

Environmental Report 2023

Joy brings us together



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About this Environmental Report

Editorial Policy

The Kirin Group's main business areas are Japan, Oceania, and Asia, and it operates in the "Japan Beer and Spirits Businesses," "Japan Non-alcoholic Beverages Businesses," "Oceania Integrated Beverages Business," "Pharmaceuticals Business," and "Other Businesses."

Approximately 58% of revenue comes from "Japan Beer and Spirits Businesses," "Japan Non-alcoholic Beverages Businesses," and "Oceania Beer and Spirits Business. Approximately 20% of other revenue is from the "Pharmaceuticals Business". Initiatives to address the environmental issues are positioned as one of the purposes of CSV (the creation of value that can be shared with society), which is the core of our management strategy for the realization of sustainable growth.

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 Report, 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 The Environment Website

<https://www.kirinholdings.com/en/impact/env/>



Kirin Group Environmental Report

https://www.kirinholdings.com/en/investors/library/env_report/



Kirin Holdings Investor Relations Information

<https://www.kirinholdings.com/en/investors/>



KIRIN CSV REPORT (Integrated Report)

<https://www.kirinholdings.com/en/investors/library/integrated/>



Lion Sustainability Website

<https://lionco.com/force-for-good/>



KYOWA KIRIN Sustainability Website

<https://www.kyowakirin.com/sustainability/>



Reporting Period

FY2022 (January–December 2022)

Where necessary, this report also contains historical data showing trends for the past 3 to 5 years.

Organizations Covered by this Report (FY2022)

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) KIRIN VIVAX, Tokai Beverage Service
Oceania Integrated Beverages Business	Lion, New Belgium Brewing
Pharmaceuticals Businesses	Kyowa Kirin, Kyowa Kirin Frontier, Kyowa Medical Promotion, 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, Biokyoowa, Shanghai Kyowa Amino Acid, Thai Kyowa Biotechnologies, Kirin Holdings, Kirin Business Expert, KIRIN BUSINESS SYSTEM, Koivai Dairy Products Company, Limited, Kirin Echo, Kirin and Communications, Kirin Engineering, Kirin City, Kirin Techno-System, KIRIN GROUP LOGISTICS

- The transfer of all shares of Myanmar Brewery held by our subsidiary Kirin Holdings Singapore Pte, Ltd. to Myanmar Brewery was completed on January 23, 2023, but we partially excluded this from the scope of this report.
- The commencement of procedures to make Blackmores Limited, an Australian company, a subsidiary was disclosed on April 27, 2023, but is excluded from the scope of the 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/esgdatabook2023.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) Risk and Opportunity Management and Disclosure Framework v0.1~0.4 Beta (2022 and 2023)
- SASB Standards (October 2018 version) Food & Beverage Sector/Alcoholic Beverages Industry and Non-Alcoholic Beverages Industry

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 CEO

The year 2022 could be described as the year when the importance of sustainable use of natural capital is internationally acknowledged. The Kirin Group was a global pioneer in experimenting the LEAP approach*¹ advocated by the Taskforce on Nature-related Financial Disclosures (TNFD), and highly recognized by stakeholders and the media both in Japan and overseas.

Corporate activities are generally regarded to have a negative impact on nature, but it has recently become clear that businesses can also have a positive impact on nature. The term "nature positive*²" is gaining attention as a phrase that refers to halting the loss of biodiversity and putting it on a recovery trajectory. In our ecosystem surveys conducted through joint research with National Agriculture and Food Research Organization*³ at Château Mercian Mariko Vineyard since 2014, we have demonstrated through scientific research that the conversion of derelict land to the use of hedged and grass-cultivated vineyards has enriched nature.

The concept of Satoyama is behind the "nature positive" results at Mariko Vineyard. The vineyard cultivated in hedgerow style has created grasslands, which are facing a crisis of being endangered, and revived a balanced Satoyama environment in harmony with the surrounding rice paddies, forests, and water sources, which in turn has helped to promote the recovery of biodiversity. This year Mariko Vineyard was designated by the Ministry of the Environment as an approved site contributing to the "30 by 30" target to make at least 30% of land and sea into conservation areas, as adopted at the Fifteenth meeting of the Conference of the Parties (COP15) to the UN Convention on Biological Diversity in 2022. It is fair to say this is a good example of how businesses can create value for local economies and the natural environment. In Japan, we believe that human activities and nature can coexist in harmony, as is evident in traditional Satoyama

landscapes. Humans should not recklessly interfere with remaining areas of untouched nature, but the reality is that most of the natural environment in Japan is "secondary nature," which has been protected through human intervention, resulting in the creation of various types of value for society. The abandonment of farmland will result in the loss of this "secondary nature." When humans continue to work in harmony with nature, both nature and local economies are protected. Approaches similar to the Japanese idea of Satoyama landscapes are also commonly held in East Asia and Southeast Asia.

On the other hand, in the West, many people view the lives and activities of humans, including agriculture, as destructive to nature, and believe that we must keep humans away in order to protect nature. At present, the methodologies for setting scientific targets for nature are under consideration in the SBTN framework and guidance on nature-related risk management and disclosure is under consideration in the TNFD framework. If the creation of global standards related to natural capital is led only by Western countries, as has previously been the case with climate change, differences in ways of thinking about how humans relate to nature could lead to a situation that does not fit the realities of East and Southeast Asia, including Japan.

I consider the idea of Satoyama landscapes to be a concept for sustaining natural capital that has originated in Japan, but which is valid around the world. By actively participating in global initiatives related to rulemaking for natural capital, Kirin hopes to extend to the rest of the world an understanding that there are types of nature that are preserved and restored through proper human involvement, rather than simply keeping businesses away from nature, as well as the usefulness of the Satoyama landscape concept.



Kirin Holdings Company, Limited
President & CEO
Yoshinori Isozaki

*1 See page 18 of the Kirin Group Environmental Report 2022 for trial disclosure based on the LEAP approach.

https://www.kirinholdings.com/en/investors/library/env_report/

*2 To halt and reverse the loss of biodiversity and put it on a recovery path, the G7 adopted the "G7 2030 Nature Compact" at the G7 meeting held in the UK in 2021 in which it was clearly stated that "nature will be positively transformed by 2030 and fully restored by 2050, compared to 2020 levels."

*3 The communication name for the National Agriculture and Food Research Organization. With about 1,700 researchers, it is the largest research institute in Japan that conducts research and development in a wide range of fields from basic to applied for the development of Japan's agriculture and food industry.

Message from the Officer in Charge of CSV Strategy

In 2022, the United Nations Conference of the Parties to the Framework Convention on Biological Diversity (COP15) was held in Montreal, and a new global goal of "30 by 30" was set forth in the Kunming Declaration to make 30% of the world's land and sea areas into conservation areas.

In terms of natural capital, companies are now required to assess the risks and opportunities associated with their entire value chain, and to address them in light of the impact of climate change. At Kirin, our style has long been a holistic approach to natural capital and the climate change that affects it.

Last year, in the Kirin Group Environmental Report 2022, we disclosed information on a trial basis in line with the "LEAP" approach advocated in the beta version of the "Task Force on Nature-related Financial Disclosures (TNFD)" framework. LEAP is a method for companies to understand the risks and opportunities associated with natural capital through analysis and assessment based on a process where they Locate the interface with nature, Evaluate priority dependencies and impacts, Assess material risks and opportunities, and Prepare to respond and report.

LEAP is an excellent tool for revealing that agricultural products and water, which are essential for determining our product's characteristics, are "unique" and "dependent" on "locations." In line with the LEAP framework, we have been able to provide information in a simple form concerning matters such as our support for the acquisition of sustainable farming certification by tea growers in Sri Lanka, which was previously difficult to explain owing to the complicated relationships involved, and our different approaches to water resources in Japan and Australia, which have different water risks and stresses. The same can be said of SBTN's "AR3T Framework," under which we also disclosed information on a trial basis at the same time, in 2022.

In March 2023 in New Belgium Brewing (Colorado, US), together with the TNFD, we tested the discussion on our businesses with prototype model for scenario analysis of

natural capital and published the details in the draft TNFD guidance beta v0.4 and at a workshop hosted by the TNFD Consultation Group of Japan. By actively participating in the pilot program, we will contribute to making the disclosure framework more practical and enhance our level of skill in this area at an early stage.

There are almost no agreed-upon scenarios for natural capital, and the dependence and impact of businesses on natural capital varies greatly from location to location. Accordingly, we must start by identifying the interface between our businesses and nature.

At Kirin, we will not begin an exhaustive analysis and assessment of challenges related to natural capital, but instead we will proceed by drawing on specific knowledge from individual areas where our businesses have a strong relationship with the community, and utilizing the TNFD framework and the SBTs for Nature methodology, taking into account materiality in our businesses. In this year's environmental report, based on the TCFD framework, we integrated the beta version of the TNFD, and explained the Kirin Group's environmental management as comprehensively as possible.

The message of the Kirin Group's Environmental Vision 2050 is "Enrich the Earth with Positive Impact." Behind this message lies Kirin's brewing philosophy of "Reverence for Life." Beer can only be brewed with the blessings of nature in the form of raw materials - crops, water and yeast. Our approach is that we must respect life and humbly learn from its power, precisely because our businesses depend on "life" itself. We will lead the world in ensuring the sustainability of natural capital, as we have done for climate change, because the sustainability of our businesses depends on the blessings of nature.

Kirin Holdings Company, Limited
Senior Executive Officer
(Officer in Charge of CSV Strategy, Group Environmental Manager)

Ryosuke Mizouchi



Corporate Data

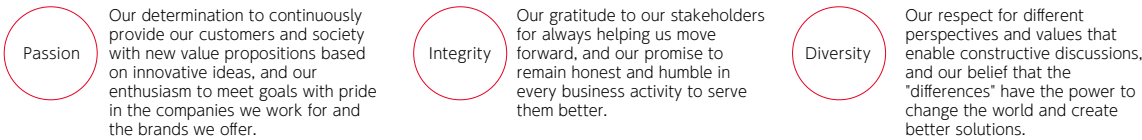
Corporate Philosophy

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

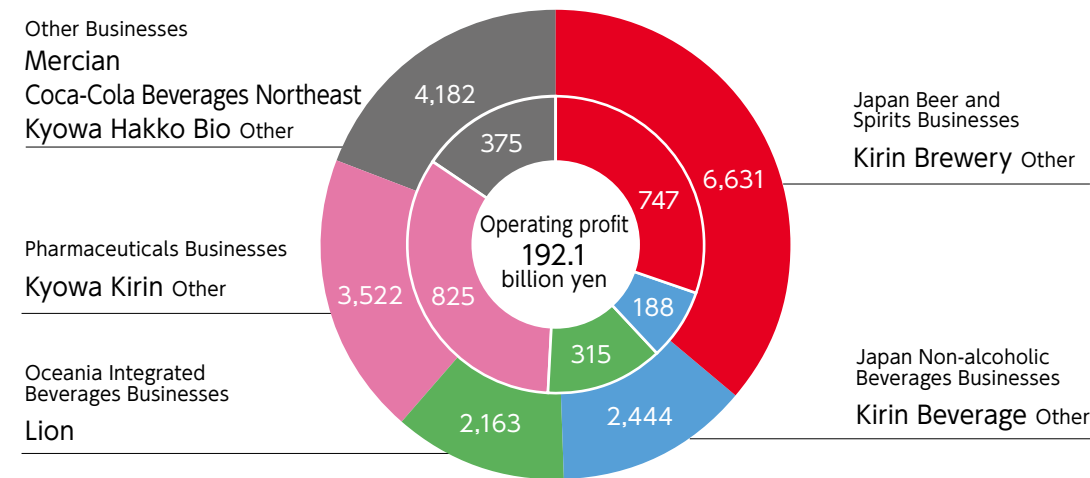
A global leader in CSV, creating value across our world of Food & Beverages to Pharmaceuticals.

"One KIRIN"Values



*Inside: Normalized Operating Profit.
Outside: Revenue (Actual results for the year ended December 31, 2022)

Sales revenue **1,989.5** billion yen

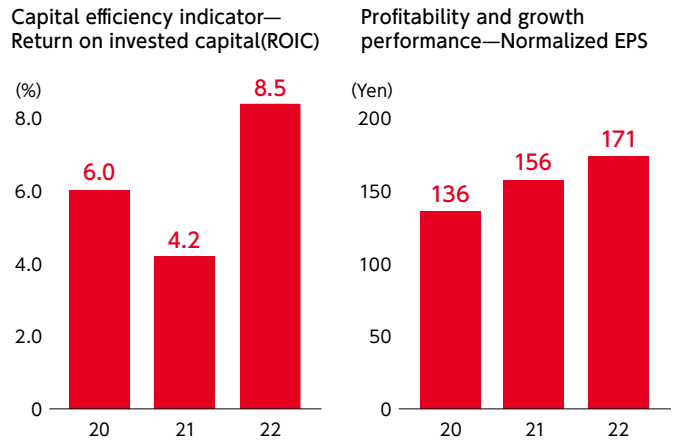


Segment	Food & Beverages	Pharmaceuticals	Health science	Company
Japan Beer and Spirits Businesses	●			Kirin Brewery
Japan Non-alcoholic Beverages Businesses	●			Kirin Beverage
Oceania Integrated Beverages Businesses	●			Lion
Pharmaceuticals Businesses		●		Kyowa Kirin
Other Businesses	●		●	Mercian Coca-Cola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

Company Overview

Trade Name	Kirin Holdings Company, Limited
Date of Incorporation	February 23, 1907 <small>*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.</small>
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	30,464 employees on a consolidated basis (as of December 31, 2022)

Financial Key Performance Indicators

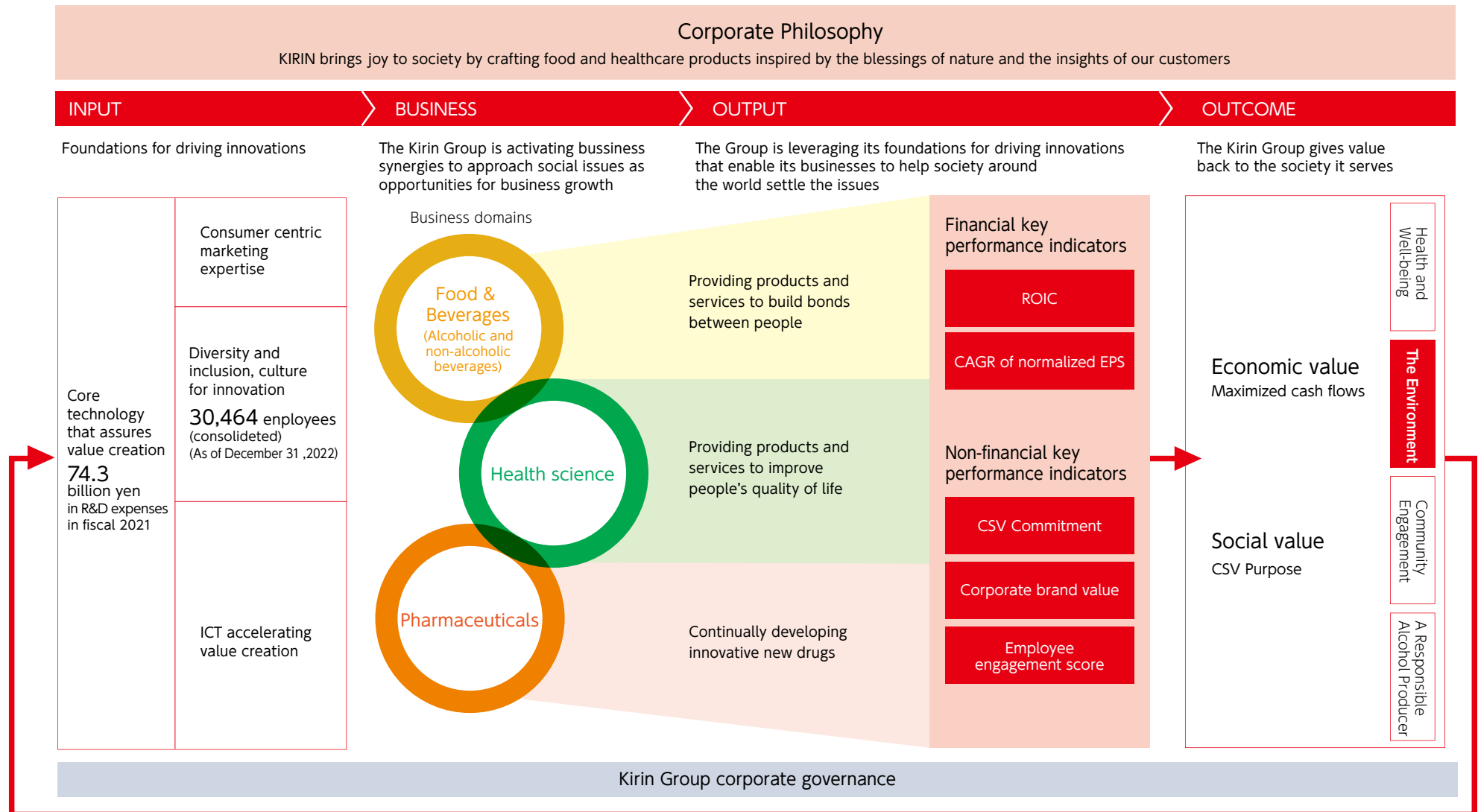


Value Creation Model

The Kirin Group places CSV at the core of our 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" below is a continuous mechanism that amplifies these two types of value creation through a cycle of reinvesting economic value gained in our capabilities

as an organization. Operating our businesses across the three areas from food and beverages to pharmaceuticals requires the input of natural capital and the resolution of environmental issues in areas such as containers and packaging, and climate change. We believe that realizing solutions to these issues and sustainable use of natural capital through our businesses

will contribute to the value we give back to society. For this reason, we regard that the "environment," which is indicated as one of the non-financial targets in the value creation model below, is an important factor for value creation. On page 11, under "Kirin's Environmental Value Correlation," we explain how environmental issues relate to the Kirin Group's value creation model.



Identification of Materiality

When formulating the Kirin Group 2022-2024 Medium-Term Business Plan, the second stage of our Long-Term Management Vision, the Kirin Group Vision 2027, announced in 2022, we assessed the importance of sustainability issues. In accordance with the flow for the identification of materiality (below), we updated our social and environmental analysis, and after dialogue with internal and external stakeholders, as well as discussions among management including the Group CSV Committee on multiple occasions, and deliberation at meetings of the Board, we revised the Management Issues for Sustainable Growth (Group Materiality Matrix) (below on the right) in anticipation of the situation in ten years' time. We use this process to identify the issues that are most important to

Flow for the identification of materiality

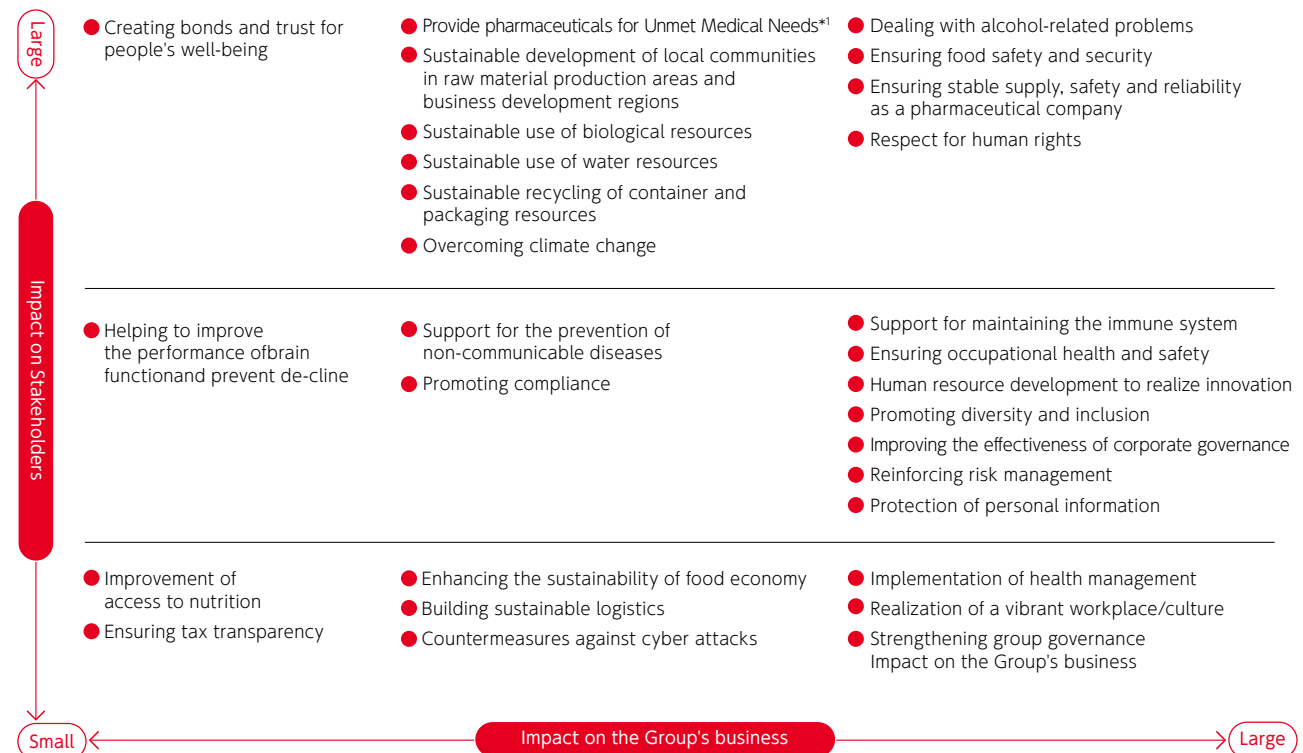


the Kirin Group and its stakeholders and which areas the Kirin Group can positively impact. As a result, we reconfirmed that the following four important issues related to the environment that we set in the Kirin Group's Environmental Vision 2050 are highly material issues for Kirin Group management: "sustainable use of biological resources," "sustainable use of water resources," "sustainable recycling of containers and packaging," and "overcoming climate change." The beta version of TNFD framework, published in March 2022, recommends a holistic approach to climate and nature-related issues. The holistic approach is a fundamental concept of the 2013 Kirin Group Long-Term Environmental Vision, in which we clearly state that the

four environmental issues of "biological resources," "water resources," "containers and packaging," and "climate change" are not independent but "interrelated environmental issues." The Kirin Group has continuously pursued this concept since we turned our focus to environmental activities with a global perspective in early 1990.

As a pioneer of the holistic approach, we intend to contribute to increased global awareness of this concept and the resolution of environmental issues. Through this process, we identify the most important issues for the Kirin Group and its stakeholders, and examine which domains the Kirin Group can make a positive impact in.

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

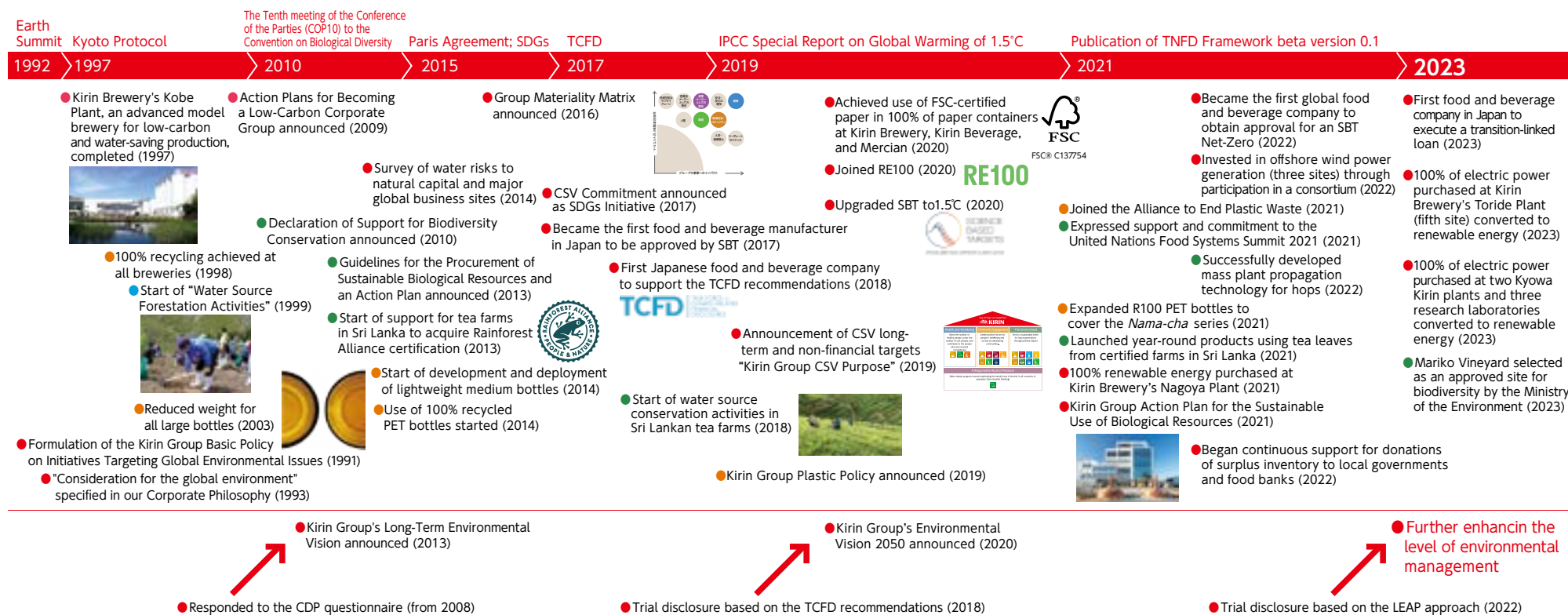
In the Kirin Group, we have enhanced the level of our environmental management by repeatedly anticipating global trends and engaging in initiatives on a trial basis. Taking the opportunity of the 1992 Global Environment Summit in Rio de Janeiro, in 1991, the previous year, we established the Kirin Group's Basic Policy for Addressing Global Environmental Issues. In 1993, the year after the Summit, we revised our management philosophy to state: "We aim to be a corporate group that considers the global environment." In this way, we accelerated our environmental management by making a major shift from activities centred on pollution control to activities with a global perspective. It resulted in industry firsts, such as our subsequent corporate presentation at the 1997 Third Conference of the Parties to the United Nations Framework Convention on Climate Change held in Kyoto, "Water Source Forest Activities" launched in 1999, the lightest weight returnable beer bottle in Japan in 2003, and 100% FSC certified paper for paper containers in 2020. Our response to advanced disclosure frameworks has further

significantly raised the level of the Kirin Group's environmental management. From around 2008, we began full-fledged measures to respond to questionnaires sent by the CDP, an environmental non-governmental organization (NGO) that currently has the greatest influence on responses to environmental issues such as climate change. At that time, not so many people did not think that ESG would become such an important issue in Japan, but we thought that answering the questionnaire would be the best way to proactively identify environmental issues that required a global response. The "mental exercises" required to respond appropriately to the CDP questionnaire contributed to our multilayered understanding of global environmental issues, as well as the Kirin Group Long-Term Environmental Vision, which we disclosed in 2013. Thanks to our quick response to the scenario analysis called for in the TCFD guidance released in 2017, we have ensured that an understanding has spread from management to employees that the

Kirin Group's environmental themes of "biological resources," "water resources," "containers and packaging," and "climate change" must be approached not as separate issues, but as interrelated issues in a holistic manner. This shared understanding formed the basis for subsequent enhancements to the level of environmental management.

In this way, we have created a shared understanding within the company that responding to advanced disclosure frameworks will improve the level of environmental management, which in turn made it easier for us to take on the challenge in 2022 of disclosing information on a trial basis based on the LEAP approach advocated in beta v0.1 of the TNFD framework issued in 2021.

Although there are risks involved in trying the disclosure of information on a trial basis at an early stage, we believe it will contribute to the acquisition of large amounts of feedback, leading to a multilayered understanding of environmental issues, clarification of our vision, and enhancement of the level of environmental management. Going forward, we will continue taking the lead in achieving a decarbonized society, being nature positive, and building a circular economy, by continuing to take on new challenges one step ahead of global environmental challenges.



Kirin Group's Environmental Vision 2050

Enrich the Earth with Positive Impact

Against the backdrop of the climate crisis, the ongoing loss of biodiversity, and the increasing severity of global environmental problems such as ocean pollution caused by plastics, society is approaching a major turning point. Industries such as Kirin Group that rely on water, agricultural products, and other blessings of nature are vulnerable to climate change, and must move quickly to overcome these issues.

In scenario analysis based on the TCFD final report, which we have been conducting since 2017, we have seen the enormous scale of the impact of climate change on agricultural products and water resources, and it has become clear that minimizing

and neutralizing negative impacts will not be sufficient to limit the impact on natural capital and deliver a sustainable planet to the next generation. We also expect that corporate environmental initiatives will evolve from being self-contained to having a positive impact on wider society.

In order to meet these demands from society, we have further developed our existing holistic approach to the environment with the Kirin Group's Environmental Vision 2050, which the Board deliberated, resolved, and renewed in 2020, as well as the "positive impact" approach that we have newly introduced. With regard to renewable energy sources, we prioritize

"additionality," i.e., contributing to the decarbonized society by adding and increasing renewable energy in the world. We aim to build a "society that continuously recycles plastics" by developing our own commercialization techniques for chemical recycling. With regard to natural capital, we aim to be "nature positive," whereby the expansion of our businesses will contribute to the restoration of ecosystems and increase of their services.

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.



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

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

Efforts for Realization

 <h4>Biological Resources</h4> <p>A society that values sustainable biological resources.</p>	<h4>Cultivate, expand and procure sustainable agricultural raw materials</h4> <ul style="list-style-type: none"> ● Procure agricultural raw materials that comply with certification schemes, such as FSC, RSPO and the Rainforest Alliance. ● Cultivate agricultural raw materials that are suited to global warming and expand them to raw material production areas. ● Promote recycling and reduction of product waste, thereby bringing food waste generated by production activities to zero. <h4>Stand by the side of farmers to make raw material production areas sustainable</h4> <ul style="list-style-type: none"> ● Expand support in acquiring sustainable certifications, such as the Rainforest Alliance, and solve environmental issues, etc., in production areas. ● Examine and research contributions to affluent biodiversity by sustainable agriculture and expand the outcomes to raw material production areas.
 <h4>Water Resources</h4> <p>A society that values sustainable water resources.</p>	<h4>Bring water, used as a raw material, to a sustainable state</h4> <ul style="list-style-type: none"> ● Continue to reduce the volume of water use in group operational bases. ● Further promote water source forestation activities in Japan. <h4>Solve problems with water in a way that suits the characteristics of basin regions where our business bases are located</h4> <ul style="list-style-type: none"> ● Minimize risk during water-related disasters by reinforcing resilience and efficiency for supply chains. ● Implement water source preservation activities and education programs to preserve water in raw material production areas, thereby solving water issues in the value chain.
 <h4>Containers and Packaging</h4> <p>A society that circulates containers and packaging in a sustainable way.</p>	<h4>Develop and disseminate sustainable containers and packaging</h4> <ul style="list-style-type: none"> ● Use sustainable containers and packaging that employ recycled materials and biomass. ● Aim to develop new containers and services. <h4>Build a resource-recycling system to make containers and packaging sustainable</h4> <ul style="list-style-type: none"> ● Take the lead in improving the recycling system in Japan. ● Contribute to collection of resources and establishment of recycling infrastructure in areas where operations are maintained.
 <h4>Climate Change</h4> <p>A society that has overcome climate change.</p>	<h4>Realize Net-zero GHG emission from the entire value chain</h4> <ul style="list-style-type: none"> ● Achieve RE100 at an early stage and source the company's energy from 100% renewable energy. ● Realize Net-Zero GHG emissions from in the entire value chain. <h4>Lead to build a decarbonized society</h4> <ul style="list-style-type: none"> ● Build a business model that contributes to a decarbonized society with customers and other stakeholders. ● Support research to mitigate climate change and expand responsible renewable energy to society.

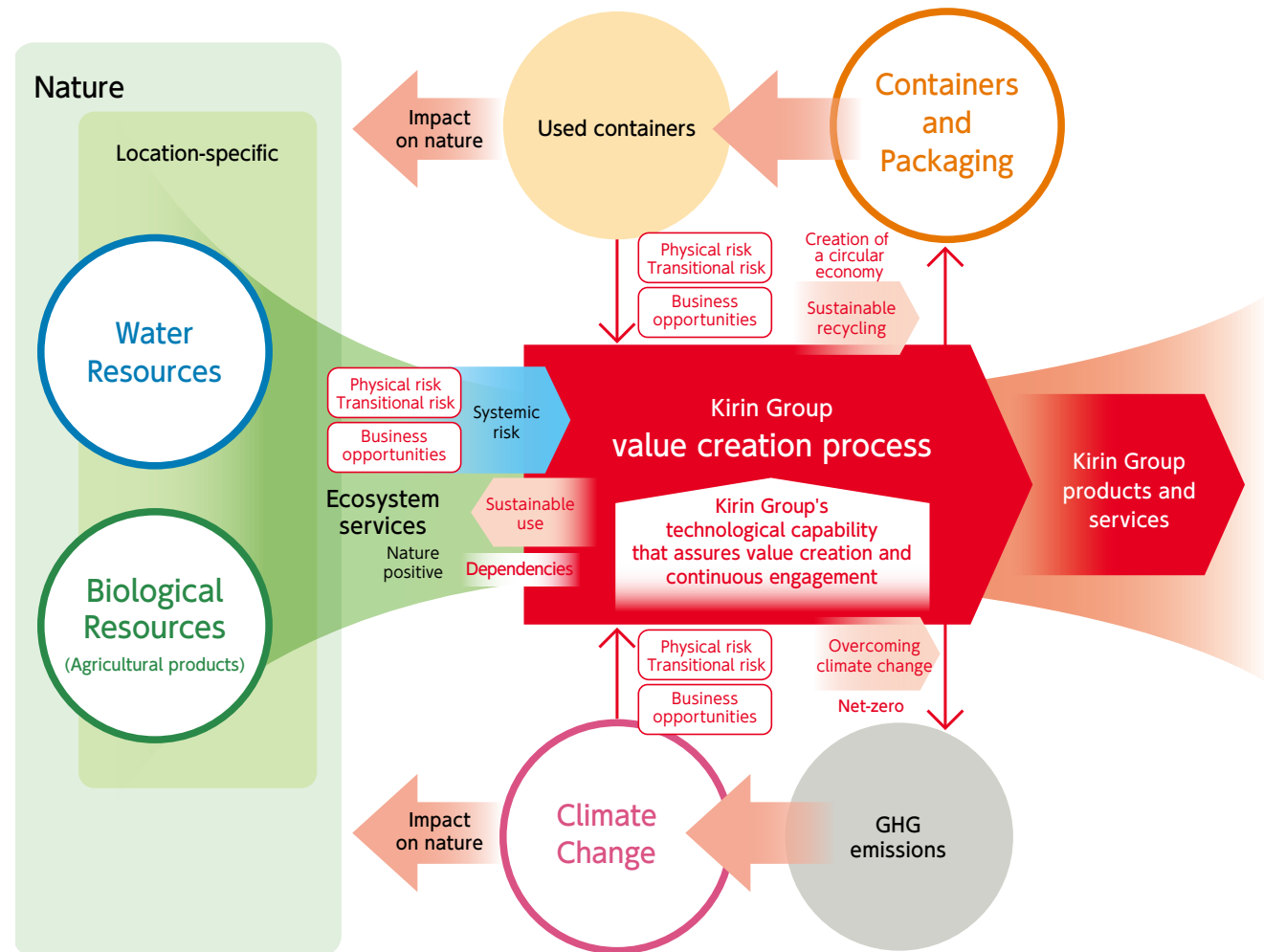
Kirin's Environmental Value Correlation

The Kirin brewing philosophy of "Reverence for Life" is behind the Kirin Group's environmental management. Malt, hops, and water are all blessings from nature, and yeast, which breaks down the sugar in wort into alcohol and carbonic acid and determines the flavor of beer, is also a microorganism. The idea is that in order to produce great-tasting beer, we need to continue to work directly with "life" and study the life sciences.

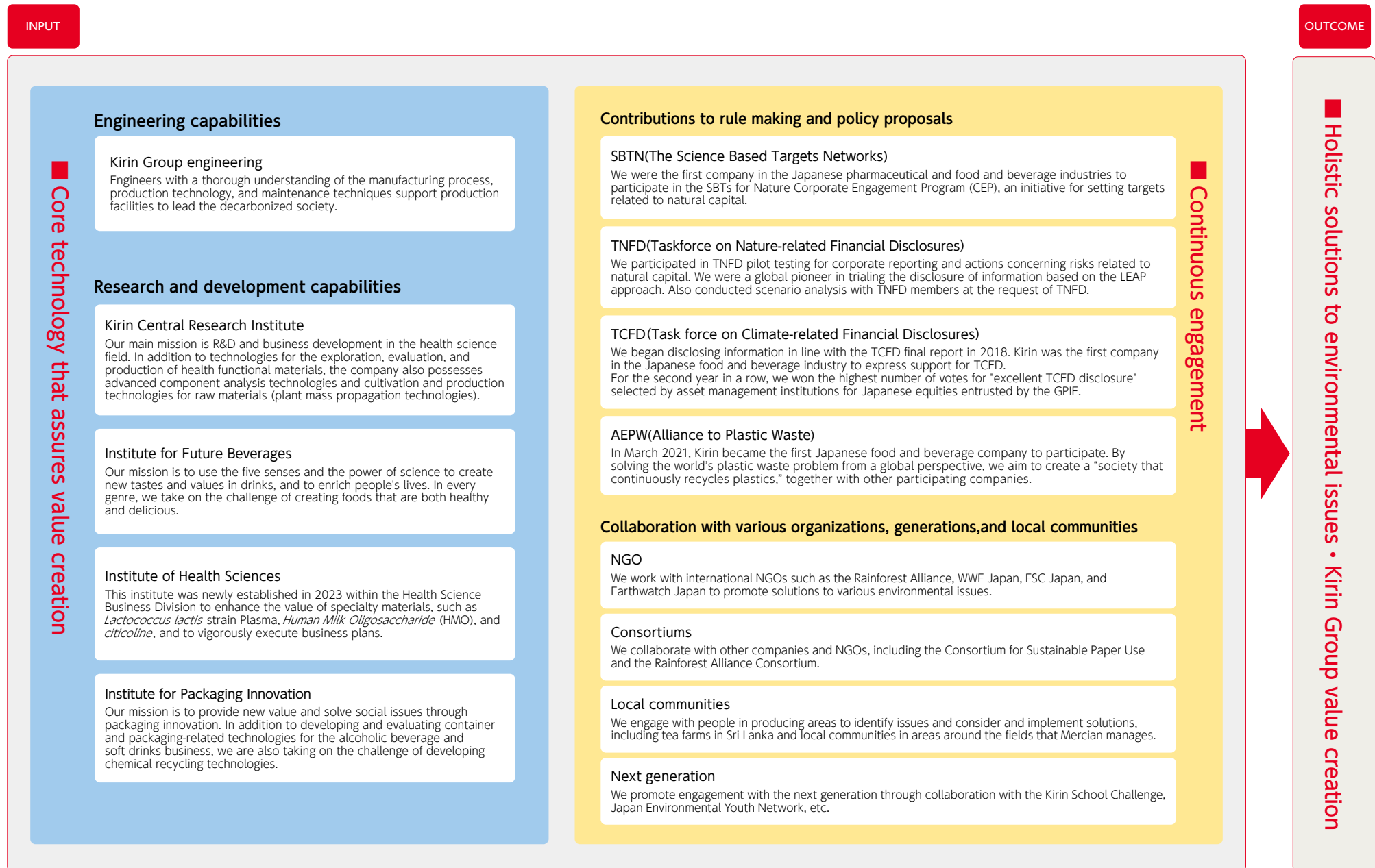
The idea of "Reverence for Life" is based on the teachings of respect for the diversity of humanity and the natural environment of Dr. Albert Schweitzer, who won the Nobel Peace Prize in 1952, namely his idea that, "I am life that wills to live, in the midst of life that wills to live." This idea also serves as the backbone of our CSV management, in which we contribute to those around us (social value), as well as our own company (economic value).

The Kirin Group was quick to view natural capital as a source of value creation, and it is fair to say that we selected agricultural products and water as the first targets for TCFD scenario analysis not only because we recognize that we are a company that uses ecosystem services, but also because we have put our brewing philosophy of "Reverence for Life" into practice at the management level.

Our corporate culture, which is fostered through developing the life sciences, has led to R&D capabilities and engineering technologies that go beyond areas outside of the life sciences, such as packaging, and contributes to the competitive advantage of the Kirin Group's engineering and R&D capabilities. At the same time, it acts as the driver for our holistic approach to four environmental issues. Such an organizational culture that values science lead to not only the industry-leading pursuit of getting our science-based GHG emissions reduction targets validated by the Science Based Targets initiative (SBTi) but also our intention to contribute to the setting of scientific targets related to natural capital through participation in the pilot program of the Science Based Targets Network. Consortiums with NGOs and other companies, collaboration with local communities, and participation in global initiatives are all aspects of our holistic approach.



Kirin's Strengths in Environmental Management



Performance Highlights (Environmental Value Created in 2022)





The Kirin Group was a global pioneer in disclosing information on a trial basis based on the "LEAP" approach advocated in the beta v0.1 of the TNFD framework in 2022. As one of four companies selected from around the world in March 2023, Kirin is leading the world in the disclosure of non-financial information related to natural capital, such as testing scenario analysis methods with TNFD members. In addition, we continue to receive high praise for our TCFD-compliant disclosure, including receiving the highest number of votes for "excellent TCFD disclosure" selected by the GPIF's domestic equity asset management institutions for the second consecutive year.

