving issues based on a comprehensive treatment of various human activities and the natural environment in raw material production areas," to address issues related to "indigenous peoples, local communities, and affected stakeholders," which the TNFD requires to be disclosed. Currently, we have only put this method into practice in Sri Lanka and vineyards in Japan, but through the "Kirin Supply Chain Environmental Program," which we launched in 2024, we intend to expand the regions where to which this method applies.

In freshwater areas, we are researching water stress and impact (water intake) in relation to water volumes in the basins of production sites and prioritizing the areas, in accordance with SBTs for Nature guidance V1.0 issued in May 2023.

Priority of manufacturing sites for each indicator: Water stress

Country	Manufacturing sites	Water stress	Water intake	Biodiversity risk
USA	Biokyowa	★★★★☆	★★★★★	★★☆
Thailand	Thai Kyowa Biotechnologies	★★★★☆	★★★☆☆	★☆☆
Japan	Kyowa Pharma Chemical	★★★☆☆	★★★★☆	★★☆
Japan	Kirin Brewery Toride	★★★☆☆	★★★☆☆	★☆☆
Japan	Kirin Brewery Yokohama	★★★☆☆	★★★☆☆	★☆☆
Japan	Kirin Distillery Gotemba	★★★☆☆	★★★☆☆	★☆☆
Japan	Kyowa Kirin Fuji	★★★☆☆	★★★☆☆	★☆☆
Australia	Lion Tooheys Brewery	★★★★☆	★★☆☆☆	★★☆
Japan	Kirin Brewery Nagoya	★★★☆☆	★★★☆☆	★★☆
China	Shanghai Kyowa Amino Acid	★★★★☆	★★☆☆☆	★☆☆
Japan	Kirin Beverage Shonan	★★★☆☆	★★☆☆☆	★★☆
Australia	Lion Castlemaine Perkins Brewery	★★★★☆	★★☆☆☆	★★☆
China	Kirin Brewery (Zhuhai)	★★★☆☆	★★☆☆☆	★★☆
USA	New Belgium Brewing Fort Collins	★★★★★	★☆☆☆☆	★☆☆

* We assess water stress using three indicators for available water resources (Aqueduct Baseline Water Stress, Water Risk Filter Baseline Water Depletion, and Blue Water Scarcity)
* Water intake refers to the percentage of the total intake for 14 sites with high water stress
* We assess biodiversity using scores for indexes calculated based on the IUCN Red List for basins at production sites (START (Species Threat Abatement and Restoration) and STARR), as well as the presence of biodiversity elements triggering KBA criteria inhabiting water within a 50km radius of basins at production sites, including fish, amphibians, turtles, crustaceans, and dragonflies

Plan to Transition to Circular Economy

Containers and Packaging

We will adopt a 3R+Renewable approach for promoting a transition to the circular economy for containers and packaging. Our main actions are as follows.

	Action
Reduce	●Utilize the "Institute for Packaging Innovation" to promote weight reduction for containers and packaging. Specifically, we developed and deployed the lightest returnable beer bottle produced in Japan and reduced the weight of cans and PET bottles.
Reuse	●We will continue to reuse returnable beer bottles
Recycle	●We collect old beer bottles and one-way bottles, turn them into cullet, and reuse them as bottles ●Expand the use of aluminum cans with a high percentage of recycled metal. ●We collect empty containers from vending machines and voluntarily collect and reuse aluminum cans in cooperation with can manufacturers. ●Lion has developed a "Sustainable Packaging Strategy," and will assume key roles such as collection coordinator in states where Container Deposit Schemes are in place in Australia. ●Based on the "Kirin Group Plastic Policy," our medium-term target is to achieve a rate of recycled resin use in 50% of PET bottles in Japan by 2027. ●In terms of "R100 PET bottles," we will gradually expand the adoption of products that use 100% recycled PET resin from mechanical recycling, the current mainstream method. ●We will also actively promote "bottle-to-bottle" horizontal recycling, in which used PET bottles are collected and recycled into new PET bottles. ●Looking ahead to future supply and demand for recycled PET resin, we will formulate and promote a roadmap for 2050, taking into account the status of progress on the development of practical applications for chemical recycling.
Renewable	●We will promote the reduction of one-way plastics and their replacement with alternative materials.

In the EU, the transition to a circular economy is positioned as part of growth strategies, and "design" is expected to play an important role in promoting this transition. Internally, the Kirin Group has the Institute for Packaging Innovation, which focuses on developing containers and packaging and solving related problems. Taking advantage of this strength, we are able to solve social issues through design related to the environment for containers and packaging. In addition to contributing to reducing GHG emissions in transportation by measures such as reducing the weight of containers and packaging, we will also contribute to the circular economy by creating practical applications for chemical recycling and building a society that recycles plastics throughout society.

Food loss and waste

The Kirin Group position issues related to food loss and waste, as issues for not only Nature Positive but also the circular economy. In order to reduce product waste losses, we are promoting manufacturing optimization by improving demand forecasts. In addition, we are promoting effective utilization methods, such as the donation of unavoidable surplus inventory to local governments, food banks, and other organizations. We are continuing to effectively use by-products generated in manufacturing processes (e.g., spent grains) as feed and compost.

We have separately provided information concerning plans for transition to a decarbonized society, Nature Positive, and a circular economy, but in reality, we will implement these plans as a single unified plan that takes into account their interconnectedness. Our specific activities and their results for each of the aforementioned transition plans are shown below.

Our specific activities and their results in relation to natural capital, in accordance with the SBTN's AR3T framework, are summarized below.

Climate change strategies and progress

	Increase in resilience (adaptation)			Minimization of impact on natural capital (mitigation)			Business opportunity	
Material agenda	Water resources		Biological resources		Containers and Packaging	Climate change		
Response strategy	●Sharing flood knowledge ●Equipment and facility measures against flooding ●Sharing drought knowledge ●Development and deployment of water usage reduction technology ●Conservation of water sources		●Procurement of materials from sustainable farms and forestry and support for obtaining certification ●Prevention of soil runoff with cover crops ●Breeding varieties suited to global warming ●Utilization of mass plant propagation technology	●Reduction of GHG emissions from farmland through regenerative agriculture and carbon storage ●Use of biogas	●Creation of more lightweight containers ●Increase rate of use of recycled aluminum in aluminum cans ●Consider the use of GHG-free aluminum cans ●Increase the horizontal recycling rate of PET bottles	●Promotion of energy conservation ●Expansion of renewable energy ●Energy transition ●Production optimization ●Improvement of transportation efficiency (modal shift and joint distribution) ●Exploration and introduction of EV and fuel cell truck technologies, etc.	●Provision of products to address infectious diseases	●Provision of non-alcoholic beverages that prevent heatstroke
Progress	●Contribution to the TNFD pilot program, including the world-leading LEAP trial disclosure (2022) and scenario analysis trial (2023) ●Participation in the pilot test of Corporate Engagement Program in SBTN for Nature (from 2021)	●Started surveys of high-risk business sites for insurance coverage, utilizing the results of simulations of natural disasters and floods (since 2022) ●Implemented flood prevention measures and equipment measures at pharmaceutical plants that must ensure a stable supply of products	●Establishment of mass plant propagation technology for hops ●Coinciding with pilot testing of scorecards for tea farms in Sri Lanka, cover crops preserve soil moisture and prevent soil runoff in heavy rainfall	●Began a joint study on controlling GHG emissions from soil and carbon storage with biochar at Mariko Vineyard ●Continued use of biogas from anaerobic wastewater treatment	●Began activities as the Japan representative of the Alliance to End Plastic Waste ●Increased use of R100 PET bottles made with 100% recycled resin ●Practical applications for chemical recycling	●Introduced large-scale solar power generation facilities at nine Kirin Brewery plants (through 2023, including eight breweries and plants with PPA model purchasing), Mercian Fujisawa Plant (2023), Kyowa Kirin Ube Plant (2023), Kyowa Hakko Bio Yamaguchi Production Center, and Lion Castlemaine Perkins (2019) Achieved 100% of procured electricity from renewable energy sources at all Kirin Brewery plants and operating sites (2024), Kyowa Kirin Takasaki Plant, Ube Plant, and research laboratories, all Lion plants in Australia and New Zealand (2023), and all Château Mercian wineries (2022). Became the first global food and beverage company to obtain approval for an SBT Net-Zero (2022) ●Launched the Kirin Supply Chain Environmental Program to strengthen cooperation with major suppliers (2024)	●Enhancement of product lineup ●Supply of materials to partner companies	●Raising awareness of heatstroke

Strategies and progress related to natural capital (AR3T-compliant disclosure)

Material agenda	Water resources	Biological resources
Avoid	●Continue development of applications for water-bag type culture vessel technology	●Achieved and maintained 100% FSC-certified paper in the Japan Non-alcoholic Beverages Businesses ●Achieved and maintained RSPO100% for operations in Japan (excluding palm kernel oil)
Reduce	●Appropriate water conservation in accordance with the level of water stress ●Introduction and continued operation of advanced water treatment using reverse osmosis membranes at Lion, which faces a high level of water stress	●Implementation of the training to support the acquisition of Rainforest Alliance certification by tea farms in Sri Lanka, development and pilot testing of the scorecard ●Continuing support for coffee farms in Vietnam to acquire Rainforest Alliance certification ●Reducing food waste in the alcoholic and non-alcoholic beverages businesses in Japan
Restore & Regenerate	●Conservation of water sources on tea farms in Sri Lanka and provision of education to local residents ●Continued water source conservation activities at production sites in Japan that began in 1999	●Restore ecosystems through the conversion of derelict farm land into hedgerow-style vineyards ●Conducted education on conserving wildlife, including the black panther, for young people in areas around farms in Sri Lanka
Transform	●As a participant in the Corporate Engagement Program of SBTs for Nature, we are contributing to the development of a framework for scientific target setting related to natural capital	●World-leading disclosure using the LEAP approach, participation in joint scenario analysis in response to request from the TNFD ●Contribute to the expansion of the supply of FSC-certified paper by establishing a consortium for sustainable paper use with other companies and NGOs ●Contribution, including establishing the Rainforest Alliance Consortium to raise awareness of sustainable agriculture

Risk and Impact Management

In the section on governance, we have described our measures to address significant physical and transitional risks related to climate change detected in scenario analysis (→P.14~P.15). Senior management deploys mitigation and adaptation strategies and manages targets under the supervision of the Board. The same applies to overall risks related to sustainability, including the degree of dependence and impact on natural capital and the creation of a circular economy. In this section, we describe our monitoring system for important risks and our response to the acute risks posed by climate change.

Risk management system

The Kirin Group has established the "Group Risk and Compliance Committee," which consists of officers at the level of senior executive officer or higher from Kirin Holdings. This committee oversees all aspects of risk management activities, including the collection of information related to risk, the formulation of Group risk policies, risk mitigation initiatives, information sharing at times of crisis and consideration of countermeasures, and instructions and support for Group companies. Risks and opportunities related to sustainability include environmental issues such as climate change, natural capital, and the circular economy; social issues such as human rights, local communities, indigenous peoples, small-scale farmers, and gender; and the mutual relationships between such issues and regulatory responses (under our risk management system, "opportunities" are included in the management of "risks").

The Board deliberates basic policies concerning important risks for the Group and risk management developed by the Group Risk and Compliance Committee and receives quarterly reports on risk monitoring. Both the Board and the Group Risk and Compliance Committee receive risk status reports from the Secretariat on a monthly basis. Group companies use similar processes as those determined by the Board of Kirin Holdings to conduct risk management, based on basic policies for important risks and risk management, including the aforementioned sustainability-related risks and opportunities. Kirin Holdings monitors important risks for each Group company for each functional division.

*1 Please see "Identification of Materiality" (→P.8) for details concerning the identification of materiality for risks and opportunities related to environmental issues, including climate change.
*2 Details of our "risk management system" are disclosed below.
(https://www.kirinholdings.com/en/purpose/governance/risk_management/)
*3 The Kirin Group revised the "Kirin Group Human Rights Policy" on November 8, 2023, in order to advance our human rights initiatives toward global, high-level industry standards.
https://www.kirinholdings.com/en/impact/community/2_1/policies/

Management of risks related to sustainability

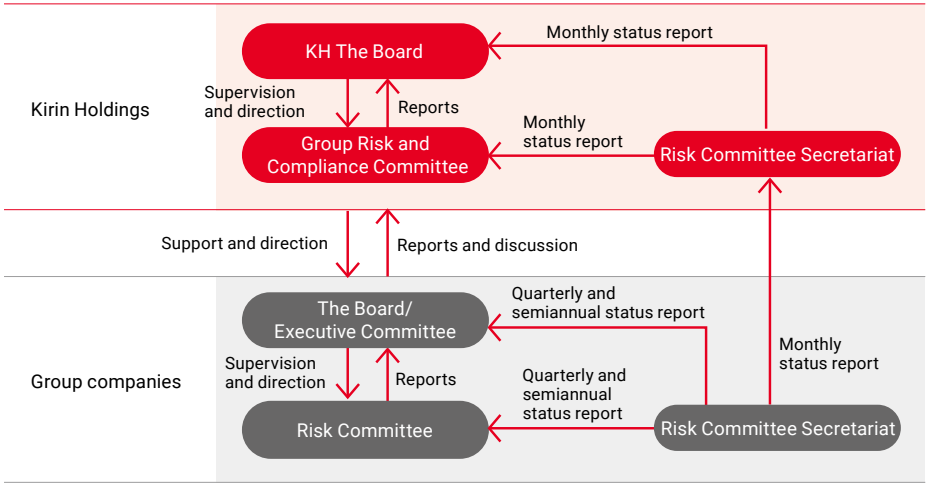
The management of risks related to sustainability includes torrential rains, floods, droughts, and wildfires, which are physical and acute risks related to climate change, and which are becoming more frequent and severe. When such climate disasters occur, the Group or the relevant company's Risk and Compliance Committee discusses the matter, and countermeasures are promptly implemented. When we expect the impact to be significant, we respond based on all-hazard mode*4 business continuity plans (BCPs). The Board of Kirin Holdings receives reports on the status of crises expected to have a significant impact as appropriate and issues necessary instructions. After a response to an individual crisis has been completed, we review the risks involved and the progress of measures to respond, and share our experience within the Group in the form of revisions to response manuals and BCPs, contributing to a sustained strengthening of management resilience. For example, we utilized knowledge gained from dealing with the 2011 flood in Queensland, Australia, to speed up the reopening of the brewery following the 2022 flood in that area. We also leverage this knowledge to strengthen our plants and breweries' ability to respond to floods that occur every year in Japan. Furthermore, we leveraged our experience of torrential rain in western Japan in 2018 to protect logistics functions during Typhoon Hagibis in the following year, 2019.

*4 An all-hazard BCP is a business continuity plan that focuses on countermeasures against the loss of management resources, such as when employees and facilities are affected by disasters, and the suspension of head office functions, rather than our approach to individual crisis events

Improving risk response capabilities

For physical and transition risks such as climate change, which will have an extremely large impact on our businesses if they occur, even though the probability of occurrence is uncertain, we have adopted a new approach to identify and examine important risks by setting scenarios and using them to analyze and assess risks. In scenario analysis, we utilize various research papers, science-based risk assessment tools such as Aqueduct, etc. We have already begun assessing the identification of dependencies, impacts, risks, and opportunities related to natural capital, both directly and in the upstream and downstream value chains, on a trial basis, in accordance with the TNFD guidance, and we intend to incorporate it as a regular process in the coming years. The Group Environmental Meeting and the Group CSV Committee share and discuss risks and opportunities identified through these processes, then they are not only submitted and reported to the Board, but the Group Risk and Compliance Committee Secretariat also receives reports on such risks, and manages them together with other risks. Additionally, we share internal examples of sustainability-related risks, such as responses to climate disasters, within the Group in order to strengthen resilience across the Group as a whole.

Risk management system

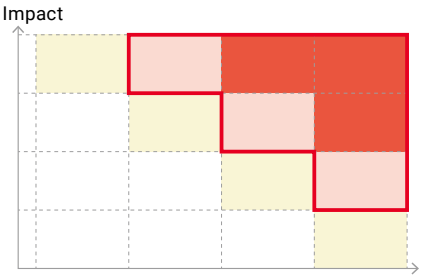


*5 The risks described above include opportunities.

Impact measurement

The Kirin Group measures the impact of important risks based on their financial impact and probability of occurrence. We manage these risks in a unified manner on a risk map, and the Board monitors and takes measures to address high-impact risks.

Risk matrix



We unify important risks for the Group on a risk map, and review their importance and countermeasures. The Board of Directors also monitors the most important risks, which are placed in quotation marks ☐.

Significant Risks and Opportunities

As described, we have analyzed and assessed sustainability-related risks related to the interconnectedness of climate change, natural capital, the circular economy, and social issues using scenario analysis and other methods. We have summarized significant risks and opportunities identified as a result in the table below. For physical risks, we have mainly analyzed risks related to major agricultural raw materials and water resources in relation to businesses ranging from food and beverages to pharmaceuticals, particularly the alcoholic and non-alcoholic beverages businesses. For transitional risks, we have analyzed energy and agricultural products, which account for a large share of procurement costs.

For natural capital, we have narrowed the scope of analysis by considering location, dependency, and the impact on nature and our businesses. In the case of containers and packaging, we set the scope of analysis after comprehensively taking into consideration resource recycling and related impacts on climate change and natural capital.

In terms of business opportunities, we have analyzed areas such as health, which is a key area for value creation through our businesses, and an area where we think we can contribute to social issues caused by climate change.

Risk/opportunity	Classification	Category	Main risk	Impact	Impact			Severity			Countermeasures
					S	M	L	S	M	L	
Physical risk	Chronic risks	Climate change and natural capital	Declining yields of agricultural products and procurement costs	・Procurement costs due to reduced agricultural yields (2 ° C scenario: approximately 1.3 billion yen to 3.4 billion yen in 2050, 4° C scenario: approximately 3.6 billion yen to 13.7 billion yen)		●	●			■	・Utilization of brewing technology that does not depend on barley ・Utilization of mass plant propagation technology ・Support for the acquisition of certification by sustainable farms ・Prevention of global warming by reducing GHG emissions
			Changes in the state of nature								
		Containers and packaging and natural capital	Damage to natural capital by improper disposal of used containers	・Negative impact on life in river basins and oceans ・Expenses associated with measures to address ocean pollution (approximately 1.1 billion yen)	●	●			■		・Increase in horizontal recycling of plastic ・3R and beautification awareness activities
	Acute risks	Climate change and natural capital	Disruptions to operations owing to floods	・Historical examples of actual flood damage (approximately 1.0 billion yen to 5.0 billion yen) ・Exposure to 200-year disasters (total of 20 locations in Japan: approximately 1.0 billion yen)	●	●	●		■		・Sharing of knowledge concerning responses to flood and capital investment ・Appropriate insurance coverage
		Climate change and natural capital	Impact on shipping & delivery owing to floods	・Risk of flooding at shipping ports for raw materials	●	●	●		■		・Sharing of knowledge on responses to floods ・Diversification of suppliers
		Climate change and natural capital	Disruptions to operations owing to droughts	・Impact from decline in production owing to droughts (approximately 30 million yen to 600 million yen)	●	●	●	■			・Advanced technologies for water use reduction ・Sharing of knowledge concerning responses to droughts
		Climate change and natural capital	Impact on agricultural products owing to floods and droughts	・High water stress in most production areas ・Increase in natural disasters in production areas	●	●	●			■	・Responses to water stress in areas producing agricultural raw materials ・Prevention of soil runoff at areas producing agricultural raw materials
		Climate change and natural capital	Impact of diseases and air pollution on agricultural products	・Declining quality of agricultural products due to smoke and air pollution ・Spread of disease	●	●		■			・Research measures from a long-term perspective
Transitional risks	Policy	Climate change	Carbon pricing and energy procurement costs	・Energy procurement costs (2° C scenario: approximately 9.4 billion yen in 2030, 4° C scenario: approximately 5.1 billion yen in 2030, 1.5° C scenario: approximately 10.2 billion yen in 2030.)		●	●		■		・Profit and loss neutral reduction of GHG emissions in brewing and manufacturing ・GHG emission reductions through logistics optimization
		Climate change	Financial impact on the procurement of agricultural products due to carbon pricing	・Procurement costs due to reduced agricultural yields (2 ° C scenario: approximately 0.9 billion yen to 4.4 billion yen in 2050, 4° C scenario: approximately 2.4 billion yen to 8.8 billion yen in 2050.)	●	●			■		・Utilization of mass plant propagation technology ・Support for the acquisition of certification by sustainable farms
		Climate change	Impact on assets	・Difficulty in recovering investment in facilities and equipment due to legal restrictions, etc. ・Damage to facilities and equipment due to flooding, etc.		●	●	■			・Understand technological trends in facilities, equipment, etc., and reflect them in capital investment plans ・Understand risks related to water and reflect them in BCPs
		Climate change	Cost of regulatory response	・Increase in human resources ・Increase in cost of response		●	●	■			・Development of infrastructure for the disclosure of information ・Enhancements to the sustainability of raw material production areas ・Nature Positive through businesses
		Natural capital	Incompatibility with rapid agricultural policy transitions	・Chain collapse of agricultural infrastructure caused by extreme bans on agricultural chemicals and fertilizers without preparation	●	●	●		■		・Support for training farmers in sustainable agriculture ・Appropriate engagement with experts and policymakers
	Technology	Climate change, natural capital, containers and packagin	Research and development capabilities	・Possibility that research contributing to decarbonization will not be put to practical use at the expected timing	●	●	●		■		・In-house packaging development technology ・Research and development on climate change and natural capital
		Climate change	Engineering capabilities	・Introduction of facilities and equipment at appropriate times and prices	●	●	●	■			・Strengthen engineering functions ・Understand technological trends and flexibly introduce technology, facilities, and equipment

Risk/opportunity	Classification	Category	Main risk	Impact	Impact			Severity			Countermeasures
					S	M	L	S	M	L	
Transitional risks	Markets	Climate change, containers and packagin	Social resistance to fossil-derived raw materials	・Growing negative impression of PET bottles	●	●		■			・Plastic resource recycling
		Climate change and natural capital	Concerns surrounding the destruction of forests	・Decrease in confidence in the amount of GHGs absorbed and stored through forests, etc.	●	●		■			・Promotion of sustainable forestry and agriculture
		Climate change	High energy prices	・Possibility that natural gas and oil prices do not fall							・Steady implementation of the roadmap for the "SBT 1.5° C" target
	Reputation	Climate change, natural capital, containers and packagin	Opportunity loss due to ethical consumption	・Decline in the assessment of our brand	●	●	●	■			・Appropriate communication to consumers
		Climate change and natural capital	Concerns about renewable energy facilities	・Opposition to installation from regions where power plants are constructed	●	●	●	■			・Introduction of renewable energy that does not have a negative impact on the environment or local communities
		Climate change, natural capital, containers and packagin	Loss of trust from long-term investors	・Loss of trust due to lack of adequate disclosure ・Increase in cost of capital	●	●	●		■		・Appropriate disclosure in line with the TCFD and TNFD frameworks
		Natural capital	Responsibility for pollution of the natural environment	・Compensation, fines, administrative dispositions, and loss of social trust	●	●	●	■			・Improvements to environmental management systems
Systemic risk	Stability of food and social systems	Natural capital	Uncontrolled expansion of conversion into crops for biofuel	・Reduction of agricultural land for food	●	●	●	■			・No use of inappropriate biofuels converted from farmland for food
		Natural capital	Ecosystem damage due to the abandonment of farmland	・Decline in ecosystem services	●	●	●	■			・Engagement with agricultural production areas and provision of training
		Natural capital	Ecosystem collapse	・Loss of ecosystem resources on agricultural land due to years of use of agricultural chemicals	●	●	●		■		・Ecosystem restoration activities focusing on hedgerow-style cultivation
Business opportunity	Markets	Climate change and natural capital	Expansion of heat stroke due to global warming	・Concerns related to increases in the number of infections and regions affected ・ Northward movement of the habitat of the Aedes albopictus	●	●	●		■		・Contribution in Health Science domain
		Climate change	Increase in heatstroke caused by global warming	・The National Institute for Environmental Studies expects the number of excess deaths related to heat to increase between 4 and 10 times under the 4℃ scenario	●	●	●	■			・Contribution with products to address heatstroke
	Products and services	Climate change	Products that contribute to decarbonization	・Possibility that products will be required that contribute to decarbonization or the shift to a low-carbon society		●	●	■			・Carbon-free products, etc.
	Resource efficiency	Climate change	Loss of sustainability of logistics	・Decline in product supply capabilities	●	●	●	■			・Stable transport and reduction of GHG emissions through more efficient deliveries
		Climate change	Reduction of container raw materials and stable procurement [climate change, containers and packaging, short to long term]	・Demands for the 3Rs and reduction in costs from the move to lightweight containers	●	●	●	■			・Container weight reduction and improvement of rate of recycled PET resin use
	Energy sources	Climate change	Demand gap and spike in prices of fossil fuels	・Increase in energy costs	●	●	●		■		・Achievement of an optimal energy mix
		Climate change	Stable procurement of renewable energy	・Increase in demand and tight supply and demand for renewable energy	●	●	●	■			・Use of renewable energy with a focus on additionality
	Resilience	Climate change, natural capital, containers and packagin	Strengthening the supply chain	・nsuring the stability of the procurement of agricultural raw materials and reduction of Scope 3 GHG emissions	●	●	●		■		・Strengthen engagement with production areas and suppliers

Metrics and Targets

Progress on medium-term GHG emissions reduction target approved by SBT (2023) (unit : tCO_2e)

■Scope1+2		Total
Scope1+Scope2		565,552
	Scope1	353,404
	Scope2	212,148
Reduction rate (compared to 2019 base year)		-31%

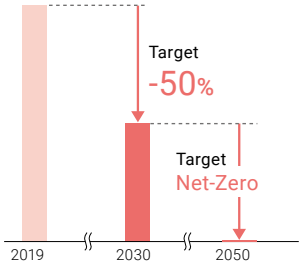
■Scope3			Total
Scope3			3,375,967
Upstream	1	Purchased goods and services	2,252,662
	2	Capital goods	211,742
	3	Fuel and energy-related emissions not included in Scopes 1 and 2	142,062
	4	Transportation and distribution (upstream)	415,350
	5	Waste generated in operations	28,800
	6	Business travel	5,684
	7	Employee commuting	8,774
	8	Leased assets (upstream)	0
Downstream	9	Transportation and distribution (downstream)	246,338
	10	Processing of sold products	0
	11	Use of sold products	9,459
	12	End-of-life treatment of sold products	55,095
	13	Leased assets (downstream)	0
	14	Franchises	0
	15	Investments	0
Reduction rate (compared to 2019 base year)			-10%

Impact for the Circular Economy (2023)

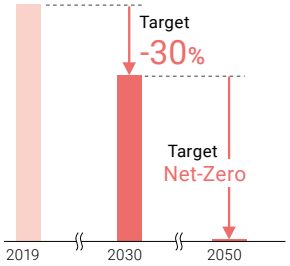
■Reduction in impact		Total
Reduction in resources (KB, KBC)	Aluminum cans	22,477t
	Glass bottles	696t
	PET bottles	5,259t
	Cardboard cartons for products	5,814t
	6-can packs	3,876t
Returnable glass bottles (KB)	Collection rate	96%

Target

Total emissions targets for Scope 1 and Scope 2*1



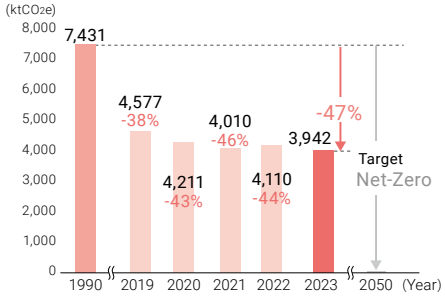
Scope 3 emissions target*1



*1 In December 2020, we upgraded our previous "SBT for 2°C" target, and received approval for our "SBT for 1.5°C" target.

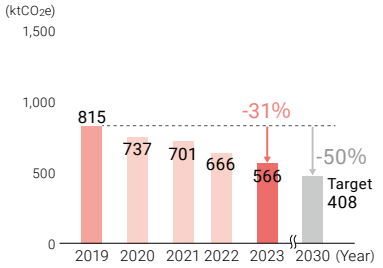
Progress

GHG emissions across the whole value chain

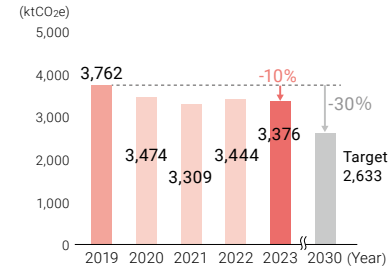


Progress toward medium-term GHG emissions reduction targets

Total emissions for Scope 1 and Scope 2

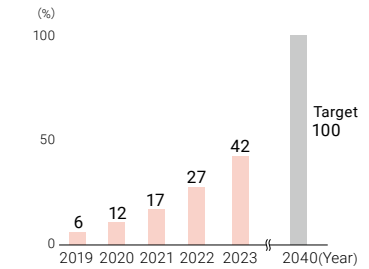


Scope 3 emissions



Progress toward the target for increased use of renewable energy

Ratio of renewable energy in plant purchased electric power



Measurement index number	Key factors of changes in nature	Indicator	Details of the measurement index
–	Climate change	GHG emissions	Published under “Metrics and Targets” “Progress on medium-term GHG emissions reduction target approved by SBT” in this report
C1.0	Change in land/ freshwater/ocean use	Total spatial footprint	For agricultural products subject to materiality analysis, the FAO indicates the following acreage per unit yield (ha/t/year). ●Black tea leaves: 0.177 ●Cardboard: 0.0186 ●Cartons: 0.0186 ●Palm oil: 0.0706 ●Coffee beans: 1.132 ●Soybeans: 0.3835 ●Barley: 0.3044 ●Hops: 0.6497 ●Wine grapes: 0.0898 * The land use area for Japanese projects calculated using ESCHER in 2014 is 228,126 ha.
C1.1		Scope of land use change	Rainforest: 42,592ha(Area of tea farms in Sri Lanka that have obtained Rainforest Alliance certification with the support of the Kirin Group) Temperate monsoon: 50ha (area of self-managed vineyards in Japan)
		Land areas that have voluntarily conserved or restored ecosystems	42,592ha (Area of tea farms in Sri Lanka that have obtained Rainforest Alliance certification with the support of the Kirin Group) Approximately 25ha (Area of micro watersheds on Sri Lanka tea farms conserved with the support of the Kirin Group. Internal size of the above certified farms) Approximately 50ha (area of self-managed vineyards in Japan)
		Land managed in a sustainable manner	Land managed in a sustainable manner 29ha (area of Mariko Vineyard certified as a SEPLS site)
C2.0	Contamination/ decontamination	Total amount of pollutants released into soil by type	No release of pollutants into soil at plants/breweries. Vineyards for Japan Wine and Sri Lankan tea farms (suppliers) use agricultural chemicals listed on white lists within standards.
C2.1		Wastewater drainage	Published under "Water Resources," "Trend in wastewater volume by destination (entire Group)," and "Reduction of Waste and Prevention of Pollution," "Wastewater quality (entire Group)" in the “ESG Databook.”
C2.2		Waste generation and treatment	Waste: Published under "Reduction of Waste and Prevention of Pollution," "Volume of waste generated (entire Group)" in the “ESG Databook.” Reduction rate of product waste loss: Published under “Food Waste Reduction and Recycling” in this report.
C2.3		Plastic pollution	5,259t (We have determined that most of our plastic usage is PET resin for bottles, and we have disclosed the amount of PET bottles used)
C2.4		Total air pollutants other than greenhouse gases	Published under “Trend in emissions of air pollutants,” “Trends in emissions of NOx and SOx (entire Group)” and “Trends in emissions of VOCs (Japan, Kyowa Kirin Group and Kyowa Hakko Bio Group)” in the “ESG Databook.”
C3.0	Resource use/ resource replenishment	Water intake and consumption from water-scarce regions	Published under "Water Resources," "Trend in water use volumes (by region)" in the “ESG Databook.”
C3.1		Amount of high-risk natural primary products procured from land	Published under "Biological Resources," "Usage of palm oil in primary and secondary raw materials" in the “ESG Databook.”
C4.0		Braceholder indicator (measures against invasive species)	We have not performed calculations because it is a breakholder indicator and detailed criteria are unclear
C5.0	Status of nature	Breakholder indicator (status of the ecosystem)	We have not performed calculations because it is a breakholder indicator and detailed criteria are unclear
		Breakholder indicator (species extinction risk)	We have not performed calculations because it is a breakholder indicator and detailed criteria are unclear
C7.0	Risk	Assets, liabilities, revenues, and extraordinary amounts assessed as vulnerable to nature-related transition risks	●1.5℃ scenario: Approx. 10.2 billion yen (2030) ●2℃ scenario: 9.4 billion yen (2030) ●4℃ scenario: 5.1 billion yen (2030) (Financial impact on agricultural products due to carbon pricing)
C7.1		Assets, liabilities, revenues, and extraordinary amounts assessed as vulnerable to nature-related physical risks	●2℃ scenario: 1.3 billion yen to 3.4 billion yen (2050) ●4℃ scenario: 3.6 billion yen to 13.7 billion yen (2050) (Financial impact of reduced agricultural yields due to climate change)
C7.2		Fines incurred during the fiscal year due to negative impacts related to nature.Fines, details and amounts of lawsuits filed	None
C7.3		Amount of capital expenditures or investments targeting nature-related opportunities, by type of opportunity, with reference to the green investment taxonomies of governments or regulatory authorities, where relevant, or third-party industry or NGO taxonomies	Approx. 150 million yen (expenditure on support for the acquisition of certification for tea farms in Sri Lanka, ecological surveys in Japan Wine vineyards, etc.)
C7.4		Growth and percentage of revenue from products and services that have a viable positive impact on nature, and explanation of those impacts	We expect that this would cover products such as Kirin Gogo-no-Kocha made with tea leaves from certified farms and Japan Wine made with grapes grown in hedgerow-style vineyards that contribute to Nature Positive, but we have not estimated the financial impact.

