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.

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 Koiwai 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℃ or 1.5℃ scenario), we have mainly used SSP1 and RCP2.6, whereas in Group Scenario 3 (4℃ 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℃ of SBT from the previous 2℃ 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℃ 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 Date 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℃ Scenario. SSP3, RCP8.5	Kirin Group Scenario 1 2℃ or 1.5℃ Scenario. SSP1, RCP2.6
Scenario		Laws and regulations related to climate change are strict in developed countries, but insufficient globally, resulting in failure to achieve the required reduction in GHG emissions. Higher temperatures, droughts and heavy rains, and reductions in daily temperature ranges lead to significant decreases in the yield and quality of agricultural products. Natural disasters caused by climate change also become frequent and severe. The financial impact on companies of compliance with laws and regulations and energy usage is small, but it becomes difficult to use low-cost, high-quality natural capital. Global warming also leads to an increase in infectious diseases, heatstroke, etc.	Governments around the world enact strict laws and regulations related to climate change, resulting in a sufficient reduction in GHG emissions. The rise in temperature is curbed, natural disasters do not increase much more than current levels, and the impact on agricultural yields is also limited. Natural disasters do not change significantly from current levels. The financial impact on companies of compliance with laws and regulations and energy usage is large, but the cost of using natural capital is acceptable. The impact of global warming on health is minimal.
Analysis results		●Significant decline in yields of major agricultural products. Possible decline in quality. Increase in procurement costs. ●Damage to agricultural production areas, production stoppages, and delivery difficulties due to floods and droughts caused by climate change. ●The increase in energy costs and agricultural prices due to carbon taxes is minimal. ●There is major harm from infectious diseases and heatstroke due to global warming.	●The impact on yields of agricultural products and procurement costs is minimal. ●The impact of floods and droughts caused by climate change on agricultural production areas, production, and delivery is minimal. ●The impact of energy costs and agricultural prices due to carbon taxes is major. ●The impact of infectious diseases and heatstroke due to global warming continues.
Scientific basis	Agricultural products	a.Decreases in global beer supply due to extreme drought and heat, Nature Plants, VOL.4, NOVEMBER 2018, 964–973(Xie, etal.) 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, HavlíkP, 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, HavlíkP, 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℃ Scenario: IPCC Special Report on Global Warming of 1.5℃)	

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.

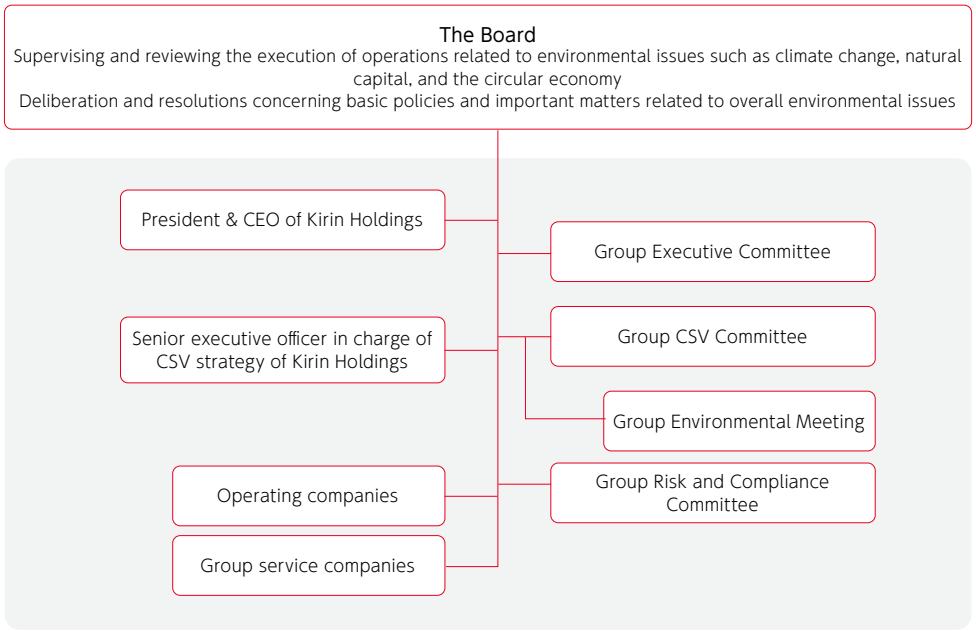
Starting from our medium-term plan in 2022, performance-linked remuneration for senior officers reflects the target achievement rate for non-financial indicators, as an incentive to promote the medium- to long-term business plan. With regard to climate change, we have set a mid-term target of a "23% reduction in GHG emissions by 2024" to achieve our "SBT for 1.5℃" target, and in relation to both climate change and natural capital, we have set targets for the efficiency of water use at production sites and breweries with high levels of water stress. 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.