Over more than three years, the spread of COVID-19 has had a significant impact on the Kirin Group's progress in resolving environmental issues. Strict restrictions on going out continued in Sri Lanka, meaning that trainers were mostly unable to travel to farms. Under these conditions, the government abruptly declared a ban on the use of chemical fertilizers and pesticides, which, combined with the subsequent economic collapse

in Sri Lanka, forced a long period of stagnation in efforts to support the acquisition of sustainable farming certification and conserve water sources within farms. Even under these difficult circumstances, the Kirin Group continued to support the acquisition of certification, while the Rainforest Alliance and local trainers did their utmost to ensure that the farms continued to grow tea. Following the declaration of WHO of the end of the global emergency over COVID-19, we will resume our activities in earnest, and will also discuss new measures to support small farms with the Rainforest Alliance, which we plan to announce later this year.

Ongoing ecological research since 2014 has scientifically demonstrated that the Château Mercian Mariko Winery in Ueda City, Nagano Prefecture, has achieved Nature Positive status by transitioning from idle, devastated land to hedge and grass cultivation, and the results were presented at COP15 in 2022. We are also engaged in procedures aimed at contributing to the OECMs*1 of the new global "30by30"*2 goal.

The ratio of recycled resins used in PET bottles for containers and packaging in fiscal 2022 was approximately 1.7 times higher than previous year. Our plan to achieve practical uses for chemical recycling is making progress, and we believe we will be sufficiently able to achieve our target of 50% by 2027. We already use 100% FSC-certified paper for paper containers in the alcohol and non-alcoholic beverages business in Japan, and together with our efforts related to PET bottles, we will contribute to the creation of the circular economy. From 2021 to the first half of 2023, the Kirin Group has been accelerating measures to install large-scale solar power generation facilities at breweries and plants, and to make the electricity purchased at breweries and plants 100% renewable. By the end of 2023, we expect 43% of the electric power used by Kirin Brewery to come from renewable energy, and we also expect Kyowa Kirin to reduce its CO2 emissions by 53% compared with 2019. As energy prices soar as a result of rising demand for energy caused by economic recovery from the spread of COVID-19 and the geopolitical impact since February 2022, we will turn this risk into an opportunity, and lead the creation of a decarbonized society.





 Biological Resources A society that values sustainable biological resources	Cultivate, expand and procure sustainable agricultural raw materials <div> <div> Paper and Printed Materials FSC-certified paper or recycled paper 100% </div> <div> RSPO (domestic primary and secondary raw materials) 100% </div> </div> <p>The product using tea leaves from certificated farm ● 250ml LL slim Kirin Gogo-noKocha Straight Tea (2021~)</p>	Stand by the side of farmers to make raw material production areas sustainable <div> <div> Number of large farms assisted to obtain certification 94 (2013 to 2022) </div> <div> Number of small farms that received training 9 2022-2024 Target : Cumulative total of 5,350 farms </div> </div>
 Water Resources A society that values sustainable water resources	Bring water, used as a raw material, to a sustainable state <div> <div> Non-financial target for water efficiency (Lion) 3.6kL/kL 2025 target : 2.4kL/kL or less </div> <div> Rate of reduction of water consumption per unit of production across Kirin Group ▲32% Actual in 2022 compared with 2018 </div> </div>	Solve water issues according to the watershed characteristics of business locations <div> <div> Number of water source conservation in Sri Lanka Cumulative Total 15 </div> <div> Water source forest conservation activities 11 </div> </div>
 Containers and Packaging A society that circulates containers and packaging in a sustainable way.	Develop and disseminate sustainable containers and packaging <div> <div> Percentage of recycled resins used in PET bottles 8.3% 2027 target: 50% </div> <div> Percentage of FSC-certified paper used for paper containers (Japan) 100% </div> </div>	Build a resource-recycling system to make containers and packaging sustainable Systems for collecting used PET bottles ● Launched a horizontal recycling trial to recycle used PET bottles into new PET bottles, at TOBU RAILWAY, Kiyosu City in Aichi Prefecture, and CHIBAYAKU GROCERIES, inc. "Yacs Drug" drugstores ● Introduced recycling boxes with new functions, designed to industry-wide specifications aimed at reducing contamination with foreign materials, next to vending machines
 Climate Change A society that has overcome climate change.	Realize Net-Zero GHG emissions from the entire value chain <div> <div> Compared with 2019 ▲18% Scope1+ Scope2 2030 target: -50% </div> <div> Compared with 2019 ▲1% Scope3 2030 target: -30% </div> </div>	Lead to build a decarbonized society Products compatible with decarbonization ● Steinlager (certified carbon zero beer under the Toitu program) ● XXXX Zero (Climate Active certified carbon zero beer)

*1 A target to effectively conserve at least 30% of land and sea areas as healthy ecosystems by 2030, with the goal of halting and reversing biodiversity loss by the same year. It was adopted as a new global target at the Fifteenth meeting of the Conference of the Parties (COP15) to the Convention on Biological Diversity held in December 2022.

*2 An acronym for Other Effective area-based Conservation Measures, which are geographically defined areas other than Protected areas, such as national parks, but that can effectively conserve biodiversity over the long term. Such areas can be included when achieving numerical targets under 30by30 targets.

*3 For details on calculation boundaries for each type of performance data, etc., see the content of our activities (→P.41~P.75)

Progress (2022)

Theme	We will create together	Major item	Minor item	Targets	2020	2021	2022
 Biological Resources	A society that values sustainable biological resources	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)	— <small>Total number of certified large farms: 94 (2013 to 2022)</small>	—	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)	— <small>Cumulative total of 120 small farms(2018 to 2022)</small>	—	Total 9 farms
		Other	Use of FSC-certified paper or recycled paper for office paper KB KBC ME	100% (2020)	100%	100%	100%
			Response to sustainable palm oil <small>*Except palm kernel oil</small> KB KBC ME KIW	100% (2020)	100%	100%	100%
			Reduction of food waste (Compared with 2015 levels) KB KBC ME	-75% (2025)	-44%	-81%	-92%
 Water Resources	A society that values sustainable water resources	Water reduction	Reduction of water consumption rate LN	2.4kl/kl (2025)	3.6kl/kl	3.5kl/kl	3.6kl/kl
			Rate of reduction of water use volumes (Compared with 2019 levels) KKC	-40% (2030)	-22%	-25%	-33%
			Rate of reduction of water use volumes (Compared with 2015 levels) KHB	-32% (2030)	-43%	-52%	-52%
		Water source conservation activities at Sri Lankan tea farms	Number of water source conservation sites KBC	5 sites (2020)	5 sites	12 sites	15 sites
 Containers and Packaging	A society that circulates containers and packaging in a sustainable way	PET bottles	Ratio of usage of recycled resin for PET bottles KB KBC ME	50% (2027)	1.4%	4.9%	8.3%
		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%
 Climate Change	A society that has overcome climate change	Reduction in GHGs	GHG emissions from the entire value chain KG	Net-Zero (2050)	4,721ktCO ₂ e	4,491ktCO ₂ e	4,876ktCO ₂ e
			GHG emission reduction rate – Scope 1 + Scope 2 (Compared with 2019 levels) KG	-50% (2030)	-10%	-14%	-18%
			GHG emission reduction rate – Scope 3 (Compared with 2019 levels) KG	-30% (2030)	-7%	-11%	-1%
		Renewable energy	Ratio of renewable energy in plant purchased electric power KG	100% (2040)	12%	17%	27%

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 Framework, TNFD Framework Draft, etc.

In this part (pages from 15 to 37), we explain how the Kirin Group assesses and analyzes 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 increase our resilience to climate change, use natural capital appropriately and continuously, and contribute to building a circular economy. In addition to information based on the TCFD final recommendations, we also provide a holistic explanation where possible, incorporating the results of our response to the TNFD framework, including our globally-pioneering trial of the LEAP approach in 2022 and our participation in the pilot test for TNFD scenario analysis.

When preparing the information in this section, we have complied with the TCFD final recommendations published in June 2018 and the new TCFD guidance published in October 2021, and we have also referred to the beta versions 0.1 to 0.4 of the TNFD framework, which were disclosed in stages between March 2022 and March 2023, and to the IFRS S1 and S2 standards formally published on June 26, 2023 by the International Sustainability Standards Board (ISSB) in parts.

15 Applicable businesses

The businesses to which this analysis applies account for approximately 90% of the Kirin Group's sales, consisting of Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, Kyowa Hakko Bio, and Koivai Dairy Products.

Time horizon

For the periods when risks will materialize, 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). However, 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.

Scenario

In scenario analysis, we use Group Scenarios that combine temperature scenarios (RCPs) and socioeconomic scenarios (SSPs) from the IPCC, etc. In Group Scenario 1 (2°C or 1.5°C scenario), we have mainly used SSP1 and RCP2.6, whereas in Group Scenario 3 (4°C scenario), we have mainly used SSP3 and RCP8.5. We have not taken the impact of geopolitical factors into consideration in this scenario analysis. Given the near absence of agreed-upon scenarios related to natural capital at present, we have partially utilized the results of climate change scenario analysis for natural capital, where we have judged that such results can be adapted. We provide information about the individual scenarios used in the relevant parts.

All research results, information, data, and other sources of information for each scenario were valid

at the time of consideration of the scenario, and by their nature, estimates of impact analyzed and calculated based on these scenarios contain uncertainties. We have acknowledged, however, that resilience assessments using scenarios are very useful. In July 2018, when we disclosed the results of the scenario analysis for the first time in our 2018 Environmental Report, the 2018 West Japan Torrential Rain Disaster (the Heavy Rain Event of July 2018) occurred, causing extensive damage to a large area of western Japan and disrupting roads and railway networks. Kirin Beverage has actively promoted a modal shift, partly also to cope with the shortage of truck drivers, and has achieved a significant reduction in GHG emissions. This shift to railway transportation, however, happened to disrupt deliveries during peak sales periods due to the disaster, which caused a major impact. We had listed the impact of natural disasters on transportation as a major risk in conventional risk management, and we had made some efforts to mitigate this risk. However, since we regarded the probability of occurrence as low, we did not consider detailed countermeasures. Based on this experience, scenario analysis has been adopted as a management method to identify and reduce risks that could have an extremely large impact on the business if they were to occur, regardless of their likelihood, and to minimize the impact of risk cases that have occurred since then.

Integration into the Strategy

The results of scenario analysis provide meaningful input information for our environmental strategy. At the Group CSV Committee meeting held in June 2019, we reported the rapidly changing situation surrounding the environment since the Paris Agreement and the findings from scenario analysis. Senior management discussed these matters, and as a result, directed the launch of a project to review the formulation of strategies and the setting of targets. In February 2020, following deliberations based on the project recommendation, the Board passed a resolution to adopt the "Kirin Group's Environmental Vision 2050," a long-term strategy that significantly raised the targets in our existing environmental vision, as well as our aim to achieve "net zero GHG emissions" by 2050. Following the declaration of our aim to achieve net zero emissions in February 2020, we joined RE100 in November 2020 and declared our aim to use renewable energy for 100% of electric power by 2040. In December 2020, the Kirin Group raised its target to 1.5°C of SBT from the previous 2°C target, for which the Group was the first Japanese food company to obtain approval from SBTi in 2017.

In 2021, we formulated a roadmap to achieve our Science-Based Target of 1.5°C by 2030 and net zero emissions target by 2050. We have also launched specific measures, such as introducing large-scale solar power generation facilities at our breweries and plants. In July 2022, we became the first food and beverage company in the world to obtain certification for an SBT for net zero. Since the impact of climate change on agricultural raw materials (biological resources) and water resources is significant, we think adaptation measures are also important for our alcoholic and non-alcoholic beverages businesses. Through our response to the TCFD Framework, we have been able to reconfirm the fact that the four environmental themes are not separate issues but are instead interrelated and thus require a holistic response.

Regarding natural capital, while participating in the pilot program for the proposed beta version of the TNFD Framework, we added the characteristic perspectives of "location-specific," "dependency," and "impact on nature" to the existing activities based on the Use of Biological Resources and activities to solve water issues that differ from country to country and region to region. We are trying to reflect this in our strategy so that we can contribute to solving climate change and container packaging issues through addressing the natural capital side.

In the future, in addition to the TCFD framework, we will advance the integrated approach by supporting the TNFD framework.

Reference information and calculation method

The specific analysis and calculation process, data used, and references are summarized in the "Holistic Analysis of Risks and Opportunities, Business Impact, and Strategies in Environmental Management." Information related to the GHG emissions calculation process (e.g., metrics, calculations or methods used to estimate GHG emissions), boundaries, coefficients used in calculations, calculation methods, etc., that are not included in each part are stated in the ESG Data Book.

ESG Data Book

<https://www.kirinholdings.com/jp/investors/files/pdf/esgdatabook2023.pdf>

Third-party certification

The Kirin Group receives assurance from an independent third party in order to ensure the reliability and transparency of information. For more information, please see the ESG Data Book.

		Kirin Group Scenario 3 4°C Scenario. SSP3, RCP8.5	Kirin Group Scenario 1 2°C or 1.5°C 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	<ul style="list-style-type: none"> ● 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. 	<ul style="list-style-type: none"> ● 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	a.Decreases in global beer supply due to extreme drought and heat, Nature Plants, VOL.4, NOVEMBER 2018, 964-973(Xie, et al.) b.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 c.Risk of increased food insecurity under stringent global climate change mitigation policy. Nature Climate Change, volume 8, pages 699-703(Hasegawa T, Fujimori S, HavlikP, Valin H, BodirskyBL, DoelmanJC, FellmannT, Kyle P et al. 2018) d.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.	
	Drought risk	AIR Touchstone version 8.2	
	Agricultural products (impact of global warming on prices and carbon taxes)	a.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 b.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- c.703(Hasegawa T, Fujimori S, HavlikP, Valin H, BodirskyBL, DoelmanJC, FellmannT, Kyle P et al. 2018)	
	Energy (carbon taxes)	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°C Scenario: IPCC Special Report on Global Warming of 1.5°C)	

Governance

Supervisory structure

In the Kirin Group, the Board of Directors supervises the execution of the Group's environmental operations, including climate change, natural capital and recycling, on a quarterly basis through monitoring the progress of non-financial targets, and deliberates and resolves on the basic policy for all environment-related issues, medium- and long-term strategies, annual plans, and important non-financial targets and KPIs, including environmental targets.

The Board monitors risks and opportunities assessed and identified by operating companies, based on reports from the Group Risk and Compliance Committee Secretariat. It makes resolutions concerning important risks (including environmental management strategies, action plans, the status of progress, and scenario analysis results) identified in risk management and materiality. The Board supervises the effectiveness of environmental management through these deliberations and reports.

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 Group CSV Committee has been established to discuss environmental and other CSV issues across the Kirin Group. The committee is an advisory body to the CEO and is chaired by the CEO of Kirin Holdings, with its members being the CEOs of major Kirin Group companies and senior officers of Kirin Holdings. With the participation and advice of outside experts from a multi-stakeholder perspective, as necessary, this committee engages in in-depth discussions on matters such as current and potential future sustainability issues, the degree of dependence, and the degree of impact, as well as risks and opportunities associated with these issues, and reports its decisions to the Board. In 2022, we increased the frequency of meetings of the Group CSV Committee (from once a year to three times a year) and newly established the Group Environmental Meeting (meets twice a year) under the Group CSV Committee.

The Group Environmental Meeting mainly monitors matters such as 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, with the officer in charge of CSV strategy as the chair and the relevant senior officers and department heads as members. At meetings of the Group CSV Committee and the Board, there are agenda items and reports concerning 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. The Kirin Group engages in environmental management, including responding to climate change, as part of our CSV management system.

Starting from our medium-term plan in 2022, performance-linked remuneration for senior 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, and in relation

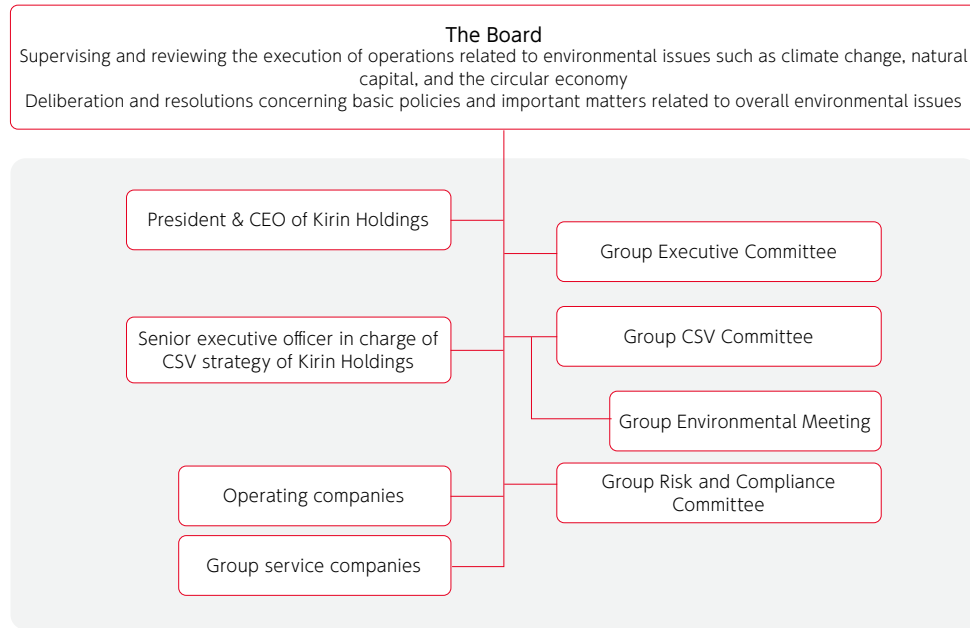
	Roles and authorities	Members	Frequency	Achievements
The Board	<ul style="list-style-type: none"> Supervision of execution of environmental operations within the Group Resolutions related to environmental policies, medium- and long-term strategies, and fiscal year plans Resolutions related to important non-financial targets and KPIs, including those concerning the environment Monitoring the degree of dependence on and impact of natural capital, as well as environmental risks and opportunities 	<ul style="list-style-type: none"> Chair: non-executive director Independent 7, Executive 5 	4 times a year + as needed (monthly for risk monitoring)	<ul style="list-style-type: none"> Quarterly supervision of execution of environmental operations Monthly monitoring of risks, including environmental Resolutions concerning plans for fiscal 2023, including environmental targets and KPIs Resolutions concerning materiality and important risks in 2023
Group Executive Committee	<ul style="list-style-type: none"> 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 on and impact of natural capital, as well as environmental risks and opportunities Supervision of the environmental operations of operating companies and divisions 	<ul style="list-style-type: none"> Convened and chaired by the CEO, Kirin Holdings Company, Limited. Executive officers of Kirin Holdings 	Approximately 30 times a year	<ul style="list-style-type: none"> Quarterly supervision of the execution of environmental operations by operating companies and divisions, and monthly monitoring of risks, including those related to the environment Deliberation of plans for fiscal 2023, including environmental targets and KPIs, and materiality Held 33 meetings in 2022
Group CSV Committee	<ul style="list-style-type: none"> Discussion of CSV policies, strategies, plans, targets, KPIs, and materiality across the Kirin Group, including those related to the environment 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> Formulation of policies, strategies, plans, targets and draft KPIs for the four environmental issues (climate change, water, containers and packaging, and biological resources) 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Formulation of draft plans for fiscal 2023 concerning the four environmental issues
Group Risk and Compliance Committee	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Chair: Executive officer in charge of legal affairs of Kirin Holdings Executive officers of Kirin Holdings 	Twice a year + as needed	<ul style="list-style-type: none"> Deliberation of basic policies for plans for fiscal 2023 and important risks for the Kirin Group Deliberation of draft revisions to compliance guidelines

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

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. For the circular economy, we have set a target of "38% usage of recycled resins in PET bottles in Japan."

We incorporate environmental targets, including climate change, 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.

Status of Governance for Environmental Issues



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, which are one of the main management indicators in our Medium-Term Business Plan.

<https://www.kirinholdings.com/en/purpose/governance/compensation/>

Our 2022-2024 CSV Commitments, which is incorporated into the management plans of the Kirin Group and operating companies, is shown below.

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

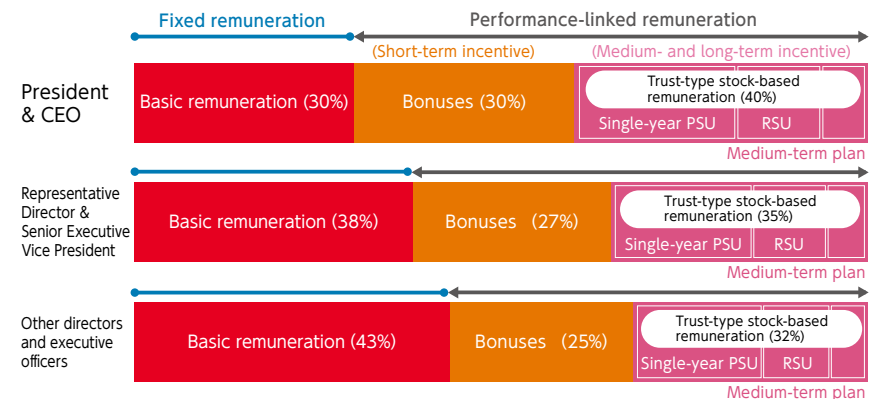
Structure of executive remuneration



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



Risk Management

Senior management develops measures to address significant physical and transitional risks related to climate change detected in scenario analysis into mitigation and adaptation strategies, as described in the section on governance, 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 within Kirin Holdings to oversee risk management, including risks related to the environment, such as climate change, natural capital, the circular economy, and laws and regulations, and other risks related to sustainability. The Board deliberates basic policies concerning important risks for the Group (under our risk management system, “opportunities” are included in the management of “risks”) 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 to conduct risk management, based on the Group’s basic policies for important risks and risk management, which were determined by the Board of Kirin Holdings. Each Group company regularly reports its risk status to the Kirin Holdings Group Risk and Compliance Committee and the Board, and Kirin Holdings monitors risk for each functional division.

*1 Please see “Identification of Materiality” (→P.8) for details concerning the identification of materiality for risks and opportunities, including environmental issues such as climate change.

*2 Details of our “risk management system” are disclosed below.

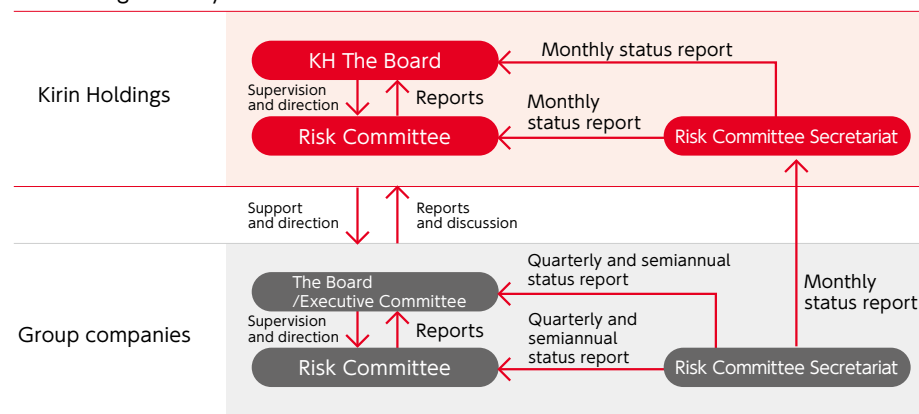
https://www.kirinholdings.com/en/purpose/governance/risk_management/

Management of risks related to sustainability

Sustainability-related risks include the physical and acute risks related to climate change, such as heavy rains, floods, droughts, and wildfires, which have become more frequent and severe in recent years. When such climate disasters occur, the Group or the relevant company’s Risk and Compliance Committee immediately discusses the matter, and countermeasures are promptly implemented. When we expect the impact to be significant, we take countermeasures in accordance with BCPs that have transitioned to all-hazard mode*³. The Board of Kirin Holdings receives reports on the status of the crisis as appropriate and issues necessary instructions. After a response to an individual crisis has been completed, we review the risks involved and the details of measures to respond, and share our experience within the Group as expertise in the form of revisions to response manuals and BCPs, contributing to a sustained strengthening of management resilience. For example, we were able to utilize 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 almost every year in Japan. In addition,

*3 All-hazard BCP: 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

Risk management system



Risk management PDCA cycle



we leveraged our experience of heavy rain in western Japan in 2018 to protect logistics functions during Typhoon Hagibis in the following year, 2019.

Improving risk response capabilities

For 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. The Group Environmental Meeting and the Group CSV Committee share and discuss risks and opportunities identified through scenario analysis, then submit and report them to the Board. The Group Risk and Compliance Committee Secretariat also receives reports on such risks, and manages them together with other risks. Additionally, we appropriately reflect internal examples of sustainability-related risks, such as responses to climate disasters, in annual risk and compliance training for all employees, and share this information within the Group in order to strengthen resilience across the Group as a whole.

Significant Risks and Opportunities

For physical risks, we have mainly analyzed the impact on major agricultural raw materials and water resources in all areas, from food and beverages to pharmaceuticals, particularly the alcoholic and non-alcoholic beverages businesses, which we have found to be significantly impacted in past scenario analysis.

For transitional risks, we have analyzed energy and agricultural products, which account for a large share of procurement costs.

In terms of business opportunities, we have analyzed areas such as health, which is a key area for the value creation from food and beverages to pharmaceuticals, and an area where we think we can contribute to social issues caused by climate change. For natural capital, we have narrowed the scope of analysis by considering location, dependency, and impact. In the case of containers and packaging, we set the scope of analysis after taking into consideration resource recycling and impacts on climate change and natural capital.

Theme	Scenario	Scenario driver/impact driver*	Time frame			Types of risks and business opportunities	Potential impact			Strategy	Related pages
			S	M	L		S	M	L		
Biological Resources	As a result of global warming, yields of major agricultural raw materials (barley, hops, coffee beans, etc.) decline significantly, affecting procurement costs. Quality degradation is also expected.	Increase in procurement costs due to decline in yields of agricultural products / climate change		●	●	Physical risk (acute and chronic) / transitional risk (market and reputation)	■	■		<ul style="list-style-type: none"> •Brewing technology that does not rely on barley •Mass plant propagation technologies •Support for farms to acquire certification for sustainable agriculture 	P31 P31, P49, P79 P31, P44, P45, P48
	Increases in the cost of petroleum-based fertilizers and chemical pesticides due to carbon pricing, as well as competition with biofuel cultivation, affect procurement costs.	Increase in procurement costs of agricultural products due to carbon pricing / changes in land use		●	●	Physical risk (acute and chronic) / transitional risk (market and reputation)		■	■	<ul style="list-style-type: none"> •Brewing technology that does not rely on barley •Mass plant propagation technologies •Support for farms to acquire certification for sustainable agriculture 	P31 P31, P49, P79 P31, P44, P45, P48
	Domestic farm land becomes derelict and distinctive agricultural products and traditional Satoyama landscapes are lost as a result of the decline in domestic farmers.	Biodiversity / ecosystem services / changes in land use	●	●		Physical risk (acute and chronic) / transitional risk (reputation)			■	<ul style="list-style-type: none"> •Support for farms to acquire certification for sustainable agriculture •Efforts to enrich ecosystems 	P31, P44, P45, P48 P47, P51
	It is discovered that the environment and the human rights of workers in areas producing agricultural products are not being protected, resulting in a loss of trust from society as a buyer and a decline in brand value.	Biodiversity / ecosystem services Violations of human rights Brand value	●	●		Reputation	■	■		<ul style="list-style-type: none"> •Support for farms to acquire certification for sustainable agriculture •Procurement of sustainable raw materials 	P31, P44, P45, P48 P50, P60, P61
	Criticism of farm expansion that destroys nature in areas that are highly dependent on location-specific agricultural products and water.	Loss of suppliers of products that depend on certain agricultural raw materials and damage to brand value	●	●		Physical risk (acute and chronic) / reputation	■	■		<ul style="list-style-type: none"> •Support for farms to acquire certification for sustainable agriculture 	P31, P44, P45, P48
Water Resources	Manufacturing becomes impossible owing to droughts caused by climate change. Society criticizes the company for operating during droughts.	Disruptions to operations owing to droughts / climate change, use of resources	●	●	●	Physical risk (acute and chronic) / transitional risk (reputation)	■	■		<ul style="list-style-type: none"> •Advanced water usage reduction technologies •Water stress response for ingredient agricultural production areas 	P55 P54, P81, P84
	Floods due to extreme rainfall accompanying climate change cause the suspension of production and obstacles to transportation in Japan and overseas.	Disruptions to operations owing to floods / climate change	●	●	●	Physical risk (acute and chronic)	■			<ul style="list-style-type: none"> •Flood response manual and facility response •Water risk response for ingredient agricultural production areas 	P81, P82 P54, P81, P82
	Floods due to extreme rainfall and droughts accompanying climate change affect areas producing agricultural products, causing significant declines in yields and affecting our procurement costs.	Decline in yields of agricultural raw materials due to droughts and floods / climate change, use of resources	●	●	●	Physical risk (chronic)	■	■		<ul style="list-style-type: none"> •Measures to address torrential rain and conserve water resources in areas where agricultural raw materials are produced 	P44, P54
	Operation is suspended and brand value declines owing to the pollution of rivers and seas caused by pollutants flowing into wastewater from business sites.	Violations of laws and regulations Scale of damage to surrounding businesses and residents due to pollution / pollution	●			Reputation	■			<ul style="list-style-type: none"> •Improvements to environmental management systems 	P19
Containers and Packaging	Climate change results in rapid increases in the price of crude oil, meaning raw material-based resins for PET bottles rapidly increase in price or become difficult to obtain.	Usage rate of recycled resins or plant-based resins	●	●		Physical risk (acute and chronic) / transitional risk (market and reputation)	■	■		<ul style="list-style-type: none"> •Expansion of mechanical recycling •Establishment of chemical recycling manufacturing technology •Creation of social systems for collecting used PET bottles 	P60 P60 P60, P64
	A failure to address marine plastic pollution problems results in a loss of trust from society and a decline in brand value.	Usage rate of recycled resins or plant-based resins / pollution	●	●		Reputation	■	■		<ul style="list-style-type: none"> •Expansion of mechanical recycling •Establishment of chemical recycling manufacturing technology •Creation of social systems for collecting used PET bottles 	P60 P60 P60, P64
	With the shift from plastic to paper containers, the use of wood and paper from forests that are not eco-friendly results in a loss of trust from society and a decline in brand value.	FSC and other certification networks and the usage rate of recycled paper / changes in land use, use of resources	●	●		Physical risk (acute and chronic) / transitional risk (market and reputation) Reputation	■	■		<ul style="list-style-type: none"> •Expansion of the use of FSC and other sustainable forest resources 	P50, P61
Climate Change	Carbon taxes are introduced and stringent policy and law are enacted around the world.	Increase in energy costs due to carbon pricing		●	●	Transitional risk (policy and law, technologies, and markets)	■	■	■	<ul style="list-style-type: none"> •Reduction of GHG emissions on a medium- to long-term profit and loss neutral basis 	P68, P69, P70
	The number of persons requiring emergency services as a result of heatstroke doubles owing to rising global temperatures.	Population requiring emergency services for heatstroke	●	●	●	Physical risk (chronic) / transitional risk (market) / products, services, and markets	■	■		<ul style="list-style-type: none"> •Contribute to products to counter heatstroke 	P33, P93
	The population exposed to the risk of infectious diseases increases as a result of higher global temperatures.	Population exposed to infectious diseases	●	●	●	Physical risk (chronic) / transitional risk (market) / products, services, and markets	■	■	■	<ul style="list-style-type: none"> •Contribution in the Health Science domain 	P33, P93
	Research on responding to climate change cannot be put into practice at the right time. We cannot introduce facilities at an appropriate time.	Research and development capabilities Engineering capabilities Human resources	●	●		Transitional risk (technologies)		■	■	<ul style="list-style-type: none"> •Research and development capabilities •Strengthen engineering functions 	P33, P49, P60, P88 P70, P88
	Brand value declines as it is pointed out that the renewable energy used by the company affects nature and the scenery, creates noise, is not resilient to disasters, etc.	Violations of policy and law, and human rights, media reporting, and brand value / changes in land use	●	●		Transitional risk (policy and law, and reputation)	■	■		<ul style="list-style-type: none"> •Introduction of renewable energy with additionality •Introduction of renewable energy with consideration for ethics 	P33, P68 P33, P68

Strategy

Results of impact assessment

Since 2017, we have continuously conducted climate change scenario analysis, which has improved our level of understanding and strategies related to risks and opportunities posed by climate change. In addition to our own production sites and breweries, we analyze the financial impact of factors such as yields of agricultural products, procurement costs, and carbon pricing. We describe our scenarios, businesses analyzed, and time horizons on (→P.15).

The main scenarios used to assess the impact of climate change are as follows.

- The impact of reduced yields of agricultural products and carbon pricing: 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 (SRCCCL)."
- Flood risk: Results of natural catastrophe model flood simulation
- Drought risk: Hypothetical situation where production is affected for a certain period of time
- Impact of carbon pricing: 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°C, etc.
- Infectious diseases: 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: S-8 2014 Report by Project Team of Comprehensive Study on Impact Assessment and Adaptation for Climate Change

The financial impact relating to natural capital and containers and packaging are estimated based on the following approach, taking into consideration factors such as dependency and impact on nature.

- Financial impacts of switching from generally procurable agricultural raw materials to sourcing from certified sustainable farms to the extent possible at the present time. (tea leaves and coffee beans).
- Financial impact in the event of a negative influence on natural capital from improperly disposed of used PET bottles that leak into the ocean (estimated from available statistics based on the company's own production volume ratios).
- Cost reduction effect if the food waste reduction target is achieved(Kirin Brewery, Kirin Beverage, Mercian, Koikai Dairy)
- Reduction in costs associated with the reduction of chemical fertilizers and pesticides for Sri Lanka tea farms

Financial impact

		Business risks / social issues	Financial impacts
Climate change	Physical risk*1	Decline in yields of agricultural products*2	2°C scenario: Approx.1.1billion yen to 3billion yen(2050) 4°C scenario: Approx.3.2 billion yen 10.4billion yen(2050)
	Transitional risks*1	Financial impact of energy due to carbon pricing	1.5°C scenario: Approx.10.6billion yen to 475.6billion yen(2030) 2°C scenario: Approx.7.7billion yen(2030) 4°C scenario: Approx.1.2billion yen(2030)
		Financial impact of agricultural products due to carbon pricing*2	RCP2.6/SSP1:Approx.0.9billion yen to 2.1billion yen(2050) RCP8.5/SSP3:Approx.4billion yen to 7.6billion yen(2050)
	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°C scenario)
Climate change and natural capital	Physical risk	Disruptions to operations owing to floods	Approx. 1 billion yen (200-year disasters, total of 20 locations in Japan)
		Disruptions to operations owing to droughts	Approx. 0.03billion yen to 0.6 billion yen
Natural capital and containers and packaging	Physical risk	Negative impact of PET bottles	Approx. 1.1billion yen
Natural capital	Transitional risk	Procurement of certified products	Approx. 0.06billion yen
	Business opportunity	Reducing food waste	Approx. 0.9billion yen
		Reduction in costs associated with the reduction of chemical fertilizers and pesticides for coffee farms in Vietnam*3	0.11billion yen

*1 Physical risks and transition risks of climate change are calculated using procurement volumes and costs for 2022.

*2 Indicates the financial impact of risks and opportunities recognized as material. We have assessed the financial impact on agricultural products of declines in yields caused by climate change and carbon pricing using the middle 50th percentile of the distribution of forecast data for price fluctuations. Owing to high levels of uncertainty, estimates of carbon pricing in the 1.5°C scenario are presented as reference data. Figures for carbon pricing indicate cases when GHG emissions are not reduced.

*3 Reduction of approximately 40 million yen from the reduction in chemical fertilizers, and addition of approximately 150 million yen from biofertilizers and personnel expenses for fertilizer appliers. Estimated based on interviews with local coffee farms.

Priority locations where nature-related dependencies and impacts are identified*4

The "Location" that have a significant impact on our businesses and is important in terms of the natural and social environment
Sri Lankan tea farms

Locate	The delicious taste of <i>Kirin Gogo-no-Kocha</i> is supported by tea farms in Sri Lanka. Water sources of large coastal cities exist on the farms.
Evaluate	Approximately 25% of the Sri Lankan tea leaves imported by Japan are used by <i>Kirin Gogo-no-Kocha</i> . Tea production areas face increased water risk and stress due to climate change, while heavy rains run off fertile soils.
Assess	If Sri Lankan tea leaves, on which Kirin is highly dependent, cannot be used sustainably, the product concept will fail.
Prepare	Support Sri Lankan tea farms in obtaining The Rainforest Alliance certifications since 2013. Widely publish the number of farms that obtained the certificate and the number of farms trained in environmental reports, and on the Web.

The "Location" where water risks are high and water resource management is particularly important
Production plants in Australia

Locate	All Kirin Group Australian brewery locations are in water-stressed watersheds
Evaluate	Water stress in Australia is very high both empirically and when measured with such tools as Aqeduct. Once every few decades, when flooding occurs due to torrential rains, the damage is significant
Assess	Water-saving technology is the best in the Group, but there remains a possibility that production could be disrupted in the event of a severe drought
Prepare	Contribute to the development of the SBTs for Nature methodology and set new goals in line with this. Widely publish results in environmental reports, and on the Web.

The Japanese wine which "Location" determines the characteristics of the product
Mariko Vineyard

Locate	An important factor that determines the taste of wine is "terroir" or the character of the land
Evaluate	Expansion of vineyards is necessary for the expansion of the Japanese wine. The target is formerly derelict land.
Assess	Joint research with the National Agriculture and Food Research Organization (NARO) revealed that converting derelict land into vineyards creates high-quality grasslands and contributes to a rich ecosystem
Prepare	Contributing to Nature Positive and 30by30. Widely publish joint research results in academic papers, environmental reports, and on the Web.

*4 Partially revised from Environmental Report 2022

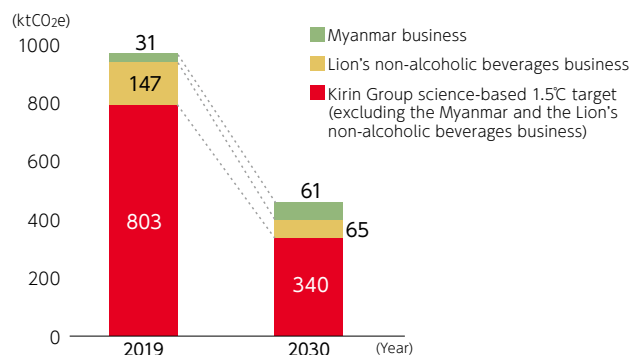
There are areas where climate change and natural capital can not be assessed separately because they are interrelated, and the beta version of the TNFD framework indicates that the results of climate change scenario analysis can be used as natural capital scenario analysis in some areas. Taking into consideration that fact that there are currently almost no agreed-upon scenarios for natural capital, in our disclosure of estimates of the impact of floods and droughts, which we were already disclosing, we have repositioned these as a physical risk for both climate change and natural capital. We calculated the negative impact of PET bottles on natural capital and disclosed it as a risk related to natural capital and packaging. Since the methodologies for calculating the financial impact of risks and opportunities related to natural capital is still a developing area, we have disclosed the impacts that can be ascertained at present.

The Nature Positive Economic Research Group* of the Ministry of the Environment, in which Kirin Holdings participated, estimates that the economic impact of natural capital in Japan will be approximately 45 trillion yen, and approximately 125 trillion yen when ripple effects in the value chain are added. This estimate, however, gives a sense of the scale of the overall economic impact in Japan and we cannot reflect it in the financial impact on individual companies. Accordingly, we have not sufficiently estimated the financial impact on natural capital.

In order to provide readers with details of individual risks and opportunities, business impact, and strategic analysis related to the environment, we have also provided this information in one place in "Holistic Analysis of Risks and Opportunities, Business Impact, and Strategies in Environmental Management" (→P.76~98).

*1 The 4th meeting of the Nature Positive Economic Research Group of the Ministry of the Environment: Impact of the Nature Positive Transition on Japan (March 6, 2023)
<https://www.env.go.jp/content/000146496.pdf>

Impact on GHG emissions from the divestment



Results of natural natural catastrophe model AIR flood simulation*

Occurrence interval (years)	Estimated amount of flood damage (JPY)
200	1,030,581,609
150	175,176,917
100	2,590,244
70	164,572
50	52,859
25	0
20	0
10	0
5	0

* We have calculated the amount of flood damage for almost all property at applicable breweries and plants, including buildings, facilities, fixtures, and products.

Results of analysis of the impact of climate change on assets

The results of assessment and analysis related to climate change for business divestitures and assets exposed to risk are shown as follows. We have determined that none of these factors will have a significant impact.

With respect to divestitures, we estimated the impact of the sale of Lion's non-alcoholic beverages business in 2021 and the Myanmar business in 2023. Physical and transitional risks have not changed significantly. Based on a retrospective review of the impact on the GHG emission reduction targets of the divested businesses back to the base year, we have determined that there is no need to restate the group-wide reduction targets. For assets exposed to risk, we estimated the impact of flooding on business sites and the impact of laws and regulations on assets. Our estimated asset exposure to a 200-year flood (total of 20 business sites in Japan) in the "Natural natural catastrophe Model AIR Flood Simulation Results" on the lower left.

We also investigated and analyzed the possibility of being forced to discontinue the use of boilers, delivery trucks, and other equipment before the end of their service life owing to laws and regulations, etc. We believe it is unlikely that there will be a material financial impact on our assets due to tightening of the laws.