External Evaluation

The Kirin Group conducts transparent information disclosure to its investors and other stakeholders.
As such, we have been selected for and rated by the following global indices.

CDP "water security" category "A-List" (eight consecutive years)

"Gold Award" in the "Environmentally Sustainable Company Category" for the first two years, and "Special Award" the fourth year

* Declined in FY2021 due to receiving the award for two consecutive years

CDP Supplier Engagement Rating "Leader Board" (six consecutive years)

"SDGs Strategy and Economic Value Award" at the Fourth Nikkei SDGs Management Grand Prix (four consecutive years)

The "Kirin Group Environmental Report 2020" won the "Climate Change Reporting Grand Prize (Minister of the Environment Award)" in the 24th Environmental Communication Award

Development of Lightweight PET Bottle "the 46th Kinoshita Prize for packaging technology"

*1 The picture of the product is the one that was available at the time of the award.

New Thin Film Deposition Technology for PET bottles WorldStar Award and Kinoshita Prize

The middle-sized bottle also received WorldStar Packaging Awards

Kirin School Challenge won the Encouragement Award in the Career Education Awards

Judge's Special Award in the 6th Ikimono Nigiwai Corporate Initiatives Contest

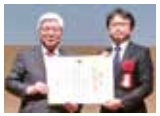
Minister of Land, Infrastructure, Transport and Tourism Award under the Excellent Green Logistics Commendation Program

Ranked No. 1 in WWF Japan's "Ranking for Corporate Measures Against Global Warming in the Food Sector"

Kirin Namacha Decaffeinated Tea Drink won WorldStar Packaging Awards

Fuji-Sankei Group Award in the 26th Global Environment Awards

Kirin School Challenge won the Judges Committee Encourage Award at the FY2017 Corporate Awards for Youth Experience Activities



Yokohama Plant won the Green Cities Awards and Green Social Contribution Award

Logistics Environmental Grand Prize at the 18th Logistics Environmental Award

King of Beasts Award in WWF Japan's "Business & Diversity Katte-ni Award"

Selected for the following indices

MSCI ESG RATINGS AA

2023 CONSTITUENT MSCI JAPAN ESG SELECT LEADERS INDEX

FTSE Blossom Japan Index

FTSE4Good

FTSE Blossom Japan Sector Relative Index

2023 Sompo Sustainability Index

Activity

Biological Resources

→P.33～P.42

A society that values sustainable biological resources

Water Resources

→P.43～P.48

A society that values sustainable water resources

Containers and Packaging

→P.49～P.56

A society that circulates containers and packaging in a sustainable way

Climate Change

→P.57～P.67

A society that has overcome climate change

Biological Resources

Background

Based on our understanding of the characteristics of natural capital, we have analyzed and evaluated risks and opportunities by using scientific tools to advance solutions to biological resource challenges. Agricultural raw materials often bring unique characteristics of the areas that produce them to be reflected in products. Therefore, we need both a local perspective of "dependence" on the crops produced by a particular "place" and a global perspective that climate change has a significant impact on the yield and quality of agricultural commodities.
In addition to scenario analysis based on the TCFD recommendations, we use the processes advocated by TNFD Framework. We will also develop a holistic approach to solving issues that takes trade-offs between climate change and natural capital into account.

We will create together

A society that values sustainable biological resources

- Cultivate, expand, and procure sustainable agricultural raw materials
- Work closely with farms to make raw material production areas sustainable

Production regions	P.35	Tea farms
	P.37	Vineyard
	P.39	Coffee farms
	P.39	Hop fields
	P.39	Mass plant propagation technology
	P.41	Support for the restoration of nature (Educational program for wildlife conservation in Sri Lanka)
Manufacturing	P.39	Palm oil
	P.40	Paper and Printed Materials
	P.41	Support for the restoration of nature (Biotopes at manufacturing plants)
Products	P.40	Food Waste Reduction and Recycling

2010 Developed the Kirin Group Declaration of Support for Biodiversity Conservation

2012 Conducted materiality analysis of biological resources

2013 Developed the Kirin Group Guidelines for the Use of Sustainable Biological Resources and the Kirin Group Guidelines for the Procurement of Sustainable Biological Resources, and selected "tea leaves," "paper and printed materials," and "palm oil" as themes
Started supporting Sri Lankan tea plantations (large farms) to obtain Rainforest Alliance certification

2014 Began an ecological survey at Tono hop fields and Mariko Vineyard

2017 Revised the Kirin Group Guidelines for the Procurement of Sustainable Biological Resources and declared 100% usage of FSC-certified paper or recycled paper in Japanese alcohol and non-alcoholic beverages businesses by the end of 2020.

2018 Started supporting Sri Lankan small tea farms to acquire Rainforest Alliance certification

2020 Expanded support for coffee farms in Vietnam to acquire Rainforest Alliance Certification.
Achieved 100% use of FSC-certified or recycled paper for paper and printed materials in the non-alcoholic beverages business in Japan.

2021 Participated in the Corporate Engagement Program of the Science Based Targets Network.
Revised the Kirin Group Action Plan for the Sustainable Use of Biological Resources to add coffee beans and soybeans as themes.
Participated in the TNFD Forum.

2022 Trial disclosure based on the LEAP approach proposed in the TNFD Framework Beta v0.1
Participated in a demonstration program aimed at the registration of OECMs under the 30by30 international target

2023 Developed the "Regenerative Tea Scorecard" together with the Rainforest Alliance as a tool to promote regenerative agriculture at tea farms in Sri Lanka

Targets and Progress

Target

Targets related to support for the acquisition of certification by tea farms in Sri Lanka (CSV commitment: 2022 to 2024, cumulative)

Number of large farms assisted to obtain certification: 15
Number of small farmers assisted to obtain certification: 5,350

Actual results

Support for obtaining certification by tea farms in Sri Lanka KBC

Number of large farms assisted to obtain certification (Number of farms that received training)

Target : 15 farms
Actual results : 4 farms (cumulative total from 2022 to 2024)

Number of small farms assisted to obtain certification (Number of farms that received training)

Target : 5,350 farmers
Actual results : 629 farms (cumulative total from 2022 to 2024)

Sustainable raw material ratio KB KBC ME

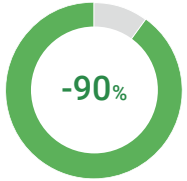
Ratio of Book & Claim RSPO certification

Primary raw materials (excluding palm kernel oil)

Office paper

FSC-certified paper or recycled paper

Food waste KB KBC ME



Rate of reduction

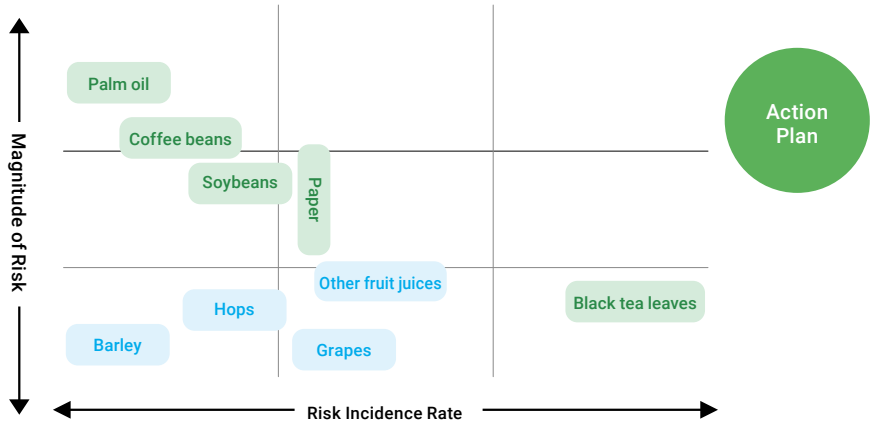
2022 (compared with 2015)

Reduction target : -75% (by 2025, compared with 2015)

Main Activities

- Revised the Kirin Group Action Plan for the Sustainable Use of Biological Resources to add coffee and soybeans to the existing black tea, paper, and palm oil in September 2021.
- Provided training to support acquisition of Rainforest Alliance certification for large farms in Sri Lanka (4 farms: cumulative total from 2022 to 2024).
- Started sales of year-round products that use tea leaves from certified farms (since 2021).
- Developed the Regenerative Tea Scorecard as a tool to promote environmentally regenerative agriculture in Sri Lankan tea farms with the Rainforest Alliance (from 2023).
- Over 200 youth have participated in educational programs for wildlife conservation in Sri Lanka (2021).
- Expanded our support for the acquisition of Rainforest Alliance certification to coffee farms in Vietnam. 350 farms completed the transition to new certification standards and 309 farms had newly acquired certification as of the end of 2022.
- Maintained the use of FSC-certified paper or recycled paper for 100% of office paper used in Japanese Alcohol and Non-alcoholic Beverages Businesses (since 2020).
- Château Mercian Mariko Vineyard has been selected as an approved Nationally Certified Sustainably Managed Natural Sites contributing to the 30by30 target by the Ministry of the Environment (2023).
- Trial disclosure based on the LEAP approach proposed in the TNFD Framework Beta v0.1 (2022), and conducted scenario analysis together with the TNFD (2023).

Materiality Analysis of Biological Resources



Prepared in 2012 and scheduled for revision in 2021
FSC®C137754

Tea farms

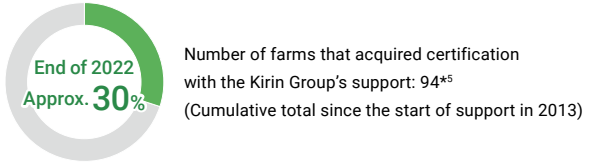
Support for acquisition of Rainforest Alliance Certification

Since 2013, The Kirin Group has supported Sri Lankan tea farms to acquire Rainforest Alliance certification. As of end of 2023, 94 large tea farms in Sri Lanka, approximately 30% of all certified large tea farms, acquired the certification by our support. In August 2021, we began sales of year-round products that use tea leaves from certified tea farms.

Kirin Gogo-no-Kocha is Japan's leading packaged black tea brand with a share of approximately 50% of the Japanese market. Since the launch of the brand, we have used Sri Lankan tea leaves as the main ingredient. As of 2023, approximately 20% of the Sri Lankan tea leaves imported by Japan were used for Kirin Gogo-no-Kocha. We considered purchasing tea leaves from certified farms to ensure sustainable procurement, but found that at the time, Sri Lanka was just after the end of the civil war and there were only a limited number of farms that were able to access training on their own. Therefore, we decided to create a positive impact on the sustainability of tea farmers by providing certification assistance to as many Sri Lankan tea farms as possible, rather than leaving behind those farms that have difficulty obtaining certification on their own.

Share of tea leaves imported into Japan by area of production

Percentage of certified large farms in Sri Lanka as a whole that have received support from the Kirin Group



Training content

In Sri Lanka, droughts and frequent heavy rains caused by climate change have become serious problems. Urbanization, industrialization, soil erosion and outflow as a result of the inappropriate use of land are also major concerns. Because large tea plantations are often located on steep, sunny slopes, heavy rains not only wash away the fertile soil, but in the past have caused landslides that have killed people living on the plantations. Covering the ground with grass (cover crop) not only enriches the ecosystem but also is an effective adaptation measure to climate change, such as preventing soil runoff from directly hitting the ground during heavy rains and retaining water during droughts. The training teaches how to identify grasses that have a negative impact on tea cultivation and ensures that the ground in the tea plantation is covered with good, deep-rooted grasses.

Training also teaches scientific methods to increase yields while reducing the use of pesticides and fertilizers. In addition to protecting the forests, the reduced expenditure on pesticides and fertilizers improve the plantation's profitability and increase the safety of the tea leaves.

Supporting growers to obtain Rainforest Alliance Certification

Kirin Gogo-no-Kocha Straight Tea using tea leaves from certified farms 250ml LL Slim


Cover crops (slope on right side)


Chemical substance storage unit


Training


Room for changing into protective clothing for spraying pesticides


Sorting boxes utilizing unnecessary drums


Panel showing wild animals to be protected


Soil runoff prevention fence

Sign indicating that child labor is prohibited

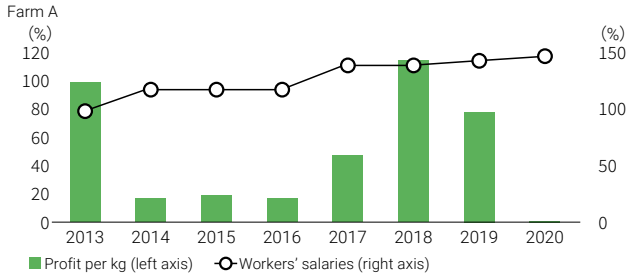
*1 Certification is awarded to farms that meet comprehensive standards for sustainable agriculture to create a better future for people and nature.
https://www.rainforest-alliance.org
*2 Intege SRI+ Tea drink market 2023 Cumulative sales value/value share
*3 Kirin research
*4 Customs clearance statistics, Ministry of Finance Japan
*5 One farm gave up the continuation of its certification in 2023

Social and economic impact of certification

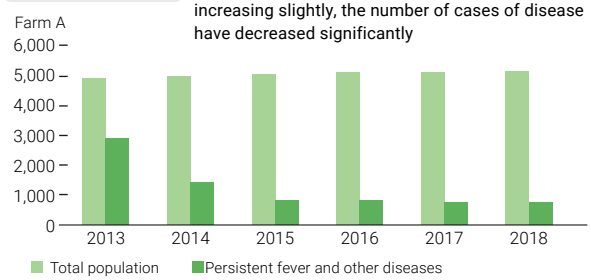
Based on data from a specific farm, our support for certification provides positive impacts, both financially and socially, on some farms and farm workers, and makes areas where raw materials are produced more sustainable.

Social impact of supporting the acquisition of Rainforest Alliance Certification

Profitability As profit per kilogram increases, workers' salaries also increase



Sanitary conditions While the total population of the farm is increasing slightly, the number of cases of disease have decreased significantly



Created by Kirin based on Rainforest Alliance data

Support for small farms to obtain certification

In 2018, we began supporting small farms to acquire certification and provided training to 620 small farms by the end of 2023. From 2022 to 2024, we plan to provide training to a cumulative total of 5,350 farmers.

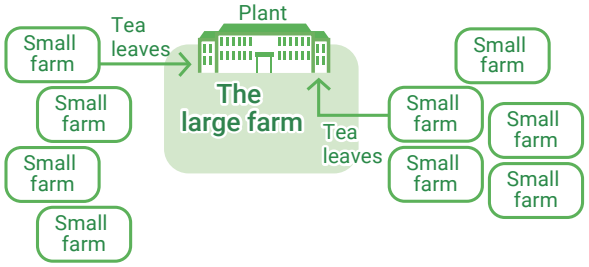
In Sri Lanka, there are said to be many small family-operated farms, with the total number in the hundreds of thousands. Tea leaves from small farms are collected by nationally licensed collectors and are then sold to nearby large farms where they are processed and shipped to various regions. Tea leaves from small farms can sometimes account for as much as half or more of the tea leaves processed in the large farms' plants. We thus determined the acquisition of certification at small tea farms is also necessary for the sustainability of black tea leaves.

For small farms to obtain certification, the training program organizes teams consist of small farms and appoint leaders for the teams. Local trainers train an elected leader, who will then train the team's smallholders to learn the certification standards. This program often takes time to start actual training since it is necessary to begin by organizing the small farms into teams. Thus, the process for small farms to acquire certification is more difficult than that for large farms.

Development of Regenerative Tea Scorecard

In October 2023, the Kirin Group began working with the Rainforest Alliance on the development of "Regenerative Tea Scorecard (referred to below as the scorecard)," in order to contribute to the expansion of regenerative agriculture. The development of the scorecard began in selected tea farms in Sri Lanka, with pilot testing to be conducted in local farms in 2024. Based on the Rainforest Alliance's definition of regenerative agriculture, the scorecard offers a way to promote soil health, biodiversity conservation on farms, ecosystem restoration, and improved livelihoods for people on farms. Tea farms can use the scorecard to identify areas for improvement in the transition to regenerative agriculture, assess the current situation, and clarify areas for improvement to transition. Through this initiative, the Kirin Group aims to support the practice of regenerative agriculture at tea farms and improve the sustainability of raw material production areas.

*1 Regenerative agriculture is a method of sustainable agriculture which goes beyond simply reducing harm from agricultural activity, and aims to repair and restore farmland through soil preparation and other means, while taking advantage of the material recycling function of nature and taking into consideration harmony with productivity.



Number of small farms assisted to obtain certification (Number of farms that received training)

Target:5,350 farmers
Actual results:629 farms
(cumulative total from 2022 to 2024)

Book donations to elementary schools in Sri Lanka

In 2007, the year following the 20-year anniversary of Kirin Gogo-no-Kocha, we launched the Kirin Sri Lanka Friendship Project to further strengthen ties with Sri Lankan tea farms and continue to ensure stable production of tea leaves.

In Sri Lanka, tea is mostly grown in mountainous areas. Schools in those areas usually do not have substantial libraries. The Kirin Group donates quality books to elementary schools for the children of tea farm workers and continues to help the children to improve their academic abilities and envision their dreams for the future. We have donated to 242 schools and plan to continue to increase the number of schools to which we donate.

Trainer Mr. Giri and farm managers (top left, top right) and the master of a small farm (bottom right), as well as a tea farm (bottom left)

Vineyard

Nature Positive at Japan Wine vineyards
Château Mercian Mariko Vineyard

Researchers from the National Agriculture and Food Research Organization (NARO) have confirmed the existence of 168 species of insects and 289 species of plants at Château Mercian Mariko Vineyard, on the Jinba Plateau in the Maruko district of Ueda City, Nagano Prefecture. We have been conducting ecological surveys since 2014, and the species that we have confirmed include endangered species listed in the Red Data Book of the Ministry of the Environment Japan. Many rare species, including endangered species, have also been found in Jyonohira Vineyard in Katsunuma-cho, Koshu City, Yamanashi Prefecture.

In addition to contributing to the expansion of our business, the conversion of derelict farmland into hedgerow-style vineyards for Japan Wine also creates valuable grasslands and contributes to the expansion and protection of Japan's traditional rural Satochi-Satoyama landscapes. There is a so-called "secondary nature" that is protected because of human efforts to preserve it. Grassland is a typical example of such nature.

In Japan Wine vineyards, we regularly cut the undergrowth for vertical shoot cultivation. Regular undergrowth cutting creates an environment where fields function as high-quality, vast grasslands, enabling the development of native and rare species, without being dominated by highly fertile plants.

Insects **168** species

Plants **289** species

Château Mercian Mariko Vineyard

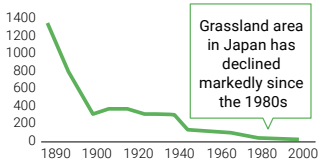
Château Mercian Mariko Winery

Careful mowing at Jyonohira Vineyard

Mariko Vinyard will be positioned as an "Other Effective area-based Conservation Measure (OECM)," which is eligible for the global target adopted at COP 15 to "make at least 30% of land and sea conservation areas by 2030" (30 by 30). Grasslands are said to have covered 30% of Japan's national land area 130 years ago, but they have dwindled to just 1% today. The ratio of endangered plants per unit area is extremely high for grasslands (see chart below), and they play an important role in conserving biodiversity.

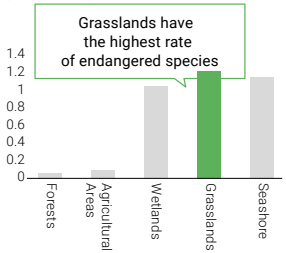
Château Mercian Mariko Vineyard was selected as Nationally Certified Sustainably Managed Natural Sites by Ministry of the Environment Japan in October 2023. It was the only site to receive approval as a certified business site growing agricultural raw materials at that time. In the future, we expect the Ministry of the Environment to register it as an OECMs in an international database and for us to be able to contribute to achieving the global target set forth at COP 15. We also plan to apply for other Château Mercian vineyards to be approved as Nationally Certified Sustainably Managed Natural Sites in order.

Trends in grassland area in Japan



Compiled from forest area statistics and Ministry of Agriculture, Forestry and Fisheries statistics.

Number of endangered species by unit area



Western Japan Grassland Association analysis and calculation in 2007

Papers by NARO related to vineyard ecosystem research are as follows.

●**Butterfly diversity in a vineyard developed from abandoned orchards**
Koichi TANAKA, Yoshinobu Kusumoto (2022) Butterfly diversity in a vineyard developed from abandoned orchards. Nodai Entomology 3: 1-7.
https://www.nodai.ac.jp/agri/original/konken/shigen/publication/nodaient_contents/contents/3/3-1.pdf

●**Vineyard bird diversity**
Naoki KATAYAMA, Hiroshi UCHIDA, Yoshinobu KUSUMOTO, Tomohiko IIDA(2022) Bird use of fruit orchards and vineyards in Japan: Mitigating a knowledge gap with a systematic review of published and grey literature, ORNITHOLOGICAL SCIENCE, 21(1), 93-114
https://www.jstage.jst.go.jp/article/osj/21/1/21_93/_article/-char/ja/

●**Recording of rare spiders at Mariko Vineyard**
Yuki G. BABA (2022) Fourth record of the ground spider Phaeocedus braccatus (L. Koch, 1866) (Araneae: Gnaphosidae) from Japan
https://media.niche-life.com/series/009/Niche009_26.pdf

Mariko Vineyard

Zygaena niphona niphona

Near threatened species on the Ministry of the Environment and Nagano Prefecture Red List

Sophora flavescens

The only edible grass for feeding *Shijimiaeoides divinus*, a butterfly that the Red List of the Ministry of the Environment lists as critically endangered IA (designated as endangered IB by Nagano Prefecture)

Argyronome laodice japonica

Critically endangered II (VU) on the Red List of the Ministry of the Environment and near threatened on the Nagano Red List

Hemerocallis citrina var. vespertina

Critically endangered II on the Red List of the Ministry of the Environment. Near threatened species on the Nagano Red List

Leonurus japonicus

Near threatened species on the Nagano Red List

Vincetoxicum pycnostelma

Near threatened species on the Ministry of the Environment and Nagano Prefecture Red List

Jyonohira Vineyard

Platycodon grandiflorus

Vulnerable species on the Ministry of the Environment's Red List and near threatened on the Yamanashi Red List (NT)

Cephalanthera erecta

Vulnerable species both the Ministry of the Environment's Red List and the Yamanashi Red List (VU)

Tengusawa Vineyard

Argyronome laodice japonica

Critically endangered II (VU) on the Red List of the Ministry of the Environment and near threatened on the Yamanashi Red List

Rare spider found in Mariko Vineyard

Phaeocedus braccatus (Gnaphosidae)

The fourth specimen of this extremely rare species to be found in Japan

Calommata signata (Atypidae)

Near threatened (NT) on the Red List of the Ministry of the Environment and endangered I (CR+EN) on the Nagano Red List

We have also conducted ecological research on spiders in the vineyard, which is the first research on spiders in a vineyard in Japan. As a result of these surveys, we have confirmed the existence of rare species of spiders, including a species found for the first time in Nagano Prefecture, endangered species listed in the Red Data Book of the Ministry of the Environment, and the fourth specimen of a rare spider found in Japan.

Studies into the process of converting derelict farmland into vineyards
Château Mercian Tengusawa Vineyard

Our joint research of ecosystem changes with NARO at Tengusawa Vineyard in Koshu City, Yamanashi Prefecture, is said to be rare case even on a global basis. The research has surveyed change of ecosystems while we convert derelict farmland into a hedgerow-style vineyard.

At Mariko Vineyard and Jyonohira Vineyard, we began our surveys after vineyards were already well-maintained. On the other hand, at Tengusawa Vineyard, we have been able to make observations based on the condition of derelict farmland before development. Through these surveys, we are able to confirm that the development of derelict farmland into vineyards enriches ecosystems.

In a survey in 2016, prior to the development of this land, insect and plant species were extremely lacking in diversity, as a result of damage from deer eating the vegetation. Since the vineyard was cultivated in 2017 and subsequently fenced off, we have seen a process of ecological enrichment as the deer-eating damage has decreased and the landscape has been transformed into a vineyard-like landscape. In vegetation surveys, we confirmed increases of of species as: 88 (2020), 103(2021), and 108(2022). Such signs indicate that the area is becoming a high-quality grassland. In insect surveys, we found Argyronome laodice japonica, a vulnerable species listed in the Ministry of the Environment and Yamanashi Prefecture's Red Data Books in 2021. The number of observable species also increased: 16(2020), 28(2021), and 30(2022).

Evolution of the Tengusawa Vineyard ecosystem

Year of study	number of species	
	Butterflies	Plants
2016	14	36
2018	13	43
2019	18	78
2020	19	88
2021	28	103
2022	30	108

Joint research on upgrading biodiversity assessment in fields and assessing the carbon storage effect

In March 2024, the Kirin Group, in a joint research project with NARO, began working to upgrade the biodiversity assessment of vineyards at Mariko Vineyard and assess the carbon storage effect, which is a measure to mitigate climate change. When upgrading the biodiversity assessment, we will analyze and evaluate the contribution of the rich ecosystem at Mariko Vineyard to the Jinba Plateau and surrounding ecosystems and explore the possibility of contributing to the restoration and maintenance of ecosystems in the area where the vineyard is located. We will also examine the possibilities for ways that hedgerow-style vineyards can contribute to the stable cultivation of high-quality grapes.

As a measure to address climate change, we plan to accumulate knowledge about regenerative agriculture*1. Greenhouse gas (GHG) emissions from agriculture account for about one quarter of global emissions, and approximately 25% of the Kirin Group's Scope 3 emissions come from agricultural raw materials. Accordingly, we will accurately measure and understand GHG emissions from vineyards and evaluate the carbon storage effect of biochar utilizing pruning debris from vineyards. In addition, we will assess the potential of regenerative agriculture as a measure to mitigate climate change, and consider its expansion to other agricultural raw materials.

*1 Regenerative agriculture refers to sustainable agriculture that reduces environmental impact from the use of chemical fertilizers and agricultural chemicals through soil preparation and other means, while taking advantage of the material recycling function of agriculture and working to achieve harmony with productivity.
*2 Pruning debris refers to branches, etc., that are cut off when pruning grapevines.
*3 Biochar is a solid material produced by heating biomass (biological material) at a temperature of 350° C or higher under oxygen concentrations controlled at non-combustion levels. In addition to its carbon storage effect on soil, biochar also improves soil water permeability and is used as a soil improvement material.

The process of converting idle and devastated land into vineyards in Tengusawa Vineyard

Coffee farms

Since 2020, the Kirin Group has supported coffee farms in Vietnam to acquire Rainforest Alliance Certification. We are expanding our activities from tea farms in Sri Lanka to coffee farms in Vietnam, leveraging our experience of the support. By the end of 2022, 350 farmers of Robusta were certified and 309 farmers of Arabica have completed the transition to Rainforest Alliance certification. In the past, Arabica coffee farmers were certified by UTZ.
Due to the global spread of COVID-19, it was difficult to visit the sites since the spring of 2020, immediately after the start of the support. In October 2022, we visited small farms receiving support in Da Lat City, the Lam Dong Province, located in central south Vietnam. Through our visit, we found that the farmers lacked agricultural knowledge because they received little technical assistance although the government encouraged them to become coffee growers.
We were also able to confirm that certification training contributes to a certain degree to the sustainability of coffee farms.
From 2024, we will move the field of our action to Gia Lai Province, Vietnam, where we plan to support 1,400 Robusta producers to obtain certification over three years. In these activities, we will focus on integrated pest management (IPM), regenerative agriculture, and water source conservation activities. Specifically, we will train farmers to produce biofertilizers themselves, utilizing coffee husks and agricultural waste to reduce chemical fertilizers and thereby reduce expenses for farmers. We also aim to improve productivity by contributing to prevention of soil erosion and the maintenance of groundwater levels through measures such as shade cultivation, provision of seedlings for wind breaking forests, and the practice of cover cropping.



Arabica coffee farms


Drying of the coffee fruit (robusta)


The picturesque coffee bean producing region of Da Lat

Hop fields

We have been conducting an ongoing living species survey in the hop fields of contracted farmers in Tono City since 2014. In 2015, we confirmed the existence of 104 species of insects and 19 species of birds.
Hop fields are plowed every year, so the fields themselves do not have the function of enriching the vegetation, but the fact that windbreaks were created and maintained for hop cultivation and that hop fields continue to function as one of the rich ecological systems in Satochi-Satoyama can be said to have contributed to the richness of the vegetation.

Palm oil

The Kirin Group uses palm oil in some of its products, but the quantity is very small. As a result, it is difficult to procure physically certified oil, so we have adopted the Book & Claim method approved by the Roundtable on Sustainable Palm Oil (RSPO) for the procurement of certified sustainable oil (excluding palm kernel oil).
In accordance with our Action Plan for the Sustainable Use of Biological Resources, we have been calculating our usage of palm oil in accordance with predetermined standards for palm oil used as a primary raw material from 2013 and as a secondary raw material from 2014, and we use RSPO-certified oil for the full amount (excluding palm kernel oil). We became an associate member of the RSPO in March 2018 and a regular member in FY2022. Since 2021, we have been a member of the "Japan Sustainable Palm Oil Network (JaSPON)," in order to accelerate the procurement and consumption of sustainable palm oil in the Japanese market as a secondary raw material.

Ratio of Book & Claim RSPO certification

Primary raw materials
Secondary raw materials

Mass plant propagation technology

Kirin's mass plant propagation technology consists of four underlying technologies: stem propagation technique (organ culture method), sprout propagation technique (PPR method), embryo propagation technique (somatic embryo method), and potato propagation technique (micro tuber method). This original technology is globally unprecedented.
Plant propagation is normally performed using seeds and cutting. These methods result in a limited cultivation period, and the growth rate can be low depending on the plant. However, Kirin's mass propagation technology that we developed through our own research makes it possible to significantly increase the number of quality plants with the same characteristics as the parent plant, regardless of the season.

Adaptation measures against climate change

Kirin's scenario analyses based on the TCFD recommendations that we have conducted since 2018 show that climate change has significant impacts on yields of many agricultural products used as raw materials. Mass plant propagation technology may be useful for promoting the spread of new varieties that have been developed in response to environmental changes. For example, it will be useful for the mass propagation of new varieties, endangered species, and useful plants, and we thus expect it to positively impact the sustainability of agriculture.

Paper and printed materials

In the Action Plan that we revised in February 2017, we declared our aim of using 100% FSC-certified paper or recycled paper by the end of 2020. This target covers paper containers in Japanese Alcoholic and Non-alcoholic Beverages Business, as well as all office paper such as copy paper, envelopes, business cards, company brochures, and other printed materials. We successfully completed the switch to 100% FSC-certified paper or recycled paper in November 2020. Currently, we are promoting the use of FSC-certified paper for paper bags with the KIRIN logo, application postcards for prizes, and some paper cups for tasting. We plan to expand these activities to other businesses in Japan and overseas in the future.

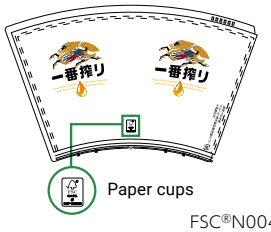
FSC-certified paper or recycled paper

Paper and Printed Materials

Envelopes

Paper bags

Application postcards



Paper cups

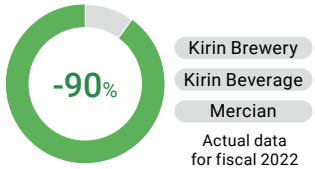
FSC®N004238

*1 The Forest Stewardship Council (FSC) Forest Certification System is a system for the appropriate management of forests and the sustainable use and conservation of forest resources. The FSC label is a mark that protects forests.
*2 The information above is current as of June 30, 2022. Photographs of envelopes, paper cups, etc., may be as of the time that events occurred, and do not necessarily represent the latest versions.
*3 For details of the use of FSC-certified paper for paper containers, please see the information in "Sustainable Paper Containers."

Food waste reduction and recycling

Reduce product waste losses

To continually reduce waste loss, we optimize our operation by improving demand forecasting, for example by closely sharing information on demand fluctuation with plants and distribution centers.
In addition, strict management of sales volume targets ensures that valuable biological resources, containers and packaging are not wasted.