	Roles and authorities	Members	Frequency	Achievements
The Board	●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	●Chair: non-executive director ●Independent 7, Executive 5	4 times a year + as needed (monthly for risk monitoring)	●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	●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	●Convened and chaired by the CEO, Kirin Holdings Company, Limited. ●Executive officers of Kirin Holdings	Approximately 30 times a year	●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	●Discussion of CSV policies, strategies, plans, targets, KPIs, and materiality across the Kirin Group, including those related to the environment	●Chair: CEO of Kirin Holdings ●Executive officers of Kirin Holdings ●CEOs of the Group's major operating companies in Japan and overseas	Three times a year	●Discussion of non-financial disclosure policies, strategies, and plans, including those related to the environment ●Reviews of ESG assessments and deliberation of enhancements
Group Environmental Meeting (Working Group on the Environment under the Group CSV Meeting)	●Formulation of policies, strategies, plans, targets and draft KPIs for the four environmental issues (climate change, water, containers and packaging, and biological resources)	●Chair: Executive officer in charge of CSV of Kirin Holdings ●Executive officer in charge of SCM strategy, General Manager of CSV Strategy Department, General Manager of Corporate Strategy Department, General Manager of Finance Department, General Manager of Procurement Department, General Manager of Corporate Communication Department, General Manager of IR Section, General Manager of Research & Development Division, and General Manager of Technology Development Department*1	Twice a year	●Formulation of draft plans for fiscal 2023 concerning the four environmental issues
Group Risk and Compliance Committee	●Deliberation of fiscal year policies concerning group risk management, including risks related to the environment, and important risks for the Kirin Group ●Monitoring risk and compliance projects and responding to sudden incidents	●Chair: Executive officer in charge of legal affairs of Kirin Holdings ●Executive officers of Kirin Holdings	Twice a year + as needed	●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.

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/conpensation/

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/

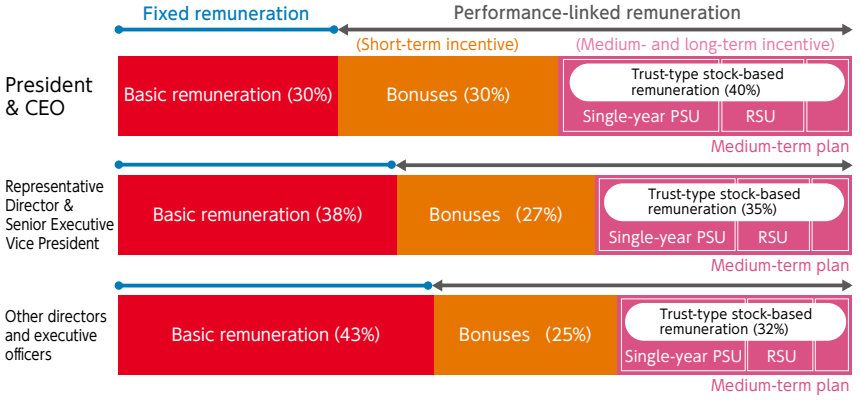
Structure of executive remuneration

Medium-Term Business Plan Management Targets = **Financial indicators**: ROIC, Normalized EPS + **Non-financial indicators**: Environment, CSV Commitment, Employee engagement score

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.

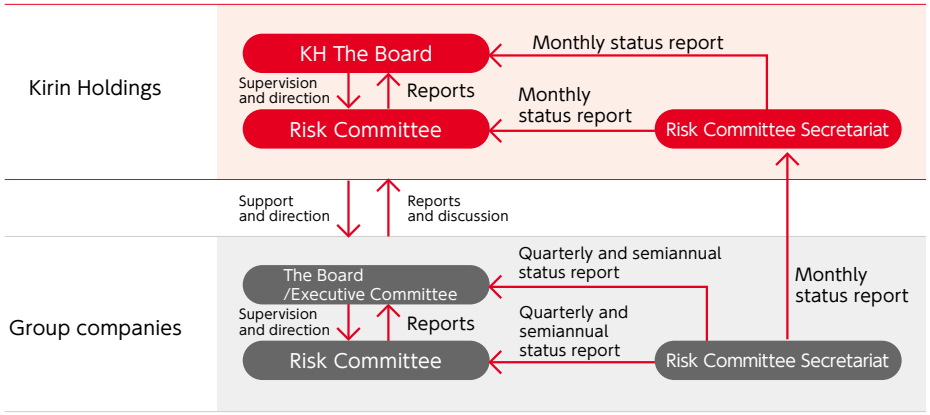
*1 Please see "Identification of Materiality" (→P.8) for details concerning the identification of materiality for risks and opportunities, including environmental issues such as climate change.
*2 Details of our "risk management system" are disclosed below.
https://www.kirinholdings.com/en/purpose/governance/risk_management/