For reference, we disclose this information as "Residual value of related facilities" in the "Related Assets" table below.

Assets exposed to risk

Related assets

Item	Amount
Damage to business sites from water risk	Approximately 1.0 billion yen to 5.0 billion yen
Exposure to 200-year disasters across 20 locations in Japan	Approximately 1.0 billion yen
Residual value of related facilities*	Approximately 1.1 billion yen

*The residual value of related facilities refers to the total residual value of boilers held by Kirin Brewery, Kirin Beverage, and Mercian, and the residual value of trucks held by group logistics companies. We have judged that the possibility that laws and regulations or social trends associated with climate change will be a primary factor forcing us to renew these boilers and trucks before the end of their service life is low.

[More information on the results of wind and water damage simulation → P.81](#)

Water usage at brewing and manufacturing sites in areas with water stress

Baseline Water Stress (WRI Aqueduct)	Number of brewing and manufacturing sites	Water usage (thousand m³)	Proportion of water usage*
Extremely High (>80%)	4	4,325	9%
High (40-80%)	8	12,389	25%

* We have disclosed a breakdown of the business sites subject to water risk and water stress assessments in the "ESG Data Book."

ESG Data Book <https://www.kirinholdings.com/jp/investors/files/pdf/esgdatabook2023.pdf>

Scenario analysis related to climate change

There is considerable variation in the results of research related to agricultural products that we refer to in our scenario analysis on climate change. For example, it is generally regarded that high temperatures and water shortages are highly likely to result in lower yields of agricultural products, but some analyses suggest that higher temperatures due to climate change will increase barley yields in places such as northern Germany, where the cold or damp climate currently makes the land unsuitable for agriculture. Scenario analysis conducted by the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection forecasts that a 1.4°C increase in temperature and a 10% decrease in annual precipitation in the Elbe River basin could reduce barley yields by 9-14% by 2055. On the other hand, scenario analysis by the Food and Agriculture Organization of the United Nations (FAO) forecasts a 17-18% increase in yields by 2050 compared with 2012 under the 4°C scenario. In this way, different forecasts exist depending on the various scenarios disclosed. Yet 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 in 2050 (2100 in some cases).

Even more serious is the impact of water risk and stress in areas producing agricultural products. In 2050, water risk will be “High” or “Extremely High” in most of our production areas, with the exception of Japan and New Zealand, and we expect impacts in areas such as the quality of agricultural products and investment in countermeasures.

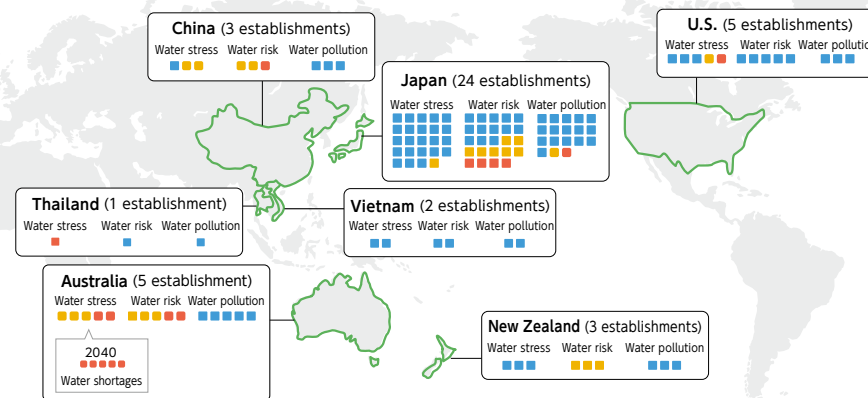
Although the impact is significant, we believe that the Kirin Group is resilient to physical risks to some extent, considering that we have been able to pass on rapid increases in the cost of raw materials caused by geopolitical factors and the depreciated yen from 2022 to 2023 to product prices our ongoing diversification of suppliers, our support for the acquisition of sustainable farming certification for tea leaves and coffee beans, and our future use of mass plant propagation technology should contribute the mitigation. Still, we will continue endeavoring to improve our resilience in the future, because there are major uncertainties from 2030 onward and we may incur a significant financial burden owing to factors such as the risk that efforts to make areas producing agricultural products sustainable will not be completed in an appropriate time and sudden natural disasters.

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, we have been conducting regular scientific surveys and utilizing the results in scenario analysis.

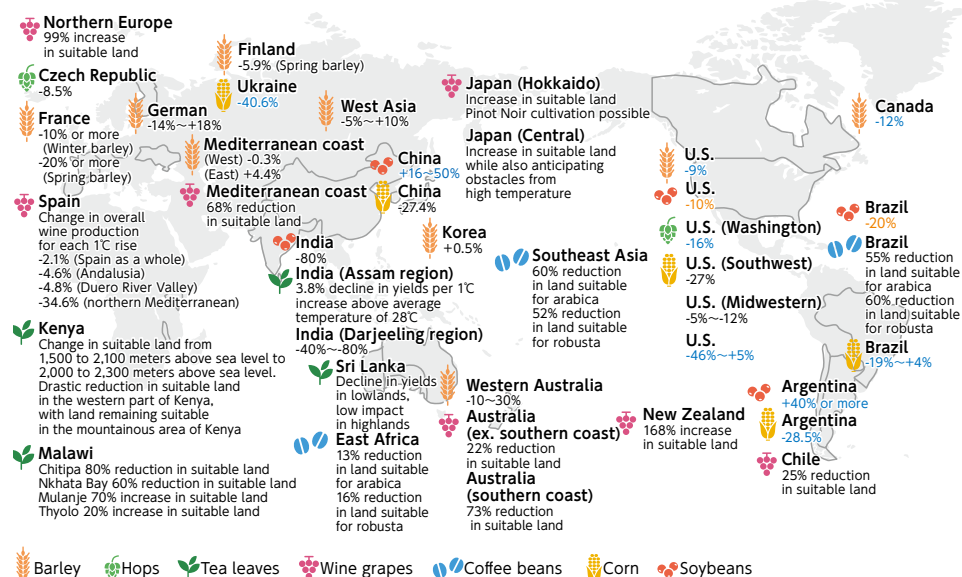
In Australia, both water risk and water stress are high, and we are constantly subject to the impact of droughts. Under these conditions, Lion's Castlemaine Perkins Brewery in Brisbane was impacted by large-scale flooding in March 2022 as a result of widespread heavy rains in eastern Australia, following previous flooding in 2011. We identify and assess the financial impact of flooding on plants and

Degree of risk and stress ■ Low ■ Medium ■ High

* Water stress and water risk are survey results from 2021, and water pollution is from 2017, and the number of business sites differs from the present.



(Forecast for 2050 unless otherwise specified in the table on P.78)



breweries with wind and flood damage simulation systems and historical flood damage coverage. Water stress is high at two plants in Australia, one in the U.S., and one in Thailand. In the future, we predict that all plants in Australia will be judged to be highly water stressed. We have calculated the estimated monetary impact of reduced production under certain assumptions at business sites with “High” levels of water stress. Our estimates ranged from approximately 30 million yen to approximately 600 million yen, but based on experience, the impact is minimal even during droughts, and we have therefore judged the risk to be minor.

In 2022, we conducted a survey concerning flooding risk and the existence of countermeasures in major barley shipping ports overseas. We found 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. Through our survey and analysis, 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. We will continue to monitor the situation.

Transitional risk

Although it is difficult to forecast the future outlook for how climate and nature-related policies, laws, and regulations will develop in the countries and regions that produce the natural capital on which the Kirin Group depends, it is possible to make highly satisfactory estimates for carbon taxes and other forms of carbon pricing because many reference scenarios indicate specific monetary levels.

In 2019, the Kirin Group estimated and disclosed the financial impact of carbon pricing on energy prices at the time of production, and we have subsequently expanded the scope of our analysis. Carbon pricing will be a significant financial burden if we do not take any action, but one aspect of carbon pricing is that it also encourages appropriate investments to reduce GHG emissions. Kirin Group has introduced Internal Carbon Pricing (ICP; \$63/tCO₂e), which preempts this effect, as a standard for making investment decisions, and we are accelerating our actions. As a result, at present, we believe that we will be sufficiently able to achieve our GHG emission reduction targets, and mitigate the impact of carbon pricing in the future.

Since 2021, we have published estimates of the financial impact of declines in yield due to climate change and carbon pricing on the cost of procuring agricultural products.*1 The studies we referenced show that, in addition to the increase in agricultural chemicals and fertilizer prices, carbon pricing also has a greater than expected impact in terms of the increase in acreage for cultivating agricultural products that can be used as biofuel, which will put pressure on agricultural acreage in areas producing agricultural raw materials. The impacts identified through the results of this research are transitional risks related to climate change as well as risks related to damage to natural capital pertaining to land use, and can therefore be considered to be related to both climate change and natural capital.

*1 The “Procurement costs from lower agricultural yields” and “Agricultural product procurement costs from carbon pricing” shown in the “Financial Impact in 2050” table reflect separate research findings and are not considered interrelated.

Business opportunities

Climate change affects many social problems. In this context, one of the four aspects of our CSV Purpose is “Health and Well-being,” and it is a priority area for us in our 2027 long-term business plan. Accordingly, the Kirin Group believes that we can make a contribution in the area of infectious diseases and heatstroke through our businesses.

With regard to infectious diseases, WHO estimates that between 2030 and 2050, climate change would cause approximately 250,000 additional deaths per year, from factors such as the spread of

Financial impact in 2050

Scenario	2°C scenario	4°C scenario
Procurement costs from lower agricultural yields	Approximately 1.1 billion yen to 3.0 billion yen	Approximately 3.2 billion yen to 10.4 billion yen
Energy costs from carbon pricing (If we do not take measures to reduce GHG emissions)	Approximately 11.4 billion yen	Approximately 1.4 billion yen
Agricultural product procurement costs from carbon pricing	Approximately 0.9 billion yen to 2.1 billion yen	Approximately 4.0 billion yen to 7.6 billion yen

*2 Please see the date as below:

•Procurement costs from lower agricultural yields (→P.78)

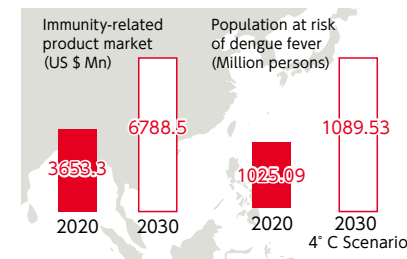
•Energy costs from carbon pricing (→P.86)

•Agricultural product procurement costs from carbon pricing (→P.87)

12 Forecast population exposed to risk of dengue fever under the 4°C 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%)

13 Market forecast for infectious disease-related products
(Persistence Market Research)



infectious diseases from expansions in the distribution of disease vectors. In Japan, the habitat of the *Aedes albopictus*, which carries dengue fever, was confirmed to have spread as far north as Aomori in 2015. According to the results of our analysis of the impact of the spread of dengue virus based on the WHO scenario concerning climate change and the impact on people's health, there are regions where improvements in sanitation and nutrition as a result of economic growth are expected to reduce the rate of infection, meaning that opportunities of our contribution to solving social issues and of our business can be anticipated.

With regard to heatstroke, 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°C 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.

*3 World Health Organization (2014) Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s.

<https://apps.who.int/iris/handle/10665/134014>

*4 S-8 2014 Report by Project Team of Comprehensive Study on Impact Assessment and Adaptation for Climate Change

https://www.nies.go.jp/s8_project/scenariodata2.html#no3

Analysis of Risks and Opportunities Related to Natural Capital

As shown in the Environmental Value Correlation Chart (→P.11), the source of the Kirin Group's value creation is natural capital. Natural capital is location-specific, and many of the Kirin Group's businesses depend on the natural capital and ecosystem services of particular locations. Although climate change will have a financial impact on the Kirin Group as a result of physical and transitional risks, we have judged that the Group has a certain level of resilience, as shown in our scenario analysis (→P.23~P.24). If, however, we lose irreplaceable location-specific natural capital and ecosystem services, it may entail the loss of our brand, which depends on these factors, and mean we are unable to sustain those businesses.

In view of the Kirin Group's high dependence on natural capital and the significant level of risk we face in the event of its loss, we conducted an "assessment of the degree of dependence and impact for each business and product group," from the latter half of 2022 to the beginning of 2023 in order to identify our businesses' degree of dependence and impact on natural capital, as well as related risks and opportunities. The screening was conducted using ENCORE*1 and expanded to include not only the domestic alcohol and spirits business and domestic beverages business, but also the entire group's business domain, to assess and understand dependence and impact throughout the entire value chain, from upstream to downstream.

The results of our assessment are shown on the bottom left. We found that the Health Science business has a very low degree of dependence and impact, while the degree of dependence and impact is moderate at production sites, and our degree of dependence on agricultural production is high, including items that may have a negative impact on nature.

We found that there are significant variations in the impact on natural capital of the beverages business, including alcohol, with the impact being very high for large-scale cultivation using irrigated water. In our 2017 water risk survey,*2 we found most of the major agricultural products used by the Kirin Group – barley, hops, tea leaves, and coffee beans were rainfed, so analysis with ENCORE as well as past water risk surveys indicated that the impact of most of the upstream portion of the value chain was moderate

In some other external databases,*3 however, there are differing research results, such as those that identify tea leaves as agricultural products with a high intensity of irrigation water use. In fact, Sri Lanka has experienced repeated droughts and torrential rains in the past decade as a result of

climate change, and major droughts have had a significant impact on tea leaf growth. Some of the farms we visited were using hoses, etc., to spray water, and it has become impossible to simply distinguish tea farms into those that use rainwater for agriculture.

Barley is another agricultural product that is heavily rainfed, so the results of ENCORE screening indicate that it has a moderate impact on natural capital, but this is not necessarily true. Colorado, where the Kirin Group's New Belgium Fort Collins Brewery and farmers of barley, a raw material, are located, is an area of extremely high water stress. In these areas, if we chose to create reservoirs as a fundamental measure against water stress, it would entail significant changes in the land use and result in a greater impact on natural environment.

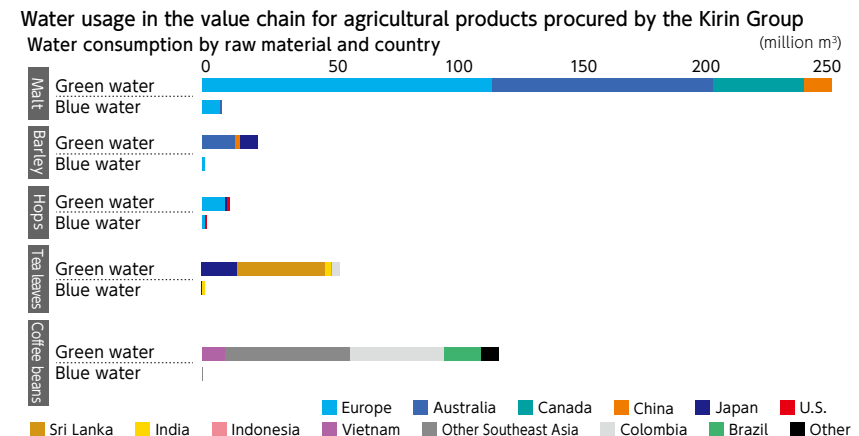
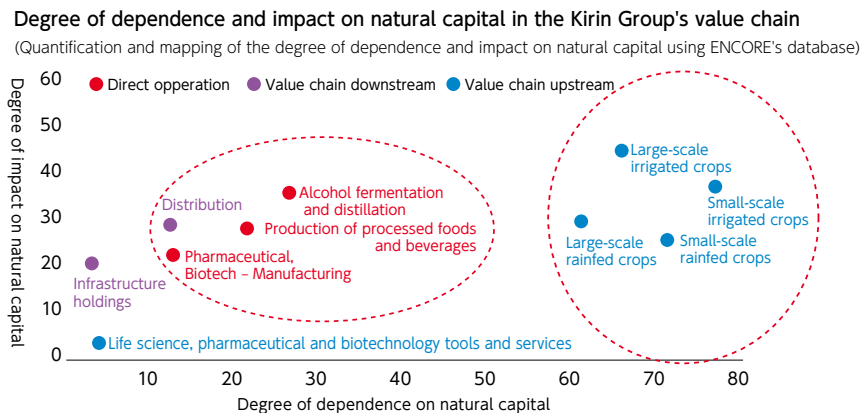
With this in mind, we might say it is important that we do not judge the risks associated with natural capital solely based on the results output by tools, but instead consider how to interpret the results. Local information is essential for developing an appropriate understanding.

While it is relatively easy to consider the whole picture for climate change because of the global impact of GHG emissions, we must start by identifying where the interface between business and nature lies in the case of natural capital because its state and the relationship of dependence and impact with our businesses vary greatly from location to location. Engagement with impacted stakeholders will also be required to solve issues. For that reason, based on the results of discussions with TNFD stakeholders, we decided to conduct a detailed study in fiscal 2022 concerning risks and opportunities in areas producing tea leaves in Sri Lanka, where the Kirin Group's operations are highly dependent on natural capital, where we have accumulated knowledge through many years of support for obtaining certification, and where we maintain a high level of engagement with local communities, such as visits about once a year to exchange views with farm managers.

*1 A tool introduced in the beta version of the TNFD framework that can be used to assess ecosystem services and abbreviation for Exploring Natural Capital Opportunities, Risks and Exposure.

*2 Results of assessment using the 2017 Water Footprint Network Water Footprint and Product Footprint statistics. For details, please see the 2017 Environmental Report.

*3 Results of assessment using the WWF-DEG Water Risk Filter. For details, please see the 2017 Environmental Report.



Sources: Estimates using the WFN's Water Footprint and Product Water footprint statistics, the Inventory Database for Environmental Analysis of the National Institute of Advanced Industrial Science and Technology, etc.

Natural capital risk and opportunity analysis based on LEAP approach

In July 2022, the Kirin Group became a global pioneer in disclosing information on a trial basis based on the "LEAP approach" for assessing risks and opportunities related to nature, proposed in the beta v0.1 of the TNFD framework. LEAP has subsequently been revised three times as part of the beta version of the TNFD framework.

The Kirin Group participated in the pilot test and exchanged views with the TNFD members.. As part of this process, we determined that it would be difficult at this stage to make a comprehensive assessment covering all aspects of our business for natural capital, which has complicated and interrelated aspects and also has many stakeholders. We believe that it is practical and effective for us to first conduct analysis based on the LEAP approach for events for which we fully understand the "location" and "dependency" of the target of analysis as a result of our efforts over the years, and for which we can adopt an approach based on communication with many stakeholders, and then subsequently expand the target of our analysis after obtaining sufficient knowledge.

This time, we conducted an assessment using the LEAP approach (TNFD framework beta v0.2) for tea farms in Sri Lanka, for which we have a high level of regional dependence as an area producing raw materials.

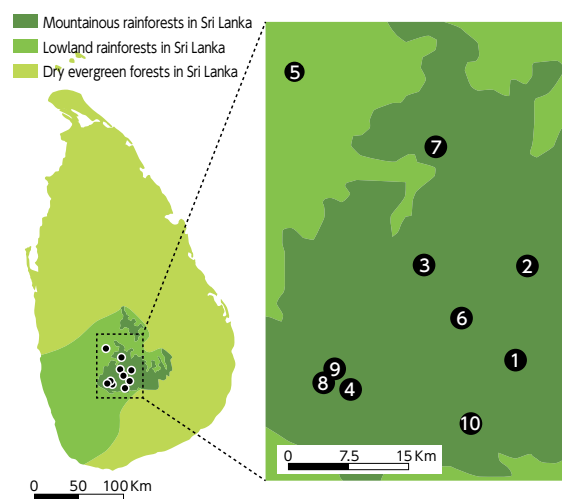
We have been using Sri Lankan tea leaves in Kirin *Gogo-no-Kocha* for more than 30 years since this product's release, and we use this fact in our marketing. Compared with many other products, this product could be described as extremely dependent on the area where raw materials are produced.

In the L (Locate) phase of the LEAP approach, we selected 10 farms in Sri Lanka that are close to natural parks and, checked their latitude and longitude, and used the Global Map of Ecoregions*1 and IUCN Global Ecosystem Typology*2 to develop an understanding of the ecosystems around these tea farms. We also conducted biome surveys of the areas where farms are located. In the L3 (identification of priority locations) phase, we performed a comprehensive assessment using IBAT,*3 the Aqueduct Water Risk Atlas, etc., taking into consideration the extent to which ecosystems in regions subject to analysis are impacted by human factors, their importance for conservation, and water stress.

The results showed that tea farms are located in mountainous and lowland rainforests, where many endemic species live. Tea farms, which use land in a concentrated manner, have a responsibility to mitigate their impact on and conserve rainforests ecosystems. We also found that there are no effective measures in place to contribute

LEAP

The regions with tea farms are home to scarce endemic species. In addition, these regions also face high levels of water stress, as well as the risk of extinction.*1



Results of analysis and asesesses of 10 targeted farms.

Mountainous rainforests in Sri Lanka		Lowland rainforests in Sri Lanka	
<div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div>		Applicable number of farms studied	<div> <div></div> </div>
Uva, Nuwara Eliya, Dimbula		Tea farm regions	Kandy
<ul style="list-style-type: none"> There are many life forms native to Sri Lanka. Limited distribution, with half or more of the endemic flowering plants and vertebrates living in production areas 		Regional characteristics	<ul style="list-style-type: none"> Existing 70% or more of Sri Lanka's endemic species. Abundance of endemic species of large trees and a high proportion of endemic species of small plants
<ul style="list-style-type: none"> Large-scale deforestation of rainforests to develop tea farms There are no measures in place for managing adjacent national parks and conservation areas 		Biodiversity concerns	<ul style="list-style-type: none"> Ecosystem damage by illegal logging of natural forests
<ul style="list-style-type: none"> Connecting ecosystems from high to low elevations Creation of green funds to purchase land for environmental conservation and establishment of public-private partnerships Conservation and restoration of forests at an altitude of approximately 1,515m or higher in accordance with laws and regulations 		Conservation efforts to be prioritized over the next 10 years	<ul style="list-style-type: none"> To maintain ecological connectivity, connect existing forests that are spread out like a mosaic and join them with neighboring protected areas Creation of green funds to purchase land for environmental conservation and establishment of public-private partnerships

Criteria for identifying 'priority locations' in the TNFD framework, which were complied with in this study and analysis.

Criteria for identifying priority locations		Indicators and databases considered to correspond to each criterion for assessment	
Ecosystem integrity	Present or expected future integrity of ecosystems. Ecosystems that are damaged or low integrity are judged to be at greater risk than healthy ones (identified based on ecosystem integrity and health, species diversity, species extinction risk, etc.)	Red List species living in the region (total "CR" + "EN" category species) □STAR+ (threat mitigation score), STAR+ (recovery score)	Studies of the number of Red List species within a 50 km radius of survey sites using IBAT For STAR, analysis using the GIS software "QGIS," with data from Nature Ecology & Evolution magazine "A metric for spatially explicit contributions to science-based species targets"
Biodiversity importance	Whether the ecosystem is internationally recognized for the importance of its biodiversity, as a biodiversity hotspot, as a protected area, or for other reasons (identified based on factors such as the existence of legal protection, whether the area is recognized as a priority area to be protected, including important regions for biodiversity, and whether the area contains unique and local ecosystems).	Proximity to protected areas Proximity to Key Biodiversity Areas (KBAs)	Studies of the number of protected areas and KBAs within a 50 km radius of survey sites using IBAT
Water stress	Locations known to have high levels of water stress.	Baseline water stress	Studies of water stress levels at survey sites using Aqueduct Water Risk Atlas

*1 Global Map of Ecoregions: A map developed by the World Wildlife Fund (WWF) to classify and map the Earth's biomes. According to Sri Lanka's terrestrial assessment with this map, the area where the tea farms are located is an ecoregion at risk of extinction, its valuable endemic habitats and high water stress

*2 A classification system developed by the United Nations Environment Programme (UNEP) for broadly classifying ecosystems on Earth

*3 An integrated database of global biodiversity information developed by the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC)

to the conservation of biodiversity, despite the fact that Horton Plains National Park and the Knuckles Conservation Area are located nearby.

One possible solution to this issue is to use green corridors to connect existing precious habitats, which are known as forest patches and are spread out like a mosaic, or combine these areas with protected areas, etc., to form larger landscapes.

In the Evaluate (E) phase, we used various papers researched and published in Sri Lanka to identify relevant environmental assets*¹ and ecosystem services, and thus developed an understanding of our dependency and impact. The results of our analysis and assessment are shown in the table below. Although our implementation of the A (Assess) phase is a work in progress, the results show that there are many items in which we can contribute to mitigating the impact on natural capital through the Kirin Group's training to support the acquisition of sustainable farming certification, which has been ongoing since 2013. It appears we can therefore say that these measures are effective in solving issues related to natural capital in Sri Lanka.

When cultivating tea leaves, water and soil are factors that we are highly dependent on to support quality. The results of our analysis also showed that the use of water, as well as the use of chemical fertilizers and pesticides, impacts on nature in production areas. We have been able to grasp the impact of N₂O emissions from fertilizers on global warming, as well as the impact of insufficient appropriate waste treatment on nature. These factors present an "impact" risk to rare species both inside and outside tea farms in Sri Lanka, where nature is abundant.

In Sri Lanka, we have experienced the impact of sudden regulations on natural capital, which could become a form of systemic risk. In 2021, the government at the time flows declared that it would make Sri Lanka

the first country in the world to have 100% organic agriculture, and banned the use of chemical fertilizers and pesticides. This regulation was withdrawn following great confusion and opposition among farmers, but the damage was so significant that rice production is said to have been cut in half. Tea leaf cultivation, as an important industry, received various forms of support from the government and was spared any major impact. If, however, the cultivation of tea leaves is abandoned because tea farms go bankrupt or for other reasons, the farms are sometimes converted to timber farms. In such cases, eucalyptus trees, known to consume large amounts of water, are often planted, and we have learned that this may cause problems with the supply of water for community use.

In the midst of this disruption, the Rainforest Alliance is leveraging its expertise in the use of organic fertilizers to provide support to ensure that tea farms are not significantly affected. In training to support the acquisition of Rainforest Alliance certification, farmers can learn how to use cover crops to prevent soil runoff during torrential rain, as well as the appropriate use of agricultural chemicals and fertilizers. As a result, they have been able to reduce soil contamination, degradation, and impact on ecosystems, and increase yields per unit area. In addition, by curbing the excessive use of pesticides and fertilizers, the income of the farms will increase and they will be able to generate sufficient profit with the existing tea farms. This contributes to preventing the deforestation of

rainforests due to the thoughtless expansion of tea farms and reducing the impact of land conversion. In this way, the issues that we have identified are consistent with activities to support certification that have been ongoing since 2013. In the future, we intend to move on to the A and P (Prepare) phases of the LEAP approach for Sri Lanka's tea farms, in which we will analyze and assess the effectiveness of our activities in detail. We have also started supporting the acquisition of certification at coffee farms Vietnam since 2020, which will enable us to understand local conditions in detail. Accordingly, we intend to conduct similar assessments in the future and clarify the direction of our efforts. In the LEAP approach, we must check each individual region for phases from E onward because the level of impact varies from region to region, and we need to involve our suppliers in surveys. For agricultural products other than those described above, we have not been able to obtain all the relevant information down to the farm level, so we will continue to conduct interviews with our suppliers, further on-site surveys, and, similarly to the most recent surveys, assess our dependence and impact on the natural capital, and consider measures to address these issues.

*1 Among the naturally occurring living organisms and non-living organisms on earth, those that mainly produce economic benefits.
Forests, wetlands, coral reefs and agricultural land are presented as examples in TNFD.

LEAP

Risks and opportunities related to "dependence"

Category	Ecosystem services	Risks	Opportunities	Existing activities* ²
Provisioning services	Water supply	<ul style="list-style-type: none"> Decline in yield due to lower water supply Conflict over water rights with local communities 	<ul style="list-style-type: none"> Ensuring the availability of sustainable water by protecting water sources 	<ul style="list-style-type: none"> Conservation activities for water sources on farms
	Genetic Material			
Regulating and maintenance services (Functions to aid production)	Water purification			
	Flood mitigation	<ul style="list-style-type: none"> Decline in yield due to poor drainage Occurrence of disasters 	<ul style="list-style-type: none"> Flood mitigation and improvement in drainage as Nature-based Solutions Improvement of water source recharge function 	<ul style="list-style-type: none"> Appropriate wastewater treatment in farms, factory and residence areas.
	Soil quality regulation			
Regulating and maintenance services (Protection from impact)	Soil and sediment retention	<ul style="list-style-type: none"> Decline in fertility and yield due to soil runoff Occurrence of disasters 	—	<ul style="list-style-type: none"> Cover crops on the farm lands
	Local climate regulation	—	—	
	Biological controls (pest controls, etc.)	<ul style="list-style-type: none"> Disease outbreak/ expansion 	<ul style="list-style-type: none"> Reduced use of pesticides based on "Nature-based Solutions (NbS) 	<ul style="list-style-type: none"> Planting plants that pests don't like

*2 Activities where it can be judged that the training conducted in support of Rainforest Alliance certification at tea farms in Sri Lanka is contributing to reducing risks and expanding opportunities identified in the assess phase of LEAP.

Risks and opportunities related to "impact"

Category	Impact drivers	Risks	Opportunities	Existing activities* ²
Use of ecosystems	Land ecosystem use	<ul style="list-style-type: none"> Loss of biodiversity through land use 	<ul style="list-style-type: none"> Preventing deforestation through proper land use and improved agricultural practices 	<ul style="list-style-type: none"> Ban on deforestation, cover crops, pesticide and fertiliser management
Use of resources	Water use	<ul style="list-style-type: none"> Depletion of water resources due to overuse Conflict over water rights with local communities 	<ul style="list-style-type: none"> Maintaining the availability of sustainable water and protecting yields by protecting water sources 	<ul style="list-style-type: none"> Conservation of Water Sources in Tea Farms
Pollution	Soil pollution	<ul style="list-style-type: none"> Long-term environmental pollution caused by the use of chemical fertilizers and pesticides Short-term decline in yield due to pesticide regulations 	<ul style="list-style-type: none"> Use of organic fertilizers to improve the environment and protect yields 	<ul style="list-style-type: none"> Appropriate use and recording of pesticides and chemical fertilisers
	Solid waste	—	—	<ul style="list-style-type: none"> Waste management
	Water pollution	—	—	<ul style="list-style-type: none"> Appropriate wastewater treatment in farms, factory and residence areas.
Climate change	Greenhouse gas emissions	—	—	
Invasive alien species, etc.	Disturbance	—	—	

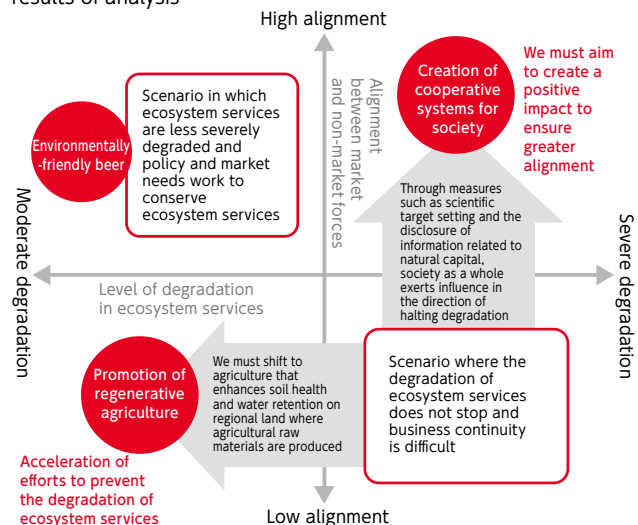
Natural Capital Scenario Analysis

In "Strategy C" of the framework presented in beta v0.1, the TNFD recommended companies to "Describe the resilience of the organization, taking into consideration different scenarios." Under beta v0.3 of the TNFD framework, which was released in November 2022, the discussion paper related to scenario analysis were published to ensure that companies discussed the sustainable use of natural capital from a long-term perspective. The purpose of the TNFD's request to the Kirin Group to participate in the pilot test was to verify the practicality of this paper. In response, the Kirin Group held a scenario analysis workshop in March 2023 at our New Belgium Brewing, a craft brewery in Colorado, U.S., where water stress is very high. A "discussion paper" for the beta v0.3 framework proposes conducting scenario analysis across two axes: the "level of degradation of ecosystem services" and "market and non-market forces." For example, we will promote analysis and discussion from the perspective of how the presence or absence of political regulation (non-market) and trends among consumers and other companies (market) will affect the company's businesses in the event of damage to nature (degradation of ecosystem services). This workshop was facilitated by a TNFD consultant, and we were joined by local water experts, as well as a diverse range of people from the New Belgium Brewing's sustainability, procurement, finance, and other departments. Members of Kirin Holdings' sustainability division and the TNFD also joined the discussion, which focused on water issues, the biggest risk to the business of New Belgium Brewing. Because the Colorado River flows from its source, Colorado, through Utah, Nevada, Arizona, and California, there are legal restrictions on the use of its water based on the "Colorado River Compact," established more than



100 years ago between Colorado as the upstream state and downstream states. At present, despite a decrease in river flow due to a decrease in snowfall in the Colorado River basin, which is thought to be the effect of climate change, water demand is increasing as a result of the expansion of agriculture and dairy farming in the upstream portion of the river, and population growth in the downstream portion, resulting in further severe restrictions on water use. It became clear that in this situation, when water stress is extremely high, governments at the state and municipal level in areas where the river flows, as well as farmers and downstream water consumers, are working together to solve issues. For example, in Colorado, where there is a flourishing agricultural industry, we found that some farmers were trying to reduce water use not only through equipment, such as adopting irrigation systems, but also by adopting regenerative agriculture to improve soil health and water retention. The New Belgium Brewing has a good understanding of such regional developments, and is considering using barley produced through regenerative agriculture. At the New Belgium Brewing, we are trying to work together with the community to solve the issue of high water stress. This is an example of how we are already putting into

Scenario analysis axes proposed by the TNFD and results of analysis



practice "working with local communities to set targets," as required in the methodology of the SBTs for Nature, which aims to set scientific targets related to natural capital. In this way, it can be described as an activity that takes into account "affected stakeholders," for which disclosure is recommended under "D" of "Risk and Impact Management" in the TNFD Framework beta v0.4. Detailed information concerning the results of this scenario analysis is provided in the beta v0.4 of the TNFD framework, published at the end of March 2023. At the end of April, in response to a request from the TNFD Consultation Group of Japan, we presented the details of our study at a meeting on scenario analysis in which many Consultation Group member companies participated, thereby widely sharing our findings outside the company, and obtaining feedback from TNFD members and participating companies. Unlike climate change, there are currently almost no publicly available scenarios for natural capital. This meant that quantitative analysis was difficult, even in this scenario analysis trial. We have determined, however, that conducting scenario analysis on the two axes of "level of degradation of ecosystem services" and "market and non-market forces" will be useful for giving us insights on how to solve issues related to natural capital within the Kirin Group and at our business sites.*¹

*1 TNFD Beta v0.4 Annex 4.10 Additional guidance on scenario analysis
https://framework.tnfd.global/wp-content/uploads/2023/03/23-23882-TNFD_v0.4_Annex_4.10_v5-2.pdf

global warming



Colorado River



Lake Powell, where drought has lowered the water level.

Approach to Environmental Issues

Holistic approach

At the heart of the Kirin Group's strategy for solving environmental issues is our holistic approach, in which we emphasize the importance of holistic solutions to the four key themes of our environmental vision: "biological resources," "water resources," "containers and packaging," and "climate change," rather than individual responses. Changes in temperature and rainfall caused by climate change will impact natural capital such as agricultural products and water. On the one hand, conserved forests absorb CO₂, and cover crops prevent soil erosion and runoff on agricultural land. This idea that the conservation and restoration of natural capital can serve as mitigation measures and adaptation measures for climate change is attracting attention as "Nature-based Solutions (NbS)*1" to social issues, and it is itself representative of Kirin Group's holistic approach. Based on this thinking, disclosures based on the TCFD

framework have described not only mitigation measures to reduce GHG emissions, but also adaptation measures strategies for agricultural products and water, where climate change will have the greatest impact, but can only be mentioned as a solution related to climate change challenges. The TNFD framework was announced in September 2023, and will be a disclosure framework related to natural capital, aimed at being "nature positive." The TNFD also prioritizes the connection with climate change, so we expect that we will be able to seamlessly utilize these two frameworks to more holistically consider environmental issues from the dual perspectives of climate change and natural capital. The TNFD, however, has yet to release an official framework, and there are not enough agreed-upon scenarios or reference research findings to develop an accurate understanding of locations and the degree of dependence and impact

to incorporate into our strategies. This means that the information we can disclose based on the draft TNFD framework is limited. Despite these challenges, in this report, based on our understanding of these circumstances, we present our strategies in accordance with the TCFD recommendations, as before, while also giving more consideration to natural capital and its relevance to containers and packaging than before. At the same time, we also use the AR3T*2 framework recommended by the SBTN to present Kirin's framework for action related to natural capital, to ensure readers understand that the measures implemented by the Kirin Group with the understanding that our businesses depend on natural capital, such as agricultural products and water, are holistically reflected in our climate change strategy.

Climate change strategies and progress

	Increase in resilience (adaptation)		Minimization of impact on natural capital (mitigation)		Business opportunities	
Material agenda	Water Resources	Biological Resources	Containers and Packaging	Climate change	Infectious diseases	Heatstroke
Strategy	<ul style="list-style-type: none"> ● Sharing flood knowledge ● Equipment and facility measures against flooding ● Sharing drought knowledge ● Development and deployment of water usage reduction technology 	<ul style="list-style-type: none"> ● Brewing technology that does not rely on barley ● Mass plant propagation technologies ● Support for farms to acquire certification for sustainable agriculture ● Carbon storage ● Biofuel 	<ul style="list-style-type: none"> ● Promotion of PET-to-PET ● Creation of more lightweight containers 	<ul style="list-style-type: none"> ● Reduce GHG emissions in Scope1 and 2 ● Reduce GHG emissions in Scope3 	<ul style="list-style-type: none"> ● Provision of products to address this issue 	<ul style="list-style-type: none"> ● Provision of non-alcoholic beverages that prevent heatstroke
Progress	<ul style="list-style-type: none"> ● Active contribution to the TNFD pilot programme, including the world-leading LEAP trial disclosure (2022) and scenario analysis trial (2023) ● Participation in the pilot test of Corporate Engagement Programme in SBTs 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 	<ul style="list-style-type: none"> ● Improving our level of skill in low-malt and no-malt beer products ● Establishment of mass plant propagation technology for hops ● Supporting the acquisition of sustainable agriculture and forestry certification, and maintain and expand its adoption ● Accumulating knowledge on Regenerative agriculture ● Continued use of biogas from anaerobic wastewater treatment ● Accumulating knowledge on blue carbon 	<ul style="list-style-type: none"> ● 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 	<ul style="list-style-type: none"> ● Developed a roadmap to reduce GHG emissions by 2030 (2022). Set reduction targets and processes for Group companies and began operation ● Installed large-scale solar power generation facilities in all Kirin Brewery plants (~2022), Kyowa Kirin Ube Plant, and Mercian Fujisawa Plant (2023), based on the PPA model (except for the Yokohama Brewery). Achieved 100% of procured electricity from renewable energy sources at Kirin Brewery's Nagoya Plant (2020), Sendai Plant (2022), Okayama Plant, Fukuoka Plant, Kyowa Kirin's Takasaki Plant, all Lion Australia and New Zealand locations (2023), and all Château Mercian wineries (2022). Became the first global food and beverage company to obtain approval for an SBT Net-Zero (2022) 	<ul style="list-style-type: none"> ● Enhancement of product lineup ● Supply of materials to partner companies 	<ul style="list-style-type: none"> ● Raising awareness of heatstroke

*1 An approach that aims to find solutions rooted in nature to issues surrounding society, such as climate change, natural disasters, and health and well-being. The concept of NbS was proposed by the IUCN in 2009, and attracted attention after significant focus on NbS as a solution to the problem of climate change at the 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) in 2021.

*2 A framework of actions recommended for companies aiming to become Nature Positive, with a four-level structure, consisting of: avoiding (Avoid) and reducing (Reduce) loss of nature, contributing to restoration and regeneration (Restore and Regenerate), and transforming underlying systems (Transform).