Reduction target -75%
(by 2025, compared with 2015)

Continuous donation of surplus inventory*4 to local governments and food banks

We are making various efforts to reduce food waste, but there are still cases when we cannot avoid generating excess inventory because of gaps between demands and supplies. Since 2022, Kirin Beverage has donated excess inventory to local governments, food banks, for effective use by those in need.

*4 Products that cannot be shipped because it takes time for them to reach the customer, even if there are no quality issues and they are within the expiration date.

Recycling

Conversion of spent grain into livestock feed

The spent grain from beer production still contains nutrients and is effectively used for cattle feed and culture media of mushrooms.

Developing food products from brewer's yeast

Lion continues to supply brewer's yeast for use as an ingredient in the Australian fermented food, Vegemite.

Reuse of spent grapes

Spent grapes from wine production are "turned over" for a period of one year in a compost heap on the company vineyard and reused as compost (organic fertilizer).

Composting site for grape press lees

Effective use of shochu spent grain

Since 2015, we have been supplying some of the residue (shochu spent grain) generated from shochu production in Mercian's Yatsushiro Plant to hog farmers in Kumamoto Prefecture. In the six years from 2015 to 2020, farmers used 7,158 tonnes of shochu spent grain as livestock feed. In 2019, Kirin Holdings, Mercian and the University of Tokyo jointly confirmed for the first time in the world that shochu spent grain can reduce stress among hogs and improve the taste of pork, demonstrating the potential for the effective use and creation of value from shochu spent grain. Since livestock feed alone is not enough to process the shochu spnet grain generated daily, we try to avoid the grain to be waste as much as possible by using the grain as a raw material for compost or as a microbial nutrient source for activated sludge in paper mills. In 2021, our initiatives to utilize shochu spent grain as livestock feed received praise, and our Yatsushiro Plant won the "Fiscal 2021 Circular Economy Creation Promotion Merit Commendation of the Minister of the Environment Japan".

Support for the restoration of nature

Educational program for wildlife conservation in Sri Lanka

Kirin Beverage is funding an educational program for wildlife conservation for young people in tea farms in Sri Lanka. Leopards, which are at the top of the food chain in the Sri Lankan ecosystem, are often caught and killed in traps set by local people, increasing the need to educate the plantation and local people about the importance of preserving the ecosystem. In 2020, a black leopard was found in a trap. The black leopard in Sri Lanka is a mutation of a leopard that has not been seen in more than a decade. This black leopard that was caught in the snare was transported to the Department of Wildlife's animal hospital at the Elephant Transit Home bordering the Udawalawe National Park but unfortunately succumbed to its injuries and stress a few days later. In the wake of this incident, Sri Lankan NGOs, the Department of Wildlife Conservation, academic experts, and farm managers passionate about environmental conservation came together to plan a pilot project to educate young tea farmers about the local ecosystem. Kirin Beverage helped implement this project through funding support. This program is implemented several times a year. Lecturers include researchers from the Tea Research Institute of Sri Lanka and representatives from environmental NGOs. Dozens of young people who live on the farms receive two days of on-farm classroom training and four days and three nights of field training at Horton Plains National Park. Over 200 youth have already participated, and there have been some examples of students in the first program finding work in environmental NGOs and the administrative departments of Horton Plains National Park.

Wildlife conservation workshop

Revegetation activities at Château Mercian Mariko Vineyard

In 2016, under the guidance of specialists, we started efforts to expand the habitats of rare and native species in the fields of Château Mercian Mariko Vineyard through revegetation activities with the participation of employees. Château Mercian values coexistence with nature, local communities, and the future. By collecting dry grass from the habitat of rare and native species and seeding it back into the field, Mariko Vineyard aims to regenerate vegetation from the seeds in dry grass that is sown. In the area where we regenerated vegetation, the average number of species present in 2016 was 8.2, but by 2021 this number had increased to 17.9.

Activities to increase shrubby sophora in Mariko vineyard

Along with an NGO and local elementary school students, we also engage in activities to increase shrubby sophora (Sophora flavescens) in Mariko Vineyard. In 2019, international NGO Earthwatch Japan and its volunteers collected, with the permission of the rice field owners, cuttings of shrubby sophora, and grew them. Two years later, at the end of May 2021, we planted the seedlings at Mariko Vineyard.
Furthermore, since 2021, Shiogawa Elementary School, a local school where Mariko Vineyard is, has participated in activities to increase shrubby sophora. The school grew cuttings in a flower bed in the schoolyard and planted them in Mariko Vineyard at the end of May 2022. We also invite a lecturer from NARO and hold environmental classes for students at the school. We continued these initiatives in 2023.

Activities to increase shrubby sophora

(Upper) Sophora flavescens planting by elementary school students at the foot of Mariko Vineyard
(Lower) Volunteer Sophora flavescens planting and cuttings

Revegetation activities at Mariko Vineyard

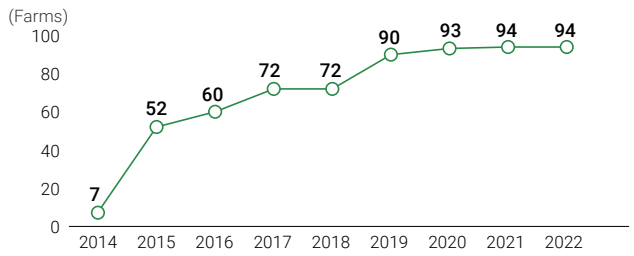
Year of study	Average number of species per square meter
2016	8.2
2017	12.0
2018	14.2
2019	16.8
2020	17.5
2021	17.9

Protection of endemic species in the biotopes in plants

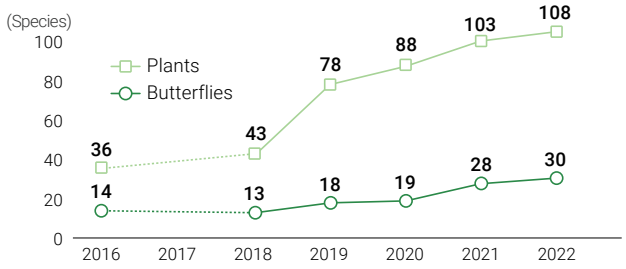
At Kirin Brewery's Yokohama Plant, in an endorsement of the "Yokohama b Plan," the city's biodiversity action plan, we built a biotope in the grounds of the plant in the summer of 2012. The Yokohama Brewery, which is a part of a widespread network of ecosystems, is pursuing initiatives to enrich the local ecosystem. Kirin Brewery's Kobe Plant has been cultivating local endangered species, including the fish species, Hemigrammocypris rasborella (golden venus chub), and Pogonia japonica, a species of orchid, in the plant's biotope that we set up in 1997. This biotope functions as a "refuge biotope" for protection and cultivation of local endangered species. Our initiatives at our Kobe Brewery won praise, and in 2018, we were awarded the "Fiscal 2018 Greening Promotion Merit Award by the Prime Minister."
Since 2005, Kirin Brewery's Okayama Plant has been involved in activities with local communities to conserve the Ayumodoki (Parabotia curtus), a nationally designated natural monument. Every year, farmed Ayumodoki raised by a local elementary school are released into the biotope on the site, and in cooperation with the Organization for the Protection of Ayumodoki in Seto and other specialists, we work to improve the environment to make it easy for Ayumodoki to grow, and conduct regular ecosystem surveys.

Key data related to biological resources

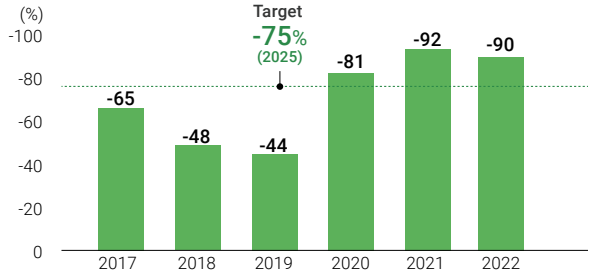
Number of large farms obtaining certification in Sri Lanka



Recovery of Tengusawa Vineyard ecosystem



Food waste reduction rate (compared with 2015)



We provide the latest updates on our initiatives related to biological resources on the following website.

https://www.kirinholdings.com/en/impact/env/3_3/

Water Resources

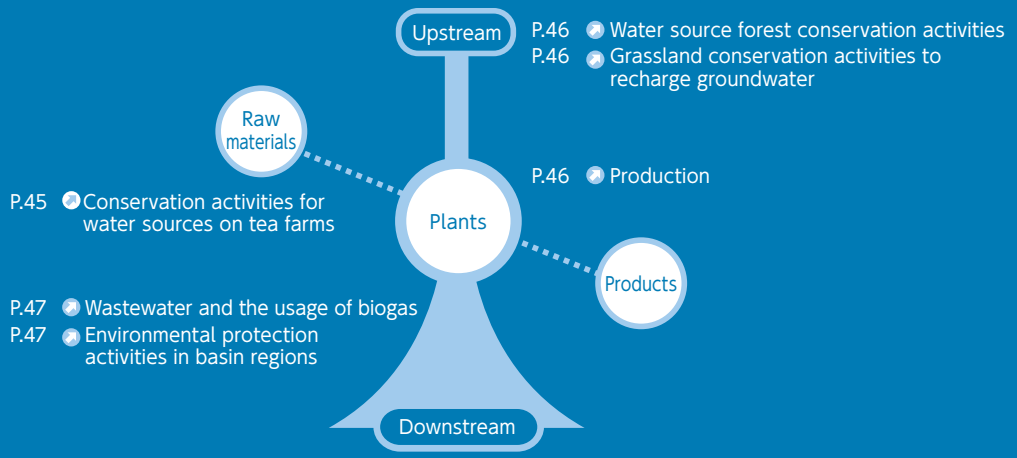
Background

Water is an essential raw material for the Kirin Group and an indispensable utility for our operation such as cleaning production equipment. The Kirin Group runs its businesses in various regions in the world; Japan has abundant water resources whereas Australia has experienced severe water shortages many times in the past. We understand through the business experiences that water risks and water stress vary significantly between countries and regions. Since 2014, we have periodically surveyed quantitative water risks and stress of operation sites by using scientific tools and applied findings from the surveys to our business strategies.
We run scenario analysis based on the TCFD recommendations to understand water risks in areas producing our agricultural raw materials and try countermeasures to the risks. We will go beyond just reducing water usage and try to identify and mitigate our impact on the natural capital of basins as a whole, collaborating with local stakeholders.

We will create together

A society that values sustainable water resources

- Bring water, used as a raw material, to a sustainable state
- Solve issues with water in a way that suits the characteristics of basin regions where our business bases are located



1966 Began full-scale introduction of wastewater treatment equipment using the activated sludge process at Kirin Brewery plants.

1997 Kirin Brewery's Kobe Plant, which has achieved the industry's highest level of water conservation, began operations.

1999 Kirin Brewery's Yokohama Plant led the industry in starting Water Source Forestation Activities.

2009 Installed a water recycling plant at Lion's Castlemaine Perkins Brewery.

2014 Identified natural capital (GHGs, water and land use) in the upstream portion of the Kirin Group's value chain and water risks at major global business sites (disclosed in 2015).

2017 Assessed water risks at 44 sites in 9 countries and in major areas producing agricultural raw materials.

2018 Started water source conservation activities at tea farms in Sri Lanka.

2019 As part of our climate scenario analysis, we conducted a more detailed water risk assessment of major areas producing agricultural raw materials.

2020 As part of our climate scenario analysis, we conducted a more detailed water risk assessment of business sites. Lion measured the water footprints of its business sites in Australia and New Zealand, as well as key agricultural raw materials.
*Oceania region only in Lion

2021 Participated in the Corporate Engagement Program of the Science Based Targets Network. Trial based on the draft methodology.
Conducted a natural catastrophe model flood simulation for 20 business sites in Japan.

2022 Began insurance risk surveys (covering major plants and breweries in Japan and overseas) based on the results of natural catastrophe model flood simulations

Targets and Progress

Target

Water consumption rate at production sites and breweries with high levels of water stress (Lion)

2025: Less than 2.4kl/kl (CSV commitment)*1
2025: 2.4kl/kl or less (non-financial target)*2
2024: 3.0kl/kl or less (non-financial target)*2

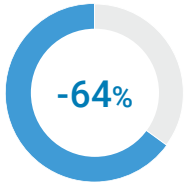
Lion
Water consumption rate

Target: 2.4kl/kl or less
Actual results : 3.6kl/kl

*1 Tooheys Brewery,Castlemaine Perkins Brewery, James Boag Brewery, Pride
*2 Tooheys Brewery,Castlemaine Perkins Brewery, James Boag Brewery

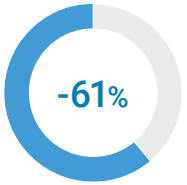
Actual results

Kirin Brewery



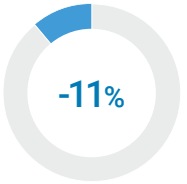
Water usage
1990
34,900 thousand m³
↓
2023
12,490 thousand m³

Kyowa Hakko Bio (global)



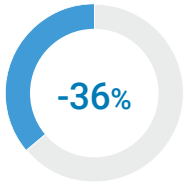
Water usage
2015
49,643 thousand m³
↓
2023
19,264 thousand m³

Kirin Beverage



Water usage
2019
968 thousand m³
↓
2023
865 thousand m³

Kyowa Kirin (global)

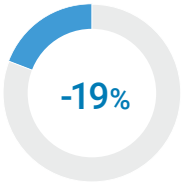


Water usage
2019
2,222 thousand m³
↓
2023
1,428 thousand m³

Mercian

Water usage
2019
2,825 thousand m³
↓
2023
2,499 thousand m³

Lion*3



Water usage
2015
2,936 thousand m³
↓
2023
2,392 thousand m³

*3 This region covers the Oceania region only. Excluding U.S. regions

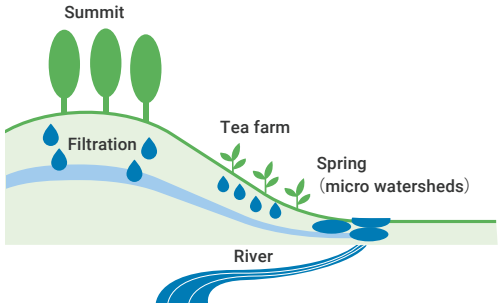
Main Activities

- Conservation of water sources at 24 locations in tea farms in Sri Lanka by the end of 2023. Also, we distributed pamphlets to raise awareness for local residents in water source areas (approximately 15,000 people) , telling the importance of water, water conservation, and protection of basin regions.
- In the Corporate Engagement Program held by the Science Based Targets Network to develop scientific approaches and rules for setting targets related to water resources (since 2021).
- A scenario analysis workshop requested by TNFD at New Belgium Brewing in Fort Collins, Colorado (US), where water stress is extremely high (2023: the details of this workshop were published in beta v0.4 of the TNFD Framework).
- Conserving biodiversity and recharging groundwater through “Water Source Conservation Forest Activities.”

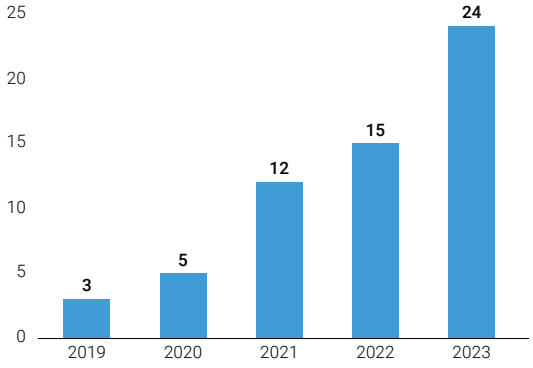
Conservation activities for water sources on tea farms

In 2018, the Kirin Group began water source conservation activities at Sri Lankan tea farms as a first step in solving water issues in areas where we source our agricultural raw materials. We completed conservation activities at 24 sites by the end of 2023. We educated 1,750 people living near water sources, telling the necessity of conserving water sources. In addition, we have distributed pamphlets to 15,000 residents, aiming to raise awareness of water conservation and watershed protection .
At the tea plantations of the Sri Lankan highlands, tea trees grow on steep slopes. In such places, rainwater penetrates into the ground and gushes out as springs if strata and other geographic conditions are met. These springs are known as micro watersheds, and can be found in the highlands of central Sri Lanka. In almost all cases, these springs are headwaters of rivers that flow through coastal towns. The watersheds are very valuable sources of water for the cities while occupying a tiny area of central Sri Lanka.
As a part of our supports for Sri Lankan tea farms to acquire Rainforest Alliance certification, we collaborate with farm managers each year. Through discussions with the managers that conservation activities of watersheds were being held up due to lack of funding although the Sri Lankan government recognized importance of micro watersheds and was willing to conserve them. Therefore, in 2018, Kirin Holdings and the Rainforest Alliance started working on activities to conserve watersheds at the farms, now collaborating with Plantation Human Development Trust (PHDT) and Estate Worker Housing Cooperative Societies (EWHCS), affiliated organizations of the Sri Lankan government.
During our most recent visit (March 2024) to farms, we saw progress in conservation efforts, with micro watersheds on farms being fenced off to prevent animal access and inappropriate use of water by others. We are commenced planting native plant species as a natural buffer around the watershed. We expect that the species will provide a diversity of vegetation at tea farms, which currently have a single crop, and prevent soil of mountain slope from flowing down to water sources as a result of torrential rain.

Mechanism of micro watersheds



Number of areas where water sources were conserved among Sri Lankan tea farms




Tea bushes planted on steep slopes


A fenced off micro watershed


Sign indicating water source conservation (President of Kirin Beverage and visiting members visited the site in February 2023)

Education programs to teach the value of water

The Kirin Group is conducting an education program to teach residents living near water sources about the importance of water and the functions of micro watersheds. At some farms, we are also working to incorporate our educational programs as a part of curriculums of nurseries for children of tea pluckers and elementary schools. We have provided the program to 15,000 people, our initial target, and plan to expand the program further.

Number of residents to educate the importance of water

Group training: 1,750 people
Distribution of pamphlets: 15,000 people

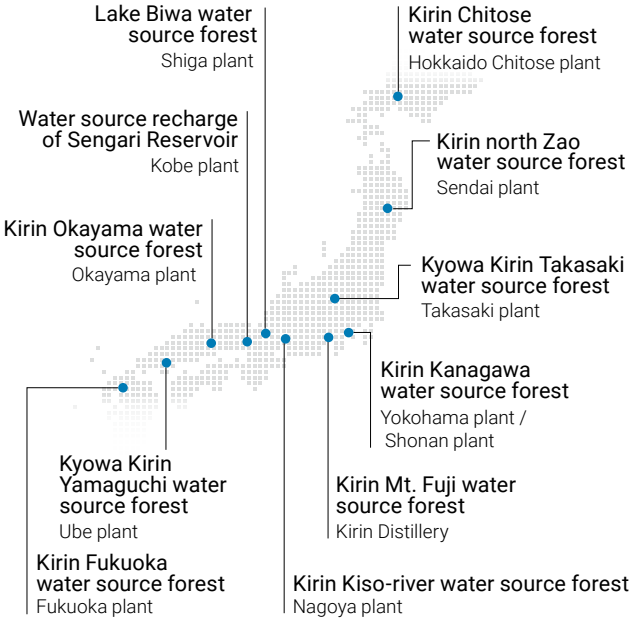

Flyer for water education

Water Source Forest Conservation Activities

"Water Source Forest Conservation Activities", an activity to protect water source forests at our plants, began in 1999 with the industry's first forest in the Tanzawa area of Kanagawa Prefecture, which is the source of water for the Kirin Brewery Yokohama Plant, and continues today at 11 locations throughout Japan. Based on medium- and long-term agreements with local governments and related organizations that manage water source forests, we have planted trees, cleared undergrowth and branches, and thinned trees, and many of our forests are now bright and lush. In some locations, customers are invited to participate in these activities.

Water Source Forest Conservation Activities at Kirin Mt. Fuji water source forest

Kirin's forest across the country



Grassland conservation activities to recharge groundwater

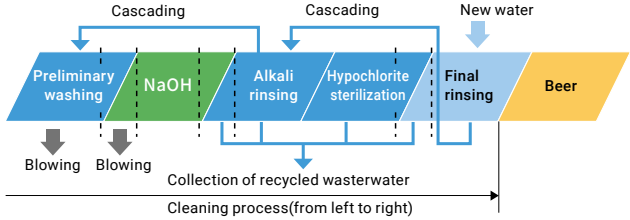
Yatsushiro Plant, one of production sites of Mercian, sent its three employees to "Aso Grassland Restoration Project" which aims to make Aso district a World Heritage Site. The project supports controlled open burning of grassland, a traditional methodology to maintain quality of grasslands. The methodology enables Aso district, where Yatsushiro Plant sources its water, to secure abundant groundwater. Maintaining grasslands not only nurtures groundwater, but also protects habitats for a wide variety of flora and fauna, including endangered species.

Cutting paths around areas for controlled burning

Controlled burning

Production

In our production process, we use a lot of water in cleaning and sterilizing processes. We have established management system to strictly control quality of the cleaning processes and water consumption by optimizing flow rate and other parameters. We also actively promote reuse of water, considering characteristics of processes.
For example, the rinsing water that we use in the final cleaning step of a equipment is relatively clean, so we can use it again for the initial cleaning step of other equipment. In this way, the water used for cleaning is cascaded for repeated use according to water quality. In order to ensure that equipments are appropriately cleaned, it is necessary to know how to use the equipment, such as how to balance the amount of water that can be recovered with the amount of water that is used, and how to time the process. The Kirin Group is achieving a high level of water conservation by accumulating best practices and sharing them among production sites.

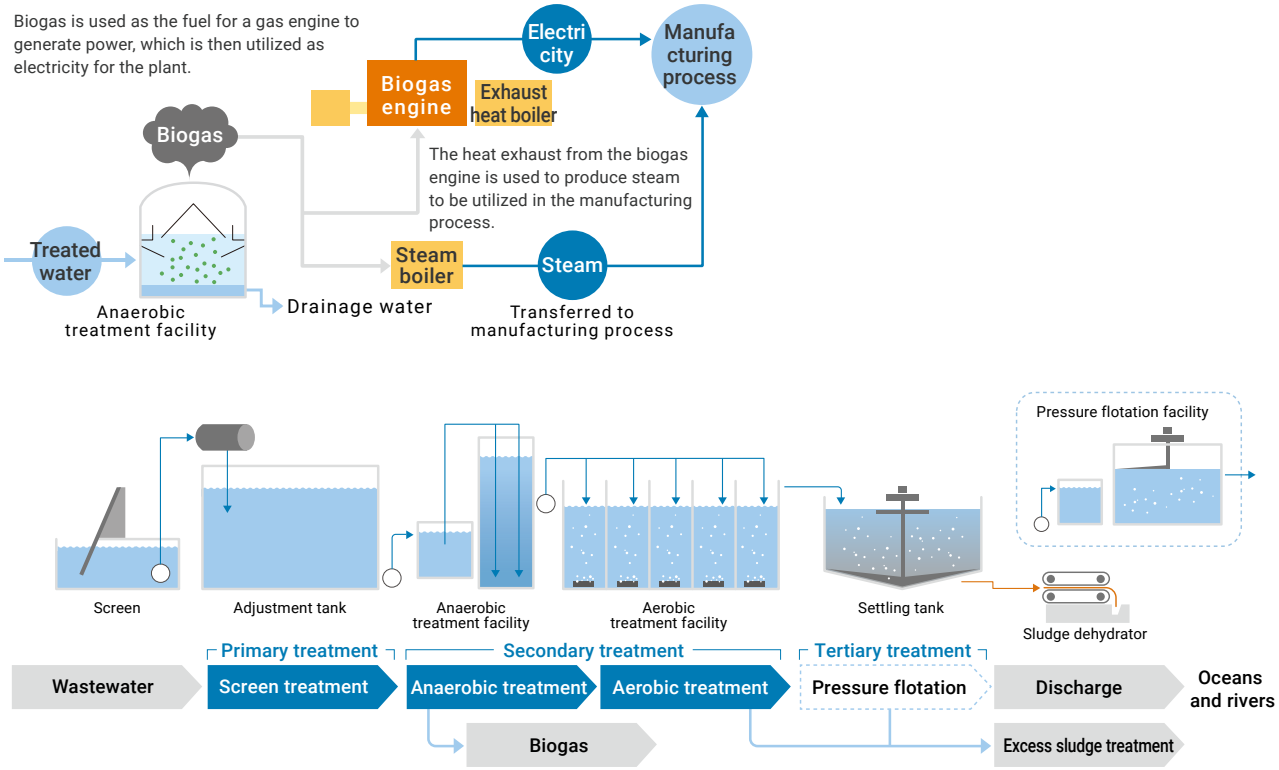


In 2009, Lion partnered with the government of Queensland, Australia, where water stress is extremely high, to install a reverse osmosis (RO) filter at the Castlemaine Perkins Brewery, to minimize water use in brewery. Lion introduced this filter in order to reduce 50% of fresh water usage in the brewery by recycling wastewater. The brewery uses treated water by RO in non-product related processes, such as cleaning, cooling, and pasteurizing. Lion is leading sustainable water use in Kirin Group.

Wastewater and the usage of biogas

Kirin Group sets higher quality standards of waste water treatments than those required by regulations. Breweries and plants in basin areas with strict regulations remove phosphorus and solids by pressure flotation in addition to conventional waste water system. We process excess sludge generated from aerobic treatment and pressure flotation into fertilizer and soil conditioner. The Kirin Group discharges clean water into the ocean, rivers, and sewers, considering local aquatic ecosystems.
In our breweries, we have introduced anaerobic treatment system to purify the wastewater generated by production processes.

Anaerobic treatment does not require electricity for aeration, and anaerobic microorganisms generate biogas as a by-product of the treatment process. The biogas contains methane as its main component, and it can be utilized in biogas boilers and cogeneration systems. The origin of biogas is agricultural products such as malt which is grown by absorbing CO_2 from the atmosphere by photosynthesis. Thus, the gas is classified as a renewable energy source since the amount of CO_2 generated from its combustion does not affect global CO_2 volume.



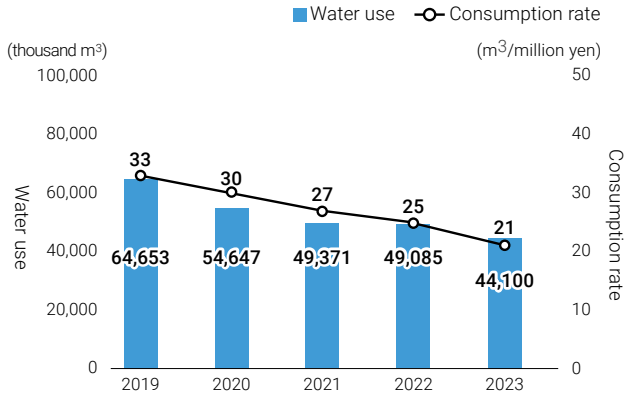
Environmental protection activities in basin regions

At the various production plants of the Kirin Group, we are conducting a range of environmental protection activities, particularly riverside clean-up activities in cooperation with local governments and NGOs. At our breweries and plants, including those of Kirin Brewery, Kirin Beverage, Mercian, Kyowa Kirin, and Koiwai Dairy Products, we engage with local environmental activities, focusing on rivers where we intake water for production and other nearby rivers.
At Yamaguchi Production Center of Kyowa Hakko Bio, employees conduct clean-up activities in the waters off Hyakken, a port facility where chemicals and glucose solutions are unloaded.

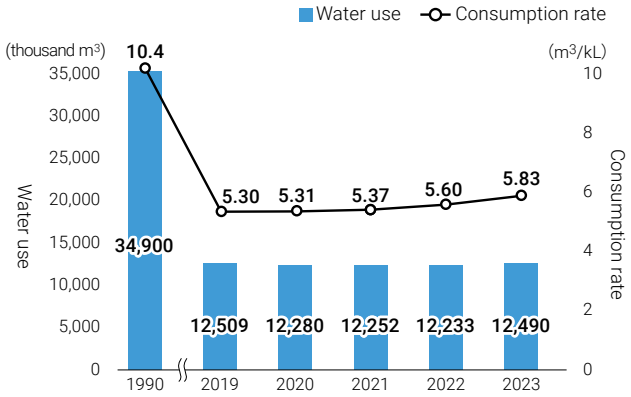
Clean-up activities off Hyakken

Key data related to water resources

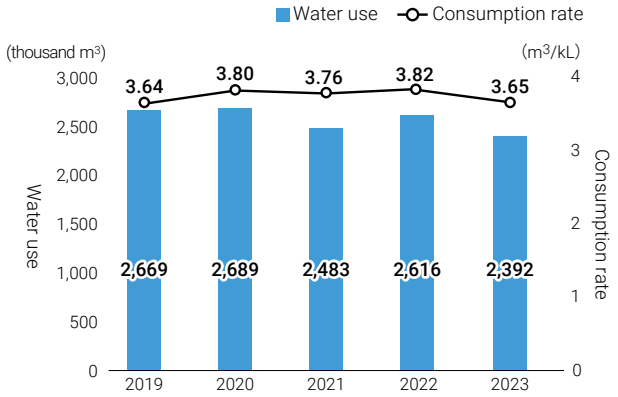
Water use and consumption rate
(water use / sales revenue) of entire Group



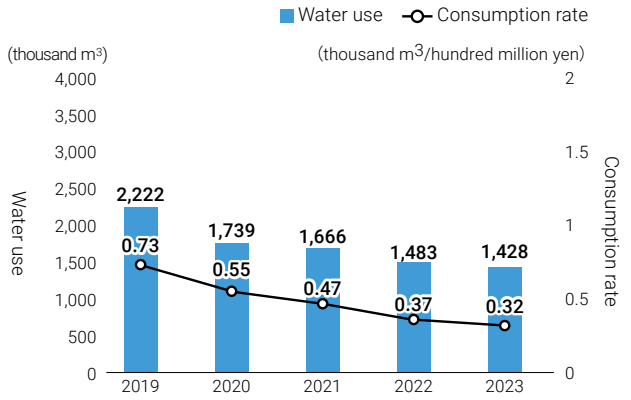
Water use and consumption rate (water use /
production volume) of Kirin Brewery



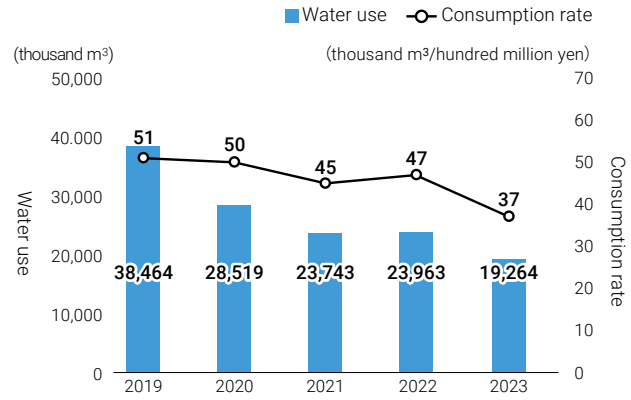
Water use and consumption rate
(water use / production volume) of Lion(Oceania region)



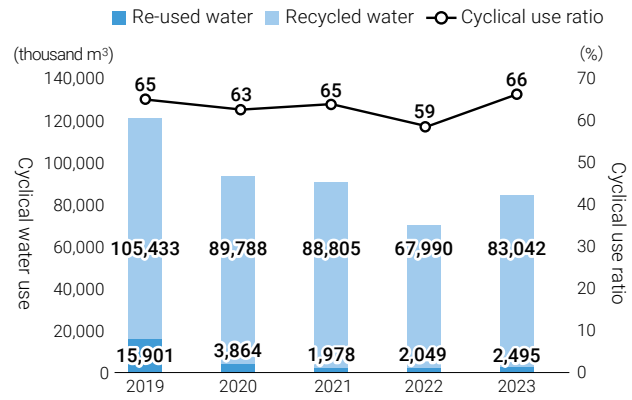
Kyowa Kirin (Global) water use and
basic unit(water use / sales revenue)



Kyowa Hakko Bio(Global) water use and basic unit
(water use / sales revenue)



Cyclical water use and cyclical use ratio
(cyclical use / (tap water use + cyclical use))of entire Group



We provide the latest updates on our initiatives related to water resources on the following website.
https://www.kirinholdings.com/en/impact/env/3_2/

Containers and Packaging

Background

Containers and packaging are essential to maintain the quality of products when delivering them to customers. Greenhouse gas (GHG) emissions, however, are currently unavoidable in the manufacturing and transportation of containers and packaging. In addition, the excessive extraction of raw materials for containers and packaging and the improper disposal of used containers and packaging can damage natural capital. To address these various issues related to containers and packaging, the Kirin Group has promoted 3Rs (Reduce, Reuse, Recycle), and has aimed to make containers and packaging lighter, utilize recycled containers, and achieve a high recycling rate. With regard to paper containers and packaging, we have been promoting sustainable paper use in order to solve problems related to human rights in raw material production areas and the destruction of forests. In 2020, we achieved 100% use of FSC-certified paper for all paper containers at Kirin Brewery, Kirin Beverage, and Mercian, which we have subsequently maintained. We plan to expand this initiative to other Kirin Group companies around the world. In response to the problems associated with plastics, we aim to create a "society that continuously circulates plastics".