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

*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

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)	■	■		・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)		■	■	・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)			■	・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	■	■		・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	■	■		・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)	■	■		・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)	■			・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)	■	■		・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	■			・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)	■	■		・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	■	■		・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	■	■		・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)	■	■	■	・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	■	■		・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	■	■	■	・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)		■	■	・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)		■	■	・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 (SRCCL)."
- 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℃, 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, Koiwai 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℃ scenario: Approx.1.1billion yen to 3billion yen(2050) 4℃ scenario: Approx.3.2 billion yen 10.4billion yen(2050)
	Transitional risks*1	Financial impact of energy due to carbon prising	1.5℃ scenario: Approx.10.6billion yen to 475.6billion yen(2030) 2℃ scenario: Approx.7.7billion yen(2030) 4℃ 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℃ 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℃ 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 *Kirin Gogo-no-Kocha* 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 *Kirin Gogo-no-Kocha*. 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 Aqueduct. 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

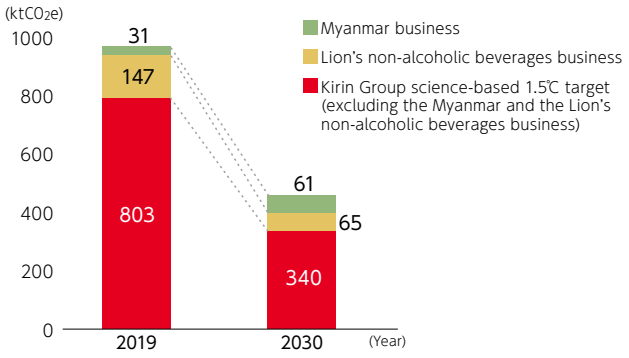
Prepare Contributing to Nature Positive and 30by30. Widely publish joint research results in academic papers, environmental reports, and on the Web.

*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

Resilience Assessment

Scenario analysis related to climate change

Physical risk

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℃ 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℃ 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).

There are many examples of forecasts of a significant impact on tea leaves in India, Africa, and Sri Lankan lowlands, as well as declines in yields of 10% or more for barley and hops. The impact is severe for coffee beans, with yields in some countries and locations expected to fall by more than 50%.

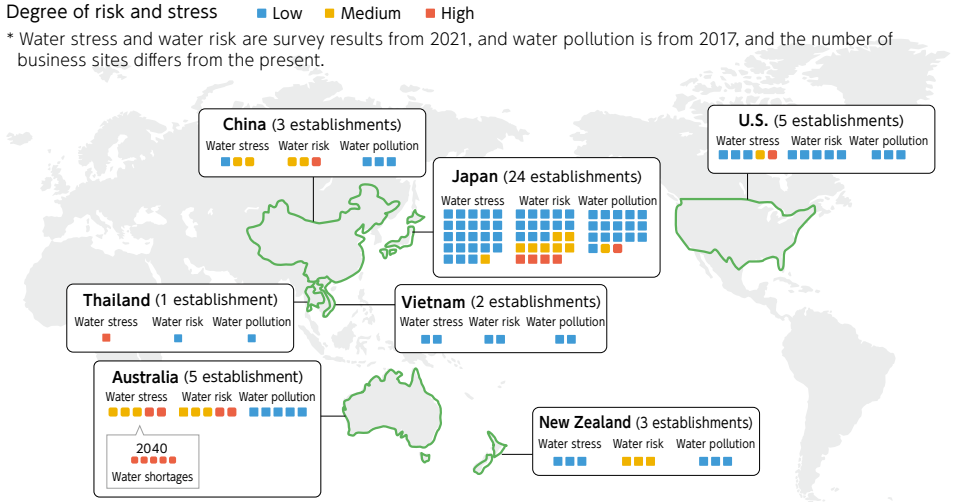
Even more serious is the impact of water risk and stress in areas producing agricultural products. In 2050, water risk will be “High” or “Extremely High” in most of our production areas, with the exception of Japan and New Zealand, and we expect impacts in areas such as the quality of agricultural products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