AR3T-compliant disclosure related to natural capital

	Avoid	Reduce	Restore & Regenerate	Transform
Biological Resources	<ul style="list-style-type: none"> Achieved and maintained 100% use of FSC-certified paper in paper containers and office paper for the alcoholic and non-alcoholic beverages businesses in Japan. Aim to use 100% FSC-certified paper or recycled paper by 2030 in major global businesses. Achieved and maintained 100% RSPO certified credits for primary and secondary raw materials in operations in Japan (excluding palm kernel oil). Avoided procuring soybeans and alcohol from countries and regions where there is a risk of deforestation. 	<ul style="list-style-type: none"> Implementation and continuation of the training for the acquisition of Rainforest Alliance certification by large and small tea farms in Sri Lanka (certification acquired at a cumulative total of 94 large farms and 120 small farms). 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 (down 92% in FY2022). 	<ul style="list-style-type: none"> Conducted joint research with NARO at Château Mercian Mariko Vineyard, Tengusawa Vineyard, and Jyonohira Vineyard, and thereby confirmed that converting derelict land to vineyards with vertical shoot cultivation will enrich ecosystems. Widely published the results in academic papers, etc. Conducted education on conserving wildlife, including the black panther, for young people in areas around farms in Sri Lanka. 	<ul style="list-style-type: none"> Participated in a pilot program to contribute to the development of guidance for appropriate financial disclosure related to natural capital, and became a global pioneer in disclosure in compliance with the LEAP approach and participating in scenario analysis workshop in response to the TNFD requests. Established a consortium with other companies and NGOs for sustainable paper use, and contributed to expanding the supply of FSC-certified paper through dialogue with paper manufacturers and paper container manufacturers, etc. Continued raising awareness of sustainable agriculture, etc., through the establishment of the Rainforest Alliance Consortium.
Water Resources	<ul style="list-style-type: none"> Continued developing applications for bag-type culture vessel technology, which enables mass plant propagation with a minimal amount of water. 	<ul style="list-style-type: none"> Introduced advanced water treatment using reverse-osmosis membranes at Lion, where water stress levels are high. 	<ul style="list-style-type: none"> Water resource conservation on tea farms in Sri Lanka started and continued in 2018. Held group training on the importance of water for 1,750 farm residents, and distributed pamphlets to 15,000 farm residents. Continued water-source conservation activities at 11 production sites in Japan that began in 1999. 	<ul style="list-style-type: none"> 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

Contributions to rule making and policy recommendations

When formulating and implementing our strategy, the Kirin Group prioritizes our contribution to global rulemaking, including the disclosure of information on environmental issues and target setting, as well as collaboration with various stakeholders and policy recommendations, in order to achieve optimization across society as a whole, instead of partial optimization for a single company. There is broad recognition of the idea that the challenges of achieving a decarbonized society and circular economy must be addressed as social systems. An approach to solving issues related to biological and water resources by viewing

them as “food systems” is also becoming more common, as demonstrated by the holding of the United Nations Food Systems Summit*¹ in 2021. Unless our response to climate change, natural capital, and the circular economy is accompanied by the transformation of social systems, there will remain issues that can not be solved by a single company. Our early understanding of this fact is the reason the Kirin Group has long worked with corporations and international NGOs and NPOs to promote our initiatives. In relation to climate change, SBT have resulted in significant increases to corporate GHG emission reduction targets, while corporate governance and management related to climate

change have significantly improved in response to the TCFD. We believe we can do the same with natural capital and the circular economy. To ensure that disclosure frameworks and target-setting methodologies are appropriate and effective, the Kirin Group is participating in the TNFD and SBTN pilot programs. We have led AEPW's efforts to build a society free of waste plastics and have been at the forefront of the industry in setting scientific goals required by SBT to lead a decarbonized society. Since social system reform cannot be done by the private sector alone, we also make necessary recommendations to policy makers.

*1 Click here for the Kirin Group's commitment to support the United Nations Food Systems Summit 2021. https://www.kirinholdings.com/jp/newsroom/release/2021/0903_03.html

Improving the resilience of areas producing agricultural raw materials

In scenario analysis related to climate change, we have utilized multiple research findings and included differing views, but taken as a whole, scenario analysis shows that the impact of climate change on agricultural products and water is inevitable. Although we have judged that there will be no major impact that will change the structure of our industry, the impact that we face as a company that depends on ecosystem services generated by natural capital to create value will not be small. While we will continue to reduce our own GHG emissions and those of our entire value chain, we still need to address and respond to the unavoidable impact of climate change. Land use changes associated with the urbanization of agricultural production areas, excessive use of pesticides, chemical fertilizers, and poor-quality organic fertilizers, also damage the natural capital of producing areas. Such problems in producing regions that are highly dependent on raw material agricultural production present a major risk. Against this background, the most important aspect of the Kirin Group's adaptation strategy is our improvement of the resilience of areas producing agricultural raw materials to climate change and other environmental impacts.

Response to biological resources

At the heart of measures to improve the resilience of areas producing agricultural raw materials and agricultural products is the utilization of sustainable farming and forest certification, etc. We have chosen appropriate ways to utilize these certifications, taking into consideration the severity of the issues faced by the relevant commodities. There is a high probability that paper, which is used in large quantities in containers and packaging, and palm oil, which is also used in flavoring agents and emulsions, are linked to severe deforestation. Taking this point into consideration, we are increasing the ratio of raw materials procured from certified farms and forests. Certification provides a minimum level of proof that a raw material has not led to deforestation. Among many stakeholders, including areas producing raw materials, policymakers, long-term investors, NGOs, consumers, and companies looking to contribute to sustainability, there is the belief that using only certified products will be the most appropriate response to prevent deforestation in areas producing raw materials. The requirements of certification systems include many items

aimed at reducing the impact of climate change, which will also improve the resilience of the farms and forests being certified.

Although there are not many cases of tea and coffee leading to deforestation, farms in production areas have a poor understanding of the need to conserve water sources and wildlife, as well as a lack of knowledge on how to reduce the impact of climate change, etc., and insufficient funds to deal with these issues, making it a major challenge to sustain agriculture. Moreover, many buyers have a poor understanding of sustainability, and the limited amount of procurement from certified farms alone doesn't have sufficient influence to protect biological resources.

The Kirin Group provides financial support to these farms to help them acquire sustainable farming certification, and we also support them to acquire and put into practice the necessary expertise through training for certification. As farms become more sustainable, they are able not just to attract good customers who care about sustainability, but are also able to produce without using excessive pesticides

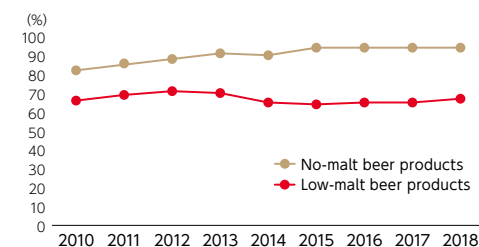
and fertilizers, resulting in better profitability. Seeing this, other farms in production areas will be interested in obtaining certification, which will lead to an increase in the number of certified farms. We believe that supporting the acquisition of certification is a better solution to improving the resilience of entire production areas to climate change and conserving natural capital.

With regard to the risk of declines in the yield of agricultural products, our raw materials, analyzing and understanding how resilient our products are to climate change will contribute to adaptation measures. For example, we believe that our competitive advantage in low-malt and no-malt beer products, which together make up a little over 40% of the Japanese market, will be one of Kirin's strengths if declines in barley yields become a reality. Kirin Brewery has held an extremely high share (see the graph) in these types of products, and we have judged that it is highly likely we will be able to maintain our advantage in terms of quality and cost, thanks to our experience effect, which is proportional to the cumulative amount brewed of such products, and our intellectual property.



Tea farm certification training in Sri Lanka

Change in Kirin Brewery domestic share of low-malt beer products and no-malt beer products market



Less than 25% malt beer products



Zero malt



Panel showing wildlife on tea farms



Recycling box



Coffee farm certification training in Viet Nam

Response to water resources

In response to the impacts of climate change on water resources, we are taking action according to the level of water risk and stress of the target locations. The Kirin Group has large business operations in Japan, where water is abundant, and Australia, where the level of water stress is very high. As such, at an early stage, we understood that problems related to water resources differ between countries and regions. Since 2014, we have used tools based on scientific perspectives to reconfirm this fact by ascertaining and analyzing water risk and stress at global plants and breweries, as well as production areas, and we reflect the results in our strategies.

Specific measures focus on solving problems related water in raw material production areas in the upstream portion of the value chain, and on saving water and providing insurance coverage for natural disasters such as floods at production sites.

As an adaptation measure in the upstream portion of the value chain, the Kirin Group has been continuously carrying out activities to conserve micro watersheds on tea farms in Sri Lanka since 2018, in response to requests from local NGO working to solve water related problems of the local including farms. These requests are based on the strong trust we have earned from farms and NGOs in Sri Lanka through our long history of continuously supporting the acquisition of certification by tea farms. Because tea farms are located in mountainous regions of Sri Lanka, which is an island nation, we are also contributing to activities to protect water sources for large coastal cities. We have also begun similar activities on a trial basis at coffee farms in Vietnam. The soil erosion caused by torrential rain attributable to the effects of climate change is a major problem for Sri Lankan tea farms that use the slopes of mountainous areas. Cover crops, where grasses that crawl the ground are grown on farmland as part of efforts to acquire certification, have been very effective.

It is not easy to solve problems related to water resources in faraway areas producing agricultural raw materials. Whether it is identifying local water problems, developing an understanding of issues, sharing solutions with local people, agreeing on measures, or other activities, building a deep relationship of trust with production areas, i.e., engagement with impacted stakeholders, is a prerequisite, and requires considerable time before we can start such activities. Simply broadening the scope of our response while our understanding of issues remains vague will not contribute to real solutions to problems. First, we will expand our expertise through trials in Sri Lanka and Vietnam and gain a deep understanding of location-specific problems related to water, and

then, we will explore how to better approach problems related to water in regions facing different challenges.

Our breweries in Australia, where water stress is high, require greater efforts to conserve water. We have increased the rate of water reuse through large-scale water purification systems that use reverse-osmosis membranes, etc., but these water purification systems require energy to operate pumps, meaning that rising GHG emissions are a problem. Even in Japan, where water stress is low, we have a long history of conserving water. Although we have successfully halved water consumption per unit compared with the past, we are approaching the limits of possible water savings through ingenuity.

We believe that it is necessary to analyze and take measures in a more scientific manner that considers not only water savings but also the ecosystems of basins. We intend to contribute to the establishment of methodologies and guidance for scientific and convincing target setting and disclosure by participating in SBTN and TNFD pilot programs. As a measure against natural disasters caused by torrential rain, etc., at production sites, we use scientific tools and wind



Micro watershed on a Sri Lankan tea farm fenced off with support from Kirin



Landslide prevention implemented with training provided to support the acquisition of certification (slopes planted with deep-rooted undergrowth)

and flood simulations to assess exposure. We plan to conduct on-site inspections of business sites assessed to be at high risk, and consider insurance coverage as necessary.

Responding to problems related to containers and packaging

Containers and packaging are necessary to deliver beverages and pharmaceutical products to customers while protecting their quality. However, the adverse effects on the environment when used PET bottles are not appropriately collected and reused, but instead released and dispersed into the ocean as microplastics are already widely known. Since the raw materials for PET bottles are derived from fossil fuels, the creation of a society that recycles plastic, without the input of new fossil fuel raw materials, is also an important issue in terms of aiming for net zero emissions. Under the Kirin Group Plastic Policy established in 2019, the Kirin Group aims to use 50% recycled PET resin in our PET bottles by 2027. With the cooperation of many stakeholders, we are working to establish a system for collecting used PET bottles and we are also moving quickly to establish manufacturing technologies based on chemical recycling, which allows us to repeatedly return used PET bottles and other used PET products to PET raw materials with no deterioration of quality, unlike mechanical recycling.

For paper containers, the use of paper poses a deforestation risk. Not only from this perspective of natural capital, but also from the perspective of climate change, forests absorb carbon dioxide from the atmosphere through photosynthesis, and stores carbon while generating oxygen as they grow, making them a valuable carbon sink. In the Kirin Group, we actively use FSC-certified paper in our paper containers, and as of the end of 2020, we had converted all primary and secondary containers for alchole and non-alcoholic beverages in Japan to FSC-certified paper^{*1}. By 2030, we also plan to switch to sustainable paper, such as FSC-certified paper and recycled paper, in all of our global businesses.

We use aluminium and steel cans for alcoholic beverages and soft drinks. Refining aluminium requires a large amount of electricity, and steel requires coke in the blast furnace process, both of which emit large amounts of GHGs during container production. Regarding aluminium, there are examples of commercialization that can be regarded as zero-GHG by using hydroelectric power generation, but it cannot be said to be common yet. The steel industry has begun to take on the challenge of developing steel manufacturing technology that utilizes hydrogen, but it seems that it will take a long time to put it to practical use.

^{*1} The products of Kirin Brewery, Kirin Beverage, and Mercian are covered

Response to climate change

Our climate change strategy consists of adaptation and mitigation measures.

For the Kirin Group, problems related to climate change mostly manifest themselves as impacts on agricultural products and water, our raw materials. We class strategies targeting biological resources and water resources, as described in previous sections, as adaptation measures.

Mitigation measures are also important. Although we are implementing adaptation measures to reduce risks related to natural capital and climate change at our production facilities, which forms Kirin's business base, we expect that we will not be able to fully address the impact of climate change if it is too rapid or too great. Accordingly, we must achieve net zero GHG emissions as soon as possible. Our climate change mitigation measures fall into three categories: promotion of energy conservation, expansion of renewable energy, and energy transition.

In the beer and non-alcoholic beverages businesses, we consume large amounts of energy for heating as part of boiling processes. At present, we mostly use natural gas as the source of energy, i.e., "fossil fuels." We believe that the most effective way for us to reduce GHG emissions is to increase our energy efficiency, while also introducing "renewable energy" after first shifting our energy mix from "fossil fuels" to "electric power." We are transitioning the energy we use for heating from "fossil fuels" to "electric power," while also promoting the introduction of "heat pumps" as a technology that is capable of conserving energy. As a measure to increase the proportion of renewable energy in our energy mix, we have installed large-scale solar power generation facilities on the roofs of our breweries and production facilities. At present, we have completed installation at all breweries in Japan, as well as the Mercian Fujisawa Plant and the Kyowa Kirin Ube Plant. We have also installed solar power generation facilities at Lion's Castlemaine Perkins Brewery and Little Creatures Geelong. We explain our roadmap for reducing GHG emissions, as well as investment amounts and sources of funds in the section on transition plans.

Research & development and engineering

We believe that the Kirin Group's R&D and engineering capabilities are key to supporting our mitigation and adaptation measures.

We believe that, if agricultural products are developed in adapting to global warming, the Kirin Group's "mass plant propagation technology" can contribute to the rapid expansion of crop acreage by producing a large number of seedlings. The resin film bag-type culture vessel system that Kirin has developed for mass plant propagation technology offers the advantages of high production and operational efficiency, light weight, low cost, high operational safety, and flexibility in adjusting production size. In 2022, we successfully developed a technology for the mass production of hops, using a globally pioneering approach in which we promote the formation of axillary buds for hops, an ingredient in beer.

The Institute for Packaging Innovation, which is engaged in the in-house development of containers and packaging, etc., on a scale in the world that is unprecedented for an alcoholic beverage manufacturer, supports strategies for mitigating climate change and creating a circular economy. The institute has contributed to state-of-the-art reductions in the weight of glass bottles, cans, PET bottles, cardboard cartons, and other containers and packaging. At present, we aim to realize a "society that continuously recycles plastics," through the development of commercial technologies for chemical recycling, in which we chemically break down, purify, and repolymerize high-purity PET bottles.

Engineering capabilities are necessary for us to lead a decarbonized society through our production departments, including energy conservation and the introduction of renewable energy. The Kirin Group has set up engineering organizations within each operating company to ensure that our production facilities are supported by engineers with a thorough understanding of manufacturing processes, production technology, and maintenance techniques. The Kirin Group owns Kirin Engineering, a general engineering company engaged in the construction of plants producing beer, non-alcoholic beverages, pharmaceuticals, and other products. This company is conducting the large-scale construction, expansion, and remodeling of production facilities for both Kirin Group



Institute for Packaging Innovation



Bag-type culture vessel system

companies in Japan and overseas and companies outside the Group.

Business opportunities

In our customer surveys that we conducted in Japan, people's health awareness was most heightened in relation to their "interest in immunity" amid the COVID-19 pandemic. In response to this issue, we think we can contribute through Foods with Function Claims (FFCs) that "help maintain the immune system in healthy people." In 2022, annual sales grew 40% year on year in "LC Plasma" related businesses, and awareness of "Lactococcus lactis strain Plasma" roughly doubled compared with 2018.

In addition to yogurt and supplements, we have expanded our lineup of Kirin Group products using "LC-Plasma" under the *Nama-cha* and *Gogo-no-Kocha* brands, which have a high level of brand awareness among consumers, and sports beverages. In addition to these products, in our BtoB business, we have also licensed and provided materials to external partner companies in Japan and overseas, and launched sales of a wide range of products, including snacks, protein, etc. In order to reach as many consumers as possible with our products, at the end of March 2022, we began rolling out non-alcoholic beverages using "LC-Plasma" in 100ml PET bottles at general merchandise stores, drugstores, and convenience stores nationwide. At the Kirin Beverage Shonan Plant, we have enhanced our manufacturing facilities for small PET bottles, thus developing a better supply system. On April 1, 2023, we established the Institute of Health Sciences by newly integrating the health science domain functions of the Kirin Central Research Institute and the Health Science Business Dept.

We believe we can make a contribution to preventing heatstroke through the sale of non-alcoholic beverages that prevent heatstroke. Our *SALTY LITCHI* brand has also become more popular as a beverage that prevents heatstroke, and we plan to expand this brand further as needed. 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 heatstroke countermeasures, etc., at schools and other institutions. This initiative won the "Best Public/Private Collaboration Award" at "Hitosuzumi Award 2021," an initiative that recognizes heatstroke awareness activities.

Transition Plans

Transition plans related to climate change

The transition planning part is divided into chapters on "Climate Change," "Natural Capital," and "Containers and Packaging," but because of the interconnectedness of each issue, each chapter refers not only to individual transition plans but also to related content.

*1 This transition plan is based on the six principles and eight elements advocated by the CDP in "ACCELERATING THE RATE OF CHANGE (CDP STRATEGY 2021-2025)."

🌐 https://cdn.cdp.net/cdp-production/comfy/cms/files/files/000/005/094/original/CDP_STRATEGY_2021-2025.pdf

Net zero transition plan

The Kirin Group has formulated a roadmap, together with investment and financing plans, for achieving science-based GHG emissions reduction targets and net zero targets, with the aim of keeping the global average temperature increase 1.5°C or lower compared with pre-industrial levels. We began operating these plans in January 2022, after they were deliberated and resolved by the Group Executive Committee. Within the roadmap shown on the right, we believe that our plans are highly accurate up to Scope 1 + 2 emissions reduction and investment and financing plans through 2030.

We have formulated plans from 2030 onward based on the assumption that infrastructure development and technological innovation will take place, so it is possible that issues that are not currently visible will become apparent in the future. There are some areas related to Scope 3 emissions where we have not finalized specific measures.

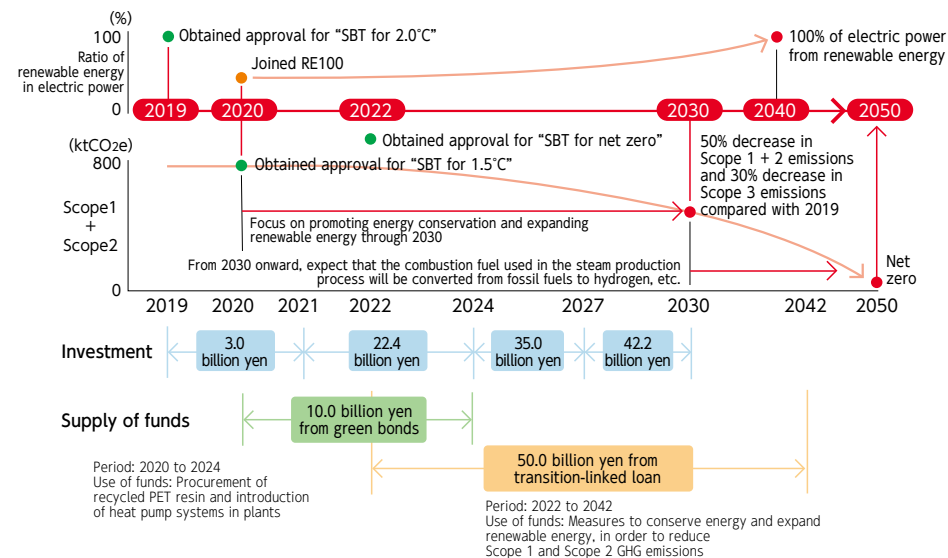
Factors such as rising energy costs due to the pandemic and geopolitical reasons, as well as the export controls of various countries producing agricultural products and underground resources, have further increased the importance of efforts to enhance energy and resource resilience. We will review our roadmap as necessary and endeavor to minimize risks. The range of areas where Kirin can control Scope 3 emissions is limited, and complex coordination and collaboration with stakeholders in the value chain is necessary to ensure effective initiatives. The Kirin Group has a track record of working with NGOs, other companies, and local communities to solve problems through initiatives related to natural capital. When responding to climate change, we hope to use these experiences to lead the creation of a decarbonized society.

Reduction of Scope 1 and Scope 2 emissions

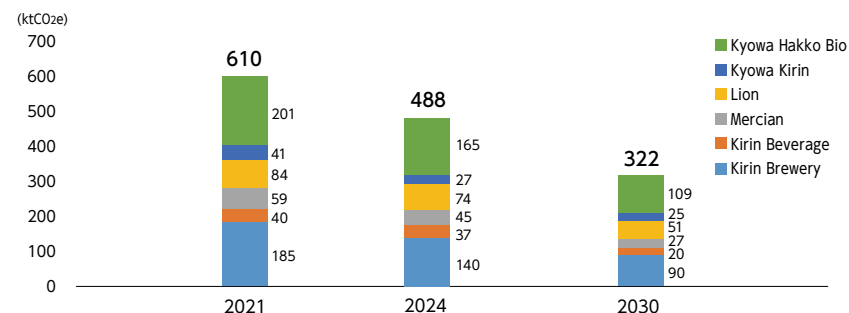
As described in the "Response to Climate Change" part of the "Approach to Environmental Issues" section, we will take a three-pronged approach to reducing Scope 1 and Scope 2 emissions, namely: "promotion of energy conservation," "expansion of renewable energy," and "energy transition."

In relation to "energy transition," we expect to replace the natural gas currently in use with hydrogen, etc., however it is unlikely that sufficient infrastructure and technology for this purpose will be in place by 2030. Therefore, we have judged that it is unlikely we will be forced to update boilers, etc., before they reach the end of their service life. Accordingly, we have judged that it is unlikely we will be forced to update boilers, etc., before they reach the end of their service life. Therefore, for the time being, we will focus on the "promotion of energy conservation" and the "expansion of renewable energy."

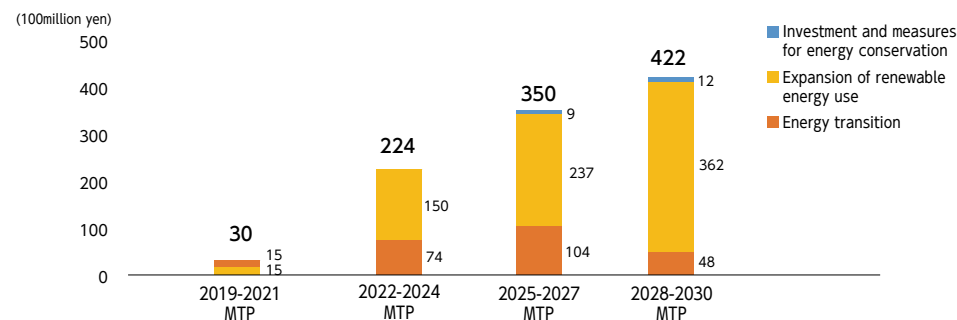
Roadmap to net zero



Reduction of Scope 1 and Scope 2 emissions



Investment



The roadmap stipulates that the introduction of renewable energy should be based on the principles of "additionality" and "ethics." In response to this, in the past few years, we have been rapidly installing large-scale solar power generation systems on the factory premises. In addition, we are aiming for the RE100 target of 100% renewable energy in 2040 by participating in offshore wind power generation projects as a partner company.

Reduction of Scope 3 emissions

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 will work to reduce emissions through the "encouragement of reduction at business partners," as well as the "reduction of our own independent emissions."

In addition to increasing the ratio of recycled resin used in PET bottles, which is currently showing results, possible targets include carbon-free aluminum cans and regenerative agriculture that can reduce GHG emissions from the soil and store carbon in the soil with biochar. Each of these will be studied in conjunction with the transition plan for natural capital and containers and packaging, respectively.

Encouragement of reduction at business partners

Plan to prioritize engagement as we reduce emissions, based on each company's reduction plans and quantitative and qualitative progress identified through surveys of major suppliers

Reduction of our own independent emissions

Reduce the weight of containers and packaging and increase the use of recycled PET resin, leveraging the strength of our in-house research institute to develop our own containers and packaging

Investment plans related to net zero

We plan our investments for achieving the roadmap to 2030 toward achieving net zero on a profit-and-loss neutral basis. Specifically, the merit in terms of costs derived from saving energy will offset depreciation and amortization from the investment and the increased procurement costs of electric power generated from renewable energy. In order to promote environmental investment, 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 into our framework for making investment decisions. Going forward, we plan to accelerate GHG reduction measures by considering ICP in our roadmap. We are considering plans for 2030 and beyond in conjunction with financing plans, but we have not yet established clear investment plans because we are assuming there will be infrastructure and technological innovation.

Investments in other resources

Climate change will significantly impact agricultural products and water resources. Accordingly, we must invest resources in mitigating this impact, as well as investment to reduce GHG emissions. We have not yet determined the amount of investment required, but we explain our approach in the section on our "transition plan" for natural capital.

Financing plans

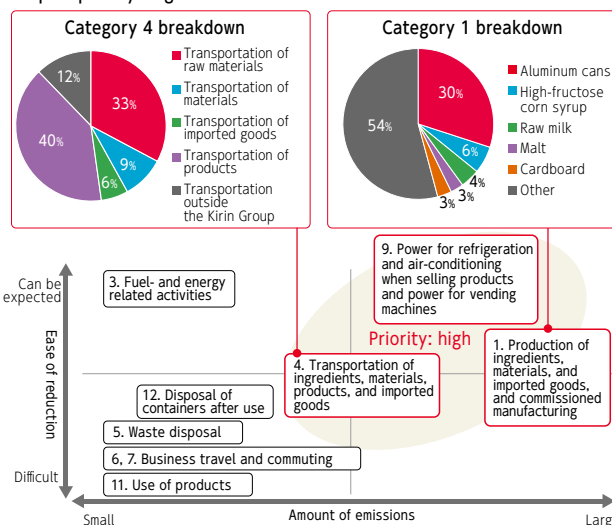
We are also creating financing plans in stages to cover the investment plans in our roadmap. In 2020, we issued green bonds (10.0 billion yen) to fund the procurement of recycled PET resin and the installation of heat pump systems at our plants and breweries. We have disclosed information about the allocation of funds and an impact report in our Environmental Report. 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 will contribute to reducing Scope 1 and Scope 2 emissions. This loan is eligible for the Ministry of Economy, Trade and Industry (METI)'s FY2022 subsidy for global warming countermeasures promotion project, as well as performance-linked interest subsidies (financial support for promoting the transition towards achieving a carbon-neutral economy) under the Industrial Competitiveness Enhancement Act.



Solar power generation facilities

Heat pump systems

Scope 3 priority targets and emissions ratios



Transition plans related to natural capital

Transition plan to nature positive

The Kirin Group has formulated and revised the Kirin Group Action Plan for Sustainable Use of Biological Resources, and currently aims to achieve targets for black tea leaves, paper/printed materials, palm oil, coffee beans, and soybeans. We have not yet set a clear transition plan to Nature Positive. The concept of Nature Positive did not exist when the Action Plan was formulated in 2013, but the Action Plan was drawn up with the main objective of preserving forests that nurture precious ecosystems, and we believe that it encompasses activities that can contribute to Nature Positive.

Although not an agricultural product covered by the action plan, we believe that the Mariko vineyard is a valuable example of Nature Positive through its business, in which the conversion of idle, devastated land into grass-cultivated vineyards enriches the ecosystem. While this example cannot be applied directly to other agricultural products, we believe that the Satoyama Landscape concept behind it can be applied more broadly. We will use this case as a venue for various practices of regenerative agriculture that are considered to contribute to Nature Positive and reflect what we have learned in the transition plan.

We would also like to reflect the strong relationship with Net Zero. Climate change can damage ecosystems by causing rapid warming and droughts, as well as affect the Kirin Group's finances through reduced yields of agricultural products. On the other hand, cover crops on tea farms and vineyards nurture rich ecosystems and serve as climate change adaptation measures to prevent soil runoff from torrential rains. NbS is a concept that describes these relationships. According to the guidelines developed by the IUCN^{*1}, NbS could, by 2030, provide about 30% of the cost of mitigation measures needed to stabilize warming below 2°C, making it a promising response to the threats to biodiversity from climate change. As such, we plan to progressively incorporate what is possible into our action plan and update our current action goals to those that contribute to Nature Positive and Net Zero by the mid-term management plan from 2025 onwards.

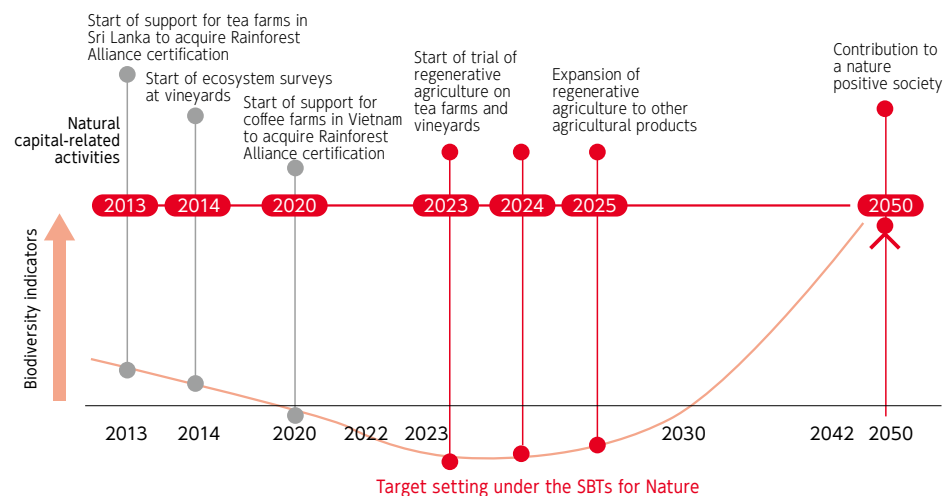
^{*1} IUCN Global Standard for Nature-based Solutions

<https://portals.iucn.org/library/sites/library/files/documents/2020-020-En.pdf>

Investment plans

Our investments and expenses related to natural capital can largely be divided into expenses associated with activities in our roadmap, and expenses for clarifying the relationship between Kirin and natural capital. Currently, the cost of supporting the acquisition of certification by Sri Lankan tea farms and Vietnamese coffee farms is around 10 million yen. The cost of joint research at Château Mercian's vineyards, our participation in the pilot programs of the TNFD and SBTN, and our rolling out of disclosure guidance within the company is about the same, which is a small amount compared with investments related to climate change and containers and packaging, but we expect that a large financial commitment will be necessary in the future. In our roadmap to achieve net zero emissions, we were able to clarify our investment and financing plans in conjunction with our long-term GHG emission reduction plans, based on the

Roadmap to nature positive



We created the graph above with reference to the "Global Goal for Nature: Nature Positive 2030" presented in "A Global Goal for Nature," and it does not represent the impact of the Kirin Group on biodiversity.
<https://www.naturepositive.org/>

fact that we can anticipate some technological trends and future innovations in the short to medium term.

However, because the state of natural capital as well as our businesses' dependence and impact on it vary greatly depending on the location, it is difficult to consider the whole picture, and we must begin by exploring, analyzing, and evaluating the interfaces between our businesses and nature. Therefore, we believe that it is difficult to quickly formulate a medium-to long-term investment plan and financing plan using only the approach from the natural capital side.

On the other hand, insurance premiums are expected to rise significantly because of frequent natural disasters, so reviewing our analysis methods, such as comparing insurance premiums to adaptation measures for physical risks related to climate change, may contribute to our investment plans.

By positioning measures such as the storage of carbon in forests and soil as mitigation measures for Scope 3 emissions, we think we may be able to clarify the amount of investment embedded in mitigation measures.

In this way, by incorporating the concept of Nature-based Solutions and positioning them as climate change mitigation and adaptation measures, we will clarify our investment and financing plans as a holistic approach to natural capital and climate change, rather than separate measures.

Transition plans related to containers and packaging

Roadmap to using 100% recycled resin

The Kirin Group has formulated a new vision, "Kirin Group Environmental Vision 2050," for strengthening social and corporate resilience and aims to create a "society in which containers and packaging are recycled in a sustainable manner." To this end, we have formulated the Kirin Group Plastics Policy as a medium-term goal and have set a target of increasing the percentage of recycled plastic used in PET bottles in Japan to 50% by 2027. To meet these targets, we have created a roadmap for achieving them, which we are using as our transition plan.

Aiming to achieve the target of 50% by 2027, we are gradually expanding the number of products using R100 PET bottles that use 100% recycled PET resin by mechanical recycling, which is now mainstream. In addition to purchasing such recycled PET resin, we are actively promoting bottle-to-bottle horizontal recycling, in which used PET bottles are collected and recycled into new PET bottles, in cooperation with local governments and companies.

On the other hand, we believe that the practical application and expansion of chemical recycling is indispensable when looking at the future supply and demand of recycled PET resin. Chemical recycling of PET bottles enables PET products other than PET bottles to be recycled as PET bottles, which would otherwise be sent for thermal recycling (heat recovery) or disposal, thereby expanding the amount of PET resin resources recycled. For this reason, the Kirin Group is studying the practical application of chemical recycling as a complement to mechanical recycling.

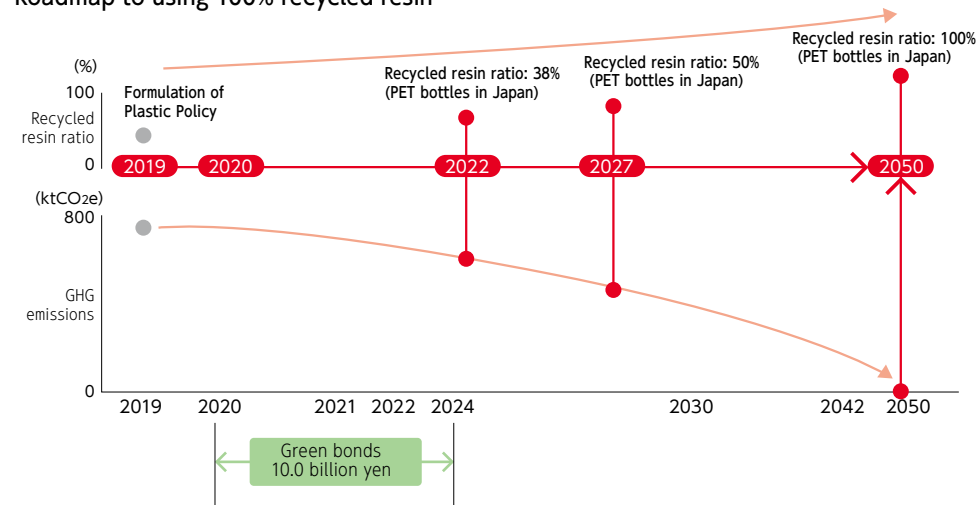
Currently, we have set a target to 2027, but we will formulate a roadmap to 2050 while monitoring progress in the practical application/commercialization of chemical recycling.

Capital investment plans

We will expand the number of products that use recycled PET resin in order to achieve the 50% target by 2027. Additionally, as a future resource circulation measure, we also plan to develop practical applications for chemical recycling. In 2020, we issued green bonds (10 billion yen) mainly for the purpose of procuring recycled PET resin. As of December 2022, a cumulative total of 4.9 billion yen has been allocated for the procurement of recycled PET resin, and we will continue to focus on the procurement of recycled PET resin. Details are disclosed in the Funding Allocation and Impact Reporting and the Environmental Report.

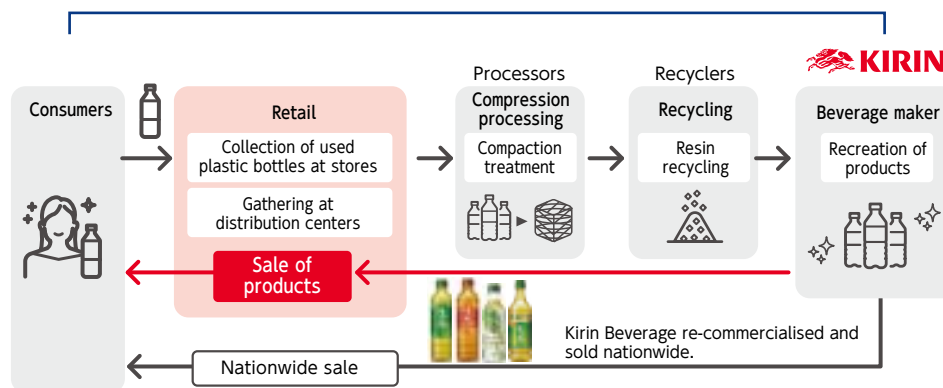
We plan to raise funds sequentially, with an eye on the practical application of chemical recycling in the future.

Roadmap to using 100% recycled resin



Examples of creation of routes to collect and recycle used PET bottles

Flow of recovery, recycling, and product creation



Metrics and Targets

Targets and amount of investment

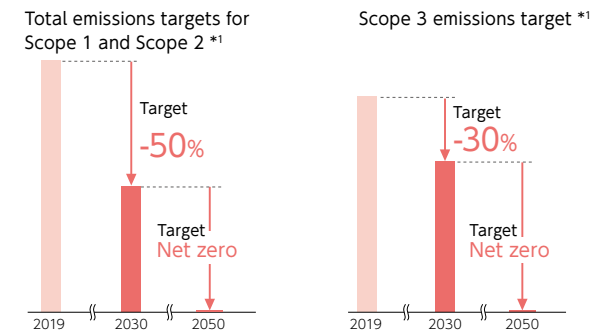
Target

Targets related to climate change	Target	Achievements
GHG emissions from the entire value chain	Net-zero (2050)	4,876ktCO ₂ e
Scope 1 + 2 (compared with 2019)	-50% (2030)	-18%
Scope 3 (compared with. 2019)	-30% (2030)	-1%
Ratio of renewable energy purchased electric power	100%(2040)	27%
Targets related to natural capital	Target	Achievements
Number of Large tea farms in Sri Lanka that received training for the acquisition of certification	Cumulative total of 15 large farms (2022 to 2024)	4 Large farms
Number of small tea farms in Sri Lanka that received training for the acquisition of certification	Cumulative total of 5,350 small farms (2022 to 2024)	9 small farms
Ratio of FSC-certified paper used for office paper in the Japan Non-alcoholic Beverages Business:100%	Maintain 100%	100%
Ratio of certified palm oil used in Japan	Maintain 100	100%
Ratio of renewable energy purchased electric power	100%(2040)	27%
Water efficiency in Lion (Oceania region only)	2.4kl/kl(2025)	3.6kl/kl
Kyowa Hakko Bio water usage	32% reduction compared with 2015 (2030)	52% reduction compared with 2015
Targets related to containers and packaging	Target	Achievements
Percentage of recycled resins used in PET bottles	50% (2027)	8.3%
Percentage of FSC-certified paper used for paper containers in the domestic beverage business	Maintain 100%	100%

Investment plans and fundraising

Climate-related capital investment in the 2019 medium-term plan (2019 to 2021)	3.0 billion yen
Total amount allocated from green bonds in 2022 (cumulative)	5.4 billion yen
Climate-related capital investment in the 2022 medium-term plan (2022 to 2024)	22.4 billion yen
ICP(Internal Carbon Pricing)	¥7,000/tCO ₂ e

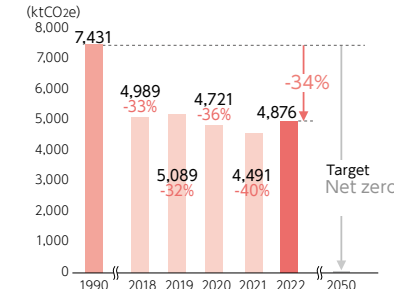
Target



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

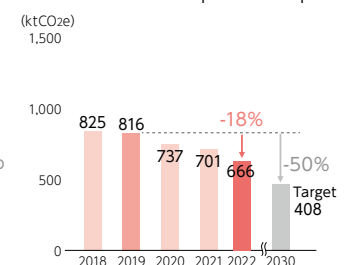
Progress

GHG emissions across the whole value chain

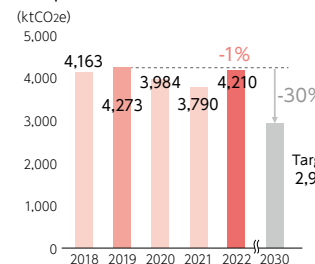


Progress towards medium-term GHG emissions reduction targets

Total emissions for Scope 1 and Scope 2

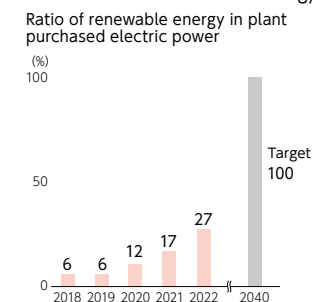


Scope 3 emissions*2



Progress toward the target for increased use of renewable energy

Ratio of renewable energy in plant purchased electric power



*2 Since 2019, we have excluded Lion's non-alcoholic beverages business from Scope 3 emissions, and we have changed to the LCA database (IDEA) offered by the National Institute of Advanced Industrial Science and Technology (AIST) for emissions per unit of production.