We will create together

A society that circulates containers and packaging in a sustainable way

- Develop and distribute sustainable containers and packaging
- Build a resource circulation system to make containers and packaging sustainable

Reduce
- P.52 Corner-cut cartons, Smart-cut cartons, 6-can pack, paper containers for wine
- P.53 PET bottles for wine, roll labels, PET bottles for water, No label product, Shortening of labels
- P.54 Aluminum cans, Lighter returnable glass bottles

Reuse
- P.54 Reuse of glass bottles

Recycle
- P.51 R100 PET bottles, chemical recycling
- P.51 Promotion of more efficient sorting, collection, and recovery
- P.55 PET bottles, glass bottles, Aluminum cans
- P.55 Promotion of recycling in Australia and New Zealand

Renewable
- P.52 FSC-certified paper containers

1993 Developed the lightest returnable glass bottles (633mL) in Japan and introduced them into the market on a limited trial basis

1994 Began using 204-diameter aluminum beer cans.

2003 Completed the switch to full use of the lightest returnable glass bottles (633mL) produced in Japan.

2004 Began using corner-cut cartons.

2014 Began developing and deploying the lightest returnable glass bottles (500mL) in Japan.
Began using PET bottles made from 100% recycled PET resin.

2017 Revised the Kirin Group Action Plan for the Sustainable Use of Biological Resources, and declared to achieve 100% use of FSC-certified paper for all paper containers at Kirin Brewery, Kirin Beverage, and Mercian by the end of 2020.

2019 Developed the Kirin Group Plastic Policy.
Began using "R100 PET bottles" made from 100% recycled PET resin for *Kirin Nama-cha Decaf*.

2020 Achieved 100% use of FSC-certified paper in all paper containers and packaging across Kirin Brewery, Kirin Beverage, and Mercian.
Began studying technologies for PET resin recycling through chemical recycling in a joint project with several companies.

2021 Expanded use of "R100 PET bottles" to cover *Kirin Nama-cha* and *Kirin Nama-cha Hoji Sencha*.
Began sales of no label products.
Joined the "Alliance to End Plastic Waste (AEPW)," an industry-led NGO.
Began trialing the collection of used PET bottles at convenience stores.

2022 Expanded the collection sites for a demonstration trial on the collection of used PET bottles.
Began joint research to explore industrial applications for PET-degrading enzymes, in order to find applications for chemical recycling.

2023 Joined the Business Coalition for a Global Plastics Treaty (Japan)
Started using chemically recycled resin in PET bottles for alcoholic beverages as the first case in Japan
Succeeded in developing technology for PET decomposition and refining

Targets and Progress

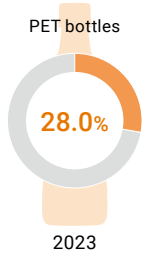
Percentage of recycled PET resin used at operating companies in Japan

100% by 2050 (Environmental Vision 2050)
50% by 2027 (Plastic Policy)
38% by 2024 (non-financial target)

PET bottle resource circulation

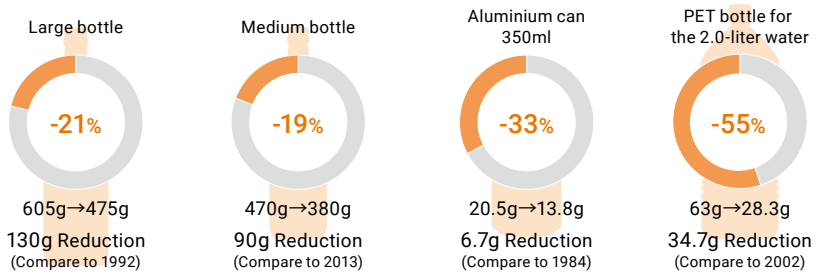
Recycled resin ratio

We will actively promote the creation of systems for efficiently collecting and using used PET bottles.



Improved sustainability of raw materials for containers and packaging

Weight reduction ratio



Adoption of sustainable paper containers

FSC-certified paper ratio

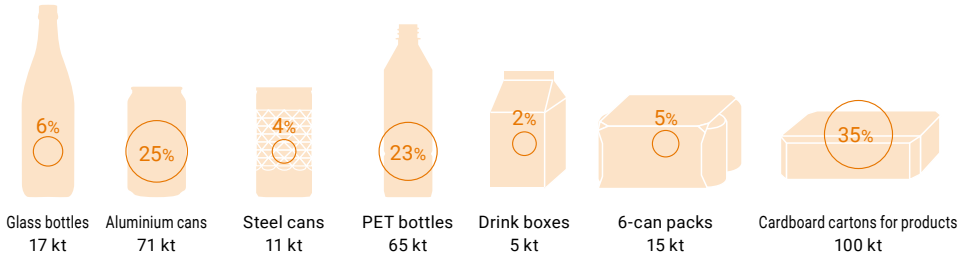
In 2020, we achieved 100% use of FSC-certified paper or recycled paper in paper containers and packaging across Kirin Brewery, Kirin Beverage, and Mercian. We plan to expand this initiative to Kirin Group companies around the world by 2030.

Main Activities

- Developed the "Kirin Group Plastic Policy" in 2019, and set a target to replace 50% of PET resin used in Japan with recycled PET resin by 2027
- Expanded the product line of “R100 PET bottles” made from 100% recycled PET resin
- Began selling no label products in 2021 in order to reduce plastic usage.
- Begun technical studies on recycling PET resin using “chemical recycling” in a joint project with several companies with the aim of creating a "society that continuously circulates PET bottles"
- Strengthened collaboration with other companies and local governments as a part of efforts to collect PET bottles
- Maintained our achievement of the 100% use of FSC-certified paper for all paper containers and packaging in Kirin Brewery, Kirin Beverage, Mercian
- Set targets to use 100% sustainable paper resources at Lion (Australia and New Zealand) by 2025
- Developed technology for decomposing PET and refining the monomers produced after decomposition in relation to chemical recycling of PET bottles in 2023
- Started using chemically recycled resin in PET bottles for alcoholic beverages for the first time in Japan in 2023
- Joined the Business Coalition for a Global Plastics Treaty (Japan) in order to establish an international treaty aimed at eliminating plastic pollution, in November 2023

Material mix of containers and packaging, by weight (Japan)

Kirin Brewery | Kirin Beverage | Mercian

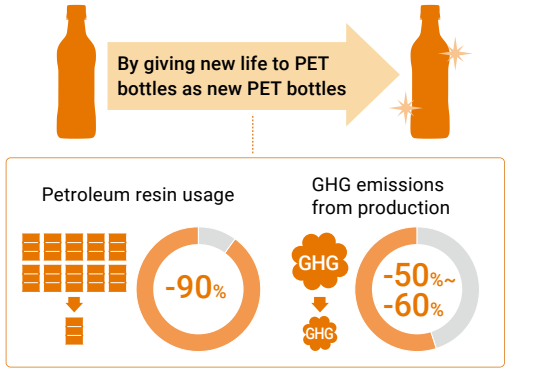


Global resource use of containers and packaging: 517 kt

Sustainable PET bottles

R100 PET bottles

In accordance with the Plastic Policy that we established in 2019, the Kirin Group is gradually expanding the use of "R100 PET bottles" made from 100% recycled PET resin.
R100 PET bottles use mechanically recycled resin. By using this resin, we can reduce petroleum-based resin by 90% and GHG emissions by 50-60%, compared with conventional PET resin..
We began using recycled resin for some of the packaging of *Kirin Gogo-no-Kocha Oishii Muto (sugar-free)* in February 2014. Subsequently, in 2019, we began using "R100 PET bottles," which use 100% recycled PET resin, for *Kirin Nama-cha Decaf*.
Our use of "R100 PET bottles" as of April 2024 is shown below.

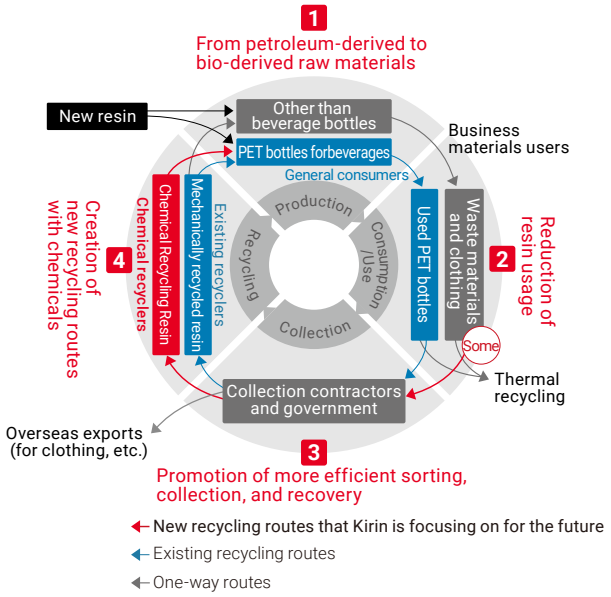


Kirin Nama-cha : 525 ml (First photo from left)
Kirin Nama-cha Hoji Sencha : 525ml(Second photo from left)
Kirin Nama-cha Karada-Hare-cha : 525ml (second from right in the photograph)
Kirin Nama-cha caffeine Zero : 430ml(The right photo)
*Product photos are as of the end of April 2024.

Chemical recycling

In December 2020, Kirin began technical studies aimed at commercialization focusing on recycling PET bottles using chemical recycling.
In the current mechanical recycling system, there are constituents that are difficult to remove from resins, and it is understood that the quality of resins deteriorates with repeated recycling.
In chemical recycling, we sort, pulverize and wash used PET bottles. After the processes, we depolymerize them (chemical decomposition treatment), and break down and refine the PET into intermediate materials, and polymerize again into PET.
It is possible to recycle used PET bottles into new materials as many times as we want by decomposing them down to molecular size. We can also recycle PET products other than used PET bottles into PET bottles with this technology.
In December 2023, we developed two technologies, an alkaline decomposition method and a method of refinement by electrodialysis. We developed the alkaline decomposition method at Kirin Central Research Institute and the method of refinement by electrodialysis in joint research with the Faculty of Science and Engineering, Waseda University. This refining method regenerates alkaline components during the refining process, which can then be reused in the decomposition process. Therefore, by combining these two technologies, we can realize a resource-circulating recycling process. With these technologies, we can carry out the processes for decomposing and recycling PET in a short time and with low energy, reducing environmental impacts and costs.
These two PET chemical recycling technologies that we have developed are currently under patent filing. The Kirin Group is seeking partners to develop practical applications for these technologies, and we are working to achieve our vision for containers and packaging and create a society that continuously circulates resources, taking the environment into consideration.
In 2023, Kirin Brewery introduced chemically recycled resin for 3L PET bottles as containers for Tap Marché and TAPPY, that are beer serving systems, at bars and restaurants. This was the first attempt to introduce chemically recycled resin for PET bottles for alcoholic beverages in Japan.
In this way, we are aiming to establish a circular economy for PET resin products.

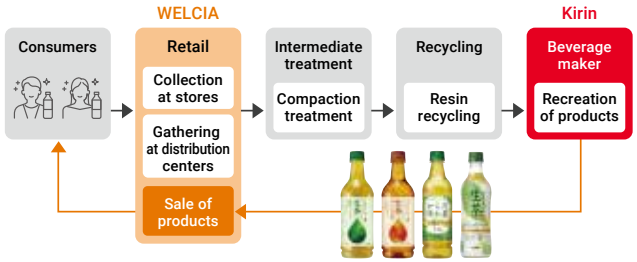
Society that continuously circulates plastics



Promotion of more efficient plastic sorting and collection

Aiming to create "a society that continuously circulates plastics," in June 2022, we launched a commercial-scale trial with WELCIA YAKKYOKU CO.,LTD., and as of March 2024, this trial has moved to regular operation.
Used PET bottles are collected and sorted using collection boxes installed in WELCIA's dragstores, and once collected at WELCIA's distribution center, they are delivered to recycler Far Eastern Ishizuka Green PET Corporation.

Flow of collecting, recycling, and product creation



Sustainable paper containers

At the end of November 2020, the Kirin Group achieved the 100% use of FSC-certified paper in all paper containers and packaging at Kirin Brewery, Kirin Beverage, and Mercian. This initiative covers all paper containers, including “6-can packs,” “gift boxes,” “paper containers,” and “cardboard cartons for products,” and it is the first declaration and achievement of such a target by a Japanese manufacturer. In 2022, we revised the “Action Plan for the Sustainable Use of Biological Resources,” and expand companies complying the action plan to Kyowa Kirin, Kyowa Hakko Bio, Lion, Koiwai Dairy Products. We began related initiatives in these companies.

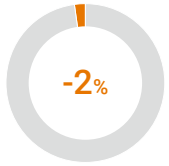
*Product photos are as of the end of April 2024 or at the time of the event.

Reduce

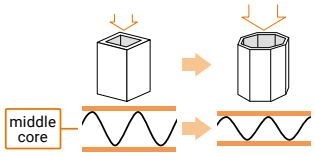
Corner-cut cartons

The Institute for Packaging Innovation developed “corner-cut cartons,” and we introduced them to the market in 2004. The beveled corners mean that the carton has eight sides, which makes the carton stronger, and the cardboard thickness has been reduced. This results in a 10.9% reduction in the weight of the carton compared to conventional cartons.

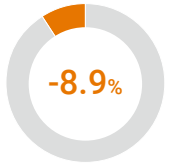
Quantity of paper saved by eliminating corners



Of the same thickness, more corners make the object more load-bearing.



Quantity of paper saved by making cardboard core thinner



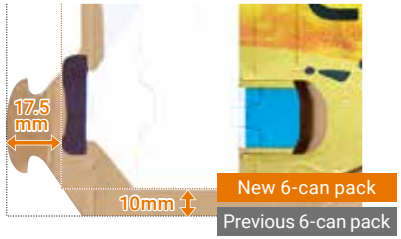
Smart-cut cartons

The smart-cut carton is based on the corner-cut carton technology. In addition to the reduction in weight, the corners of the long edges at the top of the carton have been cut to fit the space created by the lids of the 204-diameter can.
This has resulted in a 16% weight reduction compared to the previous corner-cut carton. The Institute for Packaging Innovation developed the smart-cut carton in conjunction with a container and packaging manufacturer, and obtained a joint design registration.

6-can pack

In addition to being easy to hold and remove, 6-can pack containers of beer are designed to be lightweight. For example, we have installed a cut-out section at the sides of the pack to fit the can edge (Kirin patent), and use a “can bottom lock structure” to stabilize the bottoms of the can with paper. These innovations have resulted in a reduction in packaging materials of 4 grams, or 8%, per 500 ml 6-can pack. At the same time, they have also improved the pack’s can-holding power.

Layered for comparison



Reducing the weight of paper containers for wine

Since March 2022, Mercian has reduced the weight of containers for its wine. Specifically, this innovation was applied to five types of wine, namely FRANZIA (red, white, dark red) bag-in-box and FRONTERA (Cabernet Sauvignon and Chardonnay) wine-fresh servers.
For these products, Mercian uses bag-in-box containers, consist of outer paper boxes and inner flexible plastic bags. By reducing the weight of the outer box from 190g to 143g, by approximately 25%, we reduce the use of paper resources by around 31 tons per year.

Lightweight bag-in-box packaging

*Product photos are as of the end of April 2024 or at the time of the event.

Reducing the weight of PET bottles for wine

In 2022, the Institute for Packaging Innovation developed a 720ml PET bottle for wine that is the lightest in Mercian's history. We reduced the weight by 5g, from 34g to 29g. Mercian expects that the use of this lightweight PET bottle for all 720ml PET bottle products that it produces and sells to reduce PET resin use by approximately 83 tonnes per year and GHG emissions by approximately 286 tonnes. The lightweight PET bottle received the "46th Kinoshita Award for Packaging Technology." The bottle won the award partly because we reduced resin use by approximately 15% while maintaining the "Bordeaux shoulder shape" and a "clean body shape," and partly because the fact that it uses the Kirin Group's gas barrier coating technology, which uses DLC*1 film, to keep wine fresh for a long period of time.

* Abbreviation for Diamond-Like Carbon (Patent No. 4050648, etc.), a technology that forms a thin film of carbon on the inside of PET bottles to inhibit the permeation of oxygen, water vapor, carbon dioxide and other gases.

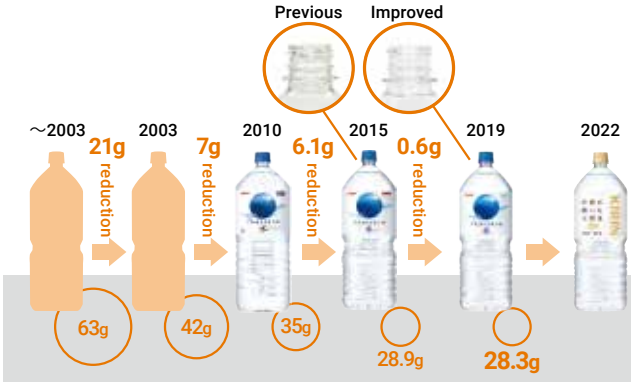
Use of roll labels

Since September 2020, Kirin Beverage has used "roll labels" on some PET bottle products for sale in vending machines. There are two main types of labels for PET bottled soft drinks: shrink labels and roll labels. We place shrink labels over bottles in the filling plant, then apply heat to shrink the label. This means a certain thickness of labels is required. On the other hand, we attach roll labels by wrapping them around the PET bottle, which enables us to make the label thinner. Customers can easily remove the label, contributing to sorting trash and recycling. At Kirin Beverage, we use roll labels for some products sold exclusively in vending machines, such as *Kirin Namacha*, *Kirin Gogo-no-Kocha Oishii Muto*, *Kirin Loves Sports*, *Kirin Amino Supplement C*, and *Kirin Tennensui Natural Mineral Water*. Since February 2023, additional roll labelers have been installed at Kirin Beverage Shonan Plant and Shiga Plant to expand application of roll labels on the company's brands.

Lightest PET bottles for water produced in Japan

The Institute for Packaging Innovation has developed and put into practical use the lightest 2L PET bottle for water produced in Japan, at 28.3g. We reduced the weight of the 2L PET bottle from 63g prior to June 2003 to 28.9g in 2015. We further reduced the weight in April 2019 by improving the bottle's screw top, including making the screw threads narrower and the screw portion shorter, thereby putting it into practical use as the lightest such PET bottle produced in Japan. These efforts will result in annual reductions of PET resin use of approximately 107 tonnes and GHG emissions of approximately 375 tonnes. In addition, for some 2L and 1.5L large PET bottle products, such as Kirin Gogo-no-Kocha and Kirin Nama-cha, we reduced the weight by approximately 16%, from 38.2g to 32.2g, by improving the molds of preforms. We have been gradually introducing these bottles since December 2020. These efforts will result in annual reductions of PET resin use of approximately 439 tonnes and GHG emissions of approximately 1,515 tonnes.

Weight reduction of 2L PET bottles for water



No label product

Since March 2021, we have been selling *Kirin Nama-cha No Label 6-Pack* and *Kirin Nama-cha Hoji Sencha No Label 6-Pack* at merchandise stores in Japan. We have also been selling *Kirin Nama-cha No Label* and *Kirin Nama-cha Hoji Sencha No Label* exclusively online. In May 2022, we expanded our range of no label products with the launch of *Kirin Gogo-no-Kocha Oishii Muto (sugar-free) No Label* and *Kirin FIRE ONE DAY Black No Label* exclusively online. In April 2023, we began sales of a new product, *Kirin Shizen-ga-Migaita Natural Water No Label*, exclusively online. In June 2022, we began test sales of *Kirin Nama-cha No Label with Paper Sticker* at some mass merchandise stores in the Tokyo metropolitan area. By attaching small paper stickers that provide required information, we can sell individual products without conventional labels. In August 2023, we announced PET bottle direct printing technology compatible with recycling processes.

No label product

No label with paper sticker

Direct print to PET bottle

*This product is fictional.

Shortening of labels and packaging materials

We have shortened the width of labels on bottles for the 600ml *Kirin Nama-cha* and *Kirin Nama-cha Hoji Sencha* that we released in 2022. By reducing the size of the labels and making it thinner by switching to roll labels, we reduced resin use by approximately 180 tonnes and GHG emissions of approximately 400 tonnes. We have made the paper packaging materials for the 525ml and 600ml products in the six-bottle packs of no label products shorter than those of the products we launched in 2021, reducing paper consumption. We also use FSC-certified paper for packaging materials and display a label of the certification.

Shortening of labels

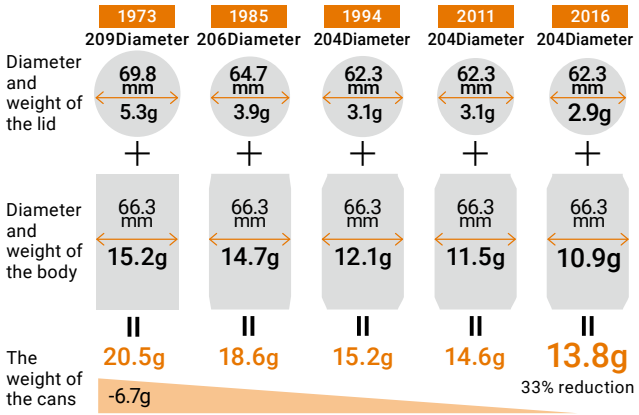
Shortening of paper packaging materials for six-bottle packs

*Product photos are as of the end of April 2024 or at the time of the event.

Reducing the weight of aluminum cans

In 2011, we achieved a weight reduction of our aluminum cans approximately 29% with our 204 diameter can compared with the 209 diameter can which was standard at the time, by reducing the diameter of can lids, narrowing the top and bottom edges, thinning the walls. Working with materials manufacturers, we developed an aluminum can with thinner can lids and a body in 2016. We have reduced the overall weight of the can by approximately 5% (from 14.6g to 13.8g). This represents a weight reduction of 33% (6.7g) from the 209 diameter can. Weight reduction is necessary for both steel and aluminum cans. In particular, aluminum requires a large amount of electricity for smelting, so weight reduction contributes significantly to the reduction of Scope 3 GHG emissions.

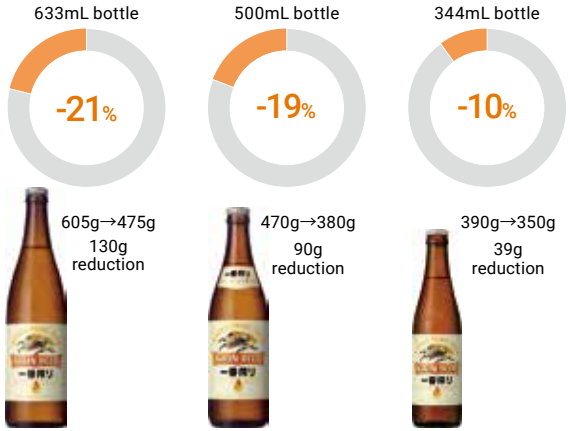
Transitioning weight of the 350ml aluminum cans



*Product photos are as of the end of April 2024 or at the time of the event.

Lightest returnable glass bottles in Japan

Our returnable glass bottles for beer are the lightest among those produced in Japan in all sizes (633mL, 500mL, and 334mL). As well as being light in weight, returnable glass bottles need to be durable enough to maintain their returnable functionality and strong enough to ensure consumer safety and security of mind. To solve this dilemma, the Institute for Packaging Innovation created the lightest returnable glass bottles by making excellent use of innovations such as a ceramic coating that forms a thin film on the bottle's outside surface, an impact-resistant shape design, and a bottle mouth design that satisfies the conflicting requirements of being easy to open and able to be sealed tightly and that is also strong enough not to chip when opened.

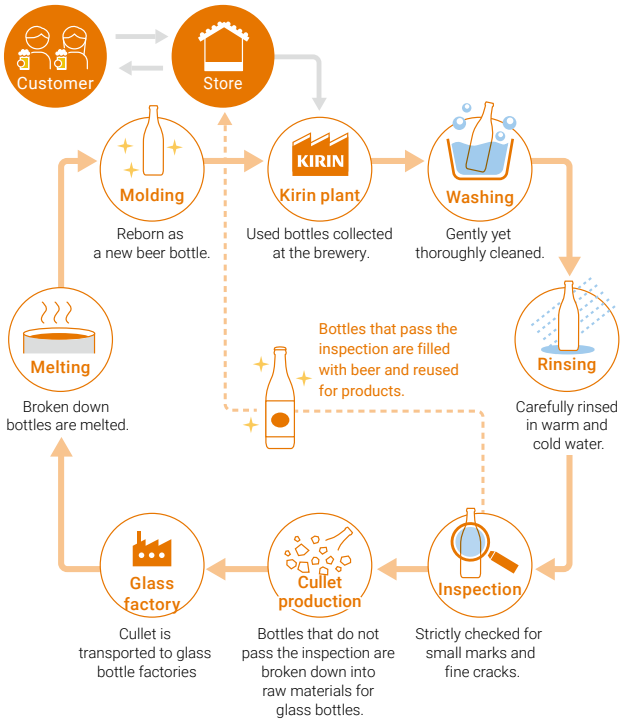


GHG reduction effect of lighter medium-size bottles

Reuse

Reuse of glass bottles

In Japan, people have collected and reused glass bottles over and over since the Meiji Era (more than a hundred years ago). Returnable glass bottles come back to plants and are washed thoroughly inside and outside to make them as clean as a new bottle. After stringently checking the bottles for scratches and cracks with an empty bottle inspection machine, we put the bottles back into production lines and fill them with beer. When handled carefully, returnable glass bottles last for an average of about eight years. This means they are used around 24 times.



Recycle

Recycling of PET bottles

The Kirin Group promotes recycling of PET bottles as a member of the Council for PET Bottle Recycling in Japan. Under the council's Fourth Voluntary Action Plan (FY2021-FY2025), members of the council are working toward a target recycling rate of at least 85% (base year: FY2004). In 2022, the recycling rate was 86.9%, achieving the target.In October 2022, Kirin Beverage introduced new recycling boxes, specially designed by soft drink industry to prevent other objects than PET bottles, next to vending machines, in order to reduce contamination by foreign substances. We had installed 1,000 boxes by the end of 2022. We will continue cooperating with the industry to promote bottle-to-bottle recycling activities.

New recycling boxes and stickers to raise awareness

Recycling of glass bottles

We turn old returnable glass beer bottles and one-way glass bottles into cullet, for use primarily as the raw material for making new glass bottles. In particular, we are pursuing uses for cullet made from colored glass, which cannot easily be reused for glass bottles. We are expanding potential ways to recycle this material for other applications, including building materials and road paving materials.

Recycling of aluminum cans

The Kirin Group is pursuing the use of aluminum cans that use a high rate of recycled metal. We have also joined the Japan Aluminum Can Recycling Association, and we provide assistance for the collection of used aluminum cans. Through such measures, we are promoting the recycling of empty cans. Can manufacturers recycle aluminum cans discarded at breweries and reuse 100% of them as aluminum cans for beer.

Promotion of recycling in Australia and New Zealand

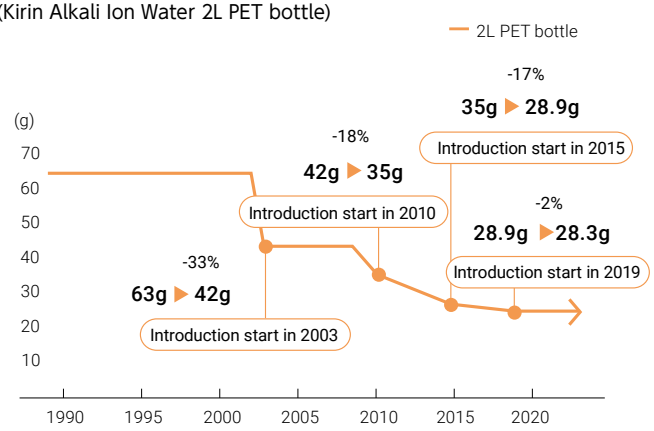
Lion has established the "Sustainable Packaging Strategy" to promote recycling. In order to promote this strategy, the company has established Lion's Sustainable Packaging Project Steering Group, and has set the following goals. Lion is also promoting activities to achieve these targets, which are aligned with those of the Australian Packaging Covenant Organisation (APCO).

- Increasing recycled content to at least 50% by 2025.
- 100% of Lions packaging material to be reusable, recyclable, or compostable by 2025
- A commitment to zero avoidable waste to landfill by 2025
- Promoting activities to achieve these targets, which are aligned with those of the Australian Packaging Covenant Organisation (APCO).

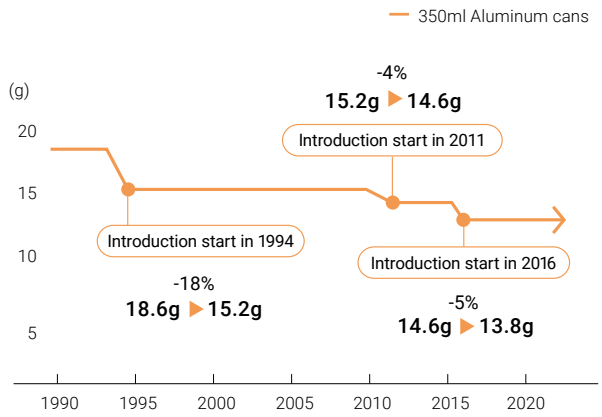
As glass accounts for the highest proportion of Lion's material inputs, Lion is working closely with its supplier to increase the recycled content of glass bottles.
Australia has container deposit schemes in seven of its eight states and territories, with Tasmania to commence a scheme in 2024.
Lion plays an important role in Australia's Container Deposit Schemes, and is involved in the management or coordination of every scheme in operation.
Our involvement dates back nearly fifty years in South Australia, where Lion holds a majority of shares in Marine Stores Pty Ltd, a collection coordinator that aggregates collected materials for reuse and recycling across South Australia and Northern Territory.
In Queensland and Western Australia, Lion participates in the administration and operation of Container Deposit Schemes as a member of the not-for-profit Container Exchange (QLD) Limited and WA Return Recycle Renew Limited (WARRRL) entities, which were established and appointed as Producer Responsibility Organisations to coordinate those schemes.
In New South Wales and Australian Capital Territory, Lion participates in Exchange for Change (EfC), a joint venture that coordinates the two schemes.
In Victoria, Lion participates as a member of not-for-profit entity VicReturn Limited, the coordinator of the Victorian scheme, which commenced in November 2023.
Lion is also a member of the not-for-profit entity TasRecycle Limited, which is bidding to be coordinator of the Tasmanian scheme expected to commence in 2024.
The majority of Container Deposit Schemes in Australia are experiencing strong growth in returns of containers, particularly those that have only been implemented in recent years. State governments of the older schemes, such as South Australia (the best performing scheme in Australia) and Northern Territory, are currently looking at legislative changes to modernize their schemes and further increase rates of return, including increased automation and technology, streamlining of scheme governance and management, and broadening the scope of containers subject to the scheme.
Lion is working closely with all scheme entities and relevant governments to look at additional initiatives and policy development to further drive growth in return, particularly in sectors such as commercial (such as hospitality) and industrial, public place, and high rise buildings.

Key data related to Containers and Packaging

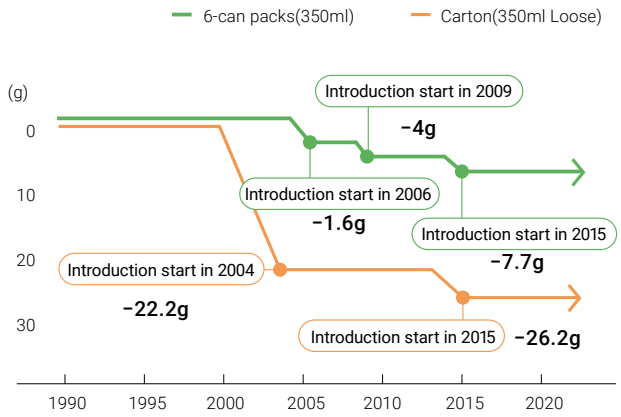
Change in weight of PET bottles
(Kirin Alkali Ion Water 2L PET bottle)



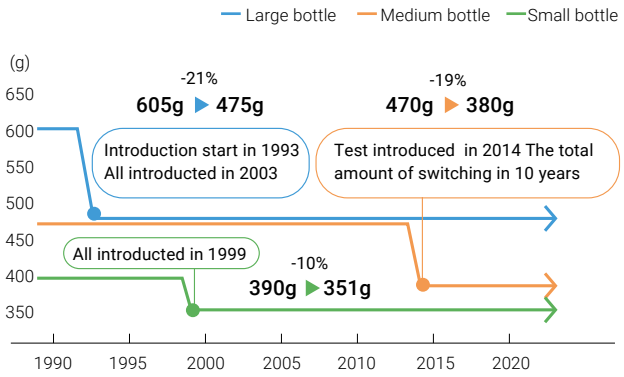
Can lighter transition



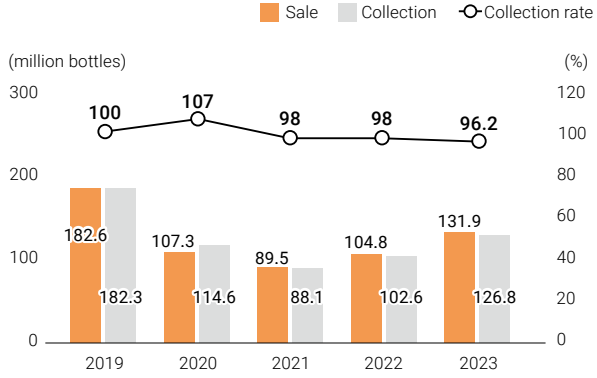
Progress in weight reduction of cartons and 6-can packs



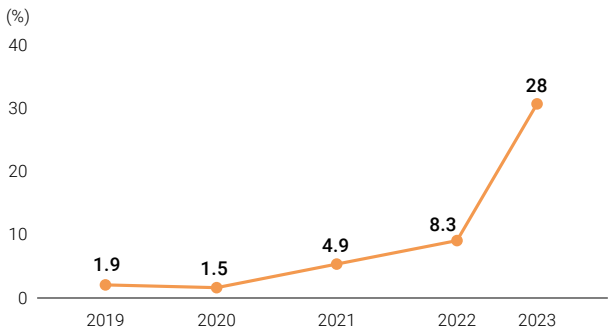
Returnable beer bottles lighter transition



Kirin Brewery trends in sale and collection of returnable glass bottles



PET bottles: Trends in the use of recycled PET resin (Japan)



We provide the latest updates on our initiatives related to containers and packaging on the following website.
https://www.kirinholdings.com/en/impact/env/3_3a/

Climate Change

Background

The Kirin Group was one of two companies that represented Japan when we presented our environmental measures to the world at the third session of the Conference of the Parties to the United Nations Framework Convention on Climate Change in Kyoto in 1997. The Kirin Group has long been working to reduce GHG emissions. The group set an ambitious target of "reducing GHG emissions across the entire value chain by half from the 1990 level by 2050" in 2009. The group recognizes impacts of climate change on natural capital, such as agricultural raw materials and water, by applying scenario analysis based on the TCFD recommendations. The group sets science-based targets for the reduction of greenhouse gas emissions, and declares its aim to switch to 100% renewable energy for electric power used by 2040, and commits Net-Zero GHG emissions by 2050. In order to lead the way in creating a decarbonized society, we have been focusing on the processes involved in these efforts. We will steadily implement integrated initiatives to reduce GHG emissions, with respect for natural capital and while promoting containers and packaging initiatives.

We will create together ahead 2050

A society that has overcome climate change

Realize Net-Zero GHG emissions across the entire value chain

Raw materials and Containers and packaging	P.59	Tea farms
	P.59	Transportation in large bags
	P.62	Lightweight containers and packaging
Production	P.61	Heat pumps
	P.61	Fuel conversion
	P.61	Improving the efficiency of refrigeration systems
Distribution	P.63	Modal shift
	P.63	Joint delivery
	P.63	Improving loading efficiency
	P.63	Vendor-managed warehouse
Sale	P.64	Vending machines
	P.64	Carbon zero certified beer
Supply chain	P.65	Cooperation with business partners

Lead to build a decarbonized society

A decarbonized society	P.59	100% renewable energy for all electric power purchased
	P.60	Solar power
	P.60	Wind power

1996 Began installing biogas boilers at breweries.

2002 Began introducing biogas cogeneration facilities at breweries.

2004 Began converting fuel used at breweries from heavy oil to city gas.

2006 Kirin Beverage was selected as an "Eco-Rail" mark-certified company. Kirin Brewery sponsored a "wind power generation project" in Yokohama City. Began introducing heat pumps for Kirin Beverage vending machines.

2007 Completed fuel conversion at Kirin Brewery.

2009 Announced Action Plans for Becoming a Low-Carbon Corporate Group, and declared aim to halve GHG emissions by 2050 compared with 1990.

2017 Obtained approval for "SBT for 2° C" target.

2019 Introduced a heat pump at Kirin Brewery's Okayama Plant.

2020 Declared our aim to achieve Net-Zero emissions by 2050 in the "Kirin Group's Environmental Vision 2050." Joined RE100 and declared our aim of using renewable energy for 100% of electric power by 2040. Acquired approval for science-based 1.5℃ target. Lion acquired certification as Australia's first major carbon neutral brewer.

2021 Moved to renewable energy for 100% of electric power purchased at Kirin Brewery's Nagoya and Sendai Plants. Began utilizing electric power from large-scale solar power generation thanks to the introduction of a PPA model at four domestic plants. Began using heat pumps on the production lines of Shinshu Beverage.

2022 Acquired Net-Zero target certification by SBTi as the first case in food & beverage industry in the world. Switched purchased electricity to 100% renewable at Kirin Brewery's Sendai and Nagoya Plants, Château Mercian's all wineries, and Lion's all business sites in Australia and New Zealand. Lion launched carbon zero beer "Steinlager" and the carbon-neutral alcohol-free beer "XXXX Zero".

2023 Mercian Fujisawa Plant and Kyowa Kirin Ube Plant introduced large-scale photovoltaic system.

2024 Kirin Brewery switched its purchased electricity at all sales and production sites to 100% renewable.
Kirin group launched the Kirin Supply Chain Environmental Program.

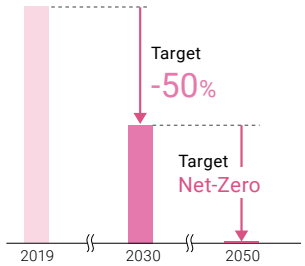
Targets and Progress

Target

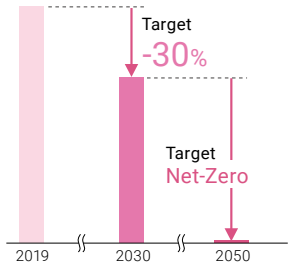
Reduction in GHG emissions

2050 Net-Zero (Environment Vision 2050)
2030 Scope 1 + 2 down 50% and Scope 3 down 30%
(compared with 2019) (SBT for 1.5℃ target)
2024 Scope 1 + 2 down 23% (compared with 2019) (non-financial target)

Total emissions for Scope 1 and Scope 2

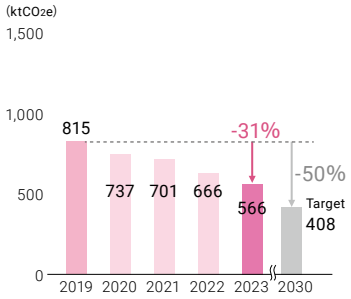


Scope 3 emissions

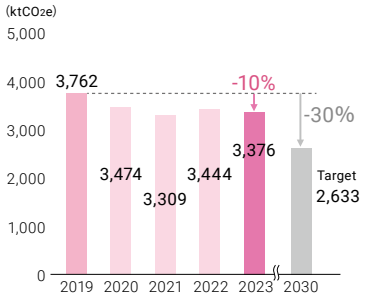


Actual results

Total emissions for Scope 1 and Scope 2



Scope 3 emissions



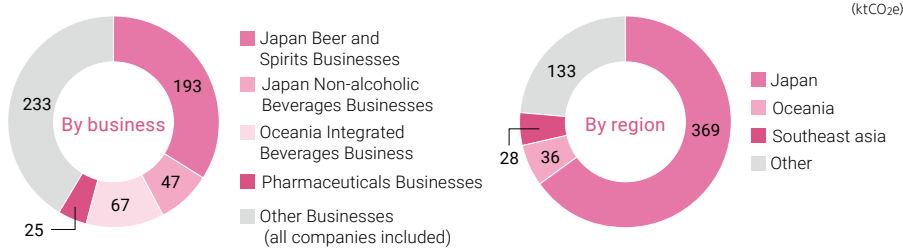
*1 In December 2020, we upgraded our previous "SBT for 2℃" target, and received approval for our "SBT for 1.5℃" target.

Main Activities

- Our long-term target to achieve Net-Zero GHG emissions across the entire value chain by 2050 certified as a science-based Net-Zero target (July 2022: the first case in food and beverage industry in the world) Obtained approval for the science-based 1.5℃ target (2020)
- Joined RE100 (2020) and set a target for renewable electricity use: 100% by 2040. Participated in Policy Working Group of RE100, and sent, as the working group, a policy proposals, e.g. expansion of renewable electricity infrastructure, to Japanese Government, aiming to achieve the 1.5℃ target.
- Achieved 100% renewable energy in purchased electricity at Kirin Brewery's all production and sales sites (two plants in 2022, three plants in 2023, and four plants and all sales sites in 2024), Kyowa Kirin Takasaki Plant, Ube Plant, research laboratories, etc., and Lion's plants in Australia and New Zealand (2023).
- Introduced large-scale photovoltaic system to nine Kirin Brewery plants (~2023, including eight breweries and plants with PPA model purchasing), Mercian Fujisawa Plant (2023), Kyowa Kirin Ube Plant (2023), Kyowa Hakko Bio Hofu Plant (2024), and Lion Castlemaine Perkins (2019)
- Launched the Kirin Supply Chain Environmental Program (2024)

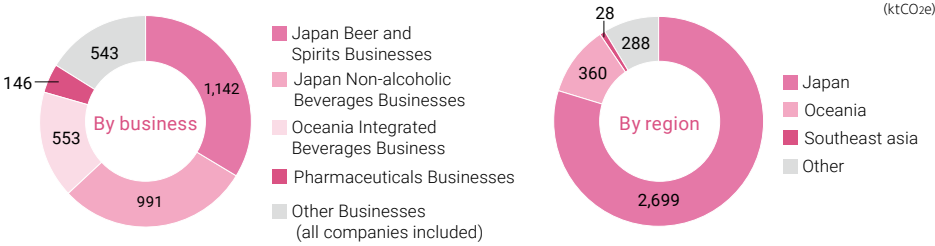
Total emissions for Scope 1 and Scope 2 (2023)

(ktCO2e)



Total emissions for Scope 3 (2023)

(ktCO2e)



Raw materials

Measures in tea farms for adapting to climate change

The Kirin Group contributes to Sri Lankan tea farms' measures for adapting to climate change through training programs for Rainforest Alliance Certification. Specifically ,Rainforest Alliance and Kirin Holdings promote tea farms to plant cover crops, grasses crawl on the ground, with deep roots on steep slopes. The cover crops prevent runoff of soil from erosion by torrential rain and falls in tea leaf production volumes.


Before measures


After measures to prevent soil runoff


Cover crops

Importing wine in large bags

Mercian imports some of its wine via marine transportation in specially designed 24kl bags (equivalent to about 32,000 of 750ml bottles) with low oxygen permeability and fills the wine into bottles in Japan. Compared to importing bottled wine, this method reduces Mercian's GHG emissions from marine transportation by roughly 60% by eliminating needs to transport heavy bottles by sea. Bottling in Japan enables us to use Ecology Bottles (made with at least 90% recycled glass), lightweight bottles, and PET bottles as containers. This production system reduces resource consumption and GHG emissions significantly throughout the value chain.


Specially designed large bags

In-line blow aseptic filling machine

In the past, we purchased empty PET bottles from container manufacturers and shipped them to plants where we filled them with beverages. With in-line blow aseptic filling machines, we mold PET bottles from preforms, thick, compact, semi-processed bottle, in our production processes and fill them under aseptic conditions. This system reduces GHG emissions of empty bottle transportation since trucks can carry much more preforms than empty molded PET bottles. In 2003, we installed preform molding equipment to a beverage production line at Kirin Distillery, the first case in Japanese beverage industry, reducing transportation loads of preforms.
At the Kirin Beverage Shonan Plant, in 2021, we switched our high-pressure compressors for PET bottle molding from V-type reciprocating compressors to screw compressors and horizontally opposed reciprocating compressors with variable frequency drives, thereby reducing annual power usage by around 8%. These machines enable us to recover waste heat from themselves and to reuse the heat to other processes.


Inverter-controlled pneumatic machinery

* The information and product images above are as of the end of June 2023.

Renewable energy

Switch purchased electricity for plants to 100% renewable

Kirin Brewery has achieved 100% of renewable energy for purchased electricity at Sendai and Nagoya Breweries since 2022, Fukuoka and Okayama Breweries since January 2023, Toride Brewery since April 2023, and Hokkaido Chitose, Yokohama, Shiga, and Kobe Breweries, as well as all sales sites, since January 2024. As a result, Kirin Brewery has achieved 100% renewable energy for purchased electricity at all production and sales sites, and the proportion of renewable energy in all electricity usage is 66%. We aim to achieve RE100 target as soon as possible and replace all electricity used in our global operation to renewable energy in the future.
Kyowa Kirin completed to switch purchased electricity to renewable of its manufacturing sites and research laboratories in Japan. Kyowa Kirin expanded the initiative from Takasaki Plant, Bio Production Technology Laboratories, Fuji Research Park, and CMC Research Center, in 2020, to Ube Plant in 2023. Through these initiatives, Kyowa Kirin reduced CO_2 emissions from its operation by 55% by the end of 2023 compared with those of 2019.
Since January 2022, all "Château Mercian" wineries (Château Mercian Katsunuma Winery, Château Mercian Mariko Winery, and Château Mercian Kikyogahara Winery) have achieved 100% renewable energy by applying renewable energy certificates with purchased electricity. At breweries in Australia and New Zealand for Lion, 100% of purchased electricity has been sourced from renewable energy since February 2023.


Kirin Brewery Sendai Plant


Kirin Brewery Nagoya Plant


Kirin Brewery Fukuoka Plant


Kirin Brewery Okayama Plant


Kirin Brewery Toride Plant


Mercian Katsunuma Winery


Mercian Mariko Winery


Mercian Kikyogahara Winery

Use of large-scale solar power generation

Kirin group values, in its renewable energy procurement, "additionality," which refers to creating new sources of renewable energy in the world, as well as "ethical procurement," which refers to considering the environmental impact and human rights in generating energy.
Kirin Brewery has introduced large-scale photovoltaic system at all nine plants (eight plants, excluding Yokohama Plant, use PPA model*1)
At Mercian Fujisawa Plant, we introduced photovoltaic electricity based on PPA model from March 2023. This initiative will reduce annual GHG emissions by approximately 124 tonnes, and increase the proportion of renewable energy in electric power used by Mercian as a whole from approximately 5% at present to approximately 8%.
At Kyowa Kirin, we have introduced large-scale photovoltaic system (1.47MW) based on PPA model at Ube Plant in 2023. This initiative reduced annual CO_2 emissions by approximately 1,029 tonnes.
Kirin Group Logistics, Kyowa Hakko Bio, and Shinshu Beverage have leased parts of their land and building roofs to photovoltaic generation businesses, contributing to both effective use of their assets and expansion of renewable energy.

Kirin Brewery
Hokkaido Chitose Plant

Kirin Brewery
Toride Brewery Plant

Kirin Brewery Shiga Brewery Plant

Mercian Fujisawa Plant

Use of solar power in Australia

Lion installed photovoltaic system to Castlemaine Perkins Brewery in 2019 and to Little Creatures Brewery in 2020.
Tooheys Brewery, the largest brewery in New South Wales, collaborates with Australian Hotels Association (AHA), contracting PPA with a renewable energy distributor.
By leveraging a buying power of Tooheys, AHA was able to introduce renewable energy at a lower price, successfully reducing the electricity unit cost for hotels' pubs from 11.5c/kWh to 6.9c/kWh.
In 2020, Lion became Australia's first large scale carbon neutral brewer, certified by Climate Active*2. Lion discloses carbon credits used to offset its emissions for a year in the annual report to comply certification requirement by Climate Active. The requirement is a new standard for carbon neutral certification in Australia.
In New Zealand, Lion has obtained Toitū*3 carbon zero certification since 2021.

Lion's Little Creatures Geelong

Renewable energy certificates

Since 2021, Kyowa Hakko Bio has introduced "Renewable Energy Certificates (I-REC)" at Thai Kyowa Biotechnologies in Thailand. This is the first case of I-REC application in pharmaceutical and food industries in Thailand. The initiative has offset emissions from electricity and reduced annual GHG emissions by 20,249 tonnes.
We have also introduced renewable energy certificates to Kyowa Hakko Kirin China Pharmaceutical and BioKyowa (I-REC and REC, respectively).

Wind power generation

Mitsubishi Corporation Offshore Wind Ltd., Venti Japan Inc., C-Tech Corporation, and Mitsubishi Corporation have been selected as power generation business operators for projects off the coast of Noshiro City, Mitane Town, and Oga City in Akita Prefecture, off the coast of Yurihonjo City in Akita Prefecture, and off the coast of Choshi City in Chiba Prefecture, through a consortium (the "Consortium") represented by Mitsubishi Corporation Energy Solutions, Ltd.
Kirin Holdings is a partner in the Consortium. These projects are Japan's first fixed-bottom offshore wind power generation projects in general sea areas. Both projects will be the largest power sources in Japan and will make a significant contribution to the Japanese government's commitment to achieve carbon neutrality by 2050. The maximum power output of the three projects will be approximately 1.69 million kW, which is sufficient to meet the electric power demand of approximately 1.21 million households.

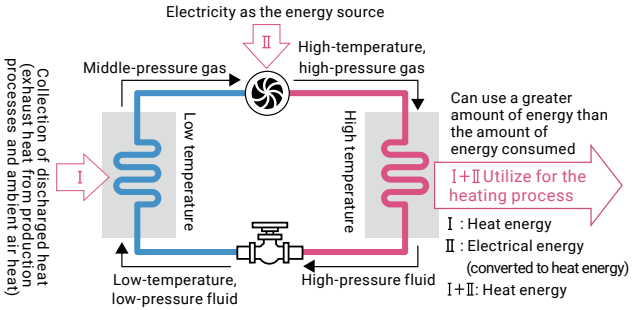
*1 PPA stands for the "Power Purchase Agreement" model and refers to an agreement between a business that sells electricity to users (PPA provider) and the users of electric power. At Kirin Brewery, MCKB Energy Service Co., Ltd., a subsidiary of Mitsubishi Corporation Energy Solutions Ltd., acts as a PPA provider, installing megawatt-class solar power generation facilities on the roofs of breweries, while Kirin Brewery purchases and uses the power generated.

*2 A third-party certification body established by the government of Australia
*3 A third-party certification body established by the government of New Zealand

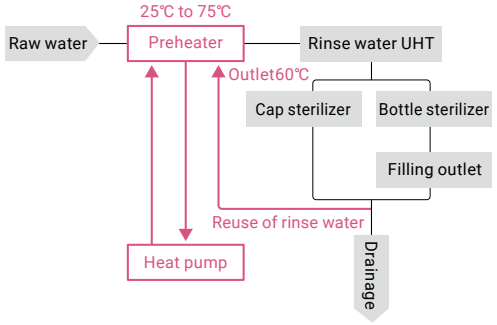
Use of heat pumps in production processes

The Kirin Group must improve energy efficiency and reduce the amount of energy consumption. At the same time, we believe that reducing dependency on fossil fuel combustion in production sites, and increase that on electricity, and, furthermore, using renewable electricity are the most effective ways of reducing GHG emissions. Kirin Brewery has successfully reduced its GHG emissions by approximately 70% over the 25 years from 1990 to 2015. In 2019, we introduced heat pump systems at the wastewater treatment facilities of six Kirin Brewery plants, thereby reducing GHG emissions by 3% (approximately 4,800 tonnes) from the previous year across Kirin Brewery as a whole (as of November 2023). At Shinshu Beverage, we reuse waste heat, which is difficult to use directly in rinsing processes for bottles and caps, through a heat pump unit, enabling us to reduce GHG emissions by approximately 970 tonnes per year. The Kirin Brewery Okayama Plant has reduced annual GHG emissions by approximately 180 tonnes by reusing waste heat and using thermal energy of atmosphere to a hot water sterilization process for cans.

Heat pump system



Shinshu Beverage production line



Reduction of GHG emissions and cost savings by heat pumps

	Total
CO_2 reduction	6,884 t-CO_2/year
Cost reduction	166,473,000 yen/year

Fuel conversion

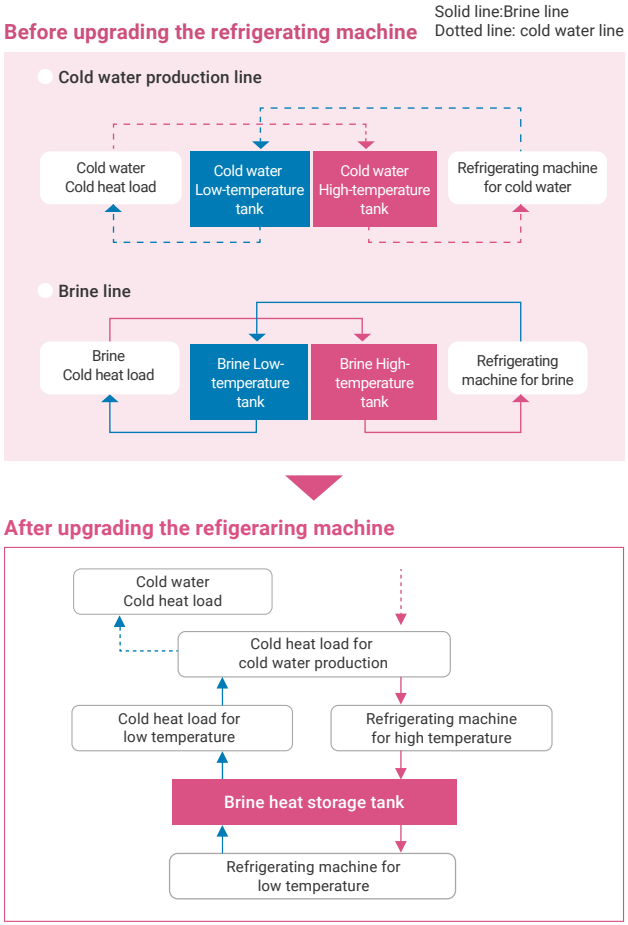
The majority of the fuel we use at breweries are consumed in boilers that generate steam. At all plants of Kirin Brewery and Kirin Beverage, we completely converted the fuel to natural gas, which generates less GHG emissions than heavy oil. We have achieved more efficient boiler operations through installation of highly efficient gas boilers. To meet part of the plant's heat and electricity needs, cogeneration systems have been installed to provide both heat and electricity.
Lion is planning to install an electric boiler at a brewery in New Zealand, which will begin operation in late 2025. It will save approximately 700 t-CO_2-e per year (6% of Lion Scope 1 and 2 emissions in New Zealand) by replacing the current LPG fuel.


Cogeneration

Improving the efficiency of refrigeration systems

At Kirin Brewery, we reduce energy consumption through improving the efficiency of refrigerating systems. We are introducing a cascade refrigeration system, which cools cooling media in multi-steps, a methodology to maximize energy efficiency of refrigerators.

Improving the efficiency of refrigeration systems



Containers and Packaging

Reduction of GHG emissions during transportation by reducing containers and packaging weight

Making containers and packaging lighter leads to reducing GHG emissions from production and transportation of the containers and packaging. Kirin Brewery and Kirin Beverage reduced GHG emissions from containers and packaging by a total of 5.3million tonnes*1 by reducing the weight of containers and packaging between 1990 and 2021.

*1 Calculated based on the Carbon Footprint Product Category Rule (Certified CFP-PCR Number: PA-BV-02) applied to the actual containers and packaging usage of Kirin Brewery and Kirin Beverage from 1990 to 2021.

Shrink labels

Roll labels

Annual CO_2 emissions when producing labels

Approximately **700t** reduction

Annual CO_2 emissions from recycled PET bottles and no label products

Approximately **1,300t** reduction

*Product photographs are current as of June 2023 or the time that events occurred.

Logistics

We are promoting joint deliveries and modal shifts

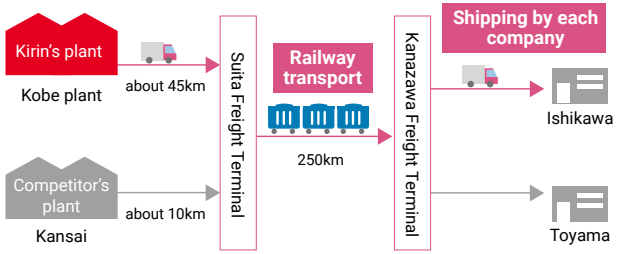
The Kirin Group regards logistics as a noncompetitive sector and is actively engaging in initiatives together with other companies in the same industry.
In 2017, Kirin Brewery and Asahi Breweries opened a joint delivery center in Kanazawa City, Ishikawa Prefecture, and launched joint train transportation from plants in western area of Japan. Neither of the companies has plants on the coastal side of Japan Sea, so products previously had to be transported by truck over long distances—of 200 km—from their plants on the Pacific Ocean side. This logistic was inefficient and heavy burdens for truck drivers. Joint transportation using train containers not only reduced significant GHG emissions but also shortened driving distances of trucks, significantly reducing burdens of drivers. Thus, the joint delivery contributes to solve capacity shortages of logistic industry, one of the biggest issues in Japanese society. Through these efforts, we have successfully completed modal shifts from long distance truck transportation, equivalent to 10,000 vehicles a year, to railway containers, and we estimate that we can thus annually reduce GHG emissions by approximately 2,700 tonnes.
In September 2017, we began joint delivery with Asahi Breweries, Suntory, and Sapporo Breweries in the eastern Hokkaido area. We estimate that the Hokkaido case results in a reduction in annual GHG emissions of approximately 330 tonnes. *1
Kyowa Kirin also applies joint deliveries and its Ube Plant utilize railway container transportation for raw material logistics.
The Kirin Group is actively pursuing modal shifts of switching from truck transport to rail and ocean transport, which has lower GHG emissions, for long-distance shipments (400 to 500 km or more). In April 2024, KIRIN GROUP LOGISTICS, Japan Freight Railway, and NIPPON EXPRESS implemented modal shifts for the Kirin Group's products equivalent to approximately 84,000 t-CO_2 (7,000 10 ton trucks, equivalent to approximately 17,000 five-ton containers) per year. This initiative is expected to reduce annual emissions by approximately 3,130 t-CO_2.

*1 Contribution to Avoided Emissions through the Global Value Chain, Fifth Edition, Keidanren (Japan Business Foundation)

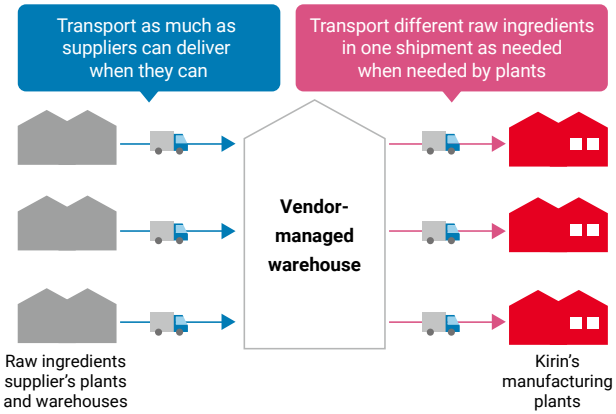
Vendor-managed warehouse

The use of vendor-managed warehouse can reduce long-distance transportation. As a result, GHG emissions are reduced, contributing to more sustainable supply chain.
With the aim of mitigating the risk of not being able to transport due to an unavailability of trucks and optimizing transportation efficiency, we started a trial operation of raw materials procurement and distribution system using raw materials warehouses (vendor-managed warehouses) close to Kirin Beverage's plants, Shonan Plant and Shiga Plant, in October 2019. By establishing vendor-managed warehouses, raw material and ingredient suppliers can transport desired amount of raw ingredients with ther convenient schedules, thereby maximizing efficiency. This initiative has made it easier for plants to cope with sudden changes in production plans and contributed greatly to improving production flexibility.

Joint delivery from Pacific Ocean side to Japan Sea side



Vendor-managed warehouse



Introducing “heat pump-type vending machines” as a pioneer of an industry and expanding the use of green power vending machines

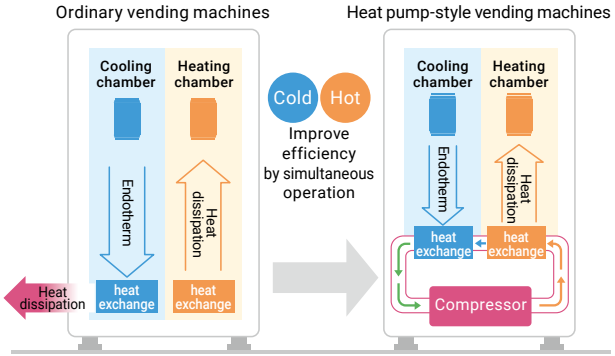
Kirin Beverage is the first in the industry to introduce heat pump-type vending machines in 2006, and from 2012, almost all newly installed vending machines for cans and PET bottles are of this type. As of March 2024, we have switched more than 90% of installed vending machines to this type.

Heat pump-type vending machines pump up waste heat generated from cooling functions and use the heat to warm up the products. This system reduces electricity consumption compared to conventional vending machines.

Some models offer higher energy-saving performance with heat source not only by recovering waste heat released by the cooling function but also by capturing heat from outside the machine and with improved insulation performance by effective use of vacuum insulation materials. These vending machines have evolved to the point where electricity consumption can be reduced by about 40% compared to 2013. Installation of the new models began in 2015, and we are aiming for approximately 90% of the new machines we install in 2024 to be new models.

Since January 2024, we have been expanding the use of green power vending machines to reduce Scope 3 emissions. This is an initiative to achieve net-zero GHG emissions by obtaining renewable energy certificates equivalent to the annual electricity consumption required for vending machine operation.

Heat pump function



Carbon neutral beer

Steinlager, which Lion sells in New Zealand, has obtained certification as a carbon zero beer under the Toitu program by a body of the New Zealand government. In 2021, we featured the Toitu carbon zero mark in our marketing campaigns to highlight to consumers the commitment Lion has made to reducing GHG emissions through Steinlager and other products.

In May 2022, Lion began selling “XXXX Zero,” Australia’s first carbon neutral and alcohol-free beer. XXXX Zero has obtained carbon neutral certification in the form of Climate Active certification.

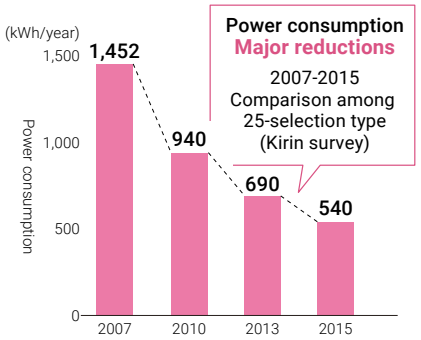
In Australia, Lion is preparing to acquire carbon neutral certification through Climate Active for many key products. In order to obtain certification, Lion is working to comply with the requirement that it must offset all GHG emissions from the complete life cycle of the product, including emissions from raw materials and packaging, distribution and product waste.

In 2020, New Belgium Brewing launched FAT TIRE ALE, the first carbon neutral beer in the United States. The carbon credits being purchased and amortized also contribute to economic support for converting farmers to regenerative agriculture.

New Belgium Brewery has created a beer called TORCHED EARTH ALE to show consumers what the future of beer might look like if climate change progresses. By showing consumers the taste of beer made from ingredients likely to be available in a future where climate change has progressed, the company is drawing attention to the importance of carbon-neutral products.

*Carbon neutral beer is referred to as "carbon zero beer" to match the name on the certification.

Trend in power consumption



TOITŪ NET CARBON ZERO ISO 14064-1 ORGANISATION

Product photographs are as of the time that events occurred.