Metrics

Progress on medium-term GHG emissions reduction target approved by SBT (2022) (unit: tCO₂e)

■Scope1+2		Total
Scope1+Scope2		665,651
Scope1		361,479
Scope2		304,173
Reduction rate (compared to 2019 base year)		-18%

■Scope3		Total
Scope3		4,210,064
Upstream	1 Purchased goods and services	2,354,830
	2 Capital goods	130,234
	3 Fuel and energy-related emissions not included in Scopes 1 and 2	158,659
	4 Transportation and distribution (upstream)	423,843
	5 Waste generated in operations	27,308
	6 Business travel	5,908
	7 Employee commuting	7,521
	8 Leased assets (upstream)	0
Downstream	9 Transportation and distribution (downstream)	1,038,586
	10 Processing of sold products	0
	11 Use of sold products	9,212
	12 End-of-life treatment of sold products	53,963
	13 Leased assets (downstream)	0
	14 Franchises	0
	15 Investments	0
Reduction rate (compared to 2019 base year)		-1%

Impact of the circular economy (2022)

■Reduction in impact		Total
Reduction in resources (KB,KBC) *2	Aluminum cans	24,294t
	Glass bottles	675t
	PET bottles	7,096t
	Cardboard cartons for products	6,287t
	6-can packs	4,228t
Returnable glass bottles (KB)	Collection rate	98%

Natural capital indicators (2022)*1

■Direct		Total
Land Use	Land use area (value chain of domestic operations)	228,126ha
Waste water	Wastewater volume	4,970km ³
	COD	1,284t
	Nitrogen	952t
	Phosphorous	122t
Waste products	Global amount generated	286kt
	Amount generated in Japan	153kt
	Final disposed volume	5kt
	Recycling rate	98%
Air Pollutants	NOx	396t
	SOx	10t
VOC (Domestic business and especially in KKC and KHB)	Methanol	255t
	Acetone	5t
	Substances subject to PRTR Act	40t
	Ethyl acetate, etc.	81t
Water	Water intake from high-stress areas	16,714km ³
Commodity	Procurement volumes of tea leaves and coffee beans	8,580t
Containers and Packaging (Kirin Brewery, Kirin Beverage, Mercian)	Amount of paper containers used (drink boxes, cartons, 6-can packs)	125kt
	PET bottle usage	66kt
	Usage of recycled resin in PET bottles	6kt
Food Waste	Reducing losses from disposing of products (KB Kirin Beverage re-commercialised and sold nationwide., Mercian)	-92%

■Value chain upstream

Number of farms supported to acquire certification	Rainforest Alliance large farms	Total 4 farms
	Rainforest Alliance small farms	Total 120 farms
Certified agricultural product usage ratio	FSC (Paper/printed matter, paper containers in the domestic beverage business)	100%
	RSPO (domestic primary and secondary raw materials)	100%

■Value chain downstream

Plastic use	Negative impact on domestic PET bottles	Approx. 1.1 billion yen
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*1 Metrics of natural capital are disclosed on a trial basis based on the draft core metrics and the draft metrics for the agriculture and food sectors presented in the TNFD Framework beta version v0.4, and metrics that are currently known or considered relevant.

*2 Resource reduction is calculated by multiplying the difference in container weight between 1990 and 2022 by the number of containers used in the reporting year (for bottles, the number of new bottles put in). Land use area is calculated using the 2014 ESCHER. Other information is reproduced from the Progress Report and ESG Data Book. <https://www.kirinholdings.com/jp/investors/files/pdf/esgdatabook2023.pdf>

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 "climate change" category
"A-List"
(four consecutive years)



CDP "water security" category
"A-List"
(seven 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



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



Kirin Namacha Decaffeinated
Tea Drink won WorldStar
Packaging Awards



The middle-sized bottle also
received WorldStar Packaging
Awards



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



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



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



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



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



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



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



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"



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



Logistics Environmental Grand
Prize at the 18th Logistics
Environmental Award



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



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



Selected for the following indices



2023 CONSTITUENT MSCI JAPAN
ESG SELECT LEADERS INDEX



Aactivity



Biological Resources

→ P.42~P.51

A society that values sustainable biological resources



Water Resources

→ P.52~P.57

A society that values sustainable water resources



Containers and Packaging

→ P.58~P.65

A society that circulates containers and packaging in a sustainable way



Climate Change

→ P.66~P.75

A society that has overcome climate change



Biological Resources

Background

We have utilized scientific tools to analyze and assess risks and opportunities and find solutions to issues related to biodiversity. Agricultural raw materials often bring the unique characteristics of the areas that produce them to be reflected in products. We must maintain both a local perspective centered on our “dependence” on agricultural products produced in specific “places” and a global perspective centered on the fact that climate change has a significant impact on the quantity and quality of agricultural raw materials.

In addition to scenario analysis based on the recommendations of the TCFD, we utilize the processes advocated in the beta version of the TNFD Framework to develop a holistic approach to solving issues related to natural capital including biological resources and climate change.

We will create together

A society that values sustainable biological resources



Cultivate, expand and procure sustainable agricultural raw materials



Stand by the side of farmers to make raw material production areas sustainable

Production regions

- P.44 🌿 Tea farms
- P.46 🌿 Vineyard
- P.48 🌿 Coffee farms
- P.48 🌿 Hop fields
- P.49 🌿 Mass plant propagation technology
- P.51 🌿 Support for the restoration of nature
(Educational program for wildlife conservation in Sri Lanka)

Manufacturing

- P.49 🌿 Palm oil
- P.50 🌿 Paper and Printed Materials
- P.51 🌿 Support for the restoration of nature (Biotopes at manufacturing plants)

Products

- P.50 🌿 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 important themes. Started supporting the acquisition of Rainforest Alliance Certification by Sri Lankan tea farms

2014

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

2017

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

2018

Started supporting the acquisition of certification by small-scale tea farms in Sri Lanka.

2020

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

2021

We participated in the Corporate Engagement Program of the Science Based Targets Network. We revised the Kirin Group Action Plan for the Sustainable Use of Biological Resources to add coffee beans and soybeans as important materials. We participated in the TNFD Forum.

2022

Became a global pioneer in trialing disclosure based on the LEAP approach advocated in beta version v0.1 of the TNFD Framework. Participated in a demonstration program aimed at the registration of OECMs under the 30by30 international target.



FSC®C137754

Targets and Progress

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 that received training: 15
Number of small farms that received training: 5,350

Target

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 farms
Actual results: 9 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

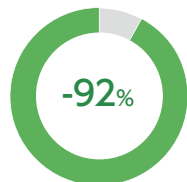
FSC-certified paper or recycled paper

Food waste

KB

KBC

ME



Rate of reduction

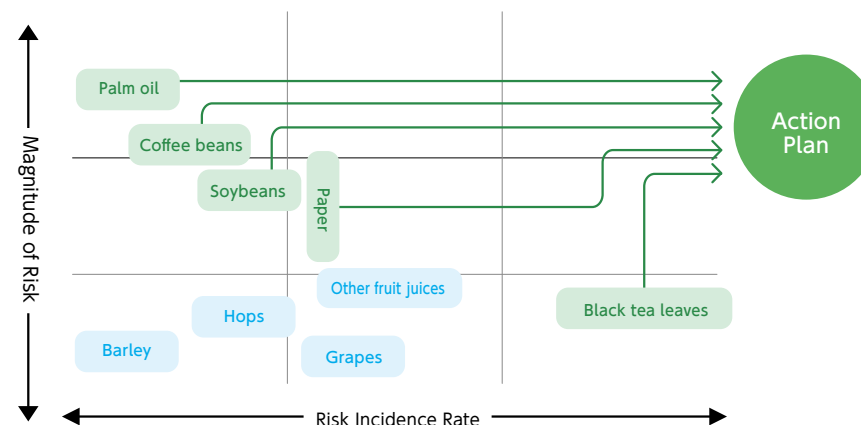
2021 (compared with 2015)

Reduction target: -95% (by 2025, compared with 2015)

Main Activities

- In September 2021, we revised the Kirin Group Action Plan for the Sustainable Use of Biological Resources (established in 2013) to add coffee and soybeans to the existing black tea, paper, and palm oil.
- The Kirin Group supports cumulative total 94 large tea farms, equivalent to approximately 30% of all large tea farms in Sri Lanka that have received Rainforest Alliance certification at the end of 2022.
- We have sales of year-round products that use tea leaves from certified farms (since 2021).
- Over 200 people have participated in educational programs for wildlife conservation in Sri Lanka (2021).
- We have expanded our support for the acquisition of Rainforest Alliance certification to coffee farms in Vietnam since 2020. 350 farms trained to transition to new certification standards and new 309 small farms acquired the certification at the end of 2022.
- We maintained the use of FSC-certified paper or recycled paper for 100% of office paper used in the Japan Alcohol and Non-alcoholic Beverages Businesses (since 2020).
- Mariko Vineyard has been selected as an approved Socio-Ecological Production Landscapes and Seascapes (SEPLS) site contributing to 30by30 in the certification demonstration program of the Ministry of the Environment (January 2023).
- We became a global pioneer with disclosure based on the LEAP approach advocated in the beta version of the TNFD Framework (2022), and conducted scenario analysis together with the TNFD (2023).

Materiality Analysis of Biological Resources

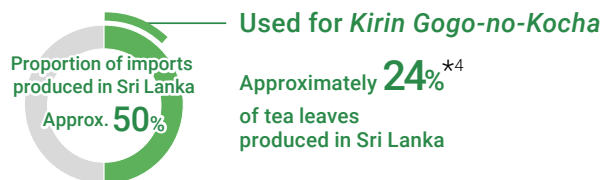


Tea farms

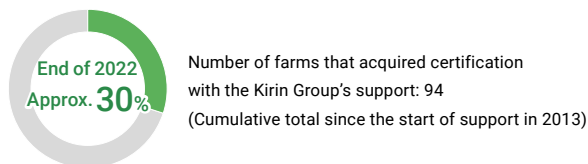
Support for acquisition of Rainforest Alliance Certification

Since 2013, the Kirin Group has supported the acquisition of Rainforest Alliance certification*1 by tea farms in Sri Lanka. As of end of 2022, we had supported the acquisition of certification at a total of 94 large tea farms in Sri Lanka, equivalent to approximately 30% of all certified large tea farms. In August 2021, we began sales of year-round products that use tea leaves from certified tea farms. Since its launch, we have used tea leaves from Sri Lanka as the main ingredient for *Kirin Gogo-no-Kocha*, Japan's leading packaged black tea brand with a share of approximately 50%*2 of the domestic packaged black tea market. When we conducted a biodiversity risk assessment in 2011, we learned that approximately 25%*3 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 at the time, Sri Lanka was in the immediate aftermath of a civil war and we found the number of farms that were able to access training themselves was limited. Therefore, rather than leaving behind such farms, we decided to create a positive impact on the sustainability of the production area as a whole by supporting the acquisition of certification by tea farms in Sri Lanka in order to build better partnerships with production areas

Share of tea leaves imported by Japan by area of production



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



and the people who work there and to continue producing tasty and trusted tea drinks.

Training content

Droughts and heavy rains are frequent in Sri Lanka due to the impact of climate change. Urbanization, industrialization, soil erosion and outflow as a result of inappropriate agriculture are also major problems. Tea farms are often located on steep, sunny slopes, so heavy rainfall not only causes the loss of fertile soil, but there have also been examples of it causing landslides that kill people living on the farms. In training, we teach people how to identify grasses that have a negative effect on tea cultivation and show them how to ensure the ground in tea farms is covered with harmless grasses with deep roots.

This prevents landslides by stopping rain from directly hitting the ground during heavy rain, while also serving to retain water during droughts, making it an effective measure for adapting to climate change.

In the training, we work not just to protect forests, but also to reduce expenditure and raise earnings for tea farms and increase the safety of tea leaves, by providing direction on scientific methods to raise yields while limiting the usage of agricultural chemicals and fertilizers.

Supporting growers obtain Rainforest Alliance Certification*3



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 spare 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.
① <https://www.rainforest-alliance.org>

*2 Actual data for 2021 based on research conducted by Food Marketing Research Institute Co., Ltd.

*3 Source: 2011 Tea Statistics, Japan Tea Association

*4 Source: 2008 Tea Statistics, Japan Tea Association

Tea farms

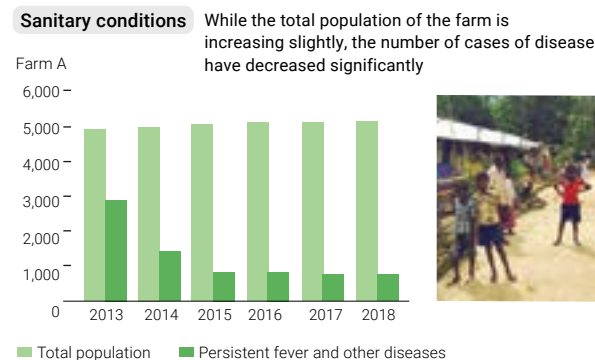
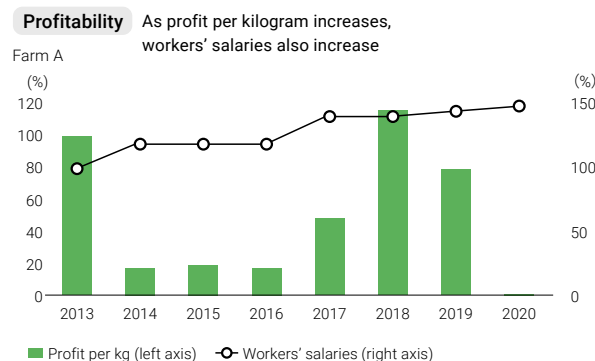
Social and economic impact of certification

This data is from a specific farm, and from it, we may say that our support for certification has a positive impact, both financially and socially, on farms and farm workers, and makes areas where raw materials are produced more sustainable.

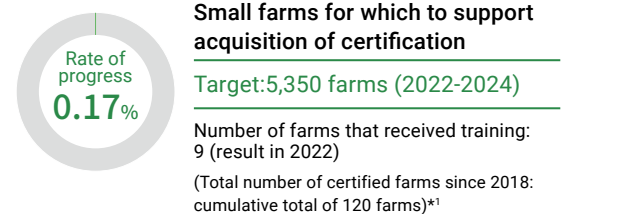
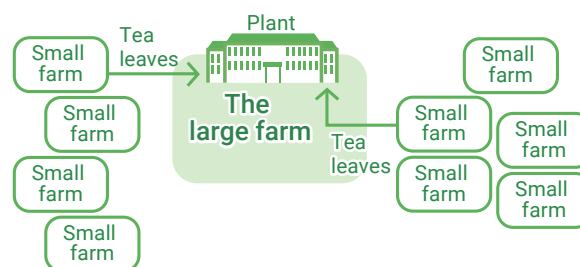
Support for the acquisition of certification by small farms

In 2018, we began supporting the acquisition of certification by small farms with 120 farms certified by the end of 2022. From 2022 to 2024, we plan to provide training to a cumulative total of 5,350 farms. In Sri Lanka, there are many small family-operated farms, with the total number said to be in the hundreds of thousands. Nationally

Social impact of supporting the acquisition of Rainforest Alliance Certification



qualified collectors collect the tea leaves that small farms produce, and sell them to large nearby farms for processing before shipping. 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. In order to obtain certification for small farms, multiple small farms are organized to form a team and appoint a leader. Local trainers first train the leaders, who then train the team's small farms, thus ensuring that they learn about the requirements of the certification standard. Since it is necessary, however, to begin by organizing the small farms into a team, it often takes time to start actual training, and the process to obtain certification is perhaps more difficult than the process for large farms.



*1 It was difficult for trainers to visit farms owing to strict curfews, etc., as a result of the spread of COVID-19 in 2021 and 2022, and training was also impacted by the financial collapse of tea farms, meaning we were mostly not able to provide training at either large or small farms.

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, unlike in urban areas, schools in rural areas such as those well known as tea-producing areas usually do not have class libraries or substantial libraries, which are taken for granted in Japan. The Kirin Group donates quality books to elementary schools for the children of tea farm workers, and continues to help children improve their academic abilities and envision their dreams for the future. We have already made donations to 242 schools and plan to continue to increase the number of schools to which donations are made.



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

Vineyard

Nature positive at Japan wine vineyards Château Mercian Mariko Vineyard

We have invited researchers from the National Agriculture and Food Research Organization (NARO), and have been conducting ecological surveys at Château Mercian Mariko Vineyard, on the Jinba Plateau in the Maruko district of Ueda City, Nagano Prefecture, since 2014. In these surveys, we confirmed the existence of 168 species of insects and 289 species of plants, including 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 farm land into hedgerow-style vineyards for Japan Wine creates valuable grasslands and contributes to the expansion and protection of Japan's traditional rural Satochi-Satoyama landscapes. Within nature, there is a kind of nature called "secondary nature" that is protected only by human intervention.

Grasslands are a typical example of such nature, and they are positioned as "Other effective area-based conservation measures (OECMs)," which are eligible

Insects
168
species

Plants
289
species



Château Mercian Mariko Vineyard

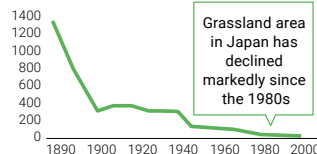


Château Mercian Mariko Winery

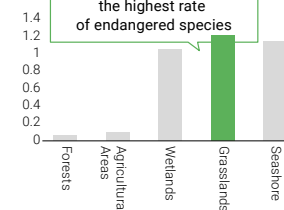


Careful mowing at Jyonohira Vineyard

Trends in grassland area in Japan



Number of endangered species by unit area



for the global target adopted at COP 15 to "make at least 30% of land and sea conservation areas" (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. However, the ratio of endangered plants per unit area is extremely high (See figure on the below), and grasslands play an important role in conserving biodiversity. In Japan Wine vineyards, we regularly cut the undergrowth for vertical shoot cultivation, and this has created an environment that functions as high-quality, vast, grasslands, enabling the development of native and rare species, without being dominated by highly fertile plants.

At Mariko Vineyard, we participated in the Ministry of the Environment's certification demonstration program for "Socio-Ecological Production Landscapes and Seascapes (SEPLS) sites" to contribute to achieving the "30by30" target, and the site was "selected" as an "approved SEPLS site," a region held by private-sector companies, local governments, or other organizations with a high amount of biodiversity, in January 2023. We have applied for official certification, which began in 2023 FY, and if the site is certified, we expect the Ministry of the Environment to register it as an OECM in an international database and for us to be able to contribute to achieving the global target set forth at COP 15.

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 Phaeoedus braccatus (L. Koch, 1866) (Araneae: Gnaphosidae) from Japan
https://media.niche-life.com/series/009/Niche009_26.pdf

Mariko Vineyard



Zygaena nippona nippona

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)



Argyrogonia 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



Argyrogonia 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



Phaeoedus braccatus (Gnaphosidae)

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



Calommatia 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 also conducted the first spider survey in a Japanese vineyard. We confirmed the existence of a rare species of spiders, including a species found for the first time in Nagano Prefecture, endangered species listed in the Red Data Book, and the fourth specimen of a rare spider found in Japan.

Vineyard

Studies into the process of converting derelict farm land into vineyards

Château Mercian Tenguasawa Vineyard

At Tenguasawa Vineyard in Kosu City, Yamanashi Prefecture, we are collaborating with NARO to conduct a research project that is rare even on a global basis, relating to changes in ecosystems as a piece of derelict farm land is converted into a hedgerow-style vineyard that can be harvested.

At Mariko Vineyard and Jyonohira Vineyard, we can only conduct surveys in well-maintained vineyards, but at Tenguasawa Vineyard, we can make observations based on the condition of derelict farm land before development. Through these surveys, we believe that we have successfully confirmed that the development of derelict farm land into vineyards enriches ecosystems.

When we investigated derelict farm land prior to its cultivation in 2016, we found only insect and plant species extremely lacking in diversity, as a result of damage from deer eating the vegetation. Since we fenced and reclaimed the area in 2017, however, the landscape has changed to one like a vineyard, and we are seeing how the ecosystem has become richer during this process. In vegetation surveys, in 2021, we confirmed the existence of 103 species, an increase from the previous

year, when it was 88, and by 2022, this number had risen to 108 species. It is fair to say that, through such signs, we have confirmed that the area is becoming a high-quality grassland. In insect surveys, we found *Argyrogonome laodice japonica*, a vulnerable species listed in the Ministry of the Environment and Yamanashi

Evolution of the Tenguasawa 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

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



Prefecture's Red Data Books in 2021, and the number of observable species increased, leaping to 28 in 2021 and 30 in 2022, from 16 in 2020.

Revegetation activities

In 2016, under the guidance of specialists, we have started restoration activities with the participation of employees to expand the habitats of rare and native species in the fields, and we are seeing tangible results. Château Mercian has established coexistence with nature, the local community, and the future as important keywords, and is putting this theme into practice at Mariko Vineyard. In fall, we collect dry grass from areas where there are rare and native species and sow it on the reclaimed lands in order to regenerate the vegetation from seeds in the dry grass that we have 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*

Along with an NGO and local elementary school students, we have begun activities to increase shrubby sophora (*Sophora flavescens*) in Mariko Vineyard. Shrubby sophora is not a rare species at the national level, but it is the sole grass used for feeding *Shijimiaeoides divinus*, a critically endangered IA (CR) butterfly. In 2019, international NGO Earthwatch Japan and its volunteers collected, with the permission of the rice field owners, cuttings of shrubby sophora from the sides of rice fields near vineyards, and took them home to grow them. Two years later, at the

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

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

end of May 2021, we planted the seedlings at Mariko Vineyard. Since 2021, Ueda City Shiogawa Elementary School at the foot of the Jinba Plateau where Mariko Vineyard is located has participated in activities to increase shrubby sophora. The school grew cuttings taken in 2021 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 have held environmental classes for students at the school.

We are continuing the above initiatives in 2023.

Coffee farms

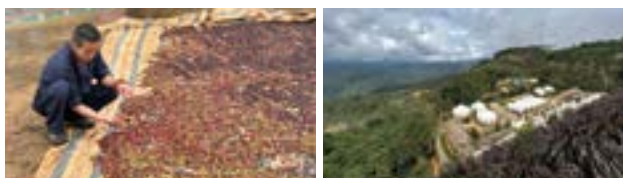
Since 2020, the Kirin Group has supported the acquisition of Rainforest Alliance Certification by coffee farms in Vietnam. We are utilizing the knowledge we have accumulated by supporting the acquisition of certification by tea farms in Sri Lanka since 2013 to expand our activities to coffee farms in Vietnam. By the end of 2022, 350 farmers growing robusta were certified and 309 arabica coffee farmers who were certified by UTZ prior to its merger with Rainforest Alliance have completed the transition to Rainforest Alliance certification.

Starting from the spring of 2020, immediately after we began providing support, we entered a prolonged period when it was difficult to conduct on-site visits owing to the global spread of COVID-19. In October 2022, we took advantage of the removal of most restrictions on travel in Vietnam and Japan to visit small farms receiving support in Da Lat City, the provincial capital of Lam Dong Province, located in central south Vietnam, with an elevation of 1,500 meters.

At the farms we visited, we learned of issues such as the fact that despite the government recommending that people become coffee farmers, there was little technical instruction and farmers were lacking in agricultural knowledge, as well as recent spikes in fertilizer prices. Meanwhile, we have confirmed that among farmers of robusta coffee, which requires space between trees, an increasing number of farmers are using organic fertilizers, which are cheaper and also have less impact on the environment than chemical fertilizers. In the beautiful coffee-producing region of Da Lat, where we visited, we learned that, in relative terms, growing coffee has become less appealing for farmers, with some farmers increasing their income by destroying half of their farms to create tourism facilities, etc. Going forward, we will continue site visits and working to solve local issues based on an understanding of factors such as the circumstances of local small farms and the support activities of suppliers and Rainforest Alliance trainers in local areas. In this way, we will continue to support the production of sustainable coffee beans from the dual perspectives of the environment and society at small farms in Vietnam.



Arabica coffee farms



Drying of the coffee fruit (robusta)

The picturesque coffee bean producing region of Da Lat

Hop fields

Hop fields living species survey

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. In the fall of 2020, we conducted a survey of the vegetation in the new hop fields of BEER EXPERIENCE, an agricultural corporation funded by Kirin Brewery, in Tono City. As a result, we found there were *Corydalis raddeana*, which are designated as "Near threatened" in the Ministry of the Environment's Red Data Book, as well as *Cynoglossum asperrimum*, which is designated as "Near threatened" by Iwate Prefecture. In a survey we conducted in spring 2021, we found *Adonis ramosa*, designated as a "Vulnerable" species by Iwate Prefecture, as well as *Anemone debilis* and *moschatel* (*Adoxa moschatellina*), which are both designated as "Near threatened" by Iwate Prefecture.

We farm the hop fields every year, so the fields themselves do not have the function of enriching vegetation. However, it is fair to say that the creation and maintenance of windbreak forests to aid in the cultivation of hops and the continued functioning of hop fields as rich ecosystems in Japan's traditional rural Satochi-Satoyama landscapes both contribute to the richness of vegetation.



Diverse forms of life inhabit the wind-breaking forests planted to protect the hops and the underbrush planted to prevent drying of the ground



Corydalis raddeana

Near threatened species on the Ministry of the Environment Red List (NT)



Cynoglossum asperrimum

Near threatened species on the Iwate Red List



Adonis ramosa

Vulnerable species on the Iwate Red List



Moschatel (Adoxa moschatellina)

Near threatened species on the Iwate Red List

➡ Mass plant propagation technology

Our research of plants began with beer ingredients such as hops and barley, developed into proprietary mass plant propagation technology in the 1980s. Recently, various sectors are increasingly focusing on this technology for its potential to solve social issues. Kirin's mass plant propagation technology is original and globally unprecedented in that it consists of four elemental 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).

Plant propagation is normally performed using seeds, cuttings, etc., but the cultivation period is limited and the growth rate can be quite 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.



Bag-type culture vessel system

Adaptation measures against global warming

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

Regeneration of coastal forests in the Tohoku Region

For two years from 2014, the Kirin Central Research Institute participated in the Ministry of Agriculture, Forestry and Fisheries project, "Dramatic Improvement of Production of Seeds and Seedlings

of *Bursaphelenchus Xylophilus* - Resistant Black Pine for Regeneration of Coastal Forests in the Tohoku Region."*

* Agriculture, Forestry and Fisheries Industry/Food Industry Science and Technology Research Promotion Project (lead institution: Forest Tree Breeding Center, Forestry and Forest Products Research Institute, Forest Research and Management Organization)

Contribution to the lunar farm

The Kirin Central Research Institute took part in the lunar surface base project led by the Ministry of Education, Culture, Sports, Science and Technology launched in 2017, which included industry academia collaboration research on a pest free farm system and emergency backup system using bag-type culture vessel technology to reproduce growth patterns similar to those under the same atmospheric pressure as on the earth, even under a low-pressure environment that resembles outer space.

World's first cultivation experiment performed onboard the ISS's Japanese Experiment Module "Kibo"

The Japan Aerospace Exploration Agency (JAXA), Takenaka Corporation, Kirin, Chiba University, and Tokyo University of Science, aiming at food production during long-term stays in space for future lunar and other exploration missions, carried out a demonstration experiment of bag-type culture vessel technology onboard the Japanese Experiment Module "Kibo" on the International Space Station (ISS). This was a first of its kind in the world.

JAXA is promoting research aimed at setting up farms on the moon and producing food to enable long-term stays without relying on supplies from Earth. Under a framework calling for joint research proposals, in 2017, Kirin began joint research project with JAXA and it related to bag-type culture vessel technology with a view to its application in space activities.

Development of mass plant propagation technology for hops

In 2022, we announced that we had successfully utilized our proprietary "mass plant propagation technology" to increase the propagation of hops seedlings by a factor of 50 or more, using a globally pioneering approach for encouraging the formation of hops axillary buds. We established new technology that at least doubles propagation efficiency, by applying "gibberellin" and "cytokinin," which control the growth of plants, in combination.

➡ Palm oil

The Kirin Group uses palm oil as an ingredient in some of its products, but because the quantity we use is very small and it is difficult to procure physically certified oil, 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 since 2013 and as a secondary raw material from 2014, and we use RSPO-certified oil for the full amount (excluding palm kernel oil).

In March 2018, we became an associate member of the RSPO, and in FY2022, we became a full member. 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

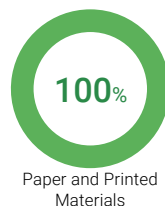
➡ Paper and printed materials

In the Action Plan that we revised in February 2017, we declared our aim of using 100% FSC-certified paper or recycled paper in the Japan Alcoholic and Non-alcoholic Beverages Business for all office paper such as copy paper, envelopes, business cards, company brochures, and other printed materials, as well as paper containers, by the end of 2020. 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 domestic and overseas businesses in the future.

FSC-certified paper
or recycled paper



*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.

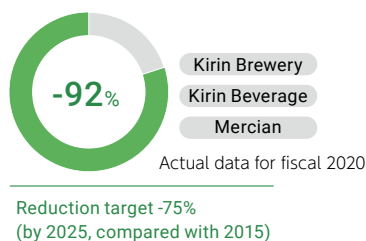
*3 For more information on the use of FSC-certified paper for paper containers, please see "Sustainable Paper Containers."

FSC®C137754

➡ Food waste reduction and recycling

Reduce product waste losses

In order to reduce losses from disposing products on an ongoing basis, we optimize production by improving demand forecasts through means such as the close sharing of information on factors affecting demand, such as retail sales, with plants and logistics centers. In addition, we are moving forward with efforts to prevent valuable biological resources and containers and packaging from going to waste by strictly managing sales volume targets.



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 surplus inventory as a result of trends in product sales and other factors. Since 2022, Kirin Beverage has donated excess inventory to local governments, food

banks, etc., for effective use by those in need.

*4 Products that have no quality problems and are within their expiration date, but that we cannot ship because they will take a long time to reach customers

Recycling

Recycling spent grains from beer mashing as livestock feed

Production processes for beer, low-malt beer, and other products generate spent grains after the mashing process. Because such spent grains contain residues of nutritious substances, we utilize them efficiently as livestock feed for cattle, for growing mushrooms, and other applications.

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 grape press lees

The grape lees from wine-making are turned over in a compost heap on the company vineyard for a year to make compost, which is used as organic fertilizer.



Composting site for
grape press lees

Effective use of shochu lees

Since 2015, we have been supplying some of the distillation residue (shochu lees) generated in the shochu production process at Mercian's Yatsushiro Plant to hog farmers in Kumamoto Prefecture. In the six years from 2015 to 2020, farmers have used 7,158 tonnes of shochu lees as livestock feed. In 2019, Kirin Holdings, Mercian and the University of Tokyo jointly confirmed for the first time in the world that shochu lees can reduce stress among hogs and improve pork palatability, demonstrating the potential for the effective use and creation of value from shochu lees. Livestock feed alone cannot fully cover the amount of shochu lees produced each day, so we are also working on other methods to enable us to dispose of as little shochu lees as possible, including utilizing them as the raw material for compost, and, since 2022, utilizing them in paper factories as a nutrient source for microorganisms in activated sludge. In 2021, our initiatives to utilize shochu lees 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," held by the Ministry of the Environment.

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 are at the top of the food chain in Sri Lanka's ecosystem, but local residents often trap and kill them in traps, raising the need for farmers and local residents to understand the importance of ecosystem conservation.

In 2020, a black panther, said to be a mutation of a leopard that was thought to have gone extinct decades ago, was found in a trap. The black panther was sheltered at the Elephant Transit Home in Udawalawe National Park, but unfortunately died 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, which Kirin Beverage helped implement through funding support. The spread of COVID-19 delayed the implementation of this project, but in 2021, two seminars for farm employees and students (69 participants in total) were held in March, and a residential workshop for a total of 43 young people was held in Horton Plains National Park in April and October. To date, a total of 200 young people have completed the curriculum, a number of whom have found work in government agencies, the private sector, environmental organizations, and other sectors.



Wildlife conservation workshop

Protection of endemic species in biotopes at manufacturing plants

At the 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 part of a widespread network of ecosystems, is pursuing initiatives to enrich the local ecosystem as a whole.

The Kirin Brewery's Kobe Plant has been cultivating local endangered species, including the fish species, *Hemigrammocypripis rasborella* (golden venus chub), and *Pogonia japonica*, a species of orchid, in the biotope that we set up in 1997. This biotope functions as a "refuge biotope" for the protection and cultivation of local endangered species. Our initiatives to date at our Kobe Brewery have won praise, and in 2018, we were awarded the "Fiscal 2018 Greening Promotion Merit Award of the Prime Minister."

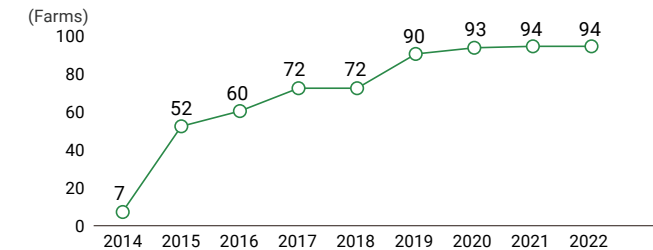
Since 2005, Kirin Brewery's Okayama Plant has been involved in activities with local communities to conserve the Ayumodoki (*Parabotia curtus*), a nationally designated natural monument. Every year, farmed Ayumodoki raised by a local elementary school are released into the biotope on the site, and in cooperation with the Organization for the Protection of Ayumodoki in Seto and other specialists, etc., we work to improve the environment to make it easy for Ayumodoki to grow, and conduct regular ecosystem surveys.



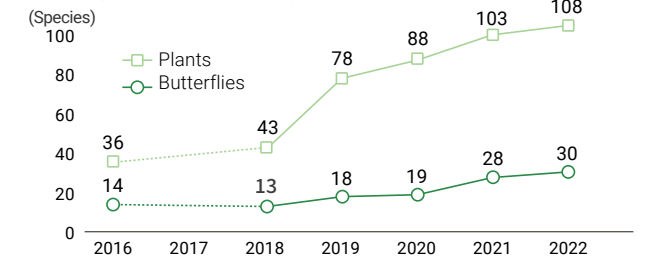
The Okayama Brewery biotope

Key data related to biological resources

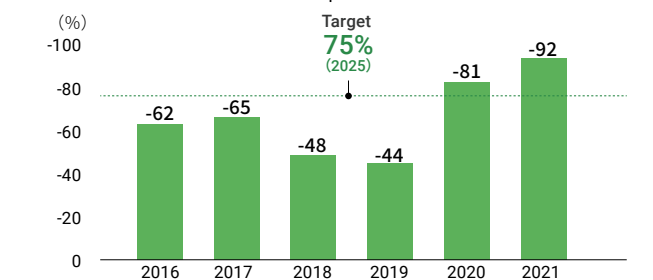
Number of large estates obtaining certification in Sri Lanka



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 not only an essential raw material for the Kirin Group, but is also an indispensable resource for cleaning our production facilities, etc. The Kirin Group has large businesses in both Japan, where water stress is low, and Australia, which has experienced severe water shortages many times in the past. We have understood from early on that water risks and water stress vary greatly between countries and regions. Since 2014, we have used scientific tools to regularly and quantitatively ascertain water risk and stress, and have used water efficiently in accordance with the level of water stress at each business site. We are conducting a scenario analysis based on the TCFD recommendations to study and identify water risks in areas producing agricultural raw materials, and testing countermeasures in areas where we can implement such measures. Looking ahead, we plan not simply to conserve water, but also to identify our impact on the natural capital of basins as a whole and work with our stakeholders to set targets to enable us to reduce our impact.

We will create together

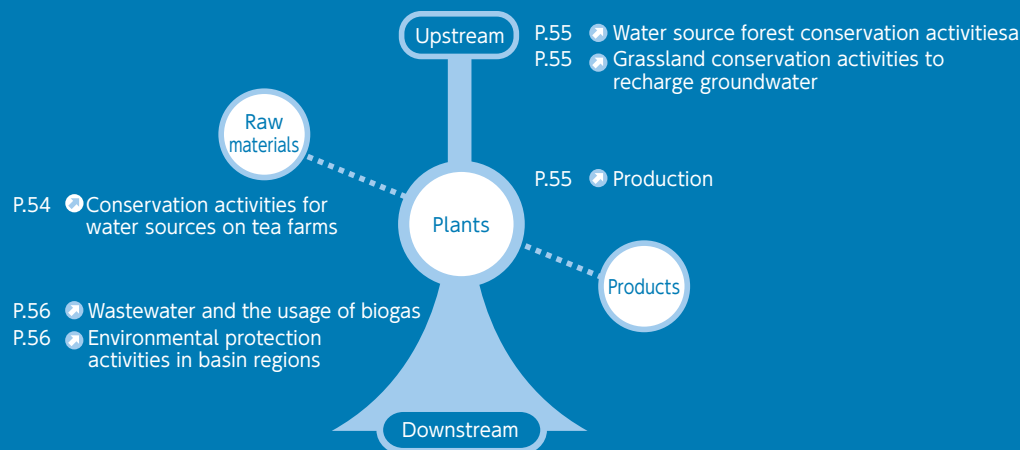
A society that values sustainable water resources



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

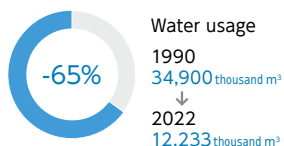
Target: 2.4kl/kl or less
Actual results : 3.6kl/kl

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

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

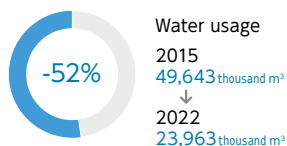
Actual results

Kirin Brewery



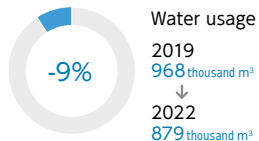
Water usage
1990
34,900 thousand m³
↓
2022
12,233 thousand m³

Kyowa Hakko Bio (global)



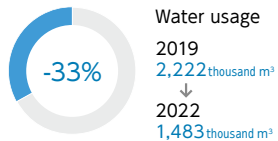
Water usage
2015
49,643 thousand m³
↓
2022
23,963 thousand m³

Kirin Beverage



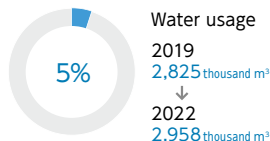
Water usage
2019
968 thousand m³
↓
2022
879 thousand m³

Kyowa Kirin (global)



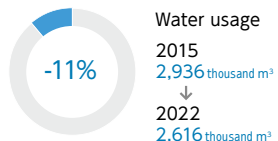
Water usage
2019
2,222 thousand m³
↓
2022
1,483 thousand m³

Mercian



Water usage
2019
2,825 thousand m³
↓
2022
2,958 thousand m³

Lion*3



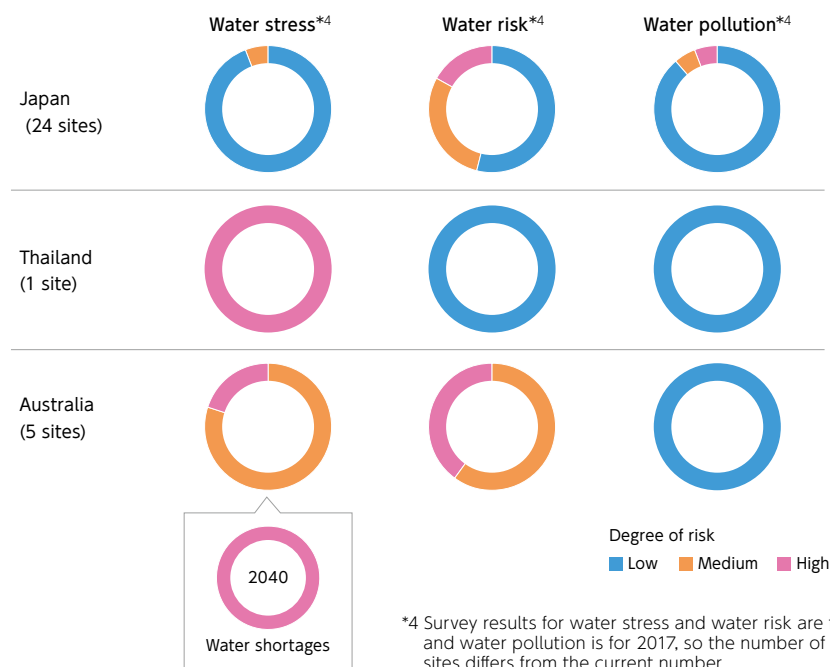
Water usage
2015
2,936 thousand m³
↓
2022
2,616 thousand m³

*3 This region covers the Oceania region only

Main Activities

- We had completed the conservation of water sources at 15 locations in tea farms in Sri Lanka as of the end of 2022, and distributed pamphlets to raise awareness for local residents in water source areas (approximately 15,000 people) concerning the importance of water, its conservation, and the protection of basin regions.
- We are participating 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).
- At New Belgium Brewery in Colorado (US), where water stress is extremely high, we conducted a scenario analysis workshop at the request of the TNFD (2023: the details of this workshop were published in beta v0.4 of the TNFD Framework).
- Although the water consumption rate at Lion, one of our non-financial targets for water, increased compared with 2021, we are continuing efforts to achieve our targets.
- Continued efforts to conserve biodiversity through "Water Source Conservation Forest Activities" groundwater recharge, etc.

Materiality analysis of water sources



*4 Survey results for water stress and water risk are for 2021, and water pollution is for 2017, so the number of business sites differs from the current number.

Conservation activities for water sources on tea farms

As a first step in solving water issues in areas where we source our agricultural raw materials in the upstream of our value chain, the Kirin Group began water source conservation activities at Sri Lankan tea farms in 2018.

We had completed conservation activities at 15 sites at the end of 2022. We have provided group training to 1,750 people living near water sources in order to support understanding of the necessity of conserving water sources. In addition, we have distributed pamphlets to 15,000 residents as part of measures to raise awareness.

At the tea farms in the Sri Lankan highlands, there are many areas with tea trees on steep slopes. In places with good conditions such as strata, however, rainwater penetrates into the ground and gushes out as springs in certain places in tea farms. These places are known as micro watersheds. Micro watersheds on tea farms can be found in the highlands of central Sri Lanka, and, in almost all cases, they are

headstreams of rivers flowing through coastal cities. For this reason, while they occupy only a tiny area, they are very precious water sources.