Supply chain

Cooperation with business partners

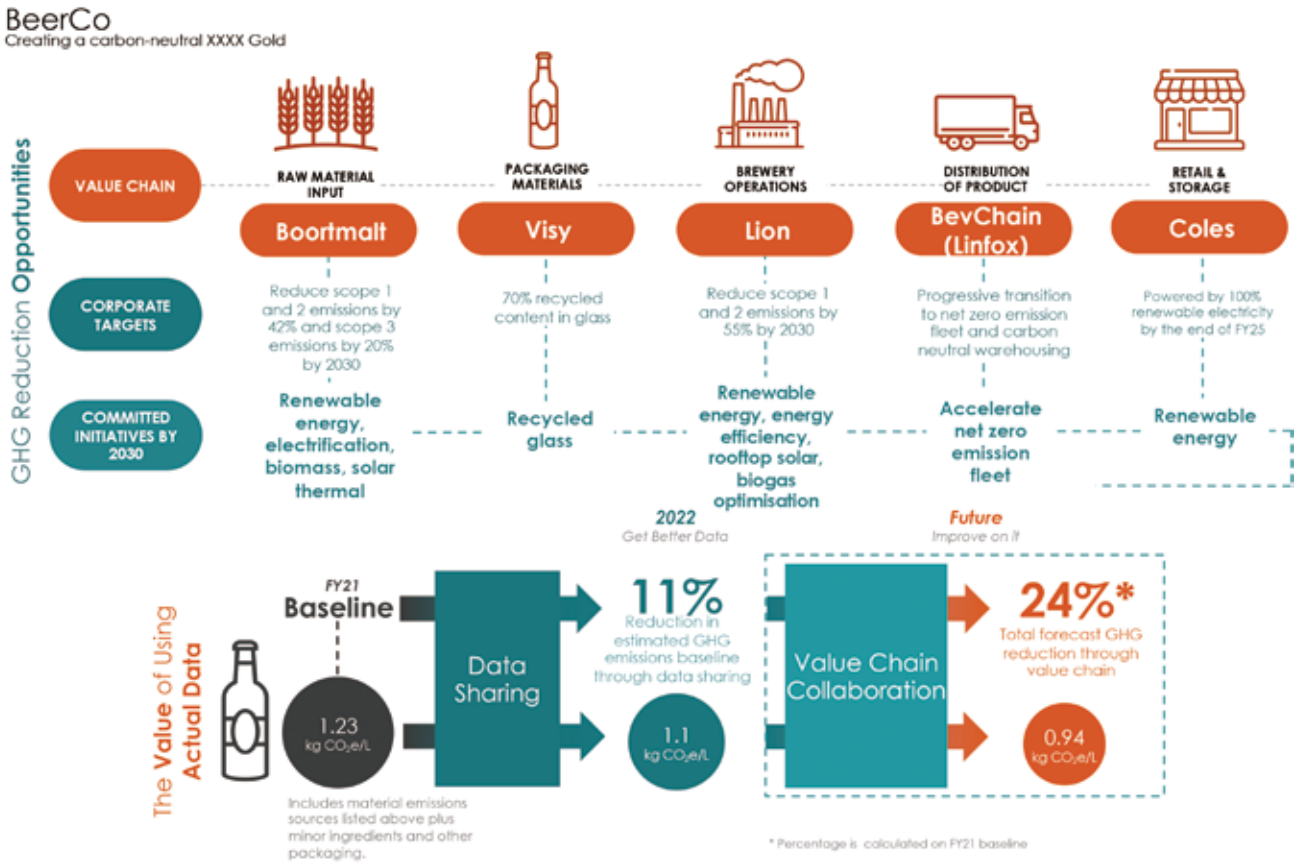
Of the categories in the “Scope 3 Standard” of the GHG Protocol, we will focus our efforts on Category 1 (purchased goods and services), which accounts for about 60% of the Kirin Group's Scope 3 emissions, followed by Category 4 (upstream transportation and distribution) and Category 9 (downstream transportation and distribution), which account for the next largest shares of emissions. In this way, we work to reduce emissions across value chain while prioritizing engagement and collaboration, through the “encouragement of reduction at business partners,” as well as the “reduction by our controllable measures.”

We have requested that all suppliers comply with the Kirin Group Sustainable Supplier Code, which includes measures to address climate change. Furthermore, in April 2024, we launched the Supply Chain Environmental Program. Through these efforts, we will strengthen cooperation with suppliers that have large GHG emissions, and promote activities in three main areas: mutual disclosure of actual GHG emissions data, target-setting requests and support for reducing GHG emissions in line with SBT levels, and cooperative efforts to reduce GHG emissions. We expect these efforts to contribute to a reduction of 10%, or one-third of our medium-term target to "reduce overall GHG Scope 3 emissions by 30% from 2019 levels by 2030."

Lion is a member of the Australian Climate Leaders Coalition, a group of CEOs of Australian companies.

For various reasons, it is difficult for suppliers, retailers, and other companies along their value chains to disclose actual data on their GHG emissions to each other. In response to this issue, the coalition adopted a system of pooling actual data to a third-party without mutual disclosure among the companies, and thus confirmed that the pooling system was able to identify Scope 3 emissions more accurately. These efforts started the conversation on how stakeholders in the value chains could work together to reduce emissions, which will result in higher Scope 3 reduction targets and contribute to highly effective actions. In addition, we are calculating the CFP per product and utilizing it to visualize GHG reduction status and set targets throughout the supply chain.

The Australian Climate Leaders Coalition has published these approaches as part of the “Scope 3 Roadmap.”



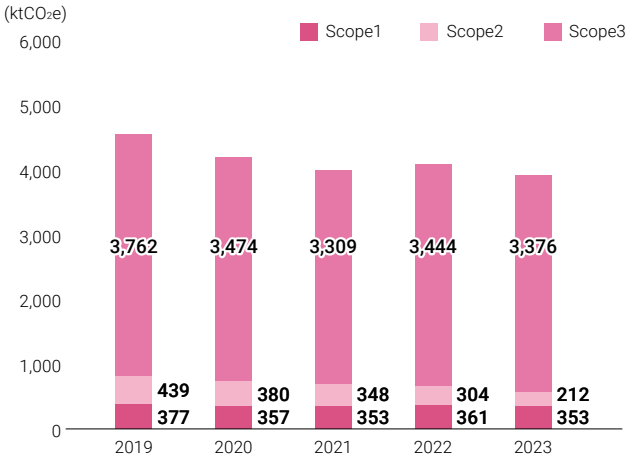
Key data related to climate change

Value chain greenhouse gas emissions

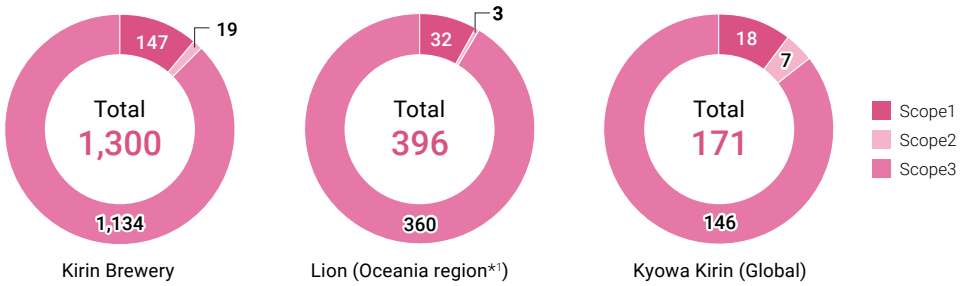
(ktCO2e)

	2019	2020	2021	2022	2023
Direct emissions from corporate activities (Scope 1 + Scope 2)	815	737	701	666	566
Scope 1 (Emissions from use of fuel)	377	357	353	361	353
Scope 2 (Emissions related to purchase of power and steam)	439	380	348	304	212
Indirect emissions (Scope 3)	3,762	3,474	3,309	3,444	3,376
Products and services purchased (Category 1)	2,568	2,390	2,281	2,357	2,253
Transportation and delivery (upstream) (Category 4)	520	486	434	428	415
Transportation and delivery (downstream) (Category 9)	294	281	273	267	246
Product use/disposal (Category 11, 12)	64	60	64	63	65
Other (Category 2, 3, 5, 6, 7, 8, 10, 13, 14, 15)	316	257	257	330	397
Emissions from entire value chain (Scope 1 + Scope 2 + Scope 3)	4,577	4,211	4,010	4,110	3,942

Trend in value chain greenhouse gas emissions

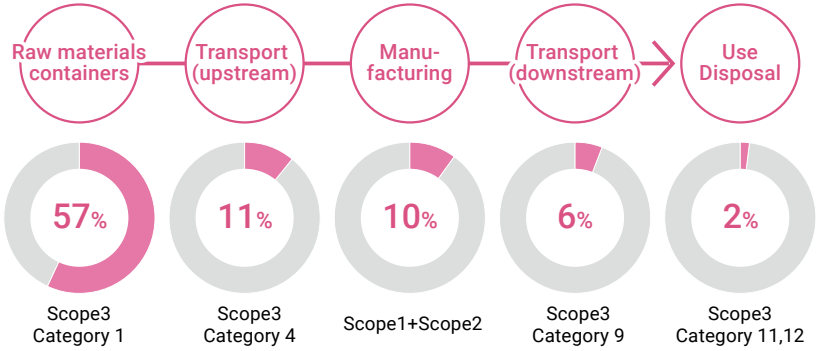


GHG emissions by business (2023) (ktCO2e)

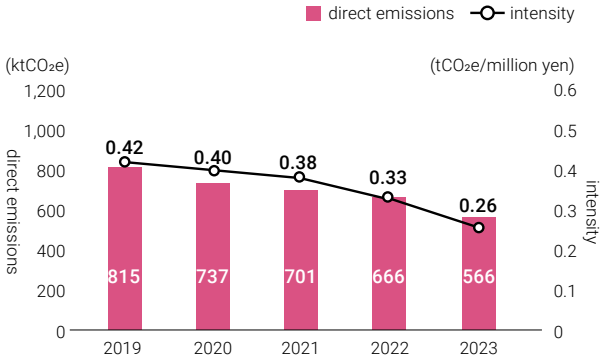


*1 This region covers the Oceania region where Lion conducts business activities.

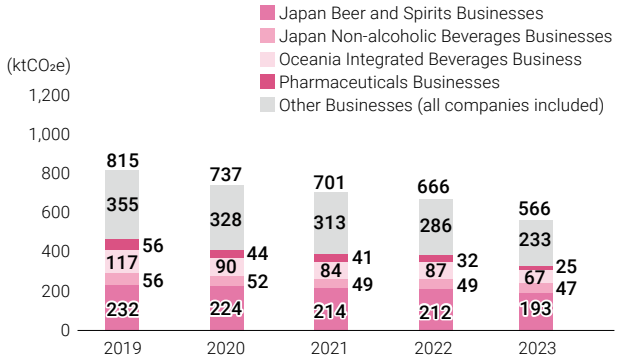
Ratios of greenhouse gas emissions in value chain (2023)



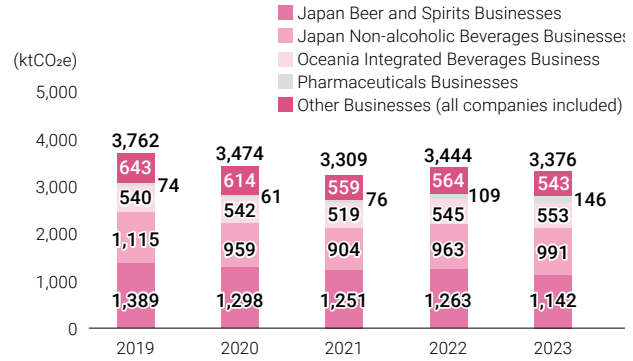
Total direct emissions (Scope 1+2) and intensity (emissions/sales revenue)



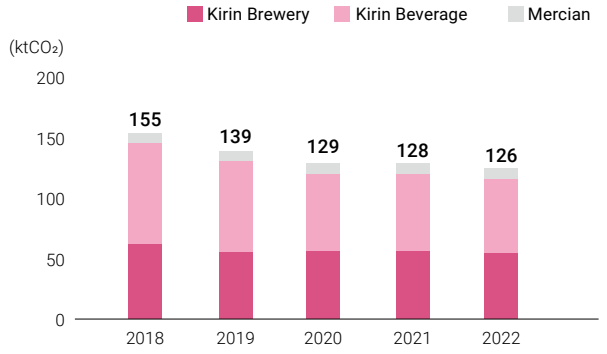
Kirin Group total direct emissions by business segment (Scope1 + 2)



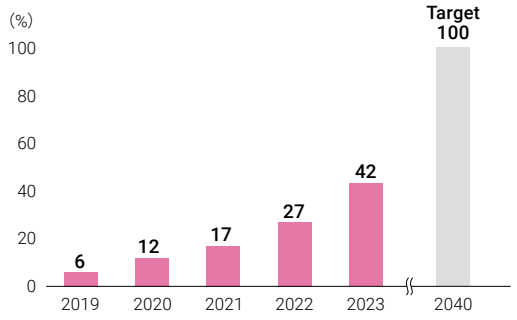
Kirin Group total Scope 3 emissions by business segment



CO_2 emissions associated with domestic transportation



Ratio of renewable energy to total electric power used in the Kirin Group as a whole



We provide the latest updates on our initiatives related to climate change on the following website.
https://www.kirinholdings.com/en/impact/env/3_1/

Overview of Holistic Analysis of Environmental Management Risks and Opportunities, Business Impact, and Strategies

In this section, we list and disclose risks and opportunities, business impact, and analysis of related strategies, for each category for which disclosure is required by the TCFD recommendations (June 2018), new TCFD guidance (October 2021), v1.0 of the TNFD recommendations (September 2023), and other standards.
There are many areas where climate change and natural capital cannot be assessed separately because they are interrelated, and we must therefore adopt integrated strategies to solve these issues. Accordingly, we provide information concerning risks and opportunities, business impact, and strategies for categories common to both frameworks. We have also provided information related to containers and packaging under categories that we have deemed relevant.
We assume that readers will refer to the information in this part as a single whole together with the information disclosed in "Holistic Environmental Management Information Disclosure Based on the TCFD Framework, TNFD Framework Draft, etc." (→P.15～P.40).
We also assume, however, that there are many occasions where readers will only refer to this part independently, and we have therefore reiterated the same tables, graphs, figures, etc., in both parts as necessary.

We plan to meet TNFD disclosure standards over a period of approximately five years.
The following is a rough overview of our schedule starting in 2022.

2022	Became a global pioneer with disclosure compliant with the LEAP approach advocated in beta v0.1 of the TNFD Framework
2023	Trial scenario analysis at New Belgium Brewery, US, with the participation of TNFD members Assessment of the financial impact of natural capital Trial assessment of risks and opportunities related to natural capital Detailed analysis of tea farms in Sri Lanka Trial of holistic disclosure with TCFD
2024	Holistic risk and opportunity assessment and determination of priority regions in accordance with v1.0 of the TNFD recommendations Detailed assessment of priority regions Holistic disclosure of natural capital, climate change, and the circular economy
2025	Revision of the "Action Plan for Sustainable Use of Biological Resources" to reflect the results of the assessment of natural capital Conduct a detailed analysis of some material natural capital identified Review of the natural capital roadmap
2026	Completion of detailed analysis for identified material agricultural products and priority regions Establishment and start of execution of our natural capital roadmap

Climate change scenarios

		Kirin Group Scenario 3 4℃ scenario. SSP3, RCP8.5	Kirin Group Scenario 1 2℃ or 1.5℃ Scenario. SSP1, RCP2.6
Scenario		●Laws and regulations related to climate change are strict in developed countries, but insufficient globally, resulting in failure to achieve the required reduction in GHG emissions. ●Higher temperatures, droughts and heavy rains, and reductions in daily temperature ranges lead to significant decreases in the yield and quality of agricultural products. Natural disasters caused by climate change also become frequent and severe. ●The financial impact on companies of compliance with laws and regulations and energy usage is small, but it becomes difficult to use low-cost, high-quality natural capital. ●Global warming also leads to an increase in infectious diseases, heatstroke, etc.	●Governments around the world enact strict laws and regulations related to climate change, resulting in a sufficient reduction in GHG emissions. ●The rise in temperature is curbed, natural disasters do not increase much more than current levels, and the impact on agricultural yields is also limited. Natural disasters do not change significantly from current levels. ●The financial impact on companies of compliance with laws and regulations and energy usage is large, but the cost of using natural capital is acceptable. ●The impact of global warming on health is minimal.
Analysis results		●Significant decline in yields of major agricultural products. Possible decline in quality. Increase in procurement costs. ●Damage to agricultural production areas, production stoppages, and delivery difficulties due to floods and droughts caused by climate change. ●The increase in energy costs and agricultural prices due to carbon taxes is minimal. ●There is major harm from infectious diseases and heatstroke due to global warming.	●The impact on yields of agricultural products and procurement costs is minimal. ●The impact of floods and droughts caused by climate change on agricultural production areas, production, and delivery is minimal. ●The impact of energy costs and agricultural prices due to carbon taxes is major. ●The impact of infectious diseases and heatstroke due to global warming continues.
Scientific basis	Agricultural products	●Decreases in global beer supply due to extreme drought and heat, Nature Plants, VOL.4, NOVEMBER 2018, 964–973 (Xie, et al.) ●IPCC (2019) Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems Chapter 5: Food Security ●Risk of increased food insecurity under stringent global climate change mitigation policy. Nature Climate Change,volume 8, pages 699–703 (Hasegawa T, Fujimori S, HavlíkP, Valin H, BodirskyBL, DoelmanJC, FellmannT, Kyle P et al. 2018) ●Zebish et al (2005) “Climate Change in Germany Vulnerability and Adaptation of climate sensitive Sectors” FAO “Food and agriculture projections to 2050” etc.	
	Drought risk	●Aqueduct 3.0 (current risk), Aqueduct 2015 (risk assessment combining future projections, climate scenarios RCP4.5 and RCP8.5, and socioeconomic scenarios SSP2 and SSP3), etc.	
	Flood risk	●AIR Touchstone version 8.2	
	Agricultural products (impact of global warming on prices and carbon taxes)	●IPCC (2019) Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems Chapter 5: Food Security and Risk of increased food insecurity under stringent global climate change mitigation policy. Nature Climate Change,volume 8, pages 699-703 (Hasegawa T, Fujimori S, HavlíkP, Valin H, BodirskyBL, DoelmanJC, FellmannT, Kyle Petal. 2018)	
	Energy	●IEA “World Energy Outlook 2019” Annex A (rate of decline in future electric power emission factors), IEA WEO 2019 (Kirin Group Scenario 3: Current Policies Scenario, Group Scenario 1: SD Scenario, 1.5℃ Scenario: IPCC Special Report on Global Warming of 1.5℃)	

Natural capital scenarios

		Kirin Group Scenario 3 4℃ scenario. SSP3, RCP8.5
Scenario		Original scenario
Scope of analysis	Dependence	●Order of assessment: tea, cardboard, soybeans, cartons, palm oil, hops, barley, wine grapes, and coffee beans
	Impact	●Order of assessment: coffee beans, hops, tea leaves, soybeans, palm oil, cartons, barley, cardboard boxes, and wine grapes
Scientific basis	GHG emissions by agricultural product	●Carbon footprint: CarbonCloud	ClimateHub database ●Agricultural production data: FAO average over the past five years, emissions models based on PCC guidelines, and global warming factors applied to IPCC GWP100 ●Paper: CFP data from the Japan Paper Association (because it is not in the ClimateHub database)
	Land use footprint	●Area harvested (ha) per crop and production quantity: t): Calculation of acreage per unit yield (ha/t) using 2022 data in FAO FAOSTAT ●Paper: Calculated using data from papers related to global forest product footprint estimation (because it is not included in FAOSTAT)
	Water footprint by agricultural product	●M. M. Mekonnen and A. Y. Hoekstra (2011) The green, blue and grey water footprint of crops and derived crop products Hydrol. Earth Syst. Sci., 15, 1577–1600 If not included in this, the water footprint was identified in another paper by Schyns et al. ●Joep F. Schyns, Martijn J. Booij, Arjen Y. Hoekstra (2017) The water footprint of wood for lumber, pulp, paper, fuel and firewood Advances in Water Resources Volume 107, September 2017, Pages 490-501
	Commodity risk	●Judged based on whether or not agricultural products are included in the SBTN's High Impact Commodity List ●Judged based on whether or not they are included in the list of commodities covered by the European Regulation on Deforestation Free Products (EUDR)
	Agricultural products and water risk by region	●Assessed by cross-referencing data on food production, demand, trade, prices, and hunger in countries and regions around the world from the WRI's Aqueduct Food and the International Food Policy Research Institute (IFPRI)

Details of physical risks

Climate change | Natural capital | Containers and packaging

Declining yields of agricultural products and increase in procurement costs [medium to long term]

Yields of agricultural raw materials may decline significantly owing to global warming and reductions in daily temperature ranges caused by climate change.

We assessed financial impacts caused by lower yields using the 25-75 percentile range of the distribution of forecast data of changes in prices. We forecast that procurement costs for agricultural products would increase by approximately 1.3 billion yen to 3.4 billion yen in 2050 under the 2℃ scenario, and approximately 3.6 billion yen to 13.7 billion yen under the 4℃ scenario (Graph: Impact of lower yields on procurement costs for agricultural products in 2050). The price range of 25-75 percentile under the 4℃ scenario was approximately 4 times larger than that of the 2℃ scenario. The difference implies that uncertainty and risks under the 4℃ scenario is higher than the 2℃ scenario. A British academic book* forecasts that European hops' yields will fall by 4-18% and the bitterness component (alpha acid) content will fall by 20-31% by 2050.

Additionally, we identified, in surveys related to water risk and water stress, severe levels of drought risk and flood risk in areas producing agricultural raw materials. The risks may impact agricultural products (Table 9).

We estimated the financial impact due to declines in agricultural yields using data from 2023 for Kirin Brewery, Kirin Beverage, Mercian, Lion (Oceania region only), Kyowa Kirin, and Kyowa Hakko Bio, referring to academic papers. Our estimates covered the following agricultural products: barley, hops, tea leaves, grape juice, starch, lactose, corn, and cassava.

Climate change | Natural capital | Containers and packaging

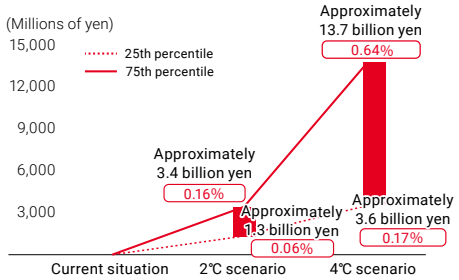
Change in the status of nature [medium to long term]

At tea farms in Sri Lanka, soil erosion and soil runoff have become problems owing to factors such as heavy rainfall caused by climate change and development in areas surrounding the farms due to economic growth. In addition, there is soil pollution caused by the use of agricultural chemicals and other problems, and these factors may change ecosystems and reduce yields of agricultural raw materials.

1 Impact of climate change on yields of key agricultural products (forecast for 2050 unless otherwise specified)

Agricultural products	Kirin Group Scenario3: 4℃, unwanted world, 2050			
	America (North and South)	Asia	Europe and Africa	Oceania
Barley	Canada -12% (2100) U.S. +9%(2100)	West Asia -5% to +10% Korea +0.5%	Finland -5.9% (spring barley) France -10% or more(Winter barley) -20% or more(Spring barley) Mediterranean coast (West)-0.3%(Portugal, Spain, France, Italy) (East)+4.4% Germany -14% to +18%	Western Australia -10 to -30%
Hops	U.S. (Washington) -16% (2100)		Czech Republic -8.5%	
Tea leaves		Sri Lanka Decline in yields in lowlands, low impact in highlands India (Assam region) 3.8% decline in yields per 1°C increase above average temperature of 28°C India (Darjeeling region) -40% to -80%	Kenya Change in suitable land from 1500 to 2100 meters above sea level to 2000 to 2300 meters above sea level. Drastic reduction in suitable land in the western part of Kenya, with land remaining suitable in the mountainous area of Kenya Malawi Chitipa 80% reduction in suitable land Nkhata Bay 60% reduction in suitable land Mulanje 70% increase in suitable land Thyolo 20% increase in suitable land	
Wine grapes	U.S. (California) 60% reduction in suitable land U.S. (Northwest) 231% increase in suitable land Chile 25% reduction in suitable land	Japan(Hokkaido) Increase in suitable land, Pinot Noir cultivation possible Japan (Central) Increase in suitable land while also anticipating obstacles from high temperatures	Northern Europe 99% increase in suitable land Mediterranean 68% reduction in suitable land Spain Change in overall wine production for each 1°C rise -2.1% (Spain as a whole) -4.6% (Andalusia) -4.8% (Duero River Valley) -34.6.% (northern Mediterranean)	New Zealand 168% increase in suitable land Australia (southern coast) 73% reduction in suitable land Australia (ex. southern coast) 22% reduction in suitable land
Coffee beans	Brazil 55% reduction in land suitable for arabica 60% reduction in land suitable for robusta	Southeast Asia 60% reduction in land suitable for arabica 52% reduction in land suitable for robusta	East Africa 13% reduction in land suitable for arabica 16% reduction in land suitable for robusta	
Corn	U.S. (Southwest) -27% U.S. (Midwestern Iowa) -5% to -12% U.S. -46/5% (2100) Brazil -19/4% (2100) Argentine -28.5% (2100)	China -27.4%	Ukraine -40.6% (2100)	
Soybeans	U.S. -10% (2080) Brazil -20% (2080) Argentine +40% or more	China +16% to +50% (2100) India -80%		

2 Impact of lower yields on procurement costs for agricultural products in 2050



Estimated for the main agricultural raw materials at Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, and Kyowa Hakko Bio.
Figures in [ ] show the percentage of revenue

* Recalculated with 2023 data

*Climate-induced decline in the quality and quantity of European hops calls for immediate adaptation measures | Nature Communications
https://www.nature.com/articles/s41467-023-41474-5

Response strategy

●Beer brewing technology that does not rely on barley (adaptation measures)

Nodogoshi Nama, which Kirin Brewery sells in Japan, is an alcoholic beverage that tastes like beer and is brewed using soybeans. We believe that the technical knowledge to achieve a beer-like flavor without relying on barley will serve as an adaptation measure for a potential decline in barley yields due to climate change in the future. We have also conducted surveys and analyses related to high-fructose corn syrup and protein sources, which are required to brew low-malt and no-malt beer products, not just *Nodogoshi Nama*, while referring to numerous academic papers, and as a result (Table 4), we have judged that there are no major issues at present.

In 2021, an international research team, including Japan's National Institute for Environmental Studies and the National Agriculture and Food Research Organization (NARO), reported that average global yields of corn, a raw material for high-fructose corn syrup, will fall by approximately 24% by the end of this century (2069 to 2099) compared with the present (1983 to 2013) under the 4°C scenario (approximately 18% increase in wheat yields). In addition, according to a study by Tigchelaaret et al., the probability of a simultaneous decline of at least 10% in yields in the four major production areas (US, China, Brazil, Argentina) is 80% or more under the 4°C scenario (2075 to 2132), 10% under the 2°C scenario (2042 to 2055), and 0% at present, indicating the possibility of avoiding a decline in yields by limiting global warming (Table 3). We anticipate that yields of sugar cane, which can act as a substitute for high-fructose corn syrup besides corn, will fall in Brazil, the leading producer, but will rise in parts of China and India.

Although there will be some variation in yield depending on the variety, we expect yields of potatoes to rise in India and the US, and overall, we do not expect yields to fall.

As for soybeans, which are a raw material for *Nodogoshi Nama*, we forecast that yields will either rise or fall depending on the region, but we have judged that there will be no significant change in global yields as a whole. We believe that it will be possible to respond to changes in the yields of these agricultural products by diversifying production areas, changing raw materials, and leveraging production technologies.

3 Probability of simultaneous 10% or 20% decline in average yield compared to the current level due to climate change in the four largest corn exporters

	2℃ scenario		4℃ scenario	
Country	>10%	>20%	>10%	>20%
United States	68.6	29.5	100.0	96.9
China	46.2	16.8	98.8	89.2
Argentina	50.0	9.9	96.9	86.9
Ukraine	51.8	19.2	98.2	85.0

4 Impacts of climate change on raw materials for high-fructose corn syrup and soybean yields (4° C scenario, 2050, unless otherwise noted)

Agricultural Products	Regional Harvest Forecasts		
	North America	South America	Asia
Sugarcane	–	Brazil -9.6%~+1.4%	Pakistan +1.6%~+4.1% China +22~+40%(2060)
Potatoes	United States No fertilizer effect Atlantic -20%~-27% Russet Burbank +0~+5% Fertilizer effective Atlantic 0~-5% Russet Burbank +18%	–	India +5.7%~+6.2% China Rainfed agriculture - Dabaihua +21.8% (2060) Irrigated agriculture, Kexin-1 +20.9% (2060)
Soybeans	United States (Central) No effect of fertilizer application -33.3% (2080) Fertilizer application +4.4% (2080)	Brazil -20%(2080)	China +50%(2080) India -8.24%

●Support for farms to acquire certification for sustainable agriculture (adaptation measures)

We will continue to support the acquisition of sustainable farm certification in order to secure production areas for agricultural products that are resilient to climate change.

Training for obtaining certification involves methods of reducing soil runoff against torrential rain by planting undergrowth on farmland and of using pesticides and fertilizers on white lists with adequate the amounts of use.

In the future, we will promote regenerative agriculture in order to minimize environmental impacts while also working to restore the nature.

●Mass plant propagation technologies (adaptation measures)

We will continue efforts to accumulate knowledge concerning applications for "mass plant propagation technologies" developed by the Kirin Central Research Institute, to prepare for falling yields of agricultural products as a result of climate change. We expect the knowledge can be used if heat-tolerant agricultural breeds are developed.

It would be difficult for the Kirin Group to transition to a business model that is completely independent of barely and hops, but we anticipate that "mass plant propagation technologies" will have a positive impact on the stability of agriculture through the cultivation of agricultural breeds suited to global warming.

The propagation technology uses "plastic bag-type culture vessel technology," which the Kirin Group has developed proprietarily. The vessel technology enables us to significantly increase growth rates of healthy seedlings with no diseases and seedlings that are genetically identical to their parents (clones) by multiples of tens or hundreds of thousands. We propagate plants by aerating a solution containing nutrients necessary for plant growth inside a bag, enabling us to use water effectively and cultivate plants in areas with high levels of water stress. In this way, we expect that we can reduce our impact on regional problems related to water.

The Kirin Central Research Institute has also developed a technology for the mass production of hops, an ingredient in beer, after successfully developing a globally pioneering approach for promoting the formation of axillary buds for hops.

More information→P.40

●GHG emissions reduction (mitigation measures)

In order to minimize the risk of falling agricultural yields, we will promote initiatives aimed at achieving Net-Zero emissions by 2050 and our science-based 1.5℃ target by 2030, in accordance with renewable energy targets under RE100 by 2040.

Details of physical risks

Climate change | Natural capital | Containers and packaging

Improper disposal of used containers [medium to long term]

If used containers of our businesses are disposed into the environment without proper recycling, they may cause damage to the natural environment and it is possible that we will face penalties associated with such damage. If we internalize externalities associated with ocean plastic pollution, we estimate that it will amount to approximately 1.1 billion yen in the future. We multiplied the "impairment cost of marine ecosystem services per ton of marine plastic," as described in a paper by Beaumont et al., by the amount of Kirin Beverage's PET materials released into the ocean. As a result, we calculated negative externalities caused by ocean pollution from sales of the Kirin Group's PET bottle products. In addition to the possible expenses described above, the PET disposal may cause stricter recycling regulations, criticism to use of plastics, and an decline in corporate brand value if companies do not respond appropriately to the plastic problems.

Response strategy

●Building a society that recycles plastics

In accordance with the "Plastic Policy" that we established in 2019, Kirin Group is progressively increasing the ratio of recycled PETresin used in its bottles to 50% by 2030 and to 100% sustainable container use by 2050. To ensure proper collection of used PET bottles, we are working with other companies and local governments to improve the efficiency of sorting and collection. At present, mechanical recycling is the mainstream, but we are also promoting the development of practical applications for chemical recycling to recycle PET products other than PET bottles and dirty PET bottles into high-quality PET bottles. Lion has also developed a "Sustainable Packaging Strategy" to promote recycling in Australia and New Zealand. In order to promote this strategy, Lion launched the "Lion's Sustainable Packaging Project Steering Group," and is promoting activities in partnership with the APCO (Australian Packaging Covenant Organisation) to achieve these goals.

Details of physical risks

Climate change | Natural capital | Containers and packaging

Disruption of operations owing to floods [short to long term]

Significant impacts, including disruptions to brewing and manufacturing, may occur as a result of damage from typhoons, heavy rainfall, and other disasters caused by climate change.
The Kirin Group has operated businesses in Japan and Australia, two countries where the level of water stress differs significantly. As such, we have developed an understanding rooted in experience of the fact that problems related to water differ between countries and regions, and that they largely depend on basins and specific locations. Since 2014, the Kirin Group has been conducting regular scientific surveys.
In 2024, we conducted surveys and analyses of water risk at brewing and production sites using Aqueduct 4.0, hazard maps created by local governments, and other resources (Figure 6: Manufacturing Site Water Risk/Stress). As a result, we found that water stress and water risk have worsened at many business sites. Floods and other forms of water risk are high at six plants or breweries in Australia and two plants or breweries in the U.S. Lion's Castlemaine Perkins Brewery in Australia, which we assessed as having a high level of water risk, has experienced flooding due to very heavy rainfall twice in 10 years, despite being in an area with high water stress. The Colorado River, used by New Belgium Brewery, a craft brewery in Colorado, the U.S., spans five states and each state has agreed upon restrictions on the use of water. In 2023, we held a scenario analysis workshop together with TNFD members. At the workshop, we confirmed that New Belgium Brewery is working with the community to solve issues related to water.
Our management benchmark for the financial impact of flooding on breweries and plants is approximately 1.0 billion yen to 5.0 billion yen, in line with the actual amounts of flood damage in the past (Table 6).
We are also using wind and water damage simulation systems to forecast losses from the risk of flooding. Our exposure to general 200-year disasters (the total of 20 business sites in Japan) is approximately 1.0 billion yen. There may be a possibility of flood damage at our business sites from a rise in sea levels caused by global warming, but although there are forecasts for a rise in sea levels of 0.46 to 0.97 meters with a 4℃ increase in temperature in Japan, we think it is still difficult to form a quantitative assessment. Going forward, we will continue paying close attention to the results of research.*1

5 Manufacturing Site Water Risk/Stress

* For water risk, water stress, and water pollution, we have referred to the following items, using the latest Aqueduct 4.0 (WRI).
Water stress: Baseline Water Stress
Water risk: Physical Risks Quantity
Water pollution: Untreated connected wastewater
See →P.114 for the number of business sites.