As part of our support for the acquisition of Rainforest Alliance certification by Sri Lankan tea farms, we are engaging with farm managers every year.

We learned that although the Sri Lankan government went as far as mapping micro watersheds in order to support understanding of their importance and make them easier to conserve and manage, these efforts were held up owing to a lack of funds.

Therefore, in order to further enhance the sustainability of tea farms whose acquisition of certification we supported and the surrounding areas, we began activities to conserve water sources at farms in 2018.

These activities involve fencing off micro watersheds of the farms so that they are not used for other purposes, and planting unique

regional native species around them. This provides a diversity of vegetation at tea farms, which have a single crop, and prevents soil from flowing down the mountain slope into water sources as a result of torrential rain, etc.

Education programs to teach the value of water

The Kirin Group is conducting an education program to teach residents living near target water sources about such matters as the importance of water and the functions of micro watersheds. At some farms, we are also working to incorporate our educational programs as part of the curriculums of day care centers and elementary schools attended by the children of tea pickers, etc. We have achieved our initial target of 15,000 people and plan to expand the program further.

Number of residents to educate about the importance of water

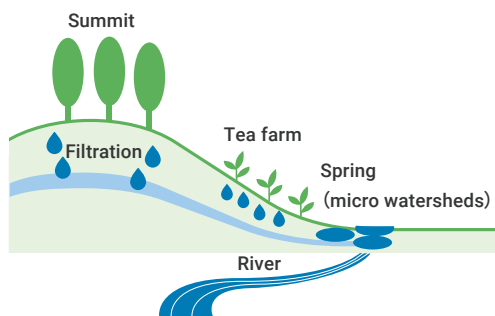


Group training: 1,750 people
Distribution of pamphlets: 15,000 people

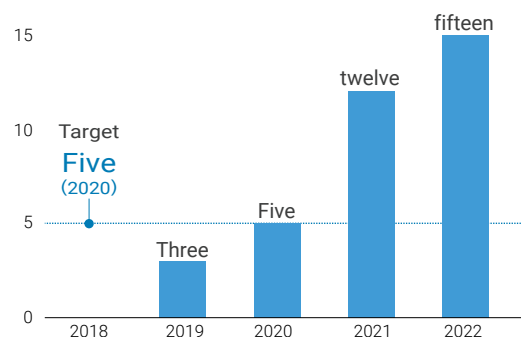


Flyer for water education

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)

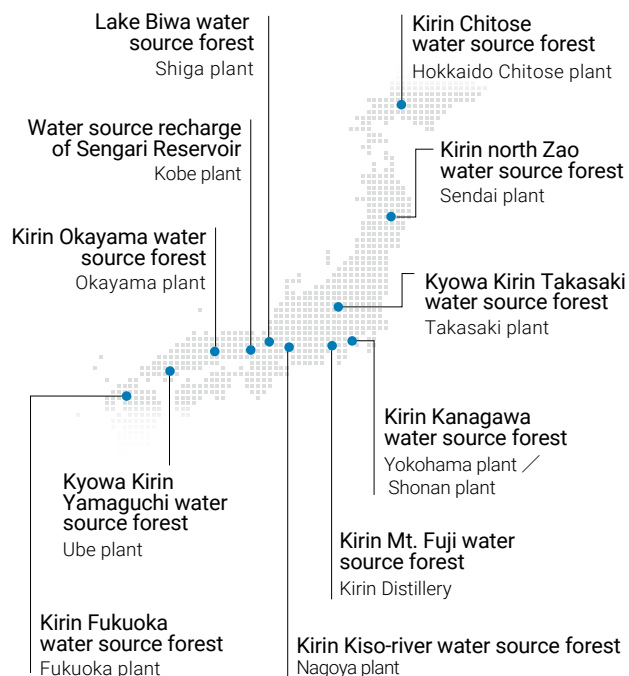
Water Source Forest Conservation Activities

Our "Water Source Forest Conservation Activities", which are an activity to protect the water sources of our breweries and plants, began in the forest of the Tanzawa district of Kanagawa Prefecture, which is the water source for Kirin Brewery's Yokohama Plant in 1999. We have adopted this initiative, which was a pioneering initiative in the industry, in 11 locations across Japan. Under medium and long-term agreements with the local governments and other relevant parties that manage the water source forests, the program includes tree planting, undergrowth cutting, pruning, and thinning. Today, many of the forests are bright, luxuriant forests. In some locations, some of our customers have volunteered to take part in the activities.



Water source forest activities at Kirin Mt. Fuji water source forest

Kirin's forest across the country



Grassland conservation activities to recharge groundwater

In the "Aso Area Grassland Regeneration Project Aimed at 'World Cultural Heritage' status", we are providing "support for the resumption of open burning" to preserve the grassland landscape of Aso.

Preserving the vast grasslands of Aso, which recharge large amounts of groundwater, will help protect the water that we use as a raw material at the Mercian Yatsushiro Plant.

In 2022, five people from the Yatsushiro Plant participated in this activity. 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



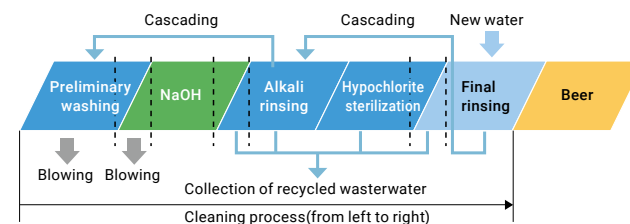
Controlled burning

Production

In plants, much of our water usage is for washing and sterilizing processes for equipment and pipes. In addition to establishing frameworks and mechanisms to confirm and assure the washing from a quality perspective, we strictly control water flow rate and velocity to ensure that we do not waste water. We also actively pursue the re-use of water, depending on the purpose. For example, the rinsing water that we use in the final step of the pipe and equipment washing process is still relatively clear, so we can use it again for the initial process of pipe washing. In this way, we have implemented a cascading system of water use in which we repeatedly use water that we have previously used in washing, according to the quality of the water. In actuality, considerable knowledge on how to use equipment is necessary to guarantee that we are properly washing the equipment and pipes, such as achieving the right balance of the amount of water we can recover and the amount of water we can use, as well as the timing of recovery and use.

The Kirin Group is achieving a high level of water conservation by sharing and accumulating various different types of expertise.

Cascading rinse water for washing tanks



In 2009, Lion partnered with the government of Queensland, Australia, to install a reverse osmosis (RO) plant at the Castlemaine Perkins Brewery, to recover wastewater and minimize our reliance on mains-fed town water in order to minimize water use in brewery areas with very high water stress. Lion has introduced a water recycling plant with the aim of reducing the amount of water used for brewing by half. We use water treated with reverse osmosis membranes in non-product related processes, such as cleaning, cooling, and pasteurizing.

Wastewater and the usage of biogas

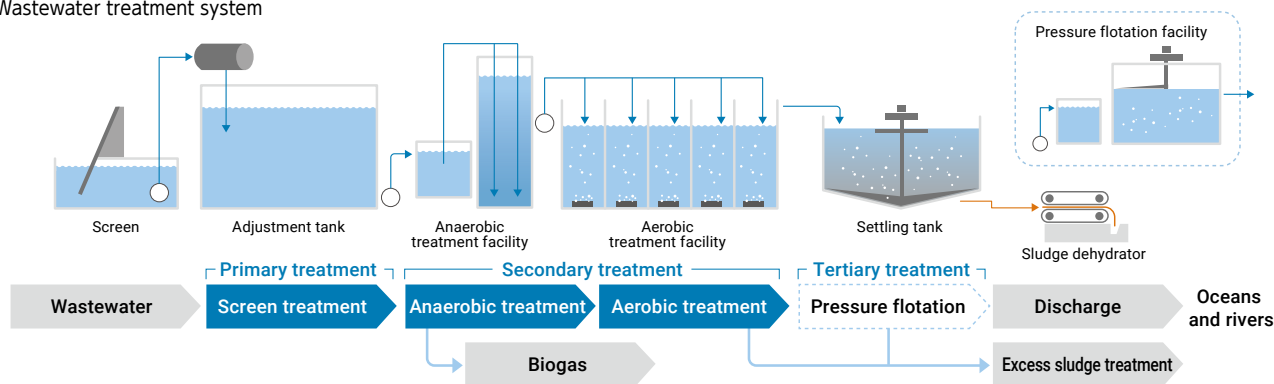
In the Kirin Group, we purify the water that we have finished using to voluntary standards that are stricter than those required by law, before we release it into rivers and sewers.

Breweries and plants in basin areas with strict wastewater standards remove phosphorus and solids by anaerobic and aerobic treatment followed by pressure flotation. We reuse excess sludge discharged from aerobic and pressure flotation treatment as fertilizer and soil conditioner. The Kirin Group discharges clean water into the ocean, rivers, and sewers in consideration of the aquatic ecosystem.

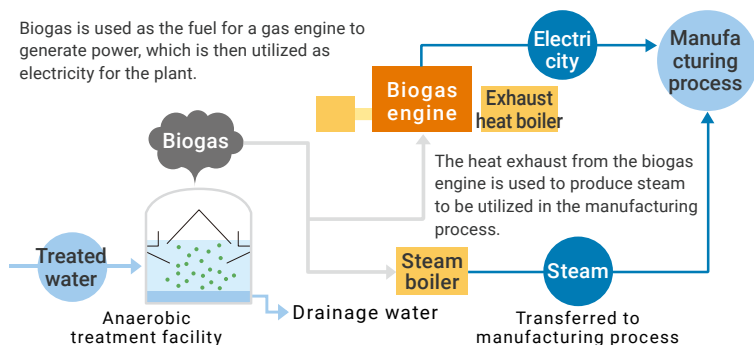
In our breweries, we have introduced anaerobic treatment facilities

to purify the wastewater generated by the production process. Unlike conventional aerobic treatment, anaerobic treatment does not require electricity for aeration. Also, the anaerobic microorganisms generate biogas as a by-product of the treatment process. This biogas, the main component of which is methane, can be utilized in biogas boilers and cogeneration systems. Biogas is derived from plant materials such as malt and is classified as a renewable energy source because the CO₂ emitted from biogas combustion originally absorbed by plants from the atmosphere is simply returned to the atmosphere.

Wastewater treatment system



Biogas is used as the fuel for a gas engine to generate power, which is then utilized as electricity for the plant.



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 are engaged in local environmental beautification and environmental protection activities, focusing on the rivers they draw water from and other nearby rivers.

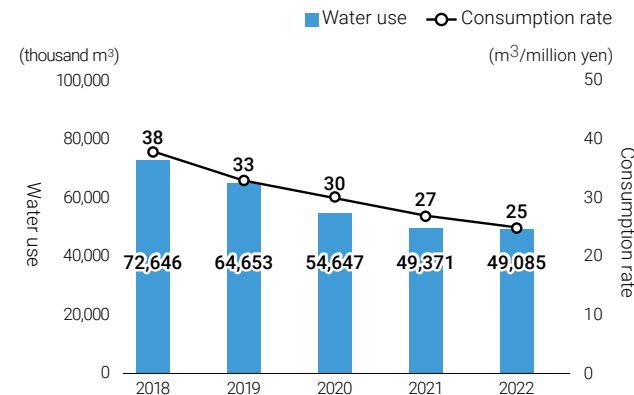
At the Kyowa Hakko Bio Yamaguchi Production Center, employees performed clean-up activities in the waters off Hyakken, a port facility where chemicals and glucose solutions are unloaded.



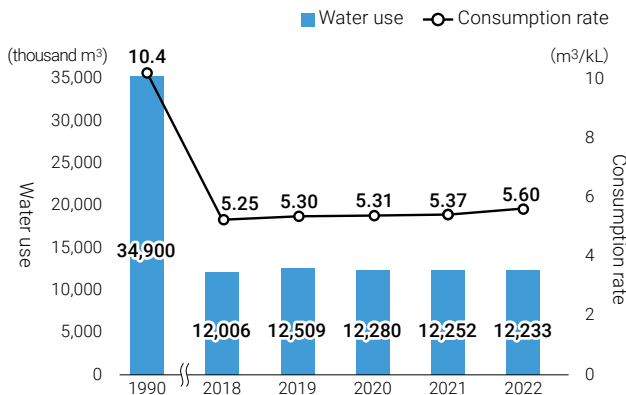
Clean-up activities off Hyakken

Key data related to water resources

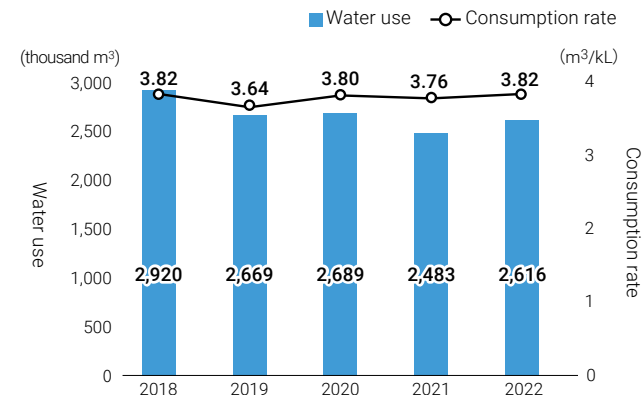
Water use and consumption rate
(water use / sales revenue) of entire Group



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

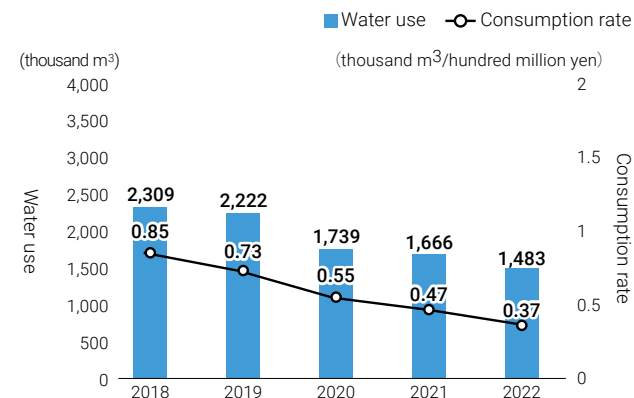


Water use and consumption rate
(water use / production volume) of Lion(Oceania region*)

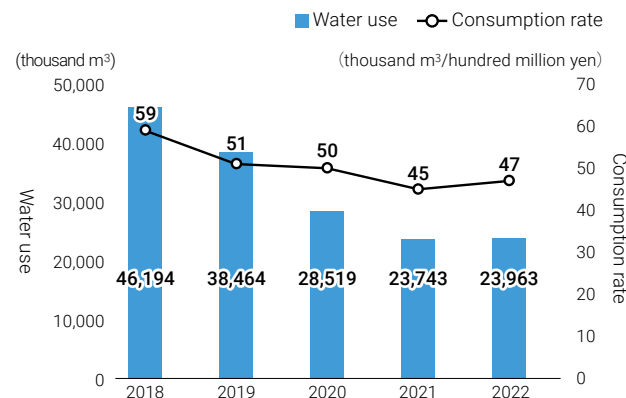


*1 Oceanian region only in Lion

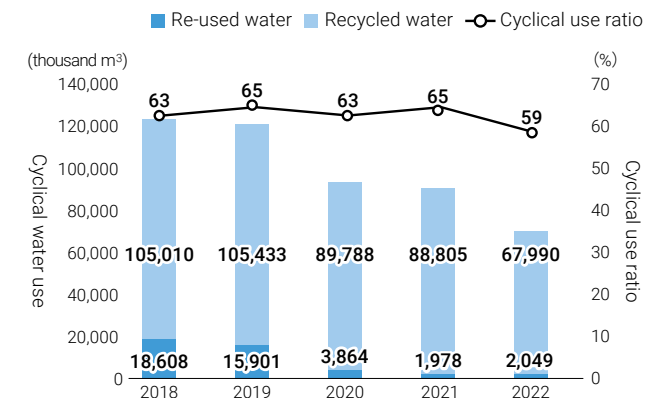
Kyowa Kirin (Global) water use and
basic unit(water use / sales revenue)



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. To address the various issues caused by containers and packaging, the entire industry has promoted 3R (reduce, reuse, recycle) and achieved a high recycling rate. With regard to paper containers, in order to solve problems related to human rights and the destruction of forests that provide raw materials, we soon began promoting sustainable paper use. By the end of 2020, we had achieved 100% use of FSC-certified paper and recycled paper for all paper containers in the Japan Alcohol and Non-alcoholic Beverages Businesses, which we have subsequently maintained. Furthermore, we plan to expand this initiative to all Kirin Group companies, including those overseas. In response to issues related to plastics, we aim to solve issues specific to countries where we operate our businesses and create a "society that continuously circulates plastics" from the global perspective.

We will create together

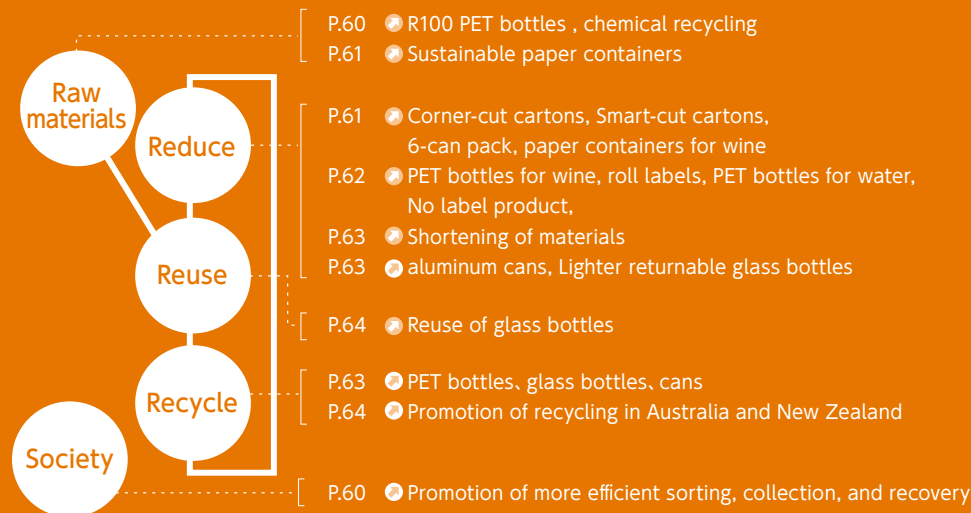
A society that circulates containers and packaging in a sustainable way



Develop and distribute sustainable containers and packaging



Build a resource circulation system to make containers and packaging sustainable



1993

Developed the lightest returnable large bottles produced in Japan and introduced them into the market on a limited trial basis.

1994

Began using 204-diameter beer cans.

2003

Completed the switch to 100% use of the lightest returnable large bottle produced in Japan

2004

Began using corner-cut cartons.

2014

Began developing and deploying the lightest returnable medium bottle produced in Japan. Began using some PET bottles made from 100% recycled PET resin.

2017

Revised the Kirin Group Action Plan for the Sustainable Use of Biological Resources, and declared our aim to achieve 100% use of FSC-certified paper for all paper containers at domestic beverage manufacturers 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 across all non-alcoholic beverage makers in Japan. In a joint project, we began studying technologies for PET recycling through chemical recycling.

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

Launched a demonstration trial on the collection of used PET bottles. Began joint research aimed at studying industrial applications for PET-degrading enzymes, in order to find applications for chemical recycling.



Targets and Progress

Percentage of recycled resin in Japan

2050: 100% (Environmental Vision 2050)

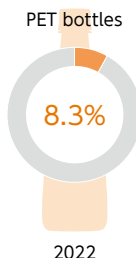
2027: 50% (Plastic Policy)

2024: 38% (non-financial target)

PET bottle resource circulation

Recycled resin ratio

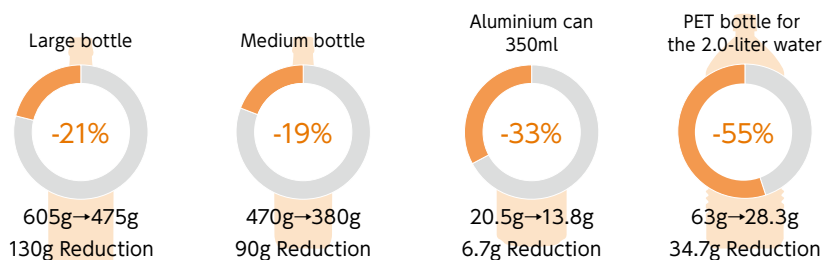
We will actively promote the creation of systems for efficiently collecting and using high-quality used PET bottles.



Weight reduction ratio

We will work to further reduce weight.

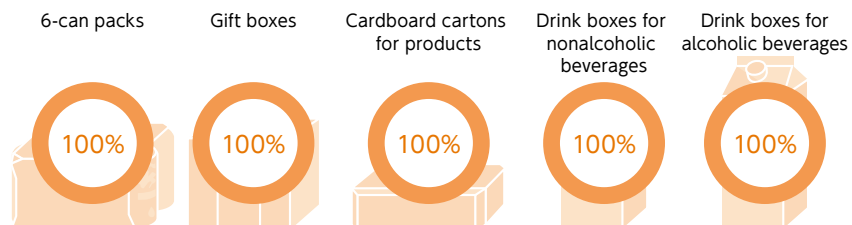
Improved sustainability of raw materials for containers and packaging



FSC-certified paper ratio

Achieved 100% ratio of FSC-certified paper in the Japan Non-alcoholic Beverages Business in 2020. We plan to expand this achievement to all Kirin Group companies, including overseas, by 2030.

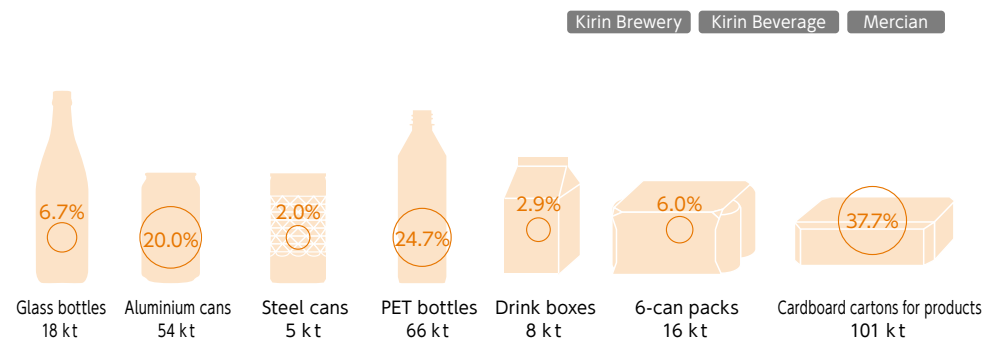
Adoption of sustainable paper containers



Main Activities

- Expanded use of "R100 PET bottles" made from 100% recycled PET resin
- In order to reduce plastic usage, we began selling no label products (2021: *Kirin Gogo-no-Kocha Oishii Muto* (sugar-free) and *Kirin FIRE ONE DAY BLACK*), shortened labels and packaging materials (2022: *Kirin Nama-cha* and *Kirin Nama-cha Hoji Sencha*), and used small paper stickers for no label products (2022: *Kirin Nama-cha*)
- With the aim of creating a "society that continuously circulates PET bottles," we have begun technical studies on PET recycling using "chemical recycling"
- Strengthened collaboration with other companies and local governments as part of efforts to collect PET bottles
- Maintained our achievement of the 100% use of FSC-certified paper for all paper containers in the Japan Alcohol and Non-alcoholic Beverages Businesses (2020), and adopted FSC-certified paper for paper packaging materials for no label six-bottle packs
- Set targets to use 100% sustainable paper resources at Lion (Australia and New Zealand) (by 2025)

Material mix of containers and packaging, by weight



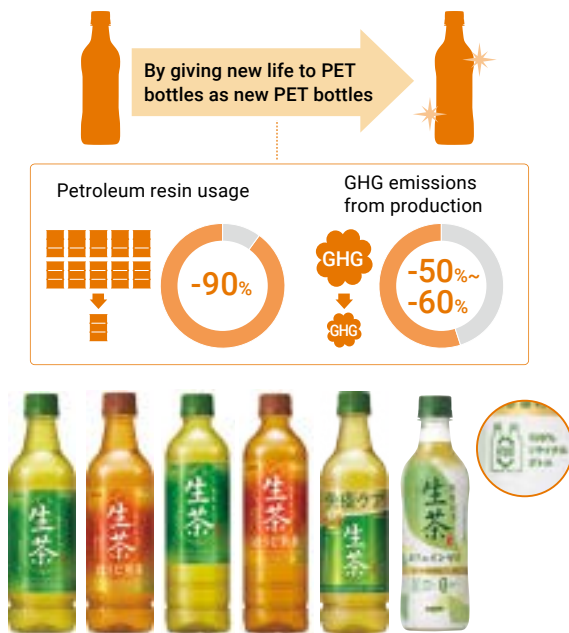
Global resource use of containers and packaging: 480 kt [For details→P.126](#)

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 "mechanical recycling" technology to enable the use of recycled PET materials as a raw material for PET bottles. Recycled PET resin uses 90% less resin derived from petroleum and achieves a reduction in GHG emissions of 50-60% compared with regular petroleum-derived PET materials. We began using recycled resin for some of the packaging of *Kirin Gogo-no-Kocha Oishii Muto (sugar-free)* product 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 2023 is as shown on the bottom left.

*1 "Kirin Nama-cha 525ml" and "Kirin Nama-cha Hoji Sencha 525ml" have partially started to be used, and are being gradually introduced.



Kirin Nama-cha : 600ml (Convenience stores only, Third photo from left), 525 ml (First photo from left)

Kirin Nama-cha Hoji Sencha : 600ml (Convenience stores only, Third photo from right), 525ml (Second photo from left)

Kirin Nama-cha Meneki Care : 525ml (second from right in the photograph)

Kirin Nama-cha caffeine Zero : 430ml (The right photo)

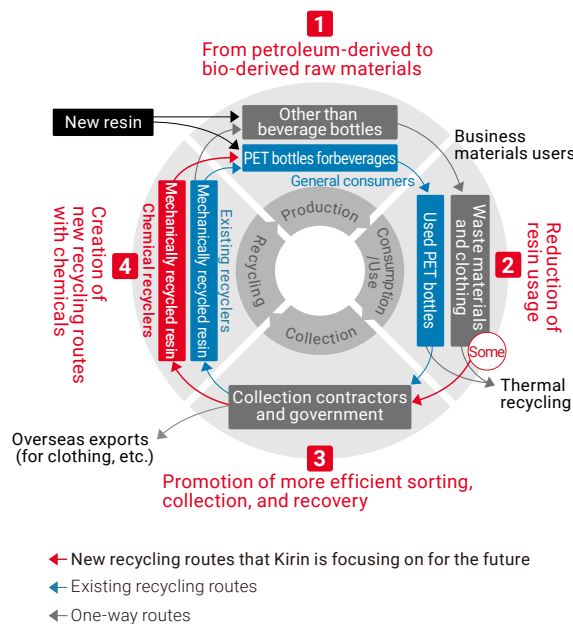
*Product photos are as of the end of June 2023.

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 impurities that are difficult to remove from recycled resins, and it is said that the quality of resins deteriorates with repeated recycling. In chemical recycling, we sort, pulverize and wash used PET bottles to remove dirt and contaminants, then we depolymerize them (chemical decomposition treatment), and break down and purify the PET into intermediate raw materials, which we then polymerize (synthesize) again into PET. It is possible to recycle PET bottles to a state similar

Society that continuously recycles plastics

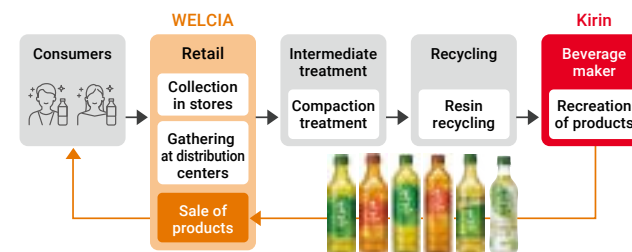


to new materials as many times as we want through decomposition down to the molecular level, and we can also recycle PET products other than used PET bottles into PET bottles. In addition to aiming to establish a circular economy for PET products, we will build a system for collecting PET products other than PET bottles. Since 2022, we have been working with FANCL to promote the reuse of PET materials.

Promotion of more efficient sorting, collection, and recovery

Aiming to create "a society that continuously recycles plastics," in July 2021, we launched a demonstration trial to collect used PET bottle containers, in collaboration with Lawson, Inc. In June 2022, we expanded the demonstration to WELCIA YAKKYOKU CO.,LTD. In the demonstration trial at WELCIA, we collect and sort used PET bottles in collection boxes installed at WELCIA stores, and after gathering these materials at a WELCIA distribution center, we transport them to Far Eastern Ishizuka Green PET Corporation, a recycler.

Flow of recovery, 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. The targeted paper containers are "6-can packs," "gift boxes," "drink boxes," and "cardboard cartons." This is the first declaration and achievement of that declaration by a Japanese manufacturer to cover all paper containers.

In 2022, we revised the "Action Plan for the Sustainable Use of Biological Resources," and expanded the scope of the Kirin Group companies to include Kyowa Kirin, Kyowa Hakko Bio, Lion, and Koivai Dairy Products. We declared our intention to switch to sustainable paper, such as FSC-certified paper and wastepaper, by 2030, and began related initiatives at those companies.



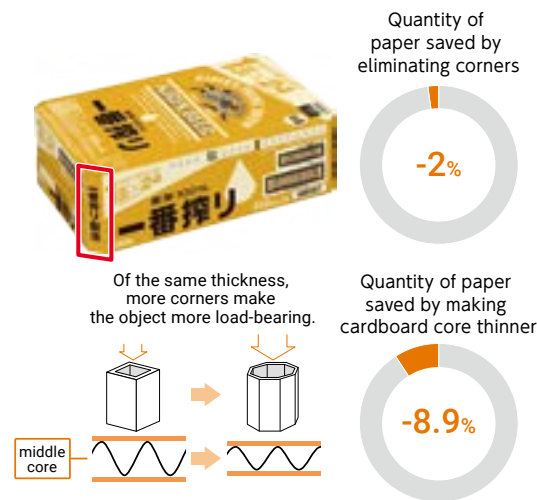
FSC®C137754

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

➡ 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 have reduced the weight of the carton and, because the carton has eight sides, making it stronger, the cardboard thickness has been reduced, resulting in a 10.9% reduction in the weight of the carton compared to conventional cartons.



Smart-cut cartons

The smart-cut carton, which we introduced in 2015, 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, which are smaller than the previous can. This has resulted in a 16% weight reduction compared to the 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

We have incorporated innovations into various parts of the 6-can pack to make it more lightweight, as well as achieving ease of carrying and removing from the shelf. For example, we have included a new cut-out section at the sides of the pack to match 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, while improving 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 wine that it sells. Mercian uses bag-in-box packaging with an inner bag inside an outer box for a total of five types of wine, namely FRANZIA (red, white, dark red) bag-in-box and FRONTERA (Cabernet Sauvignon and Chardonnay) wine-fresh servers. By reducing the weight of the outer box by approximately 25%, from 190g to 143g, we are able to reduce our use of paper resources by around 31t per year.

Lightweight bag-in-box packaging



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

Reduce

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. We expect the use of this bottle for all 720ml PET bottle products produced and sold by Mercian 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." This bottle won the award partly because we reduced resin use by approximately 15% while maintaining the "Bordeaux shoulder shape" and a "clean body shape," as well as the fact that the Kirin Group's gas barrier coating technology, which uses DLC*1 film, can keep wine fresh for a long period of time.



*1 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 with a labeler in the filling plant, then apply heat to shrink the label. This means a certain thickness is required to prevent the label from bending. We do not use heat to shrink roll labels, instead attaching them by wrapping them around the PET bottle, which enables us to make the label thinner. Customers can easily remove the label by simply pulling the edge of the label, making it easier to sort trash, and thereby promoting recycling.

The roll labels are used mainly for products sold exclusively in vending machines (in combination with shrink labels), such as *Kirin Namacha*, *Kirin Gogo-no-Kocha Oishii Muto*, *Kirin Loves Sports*, *Kirin Amino Supplement C*, and *Kirin Tennensui Natural Mineral Water*.

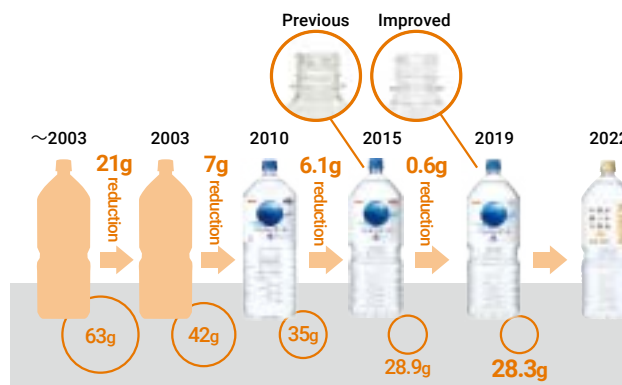
Lightest PET bottles for water produced in Japan

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, and 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 making achieving the lightest such PET bottle produced in Japan and putting it into practical use.

These efforts will result in annual reductions of PET resin use of approximately 107 tonnes and GHG emissions of approximately 375 tonnes.

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 used to make the PET bottles. We have been gradually introducing these bottles starting from products manufactured in 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.



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

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 general merchandise stores nationwide, as well as *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. On April 25, 2023, we began sales of a new product, *Kirin Shizen-ga-Migaita Natural Water No Label*, on e-commerce only.

In June 2022, we will begin test sales of *Kirin Nama-cha No Label* with Paper Sticker at some general merchandise stores in the Tokyo metropolitan area. By attaching small paper stickers that provide the required information, we are able to sell individual products at the store without conventional labels.



Reduce

Shortening of labels and packaging materials

We have shortened the label on packaging for the 600ml *Kirin Nama-cha* and *Kirin Nama-cha Hoji Sencha* that we released in 2022. In addition to reducing the size of the label and making it thinner by switching to roll labels, this will result in annual reductions of 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, thereby reducing paper consumption. We also use FSC-certified paper for packaging materials, and display a label of our certification.

Shortening of labels



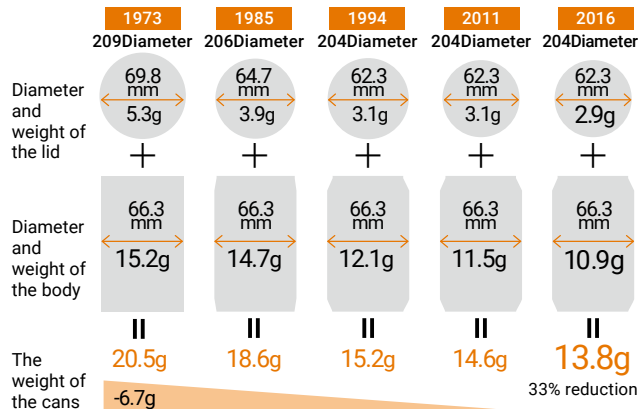
Shortening of paper packaging materials for six-bottle packs



Reducing the weight of aluminum cans

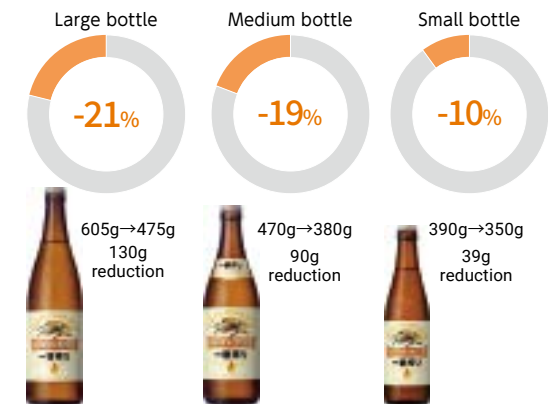
By reducing the diameter of aluminum beer can ends and narrowing the top and bottom edges of the can body to reduce the weight of the can, as well as thinning out the walls of the can body, for our 350ml aluminum cans, we have achieved a weight reduction of approximately 29% for our 204diameter can end compared with the 209diameter can end in 2011. Working with materials manufacturers, we developed an aluminum can with thinner can ends and body in 2016. We have reduced the overall weight of the can by approximately 5% (0.8g) from 14.6g to 13.8g. This represents a weight reduction of 33% (6.7g) from the 209diameter can end. Weight reduction is necessary for both steel and aluminum cans, but aluminum in particular 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



Lighter returnable glass bottles in Japan

Our returnable glass bottles for beer are the lightest weight returnable bottle produced in Japan in all sizes (large, medium, and small). 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 meet this challenge, 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 meets the conflicting requirements of being easy to open and able to be sealed tightly and that is also strong enough not to chip.



GHG reduction effect of lighter medium-size bottles



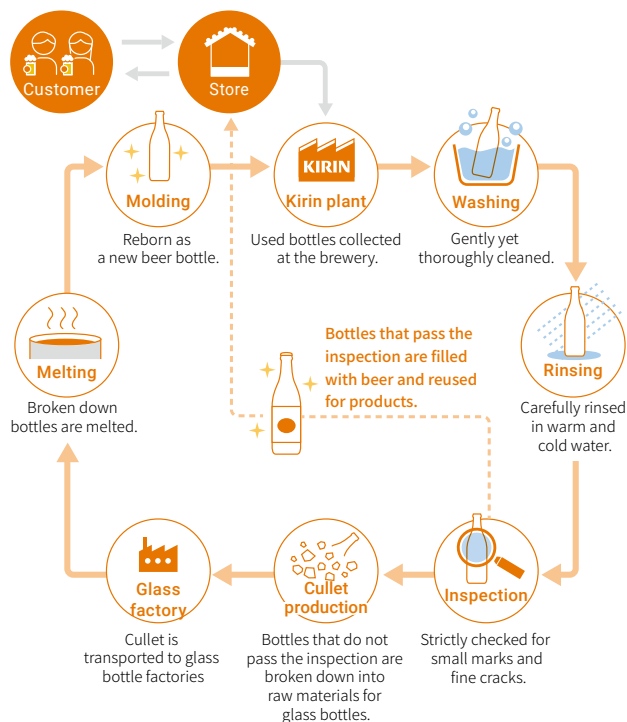
*Product photographs are current as of June 2023 or the time that events occurred.

Reuse

Reuse of glass bottles

In Japan, people have collected and reused glass bottles over and over since the Meiji Era (1868-1912), long before the word "3R" was coined.

We wash returnable glass bottles that come back to the plant thoroughly inside and out 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 them back into product service 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. When bottles have small scratches or fine cracks or are too old to be of service any longer, we crush them and turn them into a material called cullet, which we use as the raw material to make new bottles.



Recycle

Recycling of PET bottles

The Kirin Group promotes the recycling of PET bottles as a member of the Council for PET Bottle Recycling. Under the Council's Fourth Voluntary Action Plan (FY2021-FY2025), we are working toward a target recycling rate of at least 85% (base year: FY2004). In 2021, our recycling rate was 86.0%, achieving the target. We are also expanding demonstration trials for the voluntary collection of used PET bottles in partnership with companies and public administration [→P.61](#).

Recycling of glass bottles

We turn old returnable glass beer bottles that can no longer be reused and one-way bottles which are used only once into cullet, for use primarily as the raw material for making new glass bottles. 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 in building materials such as tiles and blocks and road paving materials.

Recycling of cans

The Kirin Group is pursuing the adoption of aluminum cans that use a high rate of recycled metal. We have also joined the Japan Aluminum Can Recycling Association, and we are providing assistance for the collection of used aluminum cans as a way to promote their recycling. Can manufacturers recycle aluminum cans discarded at breweries and use them as 100% aluminum cans for beer.

Promotion of recycling in Australia and New Zealand

Lion has established the "Sustainable Packaging Strategy" to promote recycling. The Lion's Sustainable Packaging Project Steering Group, established to promote this strategy, has set the following goals and is working with the Australian Packaging Covenant Organisation (APCO) to achieve them.

- 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
- Lion will promote activities to achieve these targets, which are aligned with those of the Australian Packaging Covenant Organisation (APCO).

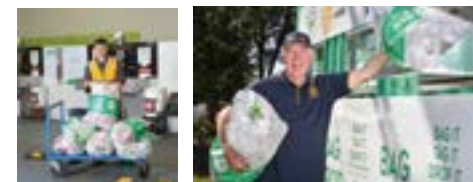
As glass accounts for the highest proportion of Lion's material inputs, Lion is working closely with its supplier to increase the recycled content of bottles.

Australia has Container Deposit Schemes in six of its eight states, and both remaining states have announced that they will implement this system in the future. Victoria and Tasmania are expected to commence schemes in 2023.

Lion plays an important role in Australia's Container Deposit Schemes. For example, in South Australia and Northern Territory, Lion holds a majority of the shares of Marine Stores, a collection coordinator that aggregates collected materials for reuse and recycling. Lion also participates in Exchange for Change (EFC), a joint venture that coordinates the New South Wales and the Australian Capital Territory Container Deposit Schemes.

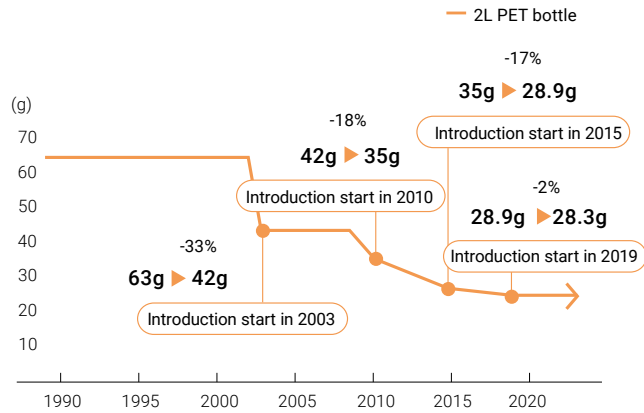
In Queensland and Western Australia, Lion participates in the administration and operation of Container Deposit Schemes as a member of the Container Exchange (QLD) Limited (CoEx) and WA Return Recycle Renew Limited (WARRRL), which were established and appointed as Producer Responsibility Organizations. Lion is a member of the nonprofit entities VicRecycle and TasRecycle, which intend to submit proposals to act as the coordinators of the Container Deposit Schemes in Victoria and Tasmania.

In New South Wales almost nine billion bottles and cans have been returned in less than four years of the scheme being in place, and there are currently 621 return points operating. The Queensland Container Deposit Scheme has been operating less than three years with nearly 5.4 billion containers returned and 341 return points in operation. The Western Australian Container Deposit Scheme commenced in October 2020, and almost one billion containers have been returned. The South Australian scheme has been operating for over 40 years and recent reports stated the return rate of beverage containers sold is approximately 76.9%. In 2022, the South Australian government is considering improvements to modernize the scheme and further increase the rate of return. Lion is working with the state government to support the development and implementation of improvements. In the Australian Capital Territory, more than 270 million containers have been returned and recycled since the scheme began operating in December 2017. The Northern Territory scheme had a total return rate of 72% of containers sold.

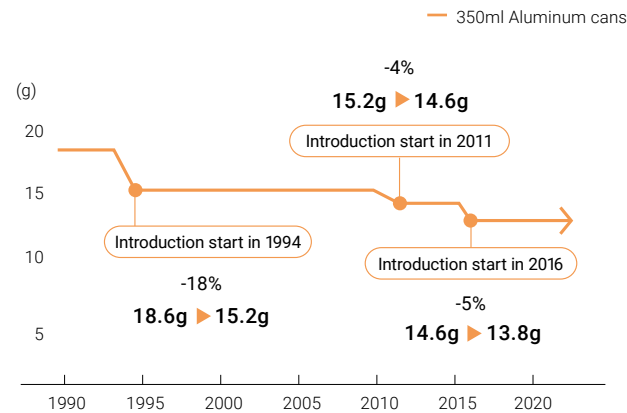


Key data related to Containers and Packaging

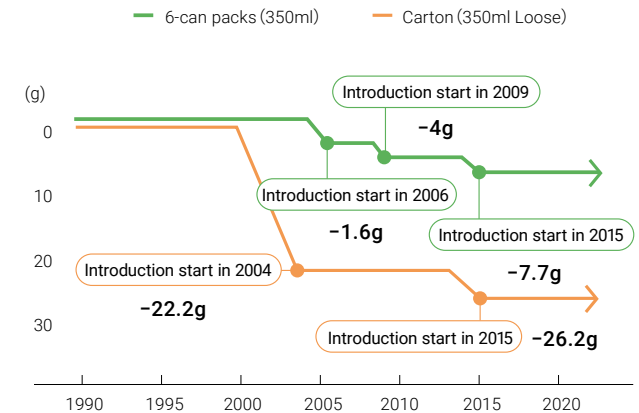
Change in weight of PET bottles
(Kirin Alkali Ion Water 2L PET bottle)



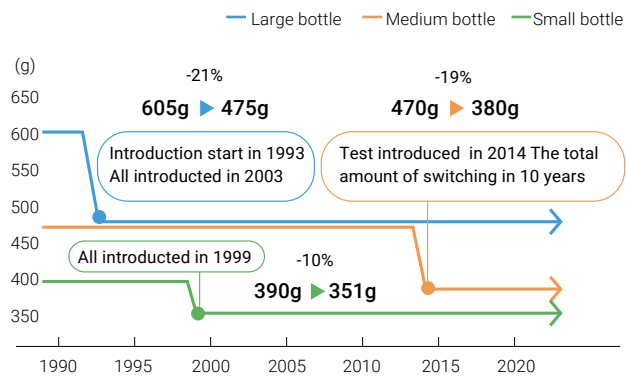
Can lighter transition



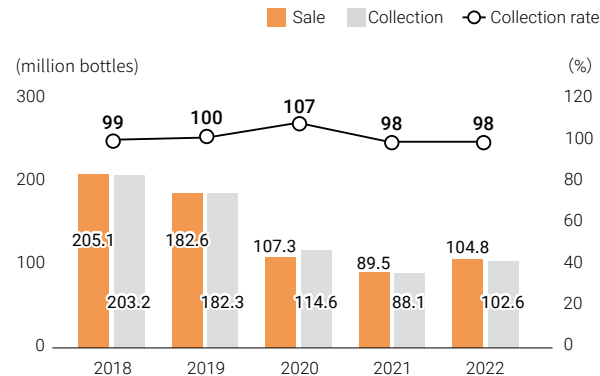
Progress in weight reduction of
cartons and 6-can packs



Returnable beer bottles lighter transition



Kirin Brewery trends in sale and
collection of returnable glass bottles



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. We have achieved significant reductions, having set an ambitious target of "reducing GHG emissions across the entire value chain by half from the 1990 level by 2050" in 2009. Since the adoption of the Paris Agreement in 2015, we have been leading the way in creating a decarbonized society, having gained a renewed understanding of our impact on natural capital such as agricultural raw materials and water through scenario analysis based on the TCFD recommendations, set science-based targets for the reduction of greenhouse gas emissions, and declared our aim to switch to 100% renewable energy for electric power used by 2040 and achieve net zero GHG emissions by 2050.

We will create together

A society that has overcome climate change



Realize net zero GHG emissions across the entire value chain

Raw materials P.68 ● Tea farms
Containers P.68 ● Ocean transportation in large bags
P.71 ● In-house production of containers

Production P.70 ● Heat pumps
P.70 ● Fuel conversion
P.70 ● Improving the efficiency of refrigeration systems

Distribution P.72 ● Modal shift
P.72 ● Joint delivery
P.71 ● Improving loading efficiency
P.72 ● Vendor-managed warehouse

Sale P.73 ● Vending machines
P.73 ● Carbon zero certified beer



Lead to build a decarbonized society

A decarbonized society P.68 ● 100% renewable energy for all electric power purchased
P.69 ● solar power generation
P.69 ● 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°C 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

Became the first global food company to achieve certification for an SBT for net zero. Switched to renewable energy for 100% of purchased electric power at Kirin Brewery Sendai and Nagoya Plants, as well as at all Château Mercian wineries. Switched to 100% renewable energy for purchased electric power at all Lion business sites in Australia and New Zealand.



Targets and Progress

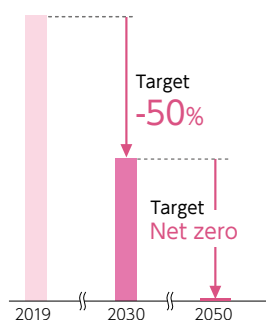
Reduction in GHG emissions

2050 Net zero (Environment Vision 2050)

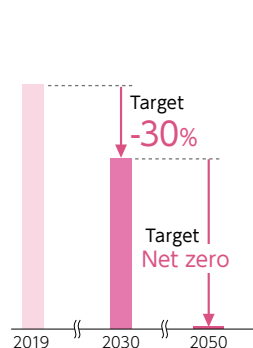
2030 Scope 1 + 2 down 50% and Scope 3 down 30%
(compared with 2019) (SBT for 1.5°C target)

2024 Scope 1 + 2 down 23% (compared with 2019) (non-financial target)

Total emissions for
Scope 1 and Scope 2

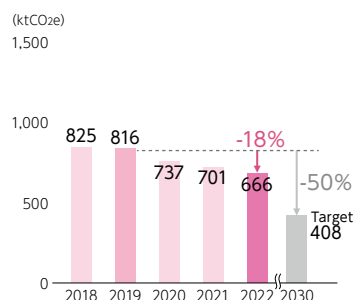


Scope 3 emissions

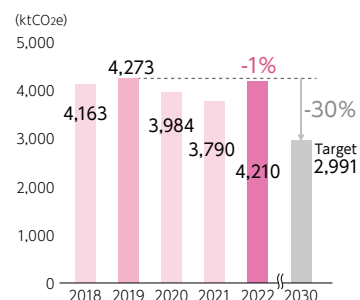


Target

Total emissions for Scope
1 and Scope 2



Scope 3 emissions



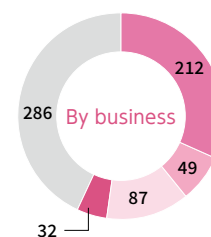
Actual results

Main Activities

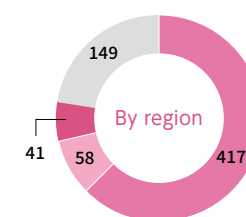
- Our long-term target to achieve net zero GHG emissions across the entire value chain by 2050 received certification as the science-based net zero target (July 2022: the first in the global food industry)
- Obtained approval for the science-based 1.5°C target (2020)
- Joined RE100 and set a target for the proportion of renewable energy in electric power used (100% by 2040) (2020)
- Achieved 100% renewable energy in purchased electric power at five Kirin Brewery plants (two in 2022 and three in 2023), Kyowa Kirin Takasaki Plant, Ube Plant, research laboratories, etc., and the Lion's plants in Australia and New Zealand (2023).
- 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), and Lion Castlemaine Perkins (2019)

Total emissions for Scope 1 and Scope 2

(ktCO₂e)



- Japan Beer and Spirits Businesses
- Japan Non-alcoholic Beverages Businesses
- Oceania Integrated Beverages Business
- Pharmaceuticals Businesses
- Other Businesses (all companies included)



- Japan
- Oceania
- southeast asia
- Other

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

*2 Since 2019, we have excluded Lion's non-alcoholic beverages business from Scope 3 emissions, and we have changed to the LCA database (IDEA) offered by the National Institute of Advanced Industrial Science and Technology (AIST) for emissions per unit of product.

Raw materials

Measures for adapting to climate change at tea farms

The Kirin Group contributes to measures for adapting to climate change through training programs for Rainforest Alliance Certification at Sri Lankan tea farms. Specifically, we instruct people to plant grasses whose roots sink deep into the soil and that crawl the ground on slopes, and thus prevent the 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 ships some of the wine it imports via ocean transportation in specially designed, large 24kl bags (equivalent to about 32,000 of 750ml bottles) with low oxygen permeability, and bottles the wine in plants in Japan. Compared to importing bottled wine, this method lets Mercian reduce GHG emissions during ocean transport by roughly 60% because it eliminates the need to transport heavy bottles by sea, although it increases the amount of GHG emissions from the company's plants owing to bottling in Japan. We are able to use Ecology Bottles (made with at least 90% recycled glass), lightweight bottles, and PET bottles as containers, which contributes to making effective use of resources and reducing GHG emissions significantly across the entire 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, to make final products. With an in-line blow aseptic filling machine, we mold PET bottle containers from a material called preform in the production process of the plant and fill them under aseptic conditions. Installation consequently contributes greatly to reducing GHG emissions as using preforms allows us to process greater loads on trucks compared to transporting empty PET bottles. In 2003, we installed preform molding equipment on the beverage production line at Kirin Distillery ahead of other players in the industry in Japan, thereby saving the transportation 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 inverter-controlled pneumatic machinery in the form of screw compressors and horizontally opposed reciprocating compressors, thereby reducing annual power usage by around 8%. This machinery can recover and reuse waste heat from compressors.



Inverter-controlled pneumatic machinery

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

Renewable energy

100% renewable energy for all electric power purchased at plants

Kirin Brewery has achieved a proportion of 100% of electric power purchased from renewable energy at the Sendai and Nagoya Breweries since 2022, the Fukuoka and Okayama Breweries since January 2023, and the Toride Brewery since April 2023. Of Kirin Brewery's total of nine plants, the company has achieved 100% renewable energy for purchased electric power at five plants, and the proportion of renewable energy in all electric power used by Kirin Brewery is 43%. In the future, we aim to replace all electric power used across the businesses of the Kirin Group with renewable energy, and soon achieve our RE100 target. Kyowa Kirin has achieved a proportion of 100% renewable energy for all electric power purchased at the Takasaki Plant, Bio Production Technology Laboratories, Fuji Research Park, and CMC Research Center since 2020, and the Ube Plant since April 2023. Through these initiatives, we expect to reduce CO₂ emissions across the Kyowa Kirin Group as a whole by 53% by the end of 2023FY, compared with 2019. Since January 2022, all "Château Mercian" wineries producing Japan Wine (Château Mercian Katsunuma Winery, Château Mercian Mariko Winery, and Château Mercian Kikyogahara Winery) have achieved 100% renewable energy by combining green power certificates with purchased electricity. At breweries in Australia and New Zealand for Lion, 100% of purchased electric power has been sourced from renewable energy since January 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

Renewable energy

Use of large-scale solar power generation

At the Kirin Group, we are prioritizing "additionality," which refers to creating new sources of renewable energy in the world. Kirin Brewery has introduced large-scale solar power generation facilities at all nine breweries (eight breweries, excluding the Yokohama Brewery, use the PPA model*1).

At the Mercian Fujisawa Plant, we installed electric power generated from solar power based on the PPA model from March 2023. Through this initiative, we 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 solar power generation facilities (1.47MW) based on the PPA model at the Ube Plant (Ube City in Yamaguchi Prefecture), which began operating in March 2023. As a result of the above, we expect to be able to reduce annual CO₂ emissions by approximately 1,029 tonnes. KIRIN GROUP LOGISTICS, Kyowa Hakko Bio, and Shinshu Beverage have leased parts of their premises and building roofs to companies that build large-scale solar power generation facilities, contributing both to effective use of company assets and to the dissemination of natural energy.



Kirin Brewery
Hokkaido Chitose Plant



Kirin Brewery
Toride Brewery Plant



Kirin Brewery Shiga Brewery Plant



Mercian Fujisawa Plant

* 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.

Use of solar power in Australia

At Lion in Australia, we installed solar power generation facilities at Castlemaine Perkins Brewery in 2019 and at Little Creatures Geelong Brewery in Victoria in 2020.

The largest brewery in New South Wales, Tooheys Brewery, has signed a PPA agreement with a renewable energy distributor in partnership with the Australian Hotels Association (AHA), which consumes a low amount of energy. By jointly signing a large power contract, the AHA was able to introduce renewable energy at a lower cost, successfully reducing the cost of power for pubs from 11.5c/kWh to 6.9c/kWh.

In order to obtain Climate Active*2 certification in Australia, Lion must disclose carbon credits used to offset total emissions for the year in its annual report, and Lion has been complying with this requirement. This certification standard is a new standard for carbon neutral certification in Australia.

In New Zealand, Lion obtained Toitū*3 carbon zero certification in 2021.



Lion's Little Creatures Geelong



*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

Renewable energy certificates

Since 2021, Kyowa Hakko Bio has introduced "Renewable Energy Certificates (I-REC)" at Thai Kyowa Biotechnologies in Thailand. This marks the first adoption of these certificates in the pharmaceutical and food industries in Thailand, and we expect it will enable us to reduce annual GHG emissions by 10,200 tonnes, thanks to the use of renewable energy sources for some of the electricity used in the plant.

Wind power

Through a consortium represented by Mitsubishi Corporation Energy Solutions, 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 of the Consortium. These projects are Japan's first fixed-bottom offshore wind power generation projects in general sea areas. They will be among the largest sources of power 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.

Production

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 shifting the energy mix from fossil fuels to electric power, and, furthermore, using electricity generated by renewable energy sources 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 five Kirin Brewery plants, thereby reducing GHG emissions by 2% (approximately 3,400 tonnes) from the previous year across Kirin Brewery as a whole.

At Shinshu Beverage, we reuse waste heat, which is difficult to use directly in rinsing processes for bottles and caps, through a heat

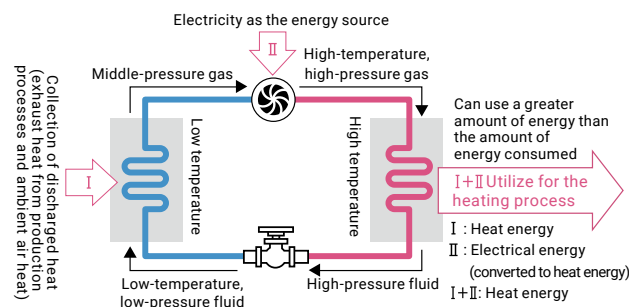
pump unit, enabling us to reduce GHG emissions by approximately 970 tonnes per year. The Kirin Brewery Okayama Plant has reduced annual GHG emissions by approximately 180 tonnes by reusing waste heat in hot water sterilization equipment for cans and heat in the air.

Fuel shift

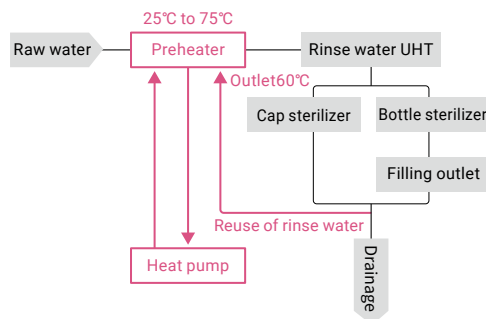
The majority of the fuel we use at breweries is consumed in the boilers that generate steam. At all Kirin Brewery and Kirin Beverage plants, we have completed the shift to natural gas, which generates less GHG emissions than heavy oil.

We have achieved more efficient boiler operations through the installation of highly efficient small boilers in line with the fuel shift. We have introduced cogeneration systems to provide some of the plants' heat and electricity.

Heat pump system



Shinshu Beverage production line

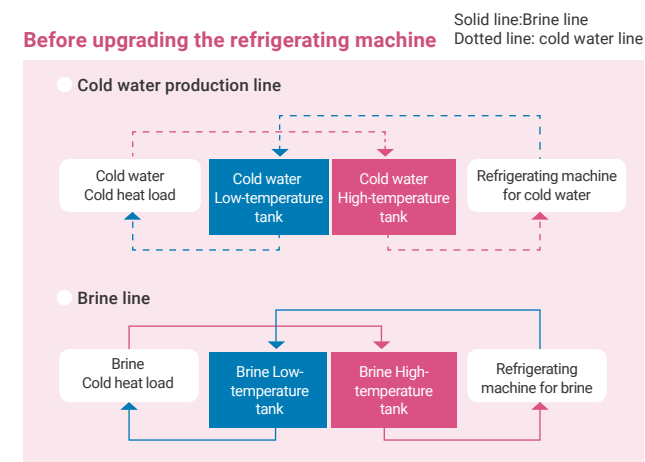


Cogeneration

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 in phases, for processes that involve a considerable temperature difference, and we are also making operational improvements to refrigeration systems.

Improving the efficiency of refrigeration systems



Containers

Reduction of GHG emissions during transportation by reducing container weight

Making containers lighter leads to reducing GHG emissions in the manufacturing process of containers and packaging and improving loading efficiency, which leads to the reduction of GHG emissions. Between 1990 and 2022, Kirin Brewery and Kirin Beverage reduced GHG emissions from container manufacturing by a total of 5.07 million tonnes*1 by reducing the weight of containers and packaging.

*1 Calculated based on the Carbon Footprint Product Category Rule (Certified CFP-PCR Number: PA-BV-02) applied to the difference in the weight of containers between 1990 and each fiscal year, multiplied by the usage of containers in the relevant fiscal year, from 1990 to 2022.



Shrink labels



Roll labels

Annual GHG emissions when producing labels

Approximately
700t
reduction



Annual GHG emissions from recycled PET bottles and no label products

Approximately
1,300t
reduction

Improving loading efficiency for transportation

Kirin Beverage has adopted a bottle shape that enhances loading efficiency, enabling us to increase the number of bottles per pallet. Since April 2022, we have been using square PET bottles for *Kirin Nama-cha* and *Kirin Nama-cha Hoji Sencha* (525 ml and 600 ml), as part of the expansion of our activities to medium-sized PET bottles. By adopting a square shape, we have increased the number of boxes loaded per pallet for 525 ml bottles from 48 cases (8 cases x 6 stacks) to 60 cases (10 cases x 6 stacks), improving loading efficiency by a factor of 1.25, and for 600 ml bottles, from 48 cases (8 cases x 6 stacks) to 50 cases (10 cases x 5 stacks), improving loading efficiency by a factor of 1.04.



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

We are promoting joint deliveries and a modal shift

The Kirin Group has positioned the logistics area as a non-competitive sector and is actively engaging in initiatives together with other companies.

In 2017, together with other companies in the industry, we established a joint delivery center in Kanazawa City, Ishikawa Prefecture, and launched joint transport by rail container from plants in the Kansai area. Neither of the companies has plants on the Japan Sea side, so products previously had to be transported by truck over long distances—of 200 km—from their plants on the Pacific Ocean side. This was inefficient and placed a great burden on the truck drivers. Joint transportation using rail containers has not only significantly reduced GHG emissions but shortened distances between the plants and the terminals and between the terminals and the destinations with a significant alleviation of the burden on drivers, which is helping to solve the social issue of a shortage in truck drivers. Through these efforts, we have successfully completed a modal shift 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 in the eastern Hokkaido area. As a result of these efforts, we are effectively utilizing railway containers and have enhanced truck loading efficiency, leading to more efficient logistics. We estimate that this results in a reduction in annual GHG emissions of approximately 330 tonnes.*1

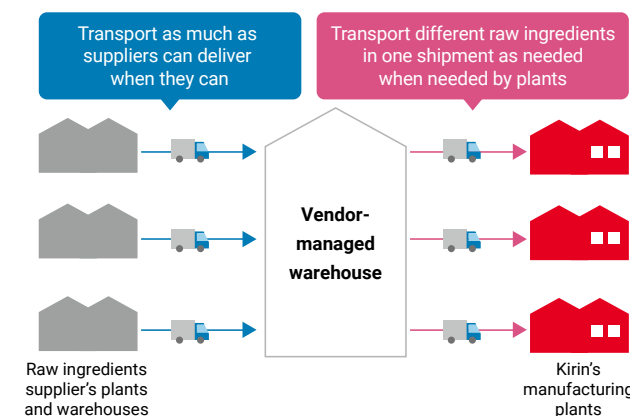
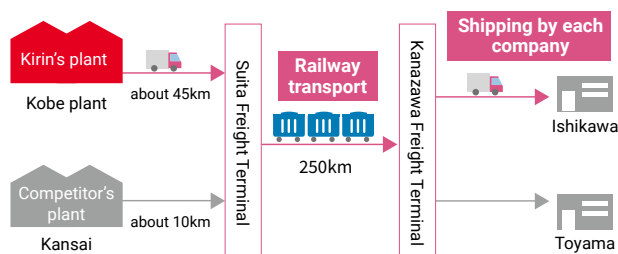
The Kirin Group is actively pursuing a modal shift of switching from truck transport to rail and ocean transport, which has lower GHG emissions, for long-distance shipments (400 to 500 km or more).

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

Vendor-managed warehouse

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 a raw materials procurement and distribution system using a raw materials warehouse (vendor-managed warehouse) adjacent to Kirin Beverage's in-house plants, the Shonan Plant and Shiga Plant, from October 2019. By establishing this facility as a vendor-managed warehouse, raw material and ingredient suppliers can transport the desired amount of raw ingredients when they need to, thereby maximizing efficiency. This has made it easier to cope with sudden changes in production plans, and contributed greatly to improving the responsiveness of plants.

Joint delivery from Pacific Ocean side to Japan Sea side



Becoming an industry pioneer in introducing “heat pump-style vending machines”

Kirin Beverage was the first in the industry to introduce heat pump style vending machines in 2006, and from 2012, almost all newly installed vending machines for cans and PET bottles are of this type. As of April 2023, we have switched more than 90% of installed vending machines to this type.

Heat pump-style vending machines pump up the waste heat generated when cooling products and use it for heating to warm up the products. This allows reduction in power consumption compared to conventional vending machines by cutting down the power used by the heaters.

Some types offer higher energy-saving performance, such as with heating functions not only by using the waste heat released by the cooling chamber as previous models did, but by capturing the heat from outside the machine, and by improving hot and cold insulation performance with the heavy use of vacuum insulation materials.

These vending machines have evolved to the point where power consumption can be reduced by about 40% compared to 2013. Installation of the new models began in 2015, and we are aiming for 80% of the new machines we install in 2023 to be new models.

Carbon zero certified beer

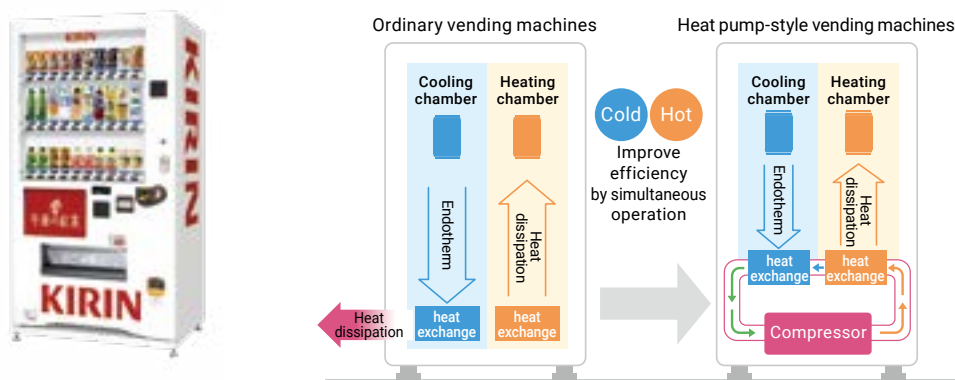
Steinlager, which Lion sells in New Zealand, has obtained certification as a carbon zero beer under the Toitu program by a body of the New Zealand government. In 2021, we featured the Toitu carbon zero mark in our marketing campaigns to highlight to consumers the commitment Lion has made to reducing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

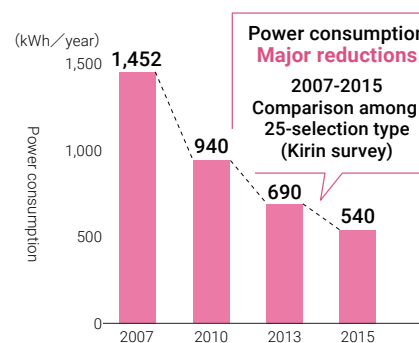


Product photographs are as of the time that events occurred.

Heat pump function



Trend in power consumption

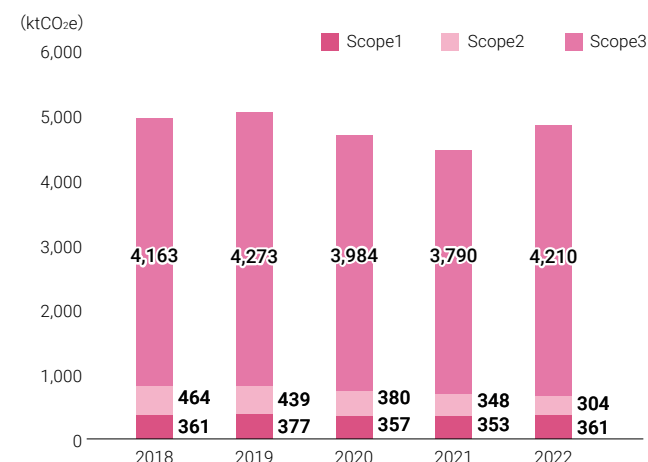


Key data related to climate change

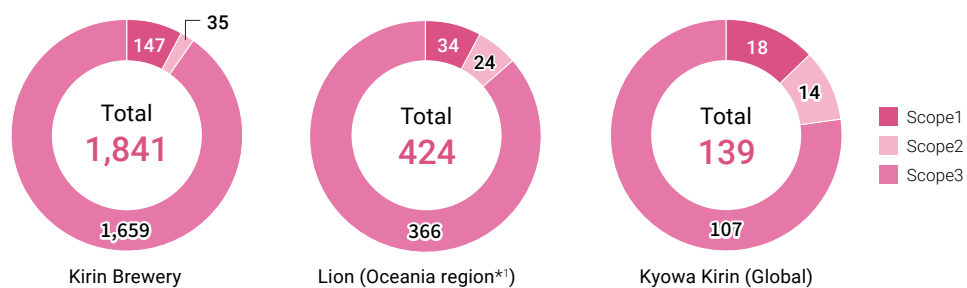
Value chain greenhouse gas emissions

	2018	2019	2020	2021	2022
Direct emissions from corporate activities (Scope 1 + Scope 2)	825	816	737	701	666
Scope 1 (Emissions from use of fuel)	361	377	357	353	361
Scope 2 (Emissions related to purchase of power and steam)	464	439	380	348	304
Indirect emissions (Scope 3)	4,163	4,273	3,984	3,790	4,210
Products and services purchased (Category 1)	2,444	2,551	2,390	2,281	2,355
Transportation and delivery (upstream) (Category 4)	380	510	481	429	424
Transportation and delivery (downstream) (Category 9)	981	834	796	760	1,039
Product use/disposal (Category 11, 12)	151	64	60	64	63
Other (Category 2, 3, 5, 6, 7, 8, 10, 13, 14, 15)	208	316	257	257	330
Emissions from entire value chain (Scope 1 + Scope 2 + Scope 3)	4,989	5,089	4,721	4,491	4,876

Trend in value chain greenhouse gas emissions

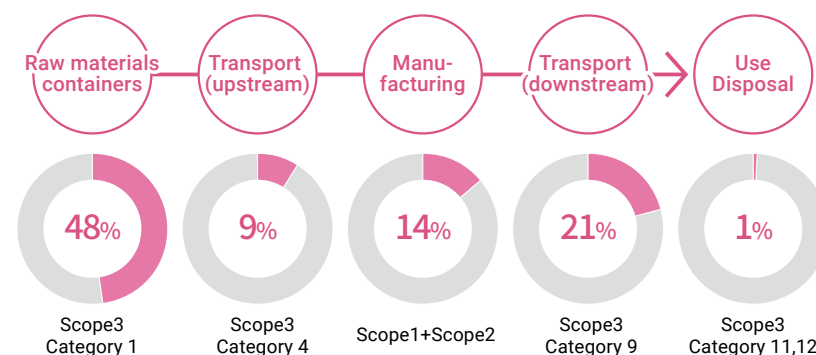


GHG emissions by business (2022) (ktCO₂e)



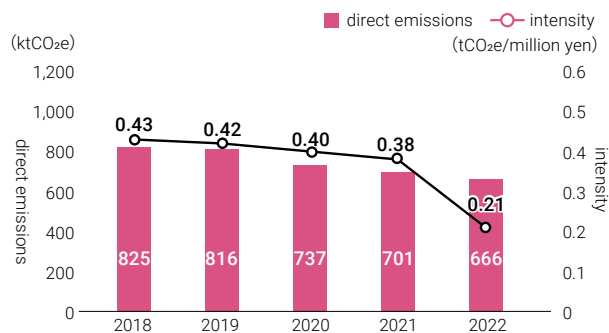
*1 This region covers the Oceania region where Lion conducts business activities.

Ratios of greenhouse gas emissions in value chain (2022)

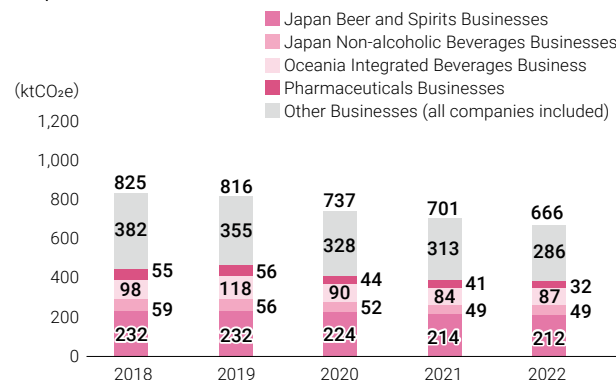


Since 2019, we have excluded Lion's non-alcoholic beverages business from Scope 3 emissions, and we have changed to the LCA database (IDEA) offered by the National Institute of Advanced Industrial Science and Technology (AIST) for emissions per unit of production.

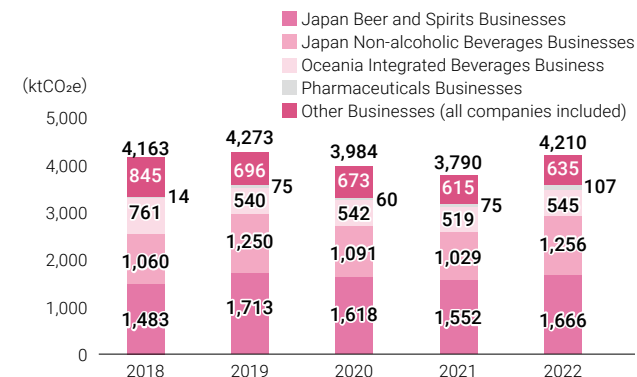
Total direct emissions (Scope 1+2) and intensity (emissions/sales revenue)



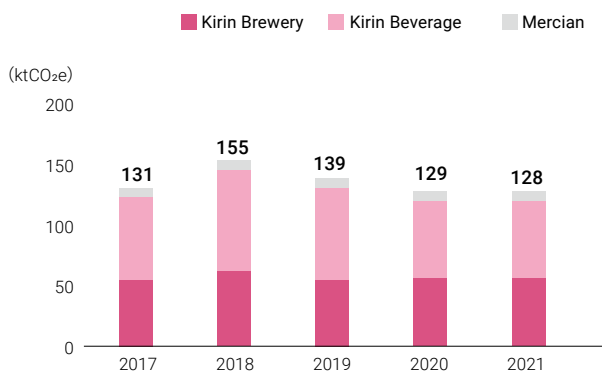
Kirin Group total direct emissions by business segment (Scope 1 + 2)



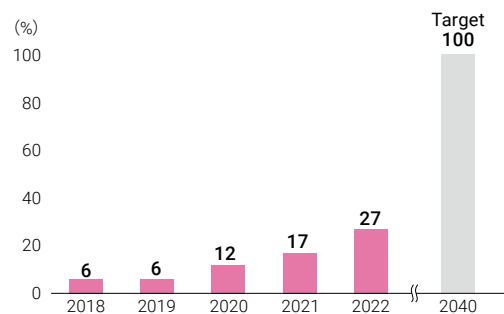
Kirin Group total Scope 3 emissions by business segment



CO₂ emissions associated with domestic transportation



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



Since 2019, we have excluded Lion's non-alcoholic beverages business from Scope 3 emissions, and we have changed to the LCA database (IDEA) offered by the National Institute of Advanced Industrial Science and Technology (AIST) for emissions per unit of production.

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

We have prepared this section under the assumption that it will be used as a reference together with "Holistic environmental management information disclosure based on the TCFD framework and TNFD framework draft, etc." (→P.15~P.39). We expect, however, that this section alone will often be used as an independent reference, and therefore, when we have deemed it necessary, we have included the same tables, graphs, figures, etc., in both sections.

Physical risks

Physical risks	Risk assessment	Strategy
Chronic risks (biological resources)	<p>Declining yields of agricultural products and procurement costs [medium to long term]</p> <ul style="list-style-type: none"> Significant decline in yields of major agricultural products, including barley, hops, tea leaves, and coffee The financial impact from lower agricultural yields caused by climate change is approximately 1.1 billion yen to 3.0 billion yen in 2050 under the 2°C scenario, and approximately 3.2 billion yen to 10.4 billion yen under the 4°C scenario (mid 50 percentile range in the price fluctuation) The risk is small for corn if the increase is 2°C or less, but there is research with different results so close attention is required. The risk of decline in yields for agricultural raw materials related to high-fructose corn syrup is low. 	<ul style="list-style-type: none"> Brewing technology that does not rely on barley (adaptation measures/risk reduction) Mass plant propagation technologies (adaptation measures/risk reduction) Support for farms to acquire certification for sustainable agriculture (adaptation measures/risk reduction) GHG emissions reduction (mitigation measures/risk reduction)
Acute risks (water resources)	<p>Disruption of operations owing to floods [short to long term]</p> <ul style="list-style-type: none"> Plants facing an elevated water risk: two in Australia, four in Japan, one in US and China respectively Historical examples of actual flood damage: Approximately 1.0 to 5.0 billion yen Exposure to 200-year disasters (total of 20 locations in Japan): Approximately 1.0 billion yen <p>Impact on shipping & delivery owing to floods [short to long term]</p> <ul style="list-style-type: none"> There is a risk of flooding at shipping ports but planned responses exist <p>Disruption of operations owing to droughts [short to long term]</p> <ul style="list-style-type: none"> High water stress plants: 2 in Australia (all 5 in the future), 1 in the USA and 1 in Thailand. Impact from decline in production owing to droughts: estimated to be between approximately 30 million yen and 600 million yen <p>Impact on agricultural products owing to floods and droughts [short to long term]</p> <ul style="list-style-type: none"> We forecast that water stress will become higher in many producing areas Natural disasters are materializing in many countries and regions 	<ul style="list-style-type: none"> Sharing of knowledge concerning responses to floods (adaptation measures/risk reduction) Insurance for flooding (adaptation measures/risk transfer) Capital investment for flooding at facilities (adaptation measures/risk reduction or acceptance) <ul style="list-style-type: none"> Sharing of knowledge on responses to floods (adaptation measures/risk reduction) Diversification of suppliers (adaptation measures/risk reduction) <ul style="list-style-type: none"> Advanced technologies for water use reduction (adaptation measures/risk reduction) Sharing of knowledge concerning responses to droughts (adaptation measures/risk reduction) <ul style="list-style-type: none"> Responses to water stress in areas producing agricultural raw materials (adaptation measures/risk reduction or acceptance) Utilization of bag-type culture vessel technology that enables the recirculation of water (adaptation measures/risk reduction) GHG emissions reduction (mitigation measures)

* Recalculated with 2022 data

Types of physical risks

Chronic risks

Details of physical risks

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

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

When we assessed the financial impact of lower agricultural yields using the 25-75 percentile range of the distribution of forecast data for change in prices, the impact was approximately 1.1 billion yen to 3.0 billion yen in 2050 under the 2°C scenario, and approximately 3.2 billion yen to 10.4 billion yen under the 4°C scenario (Graph 2). The range of the 25-75 percentile was 4.5 times larger for the 4°C scenario than the 2°C scenario, from which we can interpret that uncertainty is higher and the risk is more significant.

Since 2018, we have continued surveys and analysis of the impact of climate change on agricultural raw materials, with reference to numerous academic papers. Although the impact differs between countries and regions, we have found that there are some agricultural raw materials for which yields will decline significantly. In 2022, we added surveys related to high-fructose corn syrup and protein sources, which are raw materials for low-malt beer products, etc. Every year, we refer to the latest academic papers and revise our information related to other agricultural products (Table 1).

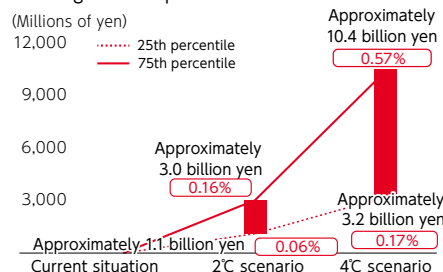
In surveys related to water risk and water stress in areas producing agricultural raw materials, we identified severe levels of drought risk and flood risk, which may impact agricultural products (Table 10).

In 2022, we estimated the financial impact of declines in agricultural yields for Kirin Brewery, Kirin Beverage, Mercian, Lion (Oceania region only), Kyowa Kirin, and Kyowa Hakko Bio, referring to numerous academic papers. Our estimates covered the following agricultural products: barley, hops, tea leaves, grape juice, starch, lactose, corn, and cassava.

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

Agricultural products	Kirin Group Scenario3: 4°C, 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) Argentina -28.5% (2100)	China -27.4%	Ukraine -40.6% (2100)	
Soybeans	U.S. -10% (2080) Brazil -20% (2080) Argentina +40% or more	China +16% to +50% (2100) India -80%		

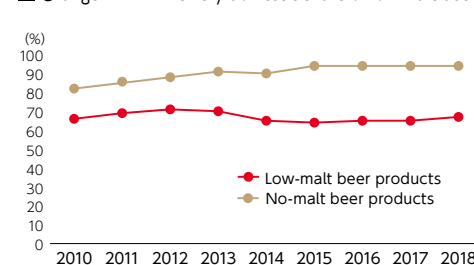
2 Impact of lower yields on procurement costs for agricultural products in 2050



Estimated for the main agricultural raw materials at Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, and Kyowa Hakko Bio. Figures in 0.06% show the percentage of revenue

*1 Recalculated with 2022 data

3 Change in Kirin Brewery domestic share of low-malt beer products and no-malt beer products market



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

With respect to declining barley yields as a result of climate change, we believe that the impact can be alleviated to a certain extent by leveraging technology for products that limit the amount of barley used. Kirin Brewery has an extremely high share in low-malt and no-malt beer categories and maintains a competitive advantage in this area. 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, while referring to numerous academic papers, and as a result (Table 5), we have judged that there are no major issues at present.

As for corn, we studied the impact of climate change on four major exporting countries of corn (approximately 87% of global exports). Although there is a fairly significant probability (Table 4) that yields

in each producing area will fall by 10% or 20%, we found that the probability that average yields will fall at the same time across the four major exporting countries was approximately 7% under the 2°C scenario. Under the 4°C scenario, this probability was approximately 86%, so we would be unable to avoid a significant impact. But if we can limit the increase within the 2°C scenario, we think we may be able to reduce the impact by changing the countries we procure from. In 2021, an international research team consisting of 20 research institutions from eight countries, including Japan's National Institute for Environmental Studies and the National Agriculture and Food Research Organization (NARO) reported average global corn yields will fall by approximately 24% by the end of this century compared with the present (1983 to 2013) if climate change progresses. We will continue

to monitor the development in research and assess new studies. We expect 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. Yields of potatoes will either rise or fall in India and America, depending on the variety, but overall, we do not expect yields to fall, partly because we expect an increase in yields in China. As for soybeans, which are a raw material for no-malt beer products, we forecast that yields will either rise or fall depending on the region, and we have judged that it is highly likely we will be able to avoid significant impact.