6 Water risk (Actual damages in past factory flooding events)

Country	Operating companies	Plant	Cost of damage*2	Sales ratio
Australia	Lion	Castlemain Perkins Brewery	Approx. 1 billion yen	0.05%
Japan	Kirin Brewery	Sendai Plant	Approx. 5 billion yen	0.27%

7 Results of wind damage simulation

Recurrence period (years)	Flood AEP(JPY)*3
1000	21,768,643,347
500	16,373,304,101
200	1,030,581,609
100	2,590,244
50	52,859

*1 Japan Meteorological Agency: Observed facts and future projections of sea level, storm surge and high waves - from "Climate Change in Japan 2020".
https://www.mlit.go.jp/kowan/content/06.pdf
*2 The amount for the Sendai Brewery is from tsunami and earthquake damage in the 2011 Great East Japan Earthquake
*3 Aggregate Exceedance Probability

Kirin Brewery Nagoya Plant

Castlemaine Perkins Brewery

Response strategy

●Sharing of knowledge on responses to floods (adaptation measures)

At breweries and plants in areas where, comparatively, there is leeway in terms of time until flooding occurs, we will minimize damage in ways such as shutting down power sources in advance. When flooding occurred at Castlemaine Perkins Brewery in 2011, there was some time between the flood alert and the actual flooding. We shut down power sources in the brewery in advance immediately after the flood alert, and as a result, we prevented harm from short-circuiting to electrical equipment in the brewery, and were able to reduce the amount of damage and quickly restart operations. Similar countermeasures were effective against partial flooding at the Kirin Brewery Nagoya Brewery in 2000.

●Insurance for flooding (adaptation measures)

We will consider insurance at business sites as an effective measure against natural disasters, including floods.
In 2020, we used the natural disaster model AIR to simulate wind and water damage for our main 20 business sites in Japan, thereby estimating loss percentages and amounts of damage for each recurrence period. For 200-year disasters (a disaster occurring once every 200 years), the total exposure across the Kirin Group was approximately 1.0 billion yen. At KYOWA PHARMA CHEMICAL, however, we calculated that the annual amount of damage from a wind and water disaster of a scale occurring once every 500 years would be equivalent to 42% of the value of its property. Accordingly, in 2022, we conducted on-site surveys, and confirmed that the amount of damage would be precisely equivalent to 17%. We also conducted risk surveys at Thai Kyowa Biotechnologies, which is located in an area where flood and other water risks are expected, in 2023 (Table 7).
Going forward, we will continue gradually conducting on-site risk surveys and assessing the possibility of insurance for business sites that we have judged to be at high risk of future flood damage, based on our wind and flood simulation system.

●Addressing flooding at facilities (adaptation measures)

We assume that flooding would have a serious impact on the continuity of our businesses, and we will therefore promote physical countermeasures as necessary at business sites where we must fulfill our responsibility to supply customers without interruption.
At Kyowa Kirin, we have judged that the amount of damages from recovery, production disruption, and business opportunity losses would be considerable in the event that water damage, etc., caused long-term disruptions to operations at Kyowa Kirin's own pharmaceutical plants, commissioned manufacturers of drug substances, and packaging material suppliers.
At Kyowa Kirin's own sites, we have formulated policies on countermeasures against water damage, and have taken measures to prevent flooding (geographically distributed storage of important assets related to production, waterproofing of buildings, moving important facilities to high floors and locations, the installation of flood walls, etc.). In the future, we intend to continue to address these issues through investment in our facilities. We will assess and address the impact across the supply chain as a whole, and take steps to avoid production disruptions and minimize damages.
At the same time, there will be a significant impact on companies commissioned to manufacture drug substances, packaging material suppliers, etc., so we will gather information about water damage countermeasures at each partner company, identify issues, and consider measures such the formulation of BCPs and disaster response drills.

*1 We have assessed risk related to flooding in a multifaceted manner, using multiple systems. Aqueduct can be used to assess risks, not just at the present but also including future forecasts. Aqueduct is the most widely used water risk assessment tool today, so one of its advantages is that it has a high potential for comparisons, but we do not know all aspects of the grounds for its assessments in details, and in some aspects it does not fully reflect Japan's complex water systems. Hazard maps provide an assessment of the worst expected damage by local governments with a deep understanding of the area. We believe that when hazard maps and Aqueduct are used together, it enables more accurate risk assessments. With simulation systems, it is possible to estimate loss percentages and amounts of damage for each recurrence period, so we use them to identify our exposure and make judgments concerning insurance.

Details of physical risks

Climate change | Natural capital | Containers and packaging

Impact on transportation from floods [short to long term]

There may be an impact on product distribution and the transportation of raw materials from typhoons, heavy rainfall, and other disasters caused by climate change. In 2018, the West Japan Torrential Rain Disaster resulted in long-term disruptions to railroads and roads in the Chugoku region, and there were major obstacles to the transportation of products from breweries and plants to customers. In 2022, we conducted a survey concerning flooding risk and countermeasures in major barley shipping ports overseas. As a result of this survey (Table 8), we found that flooding risk was low in Canada, Australia, and the United Kingdom, and that while there was a risk of future floods of between 0.5 and 5 meters in the Netherlands and Germany, planned countermeasures have been formulated and implemented. We also found that, even when flooding risk is not high in the bays themselves, disasters affecting railroads and roads linked to the bays, as well as adjacent cities, would cause obstacles to the functioning of the ports.

Response strategy

●Sharing of knowledge on responses to floods (adaptation measures)

We are developing a manual for responding when we anticipate disruptions to logistics over a wide area from natural disasters, etc. Immediately after we recovered from major damage to logistics networks from the 2018 West Japan Torrential Rain Disaster, we created a manual for responding to similar events. As a result, we were able to avoid any significant impact from subsequent typhoon damage on product distribution, including Typhoon Faxai, which caused significant damage, particularly in Chiba Prefecture, and Typhoon Hagibis, the first typhoon to receive the designation of a Disaster of Extreme Severity (both occurred in 2019) and a Specified Anomalous Disaster.

●Diversification of suppliers (adaptation measures)

We reduce risk by having multiple suppliers. We work with our suppliers as part of endeavors to sustain our supply chain, to ensure that we can stably deliver safe and secure products to customers, at the optimal price. We have diversified our procurement of malt, the main ingredient of beer, across three continents: North America, Europe, and Australia. We combine procurement measures for hops, such as adopting long-term contracts with producers, as part of efforts to secure the necessary amounts, and minimize the impact of market prices.

8 Assessment of water risk at main barley exporting ports

Country	Coast name	Flood risk	Recent disaster information	Flood control measures
Canada	Vancouver Bay	Risk of floods between 0.5 and 1m in 2100	Full-scale disruptions occurred to rail freight transportation and highways connected to the bay as a result of flooding and landslides caused by heavy rainfall in 2021	In cooperation with local NPOs, flood management strategies have been formulated and coastal lines have been repaired
Australia	Fremantle Perth Bay	Risk of floods between 0.7 and 2m between 2010 and 2080, and risk of floods between 0.5 and 5m from 2080 onward	No information about coastal disasters	On-site analysis is being conducted concerning the risk of climate change. Separately to climate change, there have been repairs to piers, bulkheads, and important facilities
United Kingdom	Southampton Bay	Low risk of flooding prior to 2050. Risk of floods between 0.5 and 5m in 2080	No information about coastal disasters. Damage from heavy rainfall occurred in the city in 2021	Coastal development is being promoted, including flooding countermeasures, and there are plans to complete the construction of bulkheads in rivers with a particularly high level of risk
The Netherlands	Rotterdam Bay	Risk of floods between 0.5 and 5m between 2010 and 2080	No information about coastal disasters	The government and companies collaborated to launch a program for managing flood risk in 2015. They are strengthening protective barriers and embankments, as it is urgently required
Germany	Bremerhaven Bay	Risk of floods between 0.5 and 5m between 2010 and 2080	No information about coastal disasters. Damage from heavy rainfall occurred in the city in 2021	Measures such as building and strengthening sea embankments and protective barriers are being implemented in accordance with plans. Repairs to 1.3km of quay walls were completed in January 2022

Details of physical risks

Climate change | Natural capital | Containers and packaging

Disruption of operations owing to droughts [short to long term]

Water is essential in brewing and manufacturing processes for alcoholic beverages, soft drinks, pharmaceutical products, and biochemical products. Accordingly, there may be disruption or obstacles to brewing and manufacturing in the event of severe droughts caused by climate change. In our assessment of water stress at manufacturing and brewing sites based on Aqueduct 4.0, other resources, water stress such as drought is elevated at seven plants in Australia, one in the U.S., and one in Thailand. We have identified the estimated financial impact of droughts on breweries and manufacturing sites based on the volume decline in brewing and manufacturing under certain assumptions at business sites with a "high" level of water stress. We estimated that the financial impact was between approximately 30 to 600 million yen, but in past examples, we have been able to minimize the impact of droughts, so we have judged that the risk is negligible.

More information on business site water risk assessments→P.74

Climate change | Natural capital | Containers and packaging

Impact on agricultural products from floods and droughts [short to long term]

There is a possibility that water risk and water stress from climate change, as well as disasters, may result in a decline in agricultural yields and an increasing financial impact related to procurement. In 2017, we used Aqueduct 2.1 to conduct detailed surveys of water risk in areas that produce agricultural raw materials, and we found that water stress would increase in many production areas (Table 9). In 2021 and 2022, such concerns became apparent in many regions around the world.

Response strategy

●Advanced technologies for water use reduction (adaptation measures)

We will appropriately reduce our use of water, taking into consideration the amount of water stress. The Kirin Group has operated businesses in Australia, where there is extremely high-water stress, and Japan, where water is relatively abundant. As such, we have known from our experiences that water risk and water stress differ between countries and regions. Since as early as 2014, we have been conducting regular surveys of water risk and water stress, and we have continued these surveys as part of our scenario analysis since 2017. We conserve water in ways suited to the differing levels of water stress in each country and region, based on our understanding of the scientific evidence. Lion experienced severe long-term droughts in Queensland. We collaborated with the state government to establish a reverse osmosis (RO) plant to collect and reuse water that has been used in brewing processes at Castlemaine Perkins Brewery in 2011, and we maintain a water consumption rate that is close to the top in the world.

More information→P.46

●Sharing of knowledge on responses to droughts (adaptation measures)

The scope to which we are able to utilize such insights differs depending on the details of the business, but we will enhance the resilience of each business while sharing insights on droughts. Thai Kyowa Biotechnologies, which faced water intake restrictions due to drought in 2020, has been able to limit water intake and avoid damage from droughts by holding large inventories and switching temporarily to products that use less water. By sharing this knowledge within the Kirin Group, we are reinforcing our ability to respond.

●Responses to water stress in areas producing agricultural raw materials (adaptation measures)

At tea farms in Sri Lanka, we began water source conservation activities on the farms in 2018, and as a result, by the end of 2022, we have conserved water sources in 15 locations. In 2020, we began similar support for the acquisition of certification at coffee farms in Vietnam. We are accumulating knowledge, and as part of training for the acquisition of certifications, we teach subjects such as ways to ensure that the ground does not dry out in the event of droughts, as well as methods to store water to prepare for droughts.

More information→P.45

●Prevention of soil runoff in areas producing agricultural raw materials (adaptation measures)

Training on activities to support sustainable agriculture certification on Sri Lankan tea plantations, including how to prevent soil runoff from torrential rains by planting deep-rooted undergrowth. Our teaching is based on methods with a scientific core, such as working with local universities to develop methods that enable farm laborers to distinguish the correct type of plants, because they must choose plants that do not harm the cultivation of tea trees. At present, we have not taken any specific measures in relation to major agricultural products in Europe and Australia, where we anticipate significant water risk and water stress, but we hope to utilize the knowledge we have accumulated through our initiatives in Sri Lanka and elsewhere.

More information→P.35,P.45

9 Water stress in major agricultural product production areas (around 2050)

Agricultural products	America (North and South)	Asia	Europe/Africa	Oceania
Barley	Canada High~Extreamly high	Japan Medium to high	Ukraine High~Extreamly high United Kingdom Low in the North, high in the South Germany medium~High Czech Republic Medium to high in Moravia, low to medium in Bohemia Belgium High France High	Australia Extremely high in the East and Southeast Medium in the Southwest
Hops	United States Medium to high in Oregon, medium to high in Idaho (partially Extremely high)	Japan Medium to high in Tono, Yokote, Yamagata Low to medium in Odate	Germany Medium~High Czech Republic Medium to high in Moravia, low to medium in Bohemia	Australia Extremely high New Zealand Low
Tea leaves		Sri Lanka Extremely high in the North, and medium to high in the South and central highlands India Low in Darjeeling and Assam, low to Medium in Nilgiri Indonesia Extremely high in Java, low in Sumatra Low in Sumatra	Kenya Low Malawi Low	
Wine grapes	Chile Extreamly high Argentine Extreamly high		Spain High in the North, extremely high in other areas	
Coffee beans	Brazil Low to medium in the Northeast, low in other regions		Tanzania Medium to high in the North, low in other areas	

Details of physical risks

Climate change | Natural capital | Containers and packaging

Impact of diseases and air pollution on agricultural products [short to medium term]

In major forest fires in California, the grapes that the Kirin Group procures were exposed to smoke that made them unusable in the making of red wine. In Sri Lanka, air pollutants from neighboring India have also caused damage to tea leaves in lowlands. We expect grapevine diseases to spread as global warming progresses.

Response strategy

●Research measures from a long-term perspective (adaptation measures)

We believe that comprehensive pest management is an effective way to control agricultural diseases, and we have already begun trials in some vineyards and tea farms. It seems likely that ecosystems will become stable when a variety of creatures live in the fields. We have also begun research concerning the possibility that the enrichment of ecosystems through hedgerow-style cultivation may suppress diseases, as well as focusing on the early detection of insects and mites that are vectors of diseases.

Long-term, ongoing research is necessary to solve various issues related to climate change and natural capital. In the Kirin Group, we have our own vineyards, and we have established strong relationships of trust with tea farms in Sri Lanka through long-term engagement. We will leverage our strength of having fields where we are able to conduct surveys and various types of tests to solve various issues related to the environment through a scientific approach and research and development with a long-term perspective.

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Carbon pricing and energy procurement costs [medium to long term]

Energy procurement and logistics costs may spike if governments introduce systems such as carbon taxes, emissions trading schemes, and carbon border adjustment mechanisms. In Japan, we anticipate initiatives such as the introduction of an emissions trading scheme by the GX League, and the introduction of systems that require generators of electric power to purchase emission allowances in the future. Such initiatives may result in additional costs. The Kirin Group will minimize the risk of cost increases by steadily reducing emissions to meet the SBT 1.5° C scenario and Net-Zero target.

Table 10 shows the results of our estimation of the financial impact of carbon pricing on energy procurement.

We estimated tax savings in 2030 of approximately 2.6 billion yen under the 4℃ scenario, 4.7 billion yen under the 2℃ scenario, and 5.1 billion yen under the 1.5℃ scenario, in the event that we achieve our science-based 1.5℃ target. Estimates for both the 4° C scenario and the 2° C scenario were larger than last year's estimates as a result of revisions to reflect recent developments to carbon price projections for each country used in the calculations. In order to reduce risk and lower our procurement costs, an effective way is to achieve or bring forward our GHG emissions reduction targets.

When assessing the impact of carbon pricing on energy procurement, we estimated the impact at Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, and Kyowa Hakko Bio in 2023. For power emissions factors and carbon taxes, we applied the 1.5℃ (Net-Zero) scenario, 2℃ scenario, and 4℃ scenario from the IEA scenarios, and set the basis of forecast carbon prices for all three scenarios.

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Response strategy

●Profit and loss neutral reduction of GHG emissions in brewing and manufacturing

In order to minimize the financial impact of carbon pricing, we will first reduce GHG emissions in accordance with our roadmap, under the basic principle of profit and loss neutrality as a group, as we work toward our 2030 "SBT 1.5° C" target for Scope 1 and Scope 2 emissions. Specifically, the merit from saving energy will offset depreciation and amortization from the investment and the procurement costs increase of renewable energy. Since the outlook for technological innovations in areas such as energy conversion and trends in energy costs are currently unclear, we cannot accurately estimate costs for 2030 onward. We will, however, incorporate measures to reduce GHGs aimed at achieving our RE100 renewable energy target by 2040 and the net-zero target by 2050 into our business plan.

Lion has already achieved carbon neutrality in both Australia and New Zealand. For information on our approach to environmental investment to reduce GHG emissions, financing, investment amounts, and ICP, please refer to the pages on "Transition Plans."

→P.20～P.24

●GHG emissions reduction through logistics optimization

In order to reduce GHG emissions in logistics departments, we will develop the various initiatives such as modal shifts, joint deliveries with industry peers, and higher loading ratios.

GHG emissions from upstream transportation (category 4), including the transportation of products, account for approximately 12% of total Scope 3 emissions, and are a major target for the reduction of emissions. In recent years, reducing the impact of transportation has also been an important initiative from the perspective of reducing the risk that we will not be able to transport products owing to the shortage of truck drivers.

More information→P.63

10 Assessment of impact of carbon pricing

	Scenario	4℃ Scenario		2℃ Scenario		1.5℃ Scenario	
	Year	2030	2050	2030	2050	2030	2050
If GHG emissions are not reduced	Carbon taxes (Billions of yen)	51	55	94	127	102	158
If we reduce GHG emissions in line with targets	Carbon taxes (Billions of yen)	26	0	47	0	51	0
Carbon taxes	Tax savings (Billions of yen)	26	55	47	127	51	158

*1 We have revised carbon tax assumptions for each country to reflect recent developments and recalculated using 2023 data.

11 Main Initiatives

Initiatives	Description and effects (2020～)
Introduction of large-scale solar power generation facilities with the PPA method	Already introduced at all eight Kirin Brewery plants in Japan, excluding the Yokohama Brewery (through 2023). Introducing at Kyowa Kirin Ube Plan, Mercian Fujisawa Plant (operating from 2023 for each), Kyowa Hakko Bio Hofu Plant (operating from 2024), and Kirin Beverage Shonan Plant (operation planned from 2024) More information→P.60
Achieved a proportion of 100% renewable energy in purchased electric power	Achieved a proportion of 100% renewable energy in purchased electric power at all Kirin Brewery plants and operating sites (through 2024), and achieved a proportion of 66% of renewable energy across all electric power used. Kyowa Kirin has achieved a proportion of 100% renewable energy in purchased electric power at its plants and laboratories (through 2023), and by end-2023, achieved a 55% reduction in CO_2 emissions compared with end-2019. At all three Mercian wineries, we achieved a proportion of 100% renewable energy in purchased electric power (2022) More information→P.59
Joint deliveries*2	Reduced GHG emissions by approximately 2,700 tons per year through joint deliveries using railroad containers in the Hokuriku region Reduced GHG emissions by approximately 330 tons per year through a similar initiative in the east Hokkaido area More information→P.63
Joint collection of beer pallets*2	Reduced GHG emissions by a total of 5,158 tons of CO_2 per year (approximately 37% compared with previous levels) across four beer companies More information→P.63

*2 Calculation procedures for joint delivery and joint collection of beer pallets are described in "Contribution to Avoided Emissions through the Global Value Chain, Sixth Edition, Keidanren (Japan Business Federation)"
http://www.keidanren.or.jp/policy/2018/102.html

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Financial impact on the procurement of agricultural products from carbon pricing [medium to long term]

The prices of agricultural products may spike if governments introduce carbon taxes and carbon border adjustment mechanisms.
Figure 12 shows the results of our estimation of the financial impact of carbon pricing on agricultural product prices. In 2023, we estimated the impact for Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, and Kyowa Hakko Bio. Our estimates covered the following agricultural products: barley, hops, tea leaves, grape juice, starch, lactose, corn, and cassava.
In our estimates, we calculated that the impact would be approximately 0.9 billion yen to approximately 4.4 billion yen under the RCP2.6/SSP1 scenario and approximately 2.4 billion yen to 8.8 billion yen under the RCP8.5/SSP3 scenario in 2050. The range of the 25-75 percentile was twice as large for the RCP8.5/SSP3 scenario than the RCP2.6/SSP1 scenario, from which we can conclude that uncertainty is higher and the risk is more significant.

Climate change | Natural capital | Containers and packaging

Impact on currently held assets [medium to long term]

There is a possibility that various policies and regulations, as well as demands from society for decarbonization will mean it may be difficult to continue to use existing facilities that use fossil fuels, etc., for the period that we initially expected. Under the Kirin Group roadmap, we plan to transition in the future from natural gas to green hydrogen and other sources of GHG-free energy as the fuel for boilers that are the heat source used in the boiling stage, etc., in brewing and manufacturing. It may become necessary to renew boilers and other facilities earlier than expected. In the same way, there is a possibility that we are required to transition the trucks we use for transportation to electric vehicles sooner than initially expected, but we believe that the impact will be small even if renewal becomes necessary before assets are fully depreciated.

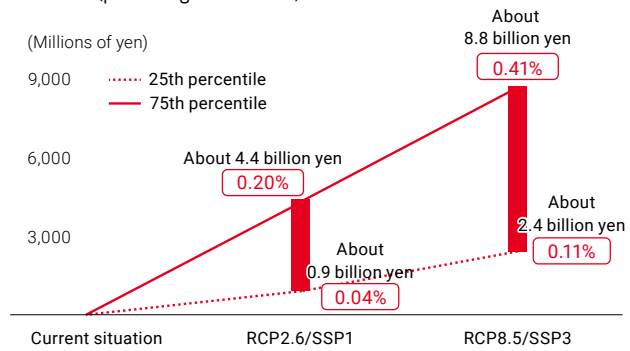
Response strategy

Mass plant propagation technologies and support for farms to acquire certification for sustainable agriculture

We consider that mass plant propagation technologies and support for farms to acquire certification for sustainable agriculture are effective as countermeasures.
Competition between alcoholic/non-alcoholic beverages and biofuels for raw materials will increase as carbon pricing causes demand for corn, soybeans, etc., as biofuels, a form of renewable energy, to increase. Mass plant propagation technologies may be able to contribute to an increase in crop acreage in response to this risk.
Carbon pricing may cause soaring prices of natural gas, which is a raw material in nitrogen fertilizer, which will impact fertilizer prices. We think that training for farmers on appropriate fertilizer management as part of support for the acquisition of sustainable agriculture certification will act as a countermeasure to minimize this impact.

More information on mass plant propagation technologies→P.39
More information on support for the acquisition of certification→P.35~P.36,P.39

12 Impact on agricultural product procurement costs from carbon pricing in 2050 (percentage of revenue)



*1 The socioeconomic systems in the papers we used for our estimates differ from the Kirin Group scenarios, so we have created and disclosed our estimates under the RCP2.6/SSP1 and RCP8.5/SSP3 scenarios in these papers (sources are listed in reference documents).
*2 Recalculated with 2023 data

Identification of trends in technology and renewal of our roadmap

The use of hydrogen, etc., will require technological innovation and infrastructure development, and we expect that full-fledged transition will not take place until 2030 or later. Until then, we think the probability is low that regulation, etc., will require us to renew our existing boilers and other brewery and plant equipment, and trucks, before they are depreciated. If we misjudge the timing of the introduction of new technology, our technology and facilities may become obsolete as a result of regulatory and social trends. Accordingly, we will address this issue by formulating roadmaps for long-term facility renewal and introduction, and constantly update the roadmaps.

More information→P.21

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Cost of regulatory response [medium to long term]

In 2023, the International Sustainability Standards Board (ISSB) finalized the IFRS Sustainability Disclosure Standards, which will serve as the global baseline for the disclosure of information related to sustainability. Based on these standards, jurisdictions around the world are creating legislation concerning information disclosure requirements for companies. The Kirin Group has business sites in Japan, Australia, the US, and the EU, and in the future, it is likely that we will be required to report sustainability-related information in accordance with the requirements of each jurisdiction. The Kirin Group believes that natural capital and climate change are among the sustainability issues for which we should disclose information. Specifically, we must explain the impact of these issues on corporate value, and our response to risks and opportunities. To achieve this, we must establish systems that enable us to accurately and quickly collect information from across the value chain and utilize it in management.
In Japan, in response to the "30by30*" target agreed at COP 15, the government will create a legal framework for "Nationally Certified Sustainably Managed Natural Sites" (to be promulgated in April 2024, and enacted in April 2025). We expect increases in labor and financial costs associated with responding to these regulations.

* Target to make at least 30% of land and sea conservation areas by 2030

Response strategy

●Development of infrastructure for the disclosure of information

Since January 2024, the Kirin Group, through our subsidiaries, has been working to establish a system for identifying and sharing non-financial information in order to immediately respond to regulations and stakeholder requirements in each global jurisdiction, as part of our efforts to provide disclosure that is compliant with the standards of the International Sustainability Standards Board (ISSB).

●Enhancements to the sustainability of raw material production areas

Since 2013, the Kirin Group has continued to support the acquisition of Rainforest Alliance certification by tea farms in Sri Lanka. This certification is a certification system for sustainable farms that focuses on environmental protection and social aspects at farms.
At present, the Kirin Group has begun working with the Rainforest Alliance on the development of "The Regenerative Tea Scorecard," in order to further enhance the sustainability of tea farms in Sri Lanka. The scorecard will serve as a tool for tea farms to start regenerative agriculture on their own initiative. Using knowledge and data obtained from pilot testing at Sri Lankan tea farms, we are considering the possibility of expanding the scorecard to other areas producing tea leaves outside of Sri Lanka in the future.

●Nature Positive through businesses

By converting derelict farmland into hedgerow-style vineyards at Château Mercian, we have created grasslands, which are valuable for Japan at the present time, and contributed to the expansion of Japan's traditional rural Satochi-Satoyama landscapes. In joint research with the National Agriculture and Food Research Organization (NARO), we showed that these initiatives enrich the ecosystems of each vineyard and contribute to Nature Positive. In particular, at Mariko Vineyard, a certified "Nationally Certified Sustainably Managed Natural Sites", we are conducting joint research with NARO to accurately identify greenhouse gases emitted from vineyard soil, evaluate the carbon storage effect of biochar by utilizing pruning debris, etc. In the future, we will look for the possibility of applying the findings to other agricultural production areas.

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Lack of research and development resources and lack of long-term perspective [short to long term]

If we cannot achieve technological development and the development of commercial applications, such as reducing the weight of containers and packaging and chemical recycling, at the required time, there is a risk that it will be difficult to maintain leadership based on our technology, and that subsequent technology development and procurement will suffer.
Concepts such as "The Climate Nature Nexus" and "NbS (Nature-based Solutions)" have emerged as adaptation measures for climate change, but since they target nature, they generally require long-term research and technological development. If we begin taking action after the risks have become clear, we risk falling behind competitors and making it difficult to recover over the long term.

Climate change | Natural capital | Containers and packaging

Decline in ability of engineering departments to respond and lack of appropriate investment [short to long term]

There is a possibility that our engineering systems aimed at achieving decarbonization are insufficient, a possibility that those systems are not appropriately applied because technical expertise is not passed on.
The effective utilization of waste heat is essential for the efficient utilization of energy. This requires not only the introduction of modern equipment and facilities, but also engineers and technology with a deep understanding of the manufacturing process.
Technological progress is rapid, and if we cannot determine the timing for introducing technology or make quick investment decisions, we may not be able to achieve reductions in GHG emissions as planned.
While momentum for the decarbonized society is rapidly increasing, there is a possibility that we will be unable to introduce renewable energy at an appropriate time and appropriate price in Japan, where the places for installing renewable energy facilities are particularly limited.

Response strategy

In-house packaging development technology

The Kirin Group has the Institute for Packaging Innovation, where we develop packaging and containers in-house, as one of the few research laboratories of its scale owned by a global food and beverage, and pharmaceutical company. We think we will be able to utilize this strength to develop advanced containers and packaging with lower GHG emissions across the value chain.
Based on the technologies it has accumulated in the development of glass bottles, cans, PET bottles, cardboard cartons, and other containers and packaging, the Institute for Packaging Innovation utilizes AI, kansei (sensibility) engineering, and other technologies. Taking advantage of the strength of having this large-scale research facility, we are able to provide technical support necessary for commercialization and develop new containers.
As part of the recycling of PET bottles, we are focusing on technical development related to chemical recycling. We have estimated that the negative impact on natural capital of PET bottles in the domestic alcoholic beverages and nonalcoholic beverages businesses amounts to approximately 1.1 billion yen (results of estimation in 2019). We aim to use recycled resin for 50% of domestic PET bottles by 2027, and we will thereby contribute to reducing social costs by transitioning to a circular economy.

Research and development on climate change and natural capital

Hops are vulnerable to climate and cultivation conditions, and there are concerns that climate change could reduce yields and alter the taste of hops. For this reason, research is underway on improvements to breeds to adapt to climate change. In 2022, Kirin developed mass plant propagation technology for hops, and we intend to build a sustainable supply system for raw materials by combining improvements to breeds and mass plant propagation technology.
At Château Mercian Mariko Vineyard, we launched a joint study in cooperation with NARO in March 2024, to assess the effects of carbon storage as a climate change mitigation measure. In this research, we intend to engage in initiatives such as assessing the carbon storage effect of biochar utilizing pruning debris from vineyards, etc.

Strengthen engineering functions

We have assigned personnel with engineering skills in each group company and ensure that we are maintaining and managing brewing and manufacturing facilities, while also training engineers and transferring technical expertise on an ongoing basis.
In the Kirin Group, engineers with a deep knowledge of brewing and manufacturing processes, production technologies, and safety technologies reliably support brewing and manufacturing facilities. Furthermore, the Kirin Group owns Kirin Engineering, a general engineering company, and we have engaged in engineering specialized in the construction of plants producing beer, non-alcoholic beverages, pharmaceuticals, and other products over many years. Through this company, we have been conducting the new expansion and remodeling of large-scale manufacturing facilities for companies both within and outside the group. By performing engineering in various businesses in-house, we make it possible for engineers to transfer expertise and technical capabilities related to building facilities. These technical capabilities that we have developed and our engineers will support the growth and development of our business domains, ranging from food and beverages to pharmaceuticals.

Understand technological trends and flexibly introduce facilities and equipment

The Kirin Group will intensively watch technological trends and social conditions in the engineering department of Kirin Brewery, and reflect these trends in the roadmap for measures against climate change, enabling us to determine what kind of equipment will be effective where in the Group, and flexibly introduce technology after close communication with each Group company.

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Environmental and economic incompatibility due to rapid agricultural policy transitions [short to long term]

Sri Lanka's sudden ban on the import of chemical fertilizers and agricultural chemicals in the first half of 2021 (later withdrawn) caused a decline in yields of many agricultural products and caused great damage to the Sri Lankan economy. Political and macroeconomic influences can cause indirect changes in the use of land as a result of changes to crops produced and reduced yields per unit area. This could encourage deforestation. Without sufficient preparation, the transition to organic farming may weaken agriculture itself and result in destruction to the natural environment in the area surrounding agricultural land.

Response strategy

Support for training farmers in sustainable agriculture

In Sri Lanka, there have been frequent cases where organic fertilizers introduced in place of chemical fertilizers were of poor quality and could not be used. It could be said that efforts to transition to organic agricultural methods without preparation did not just harm agricultural production that was stable, but also harmed the interrelated economy.
There is a risk that one such type of harm will spill over into another, which will severely harm ecosystems. In response, we believe we must learn about climate change and natural capital and adopt a holistic approach.
In our support for the acquisition of Rainforest Alliance certification, we provide training on how to properly use agricultural chemicals and fertilizers, to ensure that farms can continue to operate despite climate change and other external impacts. In the case of Sri Lanka, the Rainforest Alliance is rapidly establishing systems to reduce the impact on farms.

Appropriate engagement with experts and policymakers

The Kirin Group, in collaboration with the Rainforest Alliance, supports tea farms in Sri Lanka and coffee farms in Vietnam in obtaining sustainable certification. The Rainforest Alliance has extensive knowledge of agriculture and ecosystems in tropical regions in Asia and Africa, among others as well as a network of scientists, etc., and it has secured the trust of local farms. NARO, with which Kirin conducts joint research in the form of ecological surveys at Mariko Vineyard, etc., has trained many researchers on agriculture. We will leverage these valuable networks to respond even if events occur such as what happened when the Sri Lankan government banned the import of chemical fertilizers, etc. It is not easy to influence policies for agricultural production areas overseas, but we believe that there is a suitable environment to enable us to participate in global rulemaking.
Global rulemaking for climate change and natural capital utilizes open innovation. We will seize these opportunities and actively participate in discussions and pilot testing to contribute to ensuring that global rules are appropriate.