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

In order to ensure that areas producing agricultural products are resilient to climate change, we will continue to support the acquisition of sustainable farming certification.

[More information→P.44~P.45, P.48](#)

●Mass plant propagation technologies (adaptation measures)

We will continue efforts to enhance the range of applications of "mass plant propagation technologies" developed by the Kirin Central Research Institute, to ensure that they can be used for heat-tolerant agricultural breeds developed in response to falling yields of agricultural products as a result of climate change.

While it is difficult to conceive of a business model for the Kirin Group that is completely independent of barley and hops, we

anticipate that "mass plant propagation technologies" will have a positive impact on the stability of agriculture through cultivation if agricultural breeds suited to global warming are developed. We will be able to use plastic film "bag-type culture vessel technology," which the Kirin Group has developed proprietarily, 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 depending on the plant species. We aerate a solution containing nutrients necessary for plant growth inside a small bag, making it easier to use water more effectively than in soil cultivation and enabling cultivation in areas with high levels of water stress. In this way, we expect that we can reduce our dependence on water specific to certain countries and regions.

[More information→P.49](#)

●GHG emissions reduction (mitigation measures)

In order to minimize the risk of falling agricultural yields, we aim to achieve net zero emissions by 2050, our science-based 1.5°C target by 2030, and renewable energy targets under RE100 by 2040, in accordance with our roadmap.

4 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

Country	2°C scenario		4°C scenario	
	>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

5 Impact of climate change on high-fructose corn syrup and soybeans (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, Xexin-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%

Details of physical risks

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

Disruptions to brewing and manufacturing, or a significant impact, may occur as a result of damage from typhoons, heavy rainfall, and other disasters caused by climate change.

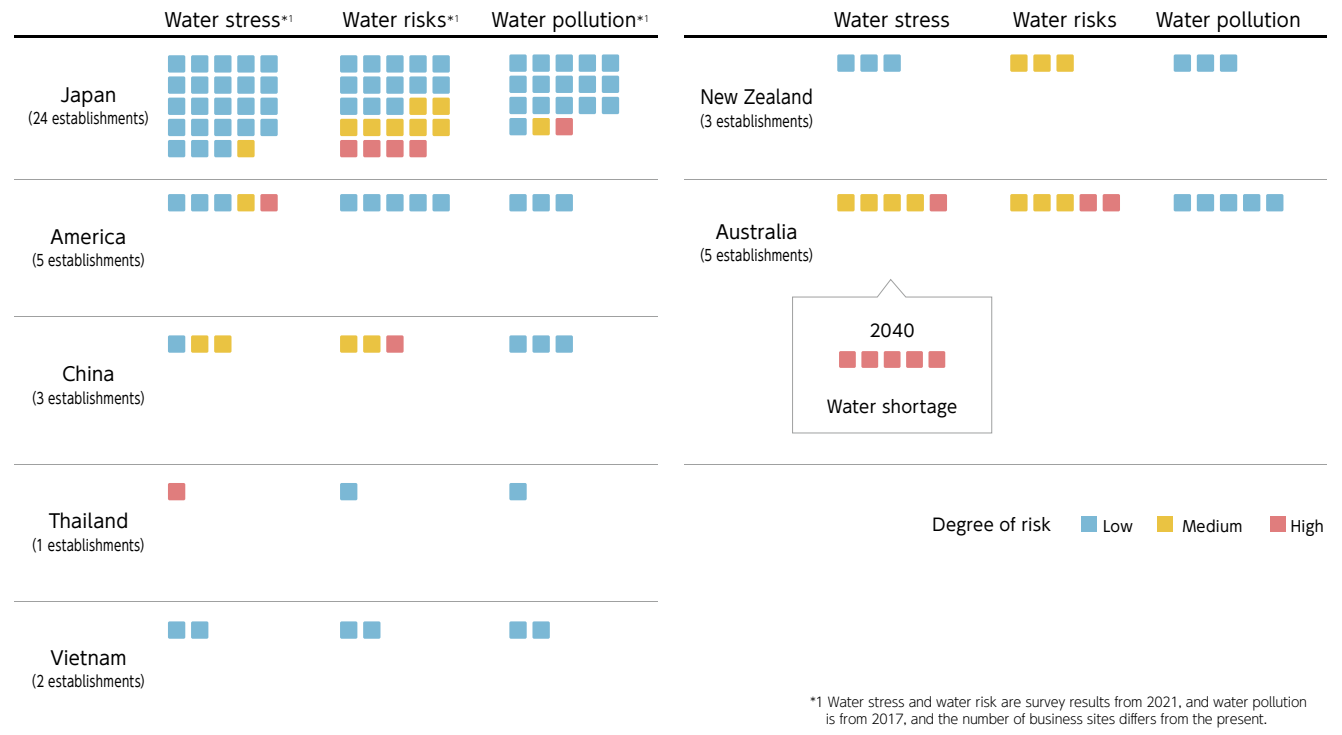
The Kirin Group has operated businesses in Japan and Australia, two countries where the level of water stress differs significantly. As such, we have developed an understanding rooted in experience of the fact that problems related to water differ between countries and regions, and that they largely depend on basins and specific locations. Since 2014, we have been conducting regular scientific surveys, and in 2021, we conducted additional surveys and assessments based on Aqueduct for main brewing sites at New Belgium Brewing in the United States in accordance with the expansion of our businesses.

In 2020, we conducted surveys and analyses of water risk at brewing and production sites using Aqueduct 3.0, hazard maps created by local governments, and other resources. As a result, we identified plants with a high level of water risk from flooding, etc., as follows: two in Australia, and four in Japan, one in U.S., and one in China (figure on the right: Manufacturing Site Water Risk/Stress). Flooding occurred at Lion's Castlemaine Perkins Brewery in Australia, which we assessed as having a high level of water risk, as a result of large-scale floods in Brisbane caused by very heavy rainfall over a wide area in the eastern part of Australia in March 2022. Flooding also occurred as a result of heavy rainfall in 2011. Going forward, we will continue using tools to assess risk, while considering factors based on our experience.

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 7).

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 is 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°C 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.

6 Manufacturing Site Water Risk/Stress



*1 Water stress and water risk are survey results from 2021, and water pollution is from 2017, and the number of business sites differs from the present.

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

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

*2 The amount for the Sendai Brewery is from tsunami and earthquake damage in the 2011 Great East Japan Earthquake

*4 Brisbane is an area of high water stress and severe drought, but at the same time it has a history of repeatedly experiencing major flooding every few decades.

*5 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>

8 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

*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, we shut down power sources in the brewery in advance, partly because there was some time between the flood alert and the actual flooding.

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, we will consider covering an insurance, etc., after on-site surveys.

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 it is a black box, 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.

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 9), 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 in 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.

9 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

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 3.0, other resources, water stress such as drought is elevated at two plants in Australia, one in the US, and one in Thailand, and we have determined that risks facing Lion's five Australian plants will increase in the future.

We have identified the estimated financial impact of droughts on breweries and manufacturing business 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.80](#)

[More information on water usage at breweries and manufacturing sites in areas with water stress→P.22](#)

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 10).

In 2021 and 2022, such concerns became apparent in many regions around the world.

The major impacts of water risk, water stress, disasters, etc., are summarized in Table 11.

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 differs 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.

At Lion, in response to 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.55](#)

●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 negative impacts by holding enough inventories and switching temporarily to products that use less water. There are limits to the situations in which we can utilize this knowledge, but by sharing it within the Kirin Group, we are reinforcing our ability to respond.

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

We will accumulate knowledge as we continue initiatives such as water source conservation activities at tea farms in Sri Lanka. 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. As part of training for the acquisition of certifications, we teach subjects such as mulching and planting shade trees 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.54](#)

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

At tea farms in Sri Lanka, we teach methods of preventing soil runoff from heavy rainfall by planting undergrowth with deep roots, as part of training in activities to support the acquisition of certification for sustainable agriculture. Our teaching is based on simple 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.44, P.54](#)



A picture drawn by children in Sri Lanka who learned that we must treasure water



A micro watershed in a tea farm in Sri Lanka that was fenced off with Kirin's support



Landslide prevention implemented as part of training in support for the acquisition of certification (the slope with undergrowth on with deep roots)

10 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 Extreamly 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 Argentina 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	

11 Major natural disasters and their impact on crops in 2021 and 2022

United States	Record droughts in California resulted in a 19% reduction in crop acreage for agricultural products and a loss of approximately 8,750 agricultural jobs. Fertilizer prices doubled
Canada	Drought reduced wheat production by 45% in Alberta. Wheat indexes rose by 65.7%. In September 2022, wildfires spread in the west and a hurricane caused extensive damage in the east.
Germany	\$40 billion in economic losses due to heavy rains, six times the average rainfall. Most of the vineyards in the Arl Gorge region were flooded. In 2022, temperatures rose to record highs, leading the European Commission to declare "We are facing the worst drought in the last 500 years."
Brazil	Droughts, frost, and freezing caused corn production to fall 9% and many products did not meet the standard quality for sale, resulting in price increases. There was a bad harvest of sugar cane owing to droughts for two years in a row. This contributed to an increase in sugar price indices of 9.6% in just one month
Kenya	The government declared a national state of emergency as a result of droughts among the worst recorded in the past 40 years. The impact on agricultural products was devastating, and an estimated 2.8 million people faced starvation
Malaysia	Palm oil production fell 11% as a result of flooding from heavy rainfall and the prolonging of the COVID-19 pandemic. Palm oil prices remain at record high levels

Physical risks

Type of transitional risk		Transitional risk and strategy		
Policy	Risk	Carbon pricing and energy procurement costs [medium to long term] <ul style="list-style-type: none"> ● Tax savings in 2030 of approximately 0.6 billion yen under the 4°C scenario, 3.8 billion yen under the 2°C scenario, and at least 5.2 billion yen under the 1.5°C scenario 	Financial impact on the procurement of agricultural products from carbon pricing [medium to long term] <ul style="list-style-type: none"> ● Approximately 0.9 billion yen to 2.1 billion yen in 2050 under the 2°C scenario, and approximately 4.0 billion yen to 7.6 billion yen under the 4°C scenario 	Impact on currently held assets [medium to long term] <ul style="list-style-type: none"> ● The possibility that we may be unable to recover investments owing to facility renewals earlier than expected as a result of legal regulations, etc., affecting through-flow boilers, etc.
	Strategy	<ul style="list-style-type: none"> ● Profit and loss neutral reduction of GHG emissions in brewing and manufacturing ● GHG emission reductions through logistics optimization 	<ul style="list-style-type: none"> ● Mass plant propagation technologies and support for farms to acquire certification for sustainable agriculture 	<ul style="list-style-type: none"> ● Identification of trends in technology and renewal of our roadmap
Technology	Risk	Research and development capabilities [short to long term] <ul style="list-style-type: none"> ● Possibility that research contributing to decarbonization will not be put to practical use at the expected timing 	Engineering capabilities [short to long term] <ul style="list-style-type: none"> ● Possibility that engineering capabilities required for decarbonization will not be transferred and cannot be utilized 	Introduction of appropriate technology and facilities [short to long term] <ul style="list-style-type: none"> ● Possibility that we cannot install energy-saving facilities and switch to renewable energy at an appropriate time or price
	Strategy	<ul style="list-style-type: none"> ● In-house packaging development technology (mitigation measures/reduction) 	<ul style="list-style-type: none"> ● Strengthen engineering functions 	<ul style="list-style-type: none"> ● Identification of trends in technology and renewal of our roadmap
Markets	Risk	Avoidance of fossil-derived raw materials [medium to long term] <ul style="list-style-type: none"> ● Possibility that people's impression of containers and packaging using raw materials derived from fossils may be negative 	Concerns surrounding the destruction of forests [medium to long term] <ul style="list-style-type: none"> ● Possibility that awareness of forests as a sink of GHG will become stronger, and there will be a stronger negative impression of forestry and agriculture 	Fluctuations in natural gas prices [medium to long term] <ul style="list-style-type: none"> ● Possibility that natural gas prices will not fall significantly
	Strategy	<ul style="list-style-type: none"> ● Plastic resource recycling 	<ul style="list-style-type: none"> ● Promotion of sustainable forestry and agriculture 	<ul style="list-style-type: none"> ● Steady implementation of our roadmap to achieve our science-based 1.5°C target
Reputation	Risk	Assessment by consumers [short to long term] <ul style="list-style-type: none"> ● Decline in the assessment of our brand owing to inferior initiatives and insufficient appropriate communication 	Social responsibility toward renewable energy [short to long term] <ul style="list-style-type: none"> ● Criticism for the inconsiderate introduction of renewable energy power generation 	Trust from long-term investors [short to long term] <ul style="list-style-type: none"> ● Possibility of loss of opportunities to secure stable investment owing to a lack of appropriate disclosure
	Strategy	<ul style="list-style-type: none"> ● Engagement with young generation 	<ul style="list-style-type: none"> ● Formulation and operation of basic policies concerning the introduction of environmental value 	<ul style="list-style-type: none"> ● Appropriate disclosure in line with the TCFD recommendations and TNFD framework

*1 Recalculated with 2022 data

Type of transitional risk

Policy

Details of transitional risks

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

Energy procurement and logistics costs may spike if governments introduce carbon taxes and carbon border adjustment mechanisms.

Table 12 shows the results of our estimation of the financial impact of carbon pricing on energy procurement.

We estimated tax savings in 2030 of approximately 0.6 billion yen under the 4°C scenario, 3.8 billion yen under the 2°C scenario, and at least 5.2 billion yen under the 1.5°C scenario, in the event that we achieve our science-based 1.5°C target. Under the 1.5°C scenario, the expected range of carbon pricing is extremely large, and there is a risk that it will be a large value.

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 2022. For power emissions factors and carbon taxes, we applied the 2°C scenario and 4°C scenario from the IEA scenarios, and set the IPCC "Special Report on Global Warming of 1.5°C" as the 1.5°C scenario and the basis of forecast carbon prices for all three scenarios.



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 achieve our targets of net zero emissions by 2050, our science-based 1.5°C target by 2030, and renewable energy targets under RE100 by 2040, in accordance with our roadmap, under the basic principle of profit and loss neutrality. Specifically, the merit from saving energy will offset depreciation and amortization from the investment and the procurement costs increase of renewable energy.

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 "Holistic Environmental Management Information Disclosure Based on the TCFD Framework, TNFD Framework Draft, etc." (→P.15~P.35).

● 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.72)

12 Assessment of impact of carbon pricing

		Scenario		Group Scenario 3 (4°C Scenario)		Group Scenario 1 (2°C Scenario)		1.5°C Scenario	
		Year		2030	2050	2030	2050	2030	2050
If GHG emissions are not reduced	Carbon taxes (Billions of yen)			1.2	1.4	7.7	11.4	10.4~470.3	15.5~904.4
	Percentage of revenue			0.06%	0.07%	0.38%	0.57%	0.53%~23.46%	0.78%~45.46%
If we reduce GHG emissions in line with targets	Carbon taxes (Billions of yen)			0.6	0	3.8	0	5.2~235.2	0
	Percentage of revenue			0.03%	0.00%	0.19%	0.00%	0.26%~11.82%	0.00%
Carbon taxes	Tax savings (Billions of yen)			0.6	1.4	3.8	11.4	5.2~235.2	15.5~904.4
	Percentage of revenue			0.03%	0.07%	0.19%	0.57%	0.26%~11.82%	0.78%~45.46%

*1 Recalculated with 2022 data

13 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 2022). Introducing at Kyowa Kirin Ube Plant and Mercian Fujisawa Plant (operating from 2023 for each), and Kirin Beverage Shonan Plant (operation planned from 2024)
Achieved a proportion of 100% renewable energy in purchased electric power	Achieved a proportion of 100% renewable energy in purchased electric power at five of nine Kirin Brewery plants (through 2023), and plan to achieve a proportion of 43% 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, plans to achieve a 53% reduction in CO ₂ emissions compared with end-2019. At three Mercian wineries, we achieved a proportion of 100% renewable energy in purchased electric power (2022) (More information→P.69)
Joint deliveries*2	Reduced GHG emissions by approximately 330 tons per year through joint deliveries using railroad containers in the east Hokkaido area (More information→P.68)
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.72)

*2 Calculation procedures for joint delivery and joint collection of beer pallets are described in "Contribution to Avoided Emissions through the Global Value Chain, Third Edition, Keidanren (Japan Business Federation)

http://www.keidanren.or.jp/policy/2018/102.html

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.

The Graph on the right shows the results of our estimation of the financial impact of carbon pricing on agricultural product prices. In 2022, we estimated the impact for Kirin Brewery, Kirin Beverage, Mercian, Lion (excluding the non-alcoholic beverages business), 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 2.1 billion yen under the RCP2.6/SSP1 scenario and approximately 4.0 billion yen to 7.6 billion yen under the RCP8.5/SSP3 scenario in 2050. The range of the 25-75 percentile was twice as larger 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.

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 becomes difficult to use existing facilities that use fossil fuels, etc., and it may be difficult to continue using them for the period that we initially expected.

Under the Kirin Group roadmap, we plan transition in the future to hydrogen and other forms of GHG-free energy to replace natural gas that we use in heating processes such as boiling in brewing and manufacturing. We may be unable to recover our investments if it becomes necessary to renew through-flow boilers and other facilities earlier than expected. In the same way, we may be unable to recover investments related to trucks that we hold if we are required to transition the trucks we use for transportation to electric vehicles sooner than initially expected.

Response strategy

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

We have judged that mass plant propagation technologies and support for farms to acquire certification for sustainable agriculture are effective as countermeasures.

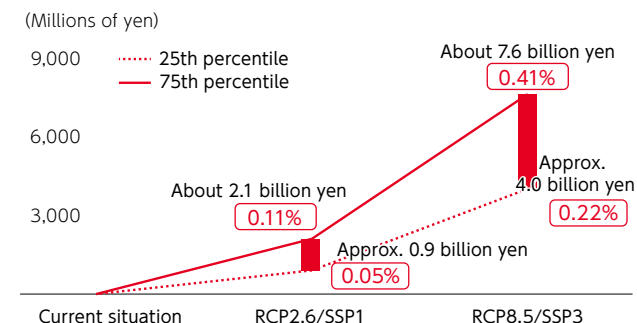
Mass plant propagation technologies may be able to contribute to an increase in crop acreage in response to the issue of competition between alcoholic/non-alcoholic beverages and biofuels for raw materials as carbon pricing causes renewable energy to expand and the use of corn, soybeans, etc., as biofuels increases.

In response to the possibility of an impact on fertilizer prices from soaring prices of natural gas, which is a raw material in nitrogen fertilizer, we think that training for farmers on appropriate fertilizer management as part of support for the acquisition of sustainable farming certification will act as a countermeasure.

[More information on mass plant propagation technologies→P.49](#)

[More information on support for the acquisition of certification→P.44~P.45, P.48](#)

■ 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.

*2 Recalculated with 2022 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 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.22](#)

Details of transitional risks

Research and development capabilities [short to long term]

There is a possibility that research contributing to a decarbonized society will not be put to practical use at the expected timing.

Category 1, which represents GHG emissions from container packaging and raw materials production, accounts for about 51% of the Kirin Group's Scope 3, and reducing GHG emissions related to containers and packaging is a key theme for achieving Net Zero.

Engineering capabilities [short to long term]

There is a possibility that our engineering systems aimed at achieving decarbonization will not be sufficient, or that we will not be able to appropriately apply them because the technical expertise is not well succeeded.

Waste heat from brewing and manufacturing processes in the alcoholic and non-alcoholic beverages businesses is at a low temperature. As such, it is difficult to achieve the efficient cascading use of heat based solely on introducing the latest facilities, and engineering and technical expertise with a deep understanding of brewing and manufacturing processes is required.

Introduction of appropriate technology and facilities [short to long term]

Alongside rapid technological progress, in recent years, there have also been major delays to deliveries of facilities and equipment as a result of the tight supply and demand for semiconductors and other facility components, etc. As such, if we are unable to identify the timing of the introduction of technology and quickly make investment decisions, there is a possibility that we will not be able to reduce GHG emissions in line with plans. 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**

We think we will be able to develop advanced containers and packaging with lower GHG emissions across the value chain, utilizing our strength – the fact that we have 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 alcoholic beverage company.

Based on the technologies it has developed over many years in areas such as glass bottles, cans, PET bottles, cardboard cartons, and other paper packaging, the Institute for Packaging Innovation utilizes AI technology, kansei (sensitivity) engineering, and other technologies and takes advantage of its strength in possessing research facilities equivalent to a small plant to enable the technical support required

to create products based on these technologies, as well as the development of new containers.

In terms of recycling PET bottles, we have created practical uses for R100 bottle technology, in which we recycle used PET bottles into new PET bottles, and we are focusing on the development of 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.

[More information→P.12](#)

● **Strengthen engineering functions**

We have established engineering teams in each group company and ensure that we are supporting brewing and manufacturing facilities, while 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 engaged in the construction of plants producing beer, non-alcoholic beverages, pharmaceuticals, and

other products. Having Kirin Engineering within the group, we have been conducting large-scale new expansion and remodeling of manufacturing facilities not only for domestic and overseas group companies but also for companies outside the group for many years. 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.

[More information→P.12](#)

● **Identification of trends in technology and renewal of our roadmap**

The Kirin Group will intensively watch technological trends and social conditions in the engineering department of Kirin Brewery, reflect them in the roadmap based on these developments, determine where and what kind of equipment introduction will be effective for the Group, and respond flexibly based on close

communication with each Group company.

When introducing renewable energy, we will also prioritize “additionality,” which indicates the actual increase in renewable energy.

[More information→P.68~P.69](#)

Details of transitional risks

Avoidance of fossil-derived raw materials [medium to long term]

There is a possibility that people may have a more negative impression than before of containers and packaging using raw materials derived from fossils as interest in problems related to plastic spreads to issues related to all aspects of climate change, not just ocean pollution. Problems related to plastics have attracted significant attention around the world, including the enactment of the "Act on Promotion of Resource Circulation for Plastics" on April 1, 2022, in Japan. 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 global warming caused by GHG emissions when they are burned, as well as problems related to the depletion of resources from raw materials derived from oil.

Concerns about deforestation [medium to long term]

As awareness of the importance of forests as GHG sinks grows, concerns about business activities that lead to deforestation are more prevalent than ever before, potentially resulting in negative impressions of forestry and agriculture to increase. The worst forest fires in Australian history, which occurred between 2019 and 2020, and the annual wildfires in California and other cases have brought more attention than ever before to the relationship between climate change impacts and forests. The United Nations Food System Summit was held in 2021, the EU's "FarmtoFork" 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 will lead to interest in forest issues.

Response strategy

●Plastic resource recycling

In accordance with the "Kirin Group Plastic Policy," which we formulated in 2019 in order to resolve problems related to plastics, we will promote PET bottles that use recycled PET resin. In the "Kirin Group Plastic 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 previously promoted the utilization of recycled PET resin through mechanical recycling. As of June 2023, R100 PET bottles made of 100% recycled PET resin are used in the 600ml (available only at

convenience stores) and 525ml bottles of *Kirin Namacha* and *Namacha Houjisencha* (gradually being introduced, starting with usage in certain products), as well as in *Kirin Namacha Immunocare* and *Kirin Namacha Caffeine Zero* bottles.

We will promote technical development related to practical uses for chemical recycling to create highly pure recycled PET resin, even from dirty used PET bottles and other PET products. In addition, we will create systems to recover used PET bottles and other PET products.

[More information→P.60](#)

●Promotion of sustainable forestry and agriculture

We are continuing initiatives to expand sustainable forestry and agriculture, and will increase the proportion of certified paper and raw materials from certified farms that we use. As one initiative targeting sustainable forestry, we are expanding the use of FSC-certified paper in paper containers. 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 intend to expand our use of sustainable paper to other group

companies in Japan, as well as our overseas businesses. As one initiative targeting 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. In August 2021, we began 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](#)



Fluctuations in natural gas prices [medium to long term]

As initiatives targeting decarbonization accelerate around the world, it is possible that the balance of supply and demand for natural gas may become tight and prices may spike in the short term, owing to such factors as the transition toward sources of energy with low GHG emissions and divestment from coal. For our future scenarios concerning natural gas prices, we have referred to "Net Zero by2050: A Roadmap for the Global Energy Sector" and "World Energy Outlook 2021 (WEO 2021)" by the IEA, and have conducted our survey based on three scenarios (Table 15): NZE (Net Zero Emissions by 2050 Scenario: an ambitious scenario in which the 1.5°C 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 expect natural gas prices to 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 necessary investment and expenses related to Carbon dioxide Capture, Utilization and Storage (CCUS), so there is a possibility that prices may not decline significantly when these costs are taken into consideration.

Response strategy

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

We believe that we must surely execute our roadmap, which we formulated in order to achieve our science-based 1.5°C 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 steadily transition away from natural gas in our energy mix to electric power, and although we will continue to use natural gas for the time being for some heating processes where it is difficult to transition to electric power, we plan to ultimately replace it with hydrogen. We do not just expect technological innovation and infrastructure development, but instead we intend to take on the challenge of using hydrogen in advance if it is possible.

[More information→P.34~P.35](#)

15 Forecast fluctuations in natural gas prices

Scenario	Current price	Future price	
	2020 USD/GJ	2030 USD/GJ	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)

Details of transitional risks

Assessment by consumers [short to long term]

There is a possibility that consumers' assessment of our brand 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 gradually incorporated into Japanese study guidelines. In recent surveys, we have found that consumer awareness of environmental issues has risen, including a significant increase in awareness of various certification systems related to eco-friendly products.

Social responsibility toward 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 harm scenery and nature and cause disasters, possibly resulting in criticism from society. Although the FIT system has contributed to the expansion of solar power facilities in Japan, it has become a significant burden on citizens, with total expenses associated with FIT purchases in Japan of 3.1 trillion yen in 2019, and estimates stating that this figure will hit 4.9 trillion yen by 2030. Even if we are able to achieve our net zero emissions target, it will not contribute to our true aim of preventing global warming if the amount of renewable energy on earth does not actually increase.

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

We may lose opportunities for securing stable investment 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 initiatives and investment.

Response strategy

●Engagement with young generations

As we promote our communications, we will prioritize engagement with the 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, but we prioritize mutual communication with junior and senior high school students, as well as spontaneous 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 in a way that is easy to understand. For young children in elementary school, 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.

●Formulation and operation of basic policies concerning the introduction of environmental value

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 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 biogas, 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." Renewable energy that has "additionality" and does not rely on the FIT system will contribute to reducing the burden on citizens.

More information→P33, P.68, P.69

●Appropriate disclosure in line with the TCFD recommendations and TNFD framework.

We will win the trust of long-term investors and secure stable investment 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.

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 final 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. Going forward, we will continue responding to any

necessary disclosure frameworks and promoting the appropriate disclosure of information.

We have won a "Gold Award" for two years (2019 and 2020) in a row in the environmentally sustainable company category of the "ESG Finance Awards Japan," and for the second consecutive year, we received the highest number of votes from investment management institutions (10 institutions in 2023 and 8 institutions in 2022) in the selection of "superior TCFD disclosure" requested to investment management institutions to which the GPIF outsources domestic equity management.

Business opportunities

Type of business opportunity	Business opportunity	Strategy
Markets	<p>Increasing interest in infectious diseases caused by global warming [short to long term]</p> <ul style="list-style-type: none"> Concerns related to increases in the number of infections and regions affected Northward movement of the habitat of the Aedes albopictus <p>Increase in heatstroke caused by global warming [short to long term]</p> <ul style="list-style-type: none"> 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°C scenario 	<p>Contribution in Health Science domain</p> <ul style="list-style-type: none"> Long-term research related to immunity Wide range of products in the Health Science domain <p>Contribution with products to address heatstroke</p> <ul style="list-style-type: none"> Provision of non-alcoholic beverages that prevent heatstroke
Products and services	<p>Products that contribute to decarbonization [medium to long term]</p> <ul style="list-style-type: none"> Possibility that products will be required that contribute to decarbonization or the shift to a low-carbon society 	<p>Decarbonization products</p> <ul style="list-style-type: none"> Provision of zero-carbon certified products
Resource efficiency	<p>Social issues related to logistics [short to long term]</p> <ul style="list-style-type: none"> Shortage of drivers and increase in GHG emissions from truck transportation <p>Social demands for the shift to lightweight containers and the 3Rs [short to long term]</p> <ul style="list-style-type: none"> Demands for the 3Rs and reduction in costs from the move to lightweight containers 	<p>Reduction in costs from more efficient transportation</p> <ul style="list-style-type: none"> Modal shift, joint deliveries, and higher loading efficiency <p>Shift to lightweight containers</p> <ul style="list-style-type: none"> Promoting the shift to lightweight materials utilizing the strengths of the Institute for Packaging Innovation
Energy sources	<p>Reduction in reliance on fossil fuels [short to long term]</p> <ul style="list-style-type: none"> Demand gap and spike in prices of fossil fuels <p>Securing of energy that can be controlled [short to long term]</p> <ul style="list-style-type: none"> Increase in demand and tight supply and demand for renewable energy 	<p>Achievement of our energy mix</p> <ul style="list-style-type: none"> Promotion to electric power in heating processes and introduction of renewable energy for electric power <p>Use of renewable energy with a focus on additionality</p> <ul style="list-style-type: none"> Introduction of solar power generation at our own breweries and plants utilizing PPAs
Resilience	<p>Strengthening the supply chain [short to long term]</p> <ul style="list-style-type: none"> Ensuring the stability of the procurement of agricultural raw materials Reduction of Scope 3 emissions 	<p>Enhancement of engagement</p> <ul style="list-style-type: none"> Engagement and appropriate responses based on visits to areas producing raw materials Conducting surveys of suppliers and engagement

Details of business opportunities

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

WHO forecasts

A report from the WHO forecasts that between 2030 and 2050 approximately 250,000 additional people will die each year compared with a world where there is no climate change as a result of factors such as the spread of infectious diseases from the expansion in the distribution of disease vectors. In Japan, the habitat of the *Aedes albopictus*, which carries dengue fever, was confirmed to have spread as far north as Aomori in 2015, and if global warming continues, it appears to be a matter of time before the northernmost limit of its habitat expands to Hokkaido.

Graph 16 shows the results of analysis that we conducted in relation to the impact of the spread of the dengue virus, based on the WHO scenario concerning climate change and the impact on people's health. The number of cases of dengue fever increased by more than 10 times in just under 20 years, from approximately 500,000 in 2000 to over 2.4 million in 2010, and approximately 5.2 million in 2019. We forecast that the total global population at risk of exposure to infection with the dengue virus will increase to a maximum of 4.4 billion by 2030.

Growth in immunity-related product market

In consumer surveys that we conducted in Japan, people's health awareness was most heightened in relation to their "interest in immunity." In response to this issue, we think we can contribute through Foods with Function Claims (FFCs) that "help maintain the immune system in consumer people." Sales in the global market for immunity and health supplements amounted to 19,040.3 million US\$ in 2020, and we forecast that the market will grow by 50% or more, to 28,961.4 million US\$ by the end of 2030 (Graph 17).

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

Heatstroke cases are expected to increase as a result 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°C 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°C 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 global warming.

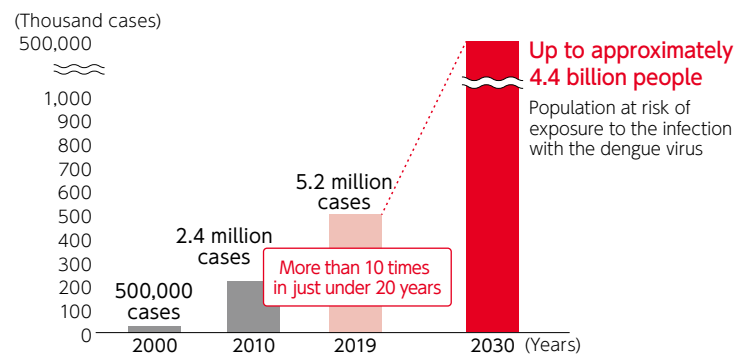
Response strategy

● Contribution to Health Science domain

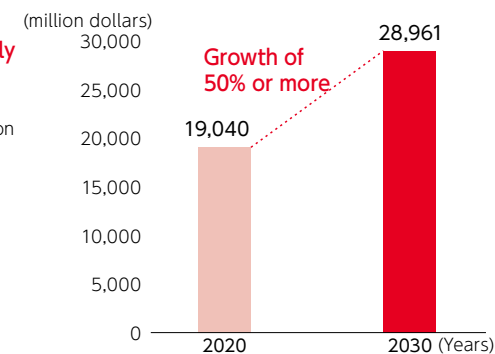
In 2021, we expanded our lineup of FFC products that "help maintain the immune system in healthy people, as we began selling such products under the *Nama-cha* and *Gogo-no-Kocha* brands, which have a high level of brand awareness among consumers, in addition to yoghurt and supplement products. In our BtoB business, annual sales in 2022 were at least four times larger than the previous year, thanks to our licensing and provision of materials to external partner companies in Japan and overseas, as well as the launch of sales of a wide range of products, including snacks, protein, etc.

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 future 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.

16 Number of dengue fever cases reported to the WHO



17 Sales in the global market for immunity and health supplements



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

We think we will be able to contribute by selling products with high brand recognition as beverages that prevent heatstroke. The *SALTY LITCHI* brand is becoming more popular 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.

Details of business opportunities

Products that contribute to decarbonization [medium to long term]

As the momentum of decarbonization grows, there is a possibility that products will be required that contribute to decarbonization or the shift to a low-carbon society.

In Australia and New Zealand, there is a high level of interest in climate change, and carbon-neutral products have become popular with consumers to some extent. Although we cannot say that interest in carbon-neutral products is high in Japan at present, awareness of the SDGs has grown significantly, including progress on their incorporation into study guidelines. As such, we have judged that there is a strong possibility that interest in ethical products will increase in the future.

Response strategy

●Decarbonization products

Lion's *Steinlager* in New Zealand is a carbon zero product certified by the Toitu program. In 2021, we focused on the Toitu carbon zero mark in a marketing campaign, and used *Steinlager's* efforts toward reducing carbon to appeal to consumers.

In Japan, we have judged that consumers do not yet require

decarbonized alcoholic or non-alcoholic beverages, but we have established standards for calculating the carbon footprint for each category of product (Product Category Rule: PCR) for beer and soft drinks, and we think it will be possible to address this need.

[More information→P.73](#)

Details of business opportunities

Social issues related to logistics [short to long term]

By increasing transportation efficiency to reduce GHG emissions, 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. Amid these conditions, a trend has become apparent among truck drivers to avoid long-distance journeys in recent years, and it has become difficult to secure drivers for such journeys. We must solve these logistics issues because it is inefficient to transport products for long distances using trucks, and it increases GHG emissions.

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. For example, in our joint delivery initiative using railroad containers

to transport products from breweries and plants in the Kansai area to the Hokuriku region, we have avoided long-distance truck transportation by completing a modal shift away from long-distance truck transportation equivalent to 10,000 vehicles a year, and we have estimated that this will contribute to reducing annual GHG emissions by approximately 2,700 tons.

[More information→P.71~P.72](#)

Social demands for the shift to lightweight containers and the 3Rs [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.

We can describe beer and soft drinks as products that represent mass production and mass consumption, and they thus use a fairly large amount of containers and packaging, which accounts for a large proportion of costs.

The domestic beverage business uses 125,000 tons of paper containers and 66,000 tons of PET bottles.

●Shift to lightweight containers

As an alcoholic beverage company, we leverage the strength of having our own Institute for Packaging Innovation, where we develop packaging and containers in-house, to promote lighter containers and packaging on a scale unprecedented globally. Our "204-diameter can ends" for aluminum beer cans have reduced weight by approximately 29% for 350ml cans compared with when we used "209-diameter can ends."

We also use beer bottles that reduce weight by 21% for large bottles

and 19% for medium-size bottles compared with conventional bottles. "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%.

The introduction of smart-cut cartons 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.60~P.62](#)

Details of business opportunities

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.

With demand expected to fall in the future, a demand gap has occurred as producing countries have avoided investment in fossil fuels, resulting in a spike in prices of fossil fuels. Producing countries are concentrated in places with high geopolitical risk, so reducing our reliance on fossil fuels will contribute to reducing risk.

Securing of energy that can be controlled [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 in the future as demand for renewable energy increases.

Response strategy

● Achievement of our energy mix

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 reliance on fossil fuels directly by reducing our use of natural gas, and also 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.33, P.70](#)

● 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 (excluding the Yokohama Brewery), and we have completed installation at all breweries. 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 renewable energy power plants can reliably add renewable energy, without any negative impact on the local community, while at the same time increasing resilience because it is possible to use it in a stable manner.

[More information→P.33, P.69](#)

Details of business opportunities

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 together with the producing areas, 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 are conducting detailed surveys related to the reduction of Scope 3 emissions, in addition to making requests and performing checks based on the Sustainable Supplier Code. We intend to base our engagement with stakeholders on the results of these surveys, and take steps to jointly solve issues as we target decarbonization.

Systemic risk

Details of systemic risk

The collapse of ecosystems owing to inconsiderate transition plans

The use of edible crops for biofuels as a source of renewable energy may compete with their use for food. The inconsiderate construction of renewable energy power plants may cause the deforestation of precious forests, resulting in landslides and flash floods when there are typhoons and heavy rainfall.

Ecological loss from accumulation

In joint research with National Agriculture and Food Research Organization (NARO) in Japan Wine vineyards, we found examples of a complete loss of ecosystems in vineyards with pergolas where weedkillers have been used continuously for many years. We have found that when we convert such places into hedgerow-style vineyards, ecosystems do not easily recover, even if there are abundant ecosystems in adjacent fields.

The spread of destruction of natural capital

The sudden import ban on chemical fertilizers and agricultural chemicals in Sri Lanka in the first half of 2021 (which was later withdrawn) led to a decline in harvests of many agricultural products, and significantly damaged the economy, which was already vulnerable. The effects have yet to surface, but land use change from tea farms to planted forests for producing timber, rubber farms, etc., and indirect land use change owing to a decline in harvests per unit land area may lead to deforestation. Without sufficient preparation, the transition to organic farming will weaken agriculture itself and result in destruction to nature in the area surrounding agricultural land.

Strategy

●Responsible approach

In transition plans related to climate change, the Kirin Group considers ways to avoid any negative impact related to other environmental issues, such as “biological resources” and “water resources.”

When introducing renewable energy, our basic policy is to “responsibly introduce renewable energy.” When procuring renewable energy, we select that which “causes no harm to the environment and does not violate human rights when power plants are constructed and fuel is procured.” We set forth examples of expected risks in relation to each source of power, including solar power, wind power, and biogas, and we evaluate these risks in

●Scientific approach

In ecological surveys with NARO, we found that converting idle farming land into hedgerow-style vineyards for Japan Wine enriches ecosystems. At the Mariko Vineyard (Ueda City, Nagano Prefecture) and Jyonohira Vineyard (Koshu City, Yamanashi Prefecture), we have found endangered species listed in the Red Data Book of the Ministry of the Environment, Japan. Although these vineyards do not use organic farming, we confirmed that there is no negative impact on nature around the vineyards. Going forward, we will continue scientific research and surveys, while cultivating grapes in ways that contribute to nature, including activities to regenerate vegetation. When supporting the acquisition of Rainforest Alliance certification by tea

●Holistic approach

In Sri Lanka, the quality of organic fertilizers introduced in place of chemical fertilizers was often poor, making them unusable. It could be said that efforts to transition to organic agricultural methods without preparation did not just harm agricultural production and ecosystems, which were interrelated and worked together to ensure stability, but also harmed the economy.

We believe that the study of climate change and natural capital, as well as a holistic approach are necessary to address the risk that one type of damage will spread to other types of damage and result in significant damage to ecosystems in this way. When promoting our responses, the Kirin Group has kept in mind the fact that environmental

advance. At present, for the most part, there are no standards related to competition between renewable energy and foodstuffs, and the EU alone imposes certain restrictions when there is an impact on biomass used for food or indirect land use change (when precious forests are converted into farmland owing to the displacement of the production of crops from land where they were originally cultivated for the production of biofuel crops). Taking into consideration the lack of clear standards for making an assessment, we have lowered the priority of the use of renewable energy from biomass.

farms in Sri Lanka, we request that tea farms comply with a white list of agricultural chemicals that have been scientifically confirmed as safe for humans and having no negative impact on the natural environment. We also request that tea farms use no more than a certain amount of agricultural chemicals determined in standards, and take records. We provide training concerning the appropriate use of fertilizer. We will provide continuous support toward the acquisition of certification and enhance our engagement with local communities, as part of efforts to enhance the sustainability of producing regions as a whole.

[More information→P.46~P.47](#)

issues are strongly interrelated. We think we have developed a deeper understanding through our scenario analysis based on the TCFD recommendations. It is not easy, however, to understand the relationship between various environmental issues, and in reality, the measures we can take are limited. Therefore, at the Kirin Group, we prioritize activities based on engagement with various stakeholders, such as consortiums with NGOs and other companies, collaboration with local communities, and participation in global initiatives. By participating in the TNFD and N and contributing to rulemaking, we will further develop our holistic approach.

[More information→P.27](#)

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- Other than barley: We calculated the impact using rates of change in costs associated with agricultural products from climate change (impact on yields) and mitigation measures (carbon pricing), as indicated in the results of research from Hasegawa et al., and presented in the IPCC "Special Report on Climate Change and Land (SRCCL)"
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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°C" as our new 1.5°C 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°C 2.5.2.1 Price of carbon emissions).
- 5) We calculated the 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.

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- 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.