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Social resistance to fossil-derived raw materials [medium to long term]

Interest in problems related to plastic is spreading to issues related to all aspects of climate change, not just ocean pollution. As a result, there is a possibility that people may have a stronger negative impression than before of containers and packaging using raw materials derived from fossils. In Japan, the "Act on Promotion of Resource Circulation for Plastics" was enacted on April 1, 2022, and interest in problems related to plastics has been increasing. Plastics are a raw material derived from oil, and we expect that as interest in problems related to climate change increases, people will focus on GHG emissions when they are burned, as well as problems related to the depletion of resources from raw materials derived from oil.

Response strategy

Plastic resource recycling

In accordance with the "Kirin Group Plastic Policy," which we formulated in 2019 with the aim of resolving problems related to plastics, the Kirin Group will promote PET bottles that use recycled PET resin. In this policy, we have set forth our target of increasing the percentage of recycled resin to 50% of PET bottles in our operations in Japan by 2027.
We have promoted the utilization of recycled PET resin through mechanical recycling. As of April 2024, we are using "R100 PET bottles," which use 100% recycled PET resin, for some products in the Kirin Nama-cha line. We will promote technical development related to practical uses for chemical recycling to create high-quality recycled PET resin by recycling dirty used PET bottles and other PET resin. In addition, we will create systems to recover used PET bottles and other PET resin.

More information→P.60

Climate change | Natural capital | Containers and packaging

Concerns about deforestation [medium to long term]

As awareness spreads of the importance of forests as GHG sinks, concerns about business activities that lead to deforestation are more prevalent than ever before, potentially resulting in stronger negative impressions of forestry and agriculture.
The worst forest fires in Australian history, which occurred between 2019 and 2020, and the frequent wildfires in California and other cases have brought attention to the relationship between climate change impacts and forests. The United Nations Food System Summit was held in 2021, the EU's "Farm to Fork" strategy and Japan's "Green Food System Strategy" have been formulated and announced, and there is a stronger focus on sustainable agricultural production than ever before. The spread of COVID-19 and geopolitical issues have also increased people's interest in food security. It is assumed that interest in sustainable agriculture due to these factors will lead to interest in forest issues.

Promotion of sustainable forestry and agriculture

The Kirin Group is continuing initiatives to expand sustainable forestry and agriculture, and we plan to increase the proportion of certified paper and raw materials from certified farms that we use. With regard to sustainable forestry, we are promoting an initiative to expand the use of FSC (Forest Stewardship Council)-certified paper. In 2020, we adopted FSC-certified paper for 100% of paper containers at Kirin Brewery, Kirin Beverage, and Mercian. In 2021, we revised our Action Plan for the Sustainable Use of Biological Resources, and we set forth our intention to expand our use of sustainable paper to all our businesses around the world. In terms of sustainable agriculture, we support the acquisition of Rainforest Alliance certification, which is a certification for more sustainable farming, at tea farms in Sri Lanka and coffee farms in Vietnam. Since August 2021, we have also been selling a year-round product in the *Kirin Gogo-no-Kocha* line that uses tea leaves from farms with Rainforest Alliance certification.

More information→P.44～P.45,P.48,P.50,P.55,P.61

Climate change | Natural capital | Containers and packaging

High energy prices [medium to long term]

As initiatives targeting decarbonization accelerate around the world, it is possible that demand for natural gas may increase and prices may rise in the short term, owing to such factors as the transition toward sources of energy with low GHG emissions and divestment from coal. We have referred to "Net-Zero by 2050: A Roadmap for the Global Energy Sector" and "World Energy Outlook 2021 (WEO 2021)" by the International Energy Agency (IEA), and have researched future natural gas prices based on three scenarios (Table 13): NZE (Net-Zero Emissions by 2050 Scenario: an ambitious scenario in which the 1.5℃ target is achieved), APS (Announced Pledges Scenario: a scenario in which all commitments already announced by the governments of each country are executed), and STEPS (Stated Policies Scenario: a scenario that only reflects implemented policies in each country).
In each scenario, we forecast that demand for natural gas will increase through 2025, and we subsequently only expect it to fall significantly in the NZE scenario. In our analysis, we forecast that natural gas prices will fall approximately 4% from current levels in the APS scenario, and rise approximately 8% in the STEPS scenario by 2050. In the NZE scenario, we expect prices will fall by around half by 2030, but these price forecasts do not reflect investment and expenses related to Carbon dioxide Capture, Utilization and Storage (CCUS), so there is a possibility that we cannot expect a significant price decline when these costs are taken into consideration.

Response strategy

Steady implementation of our roadmap to achieve our science-based 1.5° C target

We must surely execute our roadmap for countermeasures against climate change, which is based on our science-based 1.5℃ target, as we look to reduce our use of natural gas. In the Kirin Group roadmap, we plan to shift our energy mix to electric power as much as possible, and use renewable energy as the source of that electric power.
We will transition away from steam produced from gas to electric power for the heat source for heating processes. We will continue to use steam for processes and equipment where it is difficult to transition, but we plan to transition away from gas for the energy source for steam toward hydrogen produced from renewable energy.

More information→P.21~P.22

13 Forecast fluctuations in natural gas prices

Scenario	Current price 2020 USD/GJ	Future price 2030 USD/GJ	Future price 2050 USD/GJ
Net-Zero Emissions by 2050	8.3	4.6	4.4
Sustainable Development	8.3	5.7	5.6
Announced Pledges	8.3	8.0	7.2
Stated Policies	8.3	9.0	9.4

World Energy Outlook 2021 (WEO 2021)

Climate change | Natural capital | Containers and packaging

Opportunity loss due to ethical consumption [medium to long term]

If we fail to provide products that respect the environment and human rights in terms of climate change, natural capital, and containers and packaging, we risk being surpassed by competitors and losing out on opportunities to generate earnings through ethical consumption. Based on scenario analysis related to climate change and natural capital, we have concluded that a rapid expansion of the market for ethical consumption is unlikely at this time. If, however, young people interested in sustainability become the main consumers, they may choose ethical products. In addition, because issues related to containers and packaging are familiar and easily recognized by consumers, we believe that if we do not respond appropriately, it is likely to lead to criticism.

Environmentally friendly products

In the Kirin Group, we mark our relevant products as environmentally friendly. On most Kirin Brewery and Kirin Beverage paper containers, we display FSC-certified labeling to indicate the fact that we use FSC-certified paper. We use tea leaves from Rainforest Alliance-certified farms in Sri Lanka for *Kirin Gogo-no-Kocha Straight Tea 250ml (LL Slim)*, so we display a label for this certification on the product. We also use recycled PET resin for Kirin Beverage PET bottles, so we display our own labels. Lion has labels on carbon zero beer that it sells in Australia and New Zealand, and New Belgium Brewing has labels on carbon neutral beer that it sells in the US, which inform consumers about the carbon zero and carbon neutral aspects of these products.
A low level of awareness is a common issue for certification labels. Therefore, we are conducting activities to raise awareness among young people, who are our main target for such products. We enhance the awareness of elementary school students and younger children by encouraging them to look for environmental marks through a program called the "Environmental Mark Discovery Notebook." For junior and senior high school students, we hold Kirin School Challenge workshops, based on the themes of Rainforest Alliance certification and the FSC certification. Each of these programs has more than 1,000 participants.

* We refer to carbon neutral beer as "carbon zero beer" in accordance with the name used for certification.

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Assessment by consumers [short to long term]

There is a possibility that our corporate brand value may decline if our initiatives related to climate change and other aspects of sustainability are inferior, and if we cannot engage in appropriate communication. Since 2020, the SDGs have been incorporated into Japanese national curriculum. Consumer awareness of environmental issues has risen, particularly among young people.

Climate change | Natural capital | Containers and packaging

Concerns about renewable energy [short to long term]

In order to achieve our target of Net-Zero emissions, we must introduce renewable energy, but the inconsiderate construction of power plants may cause harm to scenery, nature, and human rights, and cause disasters, possibly resulting in criticism from society. For example, violations of indigenous peoples' rights when using land, harm caused by noise and vibrations from wind power generation, and deforestation caused by the procurement of raw materials for biomass energy. If measures that we implement based on an inappropriate assessment negatively impact the living environment of local residents, it is highly likely that it may result in claims for compensation.

Climate change | Natural capital | Containers and packaging

Trust from long-term investors [short to long term]

We believe there is a high risk of losing the trust of stakeholders if we lack appropriate disclosure on climate change, natural capital, the circular economy, and other environmental issues. The Kirin Group has declared our aim to be “a global leader in CSV, creating value across our world of Food & Beverages to Pharmaceuticals,” and we aim to expand our business in the Health Science domain. We believe that the support of long-term investors is necessary for long-term business transformation and environmental investment.

Response strategy

Appropriate communication to consumers

We promote our communications, we will prioritize engagement with young people who will take responsibility for the next generation. Since 2014, we have held Kirin School Challenge workshops for junior and senior high school students, based on the themes of our support for the acquisition of Rainforest Alliance certification at tea farms in Sri Lanka and the use of FSC-certified paper in paper containers. In these workshops, we do not just introduce certification systems. We prioritize communication with junior and senior high school students, as well as discussion, thinking, and sharing information among junior and senior high school students about what they should communicate to members of their own generation, and how they should do it.

We are also teaming up with multiple companies on the free distribution of the SDGs Start Book (300,000 copies per year), which teaches elementary school students and junior high school students about the SDGs and introduces our activities in Sri Lanka as an example of actions for SDGs.

For children in elementary school and younger, we are collaborating with organizations such as after-school care clubs, Girl Scouts, and Boy Scouts on the “Environmental Mark Discovery Notebook” initiative, which starts from children learning to recognize environmental marks and finding out their meanings.

Introduction of renewable energy that does not have a negative impact on the environment or local communities

In July 2021, the Kirin Group established our policy on the introduction of environmental value, with the basic policies of the “responsible introduction of renewable energy” and “additionality” when introducing renewable energy.

With regard to the “responsible introduction of renewable energy,” we prioritize ethics and select that which “causes no harm to the environment and does not violate human rights when power plants are constructed and fuel is procured,” and we also set forth examples of expected risks in relation to each source of power, including solar power, wind power, and biomass, and we check these risks in advance.

With regard to “additionality,” our policy is to “replace thermal power by creating new renewable energy power generation facilities in society, and thereby contribute to the creation of a decarbonized society.”

More information→P.60

Appropriate disclosure in line with the TCFD and TNFD recommendations

We expect that by disclosing information in a holistic, appropriate manner, in relation to climate change and the mutually related themes of natural capital and the circular economy, investors who support these initiatives will provide funds. The Kirin Group has disclosed detailed information related to climate change and other environmental factors in our Integrated Report and Environmental Report. We have also continued to disclose information in line with the recommendations of the TCFD since 2018. In our disclosure of information, we have referred to the beta version of the TNFD framework since 2022, and the ISSB Exposure Draft since 2023.

We have won a “Gold Award” three times, in 2019, 2020, and 2024, in the environmentally sustainable company category of the “ESG Finance Awards Japan.” We received the highest number of votes in 2022 and 2023, and the second highest number in 2024, from investment management institutions in the selection of "superior TCFD disclosure" requested to investment management institutions to which the GPIF outsources domestic equity management.

Details of transitional risks

Climate change | Natural capital | Containers and packaging

Responsibility for pollution of the natural environment [short to long term]

Failure to comply with environmental regulations may result in damage to the natural environment around manufacturing, brewing, and logistics sites and related regions, resulting in liability, fines, and administrative dispositions. Specifically, this could include cases where we have polluted the surrounding environment, such as air or water, in excess of legal or in-house standards, and cases where we have not appropriately entrusted waste treatment.
If genetically modified organisms and the like harm the natural environment by escaping to the outside or cause unexpected changes to ecosystems as a through "genetic disturbance" caused by hybridization, it will violate the Cartagena Protocol.
In addition to compensation, fines, and administrative dispositions, we believe these risks could also lead to a decline in public trust, an impact on sales, and even boycotts.

Response strategy

Environmental management systems

We believe that the establishment and proper operation of environmental management systems will enable us to prevent pollution to the natural environment.
In order to manage of legal requirements, we strictly manage records of revisions and abolishments at each business site, and we set voluntary management standards that are stricter than those set by laws and regulations, thereby thoroughly working to prevent environmental pollution. In addition to general pollution and health and safety issues, legal requirements include responses to waste and the Cartagena Protocol.
We operate environmental management systems to maintain compliance with these laws and regulations, and we have provided for these environmental management systems in the Principle for Kirin Group's Global Environmental Management (KGEMP).
Under the KGEMP, a Group general environmental manager has been appointed as the chief executive officer for all Group environmental matters. As of April 2023, this role is held by the Senior Executive Officer of Kirin Holdings Company, Limited with responsibility for CSV strategy. The KGEMP requires the appointment of a general environmental manager, who has responsibility and authority for environmental matters in each operating company.
In addition to monitoring to ensure that the company and its constituent companies are conducting their environmental activities appropriately, the general environmental manager conducts management reviews, identifies issues for improvement, and gives necessary directions to the relevant departments. In the event of an environmental crisis, the general environmental manager of each company will have full authority to resolve the crisis. The KGEMP stipulates that all business sites comply with laws and regulations and other rules relevant to the business's environmental activities, reduce environmental load, such as GHG emissions and water intake, and prevent pollution. All business sites must also conduct internal environmental audits to ascertain the appropriateness and legal compliance of their systems and confirm how well targets are being met. The results of these audits will then lead into management reviews. We integrate the management of environment-related processes with company management processes in a manner suited to the companies' respective regions. We incorporate environmental targets into goal-setting for each organization and individual, as well as responsible managers, and assess the degree to which those goals are achieved in assessments of performance.
The Kirin Group is working toward its declared goal of the implementation and firm establishment of thorough appropriate management of waste. To this end, we established the Kirin Holdings Waste Management Rules and are promoting the appropriate treatment of waste within the common Group systems. These rules standardize contract templates and the frequency and contents of contractor audit programs, and by keeping an updated list of staff in charge of waste management, we provide education to all staff who require it, based on standardized textbooks.
In Japan, Kirin Holdings collectively manages information on all waste disposal contractors for the Group, so in the unlikely event that a problem arises, we can immediately search for and confirm details about the contractor, its permits, the waste it is being contracted to handle, and other details. We have standardized operations in this way so that anyone who is newly assigned to waste-related work will be able to perform it with certainty.

Details of systemic risk

Climate change | Natural capital | Containers and packaging

Damage to ecosystems owing to reduction in agricultural land for food [short to long term]

There have been cases of agricultural land for the production of food being converted to agricultural land for biofuels because of high selling prices of biofuels. Appearance, taste, the health of consumers, and other factors do not matter for agricultural products for biofuel, so the production of agricultural products for biofuel tends to focus only on economics. This results in large-scale changes to the use of agricultural land, monocropping, and the use of large amounts of agricultural chemicals and fertilizers, all of which are likely to have a negative impact on agricultural land and surrounding ecosystems.

Response strategy

●Engagement with agricultural production areas

In production areas in developing countries, there are limited direct contracts with individual farmers, and it may only be possible to procure products through auctions. Where direct engagement is possible, however, through support for the acquisition of certification, as in the case of tea farms in Sri Lanka, we are able to develop an understanding of local issues and find solutions together. Our policy is to engage with farms in other areas producing agricultural raw materials as needed.

Subsidy schemes in producing countries and regions are often behind the conversion to the cultivation of agricultural products for biofuels. It is difficult to have a direct impact on rules in producing countries, so we will try participating in global rulemaking and approach farms through suppliers. We will also consider measures to respond through suppliers, such as leveraging the collection of information to distribute procurement.

Climate change | Natural capital | Containers and packaging

Ecosystem damage due to the abandonment of farmland [short to long term]

In Japan, the number of abandoned farmlands is increasing, owing mainly to the aging farmers. These abandoned lands quickly become covered with strong weeds and transition to simple ecosystems, which may result in disease in nearby farmlands. Production areas in Asia and elsewhere face problems such as soil runoff due to changes in land use associated with economic development, causing water pollution in basins and the destruction of ecosystems, with the risk of negative impact spreading to downstream areas.

●Engagement with agricultural production areas and provision of training

At tea farms in Sri Lanka, our support for obtaining certification contributes to both the conservation of nature and profitability improvements. Through many years of engagement with Sri Lankan tea farms, we support the continuation of tea leaf cultivation in ways suited to local characteristics. In addition, we offer environmental education programs and other programs in cooperation with local nature conservation organizations and the government, in order to promote appropriate actions by farmers.

In Japan, farmers, the government, and Kirin have deployed activities based on engagement, in order to prevent the abandonment of cultivation by hop farmers in Tono due to the aging population. We are taking steps to create a brand around Tono hops, and are promoting initiatives such as the utilization of these hops in craft beer and other products.

Climate change | Natural capital | Containers and packaging

Ecosystem damage due to the excessive use of agricultural chemicals [short to long term]

Examples have been confirmed of grape cultivation with pergolas where the application of defoliants to the soil for many years for operational reasons destroys the existing ecosystem in vineyards. We know that even if there are mountains and fields nearby and the ecosystem is very abundant, once an ecosystem completely collapses, it is difficult to recover easily.

●Ecosystem restoration activities focusing on hedgerow-style cultivation

In ecological surveys at vineyards, we confirmed that even if the seeds that we sow for slope greening and hedgerow-style cultivation contain invasive species, native species will gradually enter and become dominant if the environment is favorable.

Therefore, even if ecosystems are destroyed, we believe that it is possible to restore abundant ecosystems by restoring grassland through hedgerow-style cultivation.

Details of business opportunities

Climate change | Natural capital | Containers and packaging

Increasing interest in infectious diseases caused by global warming [short to long term]

WHO forecasts

A report from the WHO forecasts that if climate change continues, between 2030 and 2050 approximately 250,000 additional people will die each year as a result of the spread of infectious diseases. It also forecasts that the number of cases of dengue fever will increase significantly. In Japan, the habitat of the Aedes albopictus, which carries dengue fever, was confirmed to have spread as far north as Aomori in 2015.

The results of analysis of the impact of the spread of dengue fever based on WHO scenarios concerning climate change and the impact on people's health project that a total of 1 billion people will be at risk of infection in East and Southeast Asia. On the other hand, if we take economic growth into consideration, we project that the population at risk will decrease by approximately 25% by 2050 in high-income countries in Asia and the Pacific and in East Asia. It appears that economic growth may result in the expansion of markets related to immunity. In consumer surveys that we conducted in Japan in 2021, people's health awareness was most heightened in relation to their "interest in immunity."

Climate change | Natural capital | Containers and packaging

Increase in heatstroke caused by global warming [short to long term]

Heatstroke cases are expected to increase as a result of the impact of global warming. Based on observational and forecast data on climate change from the National Institute for Environmental Studies, under the RCP8.5 scenario (equivalent to the 4℃ scenario in Kirin Group Scenario 3), the number of heat-related excess deaths in Japan between 2080 and 2100 will be between almost four times and over 10 times the number between 1981 and 2000. In Kirin Group Scenario 3 (the 4℃ scenario), we have estimated that the Japanese market for beverages that prevent heatstroke will grow by between 94 billion yen and 188 billion yen, assuming that it correlates with the number of persons requiring emergency services as a result of heatstroke caused by climate change.

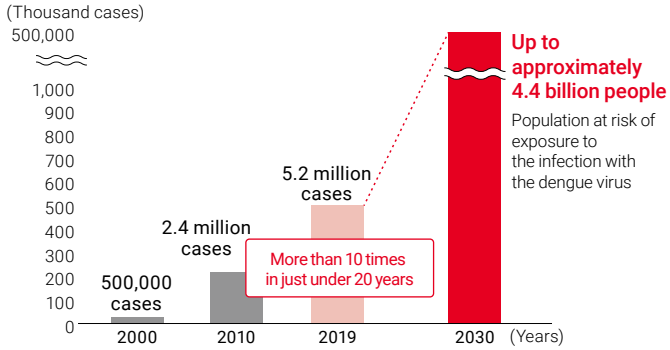
Response strategy

Contribution to Health Science domain

In 2021, we expanded our lineup of FFC products that "help maintain the immune system in healthy people." We began selling such products under the *Nama-cha* and *Gogo-no-Kocha* brands, which have a high level of brand awareness among consumers, in addition to yoghurt and supplement products. Additionally, in our BtoB business, we licensed and provided materials to external partner companies in Japan and overseas and sold a wide range of products, including snacks, protein, etc. As a result, annual sales increased 40% in 2022 compared with the previous year.

In order to offer products to more consumers, we began selling immune-related beverages in 100ml PET bottles at general merchandise stores, drugstores, and convenience stores nationwide from the end of March 2022. In anticipation of the expansion of the market for immunity-related products, we invested approximately 10 billion yen in enhancing manufacturing facilities for small PET bottles at the Kirin Beverage Shonan Plant, thus developing a supply system for immune-related beverages in small PET bottles, including 100ml PET bottles.

14 Number of dengue fever cases reported to the WHO



Estimated based on the WHO's "Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s" report.

Contribution with products to counter heatstroke

SALTY LITCHI is widely known as a beverage that prevents heatstroke. At Kirin Beverage, "heatstroke countermeasure advisors," who have received certification for completing training courses held by the Heat Illness Prevention - Communication Project, hold seminars on heat stroke countermeasures at schools and other institutions. Through this initiative, we are raising awareness about measures against heatstroke and providing more people with correct knowledge and countermeasures.

| Business opportunities | Products and services

Details of business opportunities

Climate change | Natural capital | Containers and packaging

Products that contribute to decarbonization [medium to long term]

As interest in decarbonization grows, there is a possibility that demand will increase for products that contribute to decarbonization or the shift to a low-carbon society. In the U.S., Australia, and New Zealand, carbon-neutral products are sold, and are somewhat popular in their respective markets. Although interest in carbon-neutral products may not be high in Japan at present, awareness of the SDGs has grown rapidly. As such, it appears there is a strong possibility that interest in ethical products will increase in the future.

Response strategy

●Decarbonization products

New Belgium Brewing successfully made FAT TIRE ALE, one of its main brands, the first carbon-neutral beer in the U.S. Lion launched XXXX Zero, the first carbon-neutral alcohol-free beer in Australia. Lion sells Steinlager, which is certified as a zero-carbon under the New Zealand government's Toitu program.
In Japan, we have judged that consumers do not yet require decarbonized alcoholic or non-alcoholic beverages. Under the CFP program operated and managed by the Japan Environmental Management Association for Industry, however, product category rules (PCR) have been established for calculating the carbon footprint of beer and soft drinks. The Kirin Group believes that it will be possible for us to calculate the carbon footprint based on this PCR.

More information→P.64

| Business opportunities | Resource efficiency

Details of business opportunities

Climate change | Natural capital | Containers and packaging

Sustainable logistics [short to long term]

In order to reduce GHG emissions, it is important to improve transportation efficiency. By doing this, we can also expect to solve chronic driver shortages. Transportation distances from breweries and plants to areas of consumption are tending to become longer owing to factors such as a decline in the number of breweries and plants and the concentration of breweries and manufacturing plants for small-lot product varieties. In recent years, however, it has become difficult to secure drivers for long-distance journeys. It is inefficient to transport products for long distances using trucks, and it increases GHG emissions. Therefore, we must solve these problems related to logistics.

Response strategy

●Reduction in costs from more efficient transportation

We are implementing various initiatives to make deliveries more efficient and contribute to reducing logistics costs and GHG emissions, such as a modal shift, joint deliveries, and more efficient loading. We actively promote joint deliveries with other companies by positioning the logistics functions as non-competitive fields, instead of competitive fields. For example, we are using joint deliveries with railroad containers to transport products from breweries and plants in the Kansai area to the Hokuriku region, and plan to complete a modal shift away from long-distance truck transportation equivalent to 10,000 vehicles a year, which will enable us to avoid long-distance truck transportation, and we expect this to contribute to reducing annual GHG emissions by approximately 2,700 tons.

More information→P.62~P.63

Climate change | Natural capital | Containers and packaging

Reduction of container and packaging raw materials and stable procurement [short to long term]

Society continues to demand that companies address the issue of the 3Rs for containers and packaging. At the same time, this will contribute to reducing GHG emissions, make resource use more efficient, and reduce costs.
Beer and soft drinks are products that represent mass production and mass consumption, and they thus use a large number of containers and packaging. The amount of paper containers used in the Japan Non-alcoholic Beverages Businesses is 120,000 tonnes, and the amount of PET bottles used is 65,000 tonnes.

●Reducing the weight of containers and packaging

The Kirin Group has the Institute for Packaging Innovation, where we develop packaging and containers in-house, as one of the few research laboratories of its scale owned by a global food and beverage, and pharmaceutical company. We leverage this strength to promote lighter containers and packaging. For example, our "204-diameter can lids" for aluminum beer cans have reduced weight by approximately 29% for 350ml cans compared with when we used "209-diameter can lids." We also use beer bottles that reduce weight by 21% for large bottles and 19% for medium-size bottles. Furthermore, "R100 PET bottles," which use 100% recycled PET resin, make it possible to reduce the use of resin derived from oil by 90% in manufacturing, and reduce GHG emissions from manufacturing by 50-60%. And, the introduction of smart-cut cartons, a type of cardboard packaging developed for alcoholic beverages in Japan, has contributed to cost savings of 0.17 billion yen per year, while lighter 2.0-liter PET bottles have contributed to cost savings of 0.16 billion yen per year.

More information→P.51~P.54

| Business opportunities | Energy source

Details of business opportunities

Climate change | Natural capital | Containers and packaging

Reduction in reliance on fossil fuels [short to long term]

It will be possible to stabilize our energy procurement by reducing our use of fossil fuels and transitioning to renewable energy.
As prices of fossil fuels spike, and producing countries are concentrated in places with high geopolitical risk, reducing our reliance on fossil fuels will contribute to reducing risk.

Response strategy

●Achievement of an energy mix to achieve Net-Zero emissions

We will shift our energy mix to “electric power” and utilize electric power generated from renewable energy.
In the Kirin Group roadmap, we plan to make progress on energy conservation by 2030, while also shifting our energy mix toward “electric power” by promoting the shift to electric power for heating processes as much as possible, and utilizing electric power generated from renewable energy.
It will be possible to lower our direct reliance on fossil fuels in our businesses by reducing our use of natural gas, and reduce our reliance on the fossil fuels of thermal power plants by increasing the proportion of renewable energy in the electric power that we use.

More information→P.21,P.61

Climate change | Natural capital | Containers and packaging

Stable procurement of renewable energy [short to long term]

There are various methods for introducing environmental value, each of which have their own merits and demerits, including in-house power generation, purchasing from electricity retailers, purchase of certificates that power is derived from renewable energy, and corporate PPAs. We will acquire environmental value that satisfies the criteria set forth in RE100 by introducing renewable energy, but in Japan, we expect the balance of supply and demand to grow tight over the long term as demand for renewable energy increases.

●Use of renewable energy with a focus on additionality

When introducing renewable energy, we prioritize “additionality,” which indicates the actual increase in the supply of renewable energy. We will replace thermal power plants and contribute to creating a decarbonized society by increasing renewable energy power plant facilities in society.
Specifically, we have been introducing solar power generation at breweries using the PPA model, and we have completed installation at all breweries (excluding the Yokohama Brewery, where we introduced such facilities in-house). PPA stands for Power Purchase Agreement, and it refers to a type of business model where a PPA business operator installs solar power generation facilities at no charge on land, buildings, etc., owned by the party that requires the power, and sells the power-generated by those facilities to the party that requires the power.
Installing solar panels in our own breweries and plants ensures that the power plants can reliably add renewable energy, without any negative impact on the local community, while at the same time enabling us to use such energy in a stable manner.

More information→P.21,P.60

| Business opportunities | Resilience

Details of business opportunities

Climate change | Natural capital | Containers and packaging

Strengthening the supply chain [short to long term]

We expect that our initiatives targeting the procurement of agricultural raw materials and the reduction of Scope 3 emissions will contribute to strengthening the supply chain.
It is possible that by enhancing our engagement with suppliers and producing areas, identifying various issues, and working to solve them, it will contribute to improving the resilience of suppliers, producing areas, and the Kirin Group.

Response strategy

●Enhancement of engagement

In addition to producing regions, we will enhance our engagement with suppliers.
Every year, we visit tea farms in Sri Lanka, where we engage with local managers. As part of these initiatives, we have gained an understanding of the severity of heavy rainfall associated with climate change that is affecting tea farms in Sri Lanka, which is contributing to strengthening our training to prevent soil outflow and our water source conservation activities. We have conducted detailed surveys related to the reduction of Scope 3 emissions, in addition to making requests and performing checks based on the Sustainable Supplier Code, and we base our engagement with stakeholders on the results of these surveys. In addition, we launched the Kirin Supply Chain Environmental Program in 2024 together with suppliers with high emissions, and we will jointly solve issues as we target decarbonization through initiatives such as the mutual disclosure of data, setting of targets that meet the SBT standards, and the identification of new measures.

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- Predicting the response of a potato-grain production system to climate change for a humid continental climate using DSSAT (Tooley et al. 2021)
- Potential Benefits of Potato Yield at Two Sites of Agro-Pastoral Ecotone in North China Under Future Climate Change (Tang et al. 2020)
- Response of potato biomass and tuber yield under future climate change scenarios in Egypt (Dewedar et al. 2021)
- Impacts of Climate Change on the Potential Productivity of Eleven Staple Crops in Rwanda (Austin et al. 2020)
- Estimating cassava yield in future IPCC climate scenarios for the Rio Grande do Sul State, Brazil (Tironi et al. 2017)
- Is Cassava the Answer to African Climate Change Adaptation? (Jarvis et al. 2012)
- Estimation of potential changes in cereals production under climate change scenarios (Tatsumi et al. 2011)
- Global crop yield response to extreme heat stress under multiple climate change futures (Deryng et al. 2014)
- The combined and separate impacts of climate extremes on the current and future US rainfed maize and soybean production under elevated CO2 (Jin et al. 2017)
- Climate impacts on crop yields in Central Argentina. Adaptation strategies (Rolla et al. 2018)
- Mitigating future climate change effects on wheat and soybean yields in central region of Madhya Pradesh by shifting sowing dates (Balvanshiand Tiwari 2019)
- Changing yields in the Central United States under climate and technological change (Burchfield et al. 2020)

Assessment of impact of carbon pricing

Estimation of impact of carbon pricing

1) We calculated the rate of decline in future electric power emission factors from the IEA "World Energy Outlook 2019" Annex A (Current Policies Scenario and SD Scenario).
2) We calculated actual electric power emission factors from the actual energy usage and GHG emissions of the Kirin Group in the base year (2019), and estimated future electric power emission factors under the two scenarios (Current Policies Scenario and SD Scenario) by multiplying actual emission factors by the rate of decline in emission factors calculated in Step 1.
3) We used the electric power emission factors that we calculated to forecast GHG emissions in the Kirin Group in 2030 and 2050. We categorized these forecasts depending on whether or not we take measures to reduce emissions.
4) We applied the IEA WEO 2019 Current Policies Scenario to the Kirin Group scenario 3, and the SD Scenario for the Kirin Group scenario 1, while also setting the IPCC "Special Report on Global Warming of 1.5℃" as our new 1.5℃ scenario, and we set the carbon prices indicated in each data source as the basis for the future carbon prices for each scenario (IEA WEO 2019 P758 and IPCC Special Report on Global Warming of 1.5℃ 2.5.2.1 Price of carbon emissions).
5) We calculated the future impact by multiplying the forecasts of future GHG emissions that we calculated in Step 3 by the carbon prices that we set in Step 4. We calculated the increase in costs if we did not implement initiatives to reduce GHG emissions from the difference in impact depending on whether or not we take measures to reduce emissions.

External diseconomies related to Kirin Group PET bottles

We estimated that impairment losses related to marine ecosystem services would be approximately 0.36 to 3.56 million yen (approximately 3,300 US$ to 33,000 US$) per ton of plastic in 2011, based on the estimations of Beaumont et al. We estimated that the median proportion of PET bottles that flowed into the ocean from Japan would be 0.5%, based on the "Annual Report on the Recycling of PET Bottles" by the Ministry of the Environment. We set the total amount of PET materials used by Kirin Group major domestic companies at 66,894 tons in 2018, and multiplied this amount by the above estimates.

- Beaumont et al. (2019) Global ecological, social and economic impacts of marine plastic
- Ministry of the Environment (2018) Recent Trends Surrounding Ocean Waste, and the Council for PET Bottle Recycling, (2018) Annual Report on the Recycling of PET Bottles

Increasing interest in infectious diseases caused by global warming

- WHO: "Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s"
- WHO: "Dengue and severe dengue" 10 January 2022

Increase in heatstroke caused by global warming [short to long term]

- S-8 2014 Report by Project Team of Comprehensive Study on Impact Assessment and Adaptation for Climate Change
- National Institute of Infectious Diseases, Expansion of Aedes albopictus in Japan (IASR Vol. 41 p92-93: June 2020 edition)

Financial impact of transition risks related to natural capital (procurement of certified products)

- Estimated by multiplying by royalties, etc., if coffee and tea leaves are procured as certified products.

Financial impact of transition risks related to natural capital (reduction in agricultural chemicals and chemical fertilizers at tea farms)

- Estimated based on the results of on-site interviews, taking into account prices of chemical and organic fertilizers, as well as respective personnel expenses for the application of these fertilizers.