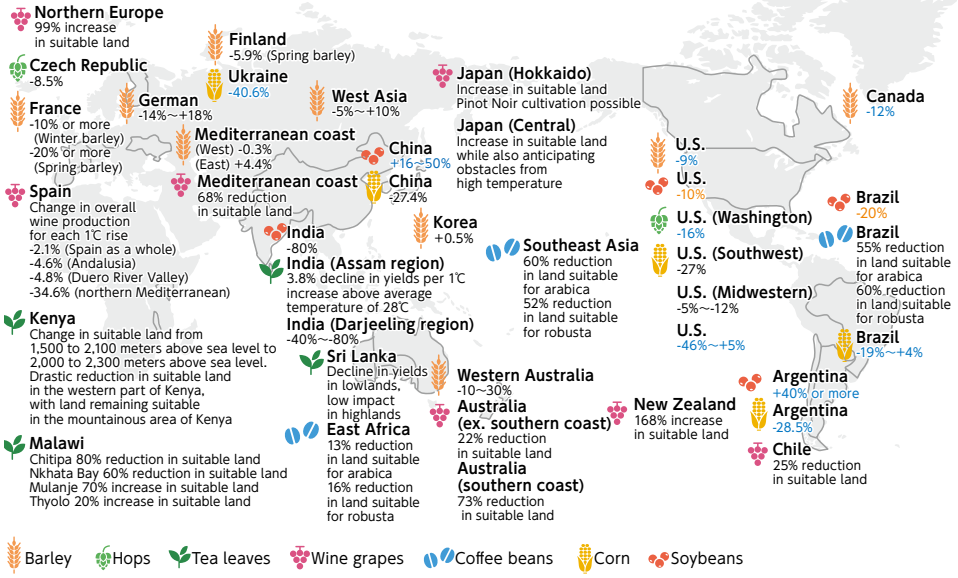
In Australia, both water risk and water stress are high, and we are constantly subject to the impact of droughts. Under these conditions, Lion's Castlemaine Perkins Brewery in Brisbane was impacted by large-scale flooding in March 2022 as a result of widespread heavy rains in eastern Australia, following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

Water risk and stress at production sites



Impact of climate change on yields of key agricultural products

(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

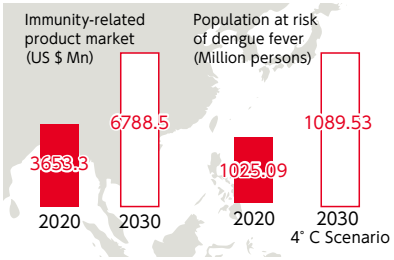
Scenario	2℃ scenario	4℃ scenario
Procurement costs from lower agricultural yields	Approximately 1.1 billion yen to 3.0 billion yen	Approximately 3.2 billion yen to 10.4 billion yen
Energy costs from carbon pricing (If we do not take measures to reduce GHG emissions)	Approximately 11.4 billion yen	Approximately 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 bellow:
・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℃ 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℃ 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

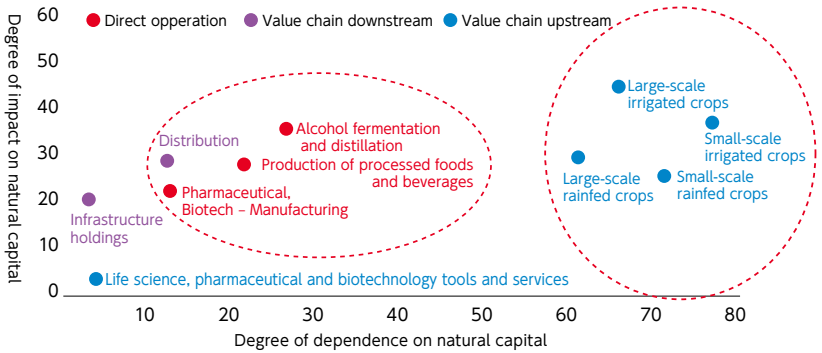
Analysis of Risks and Opportunities Related to Natural Capital

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.

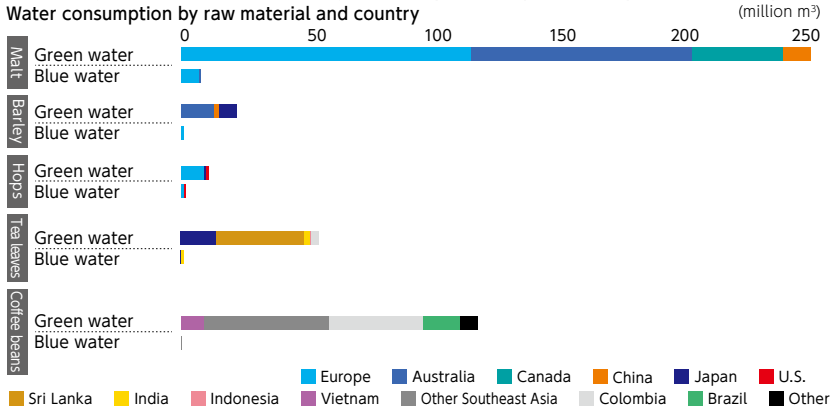
Degree of dependence and impact on natural capital in the Kirin Group's value chain

(Quantification and mapping of the degree of dependence and impact on natural capital using ENCORE's database)



Water usage in the value chain for agricultural products procured by the Kirin Group

Water consumption by raw material and country



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.

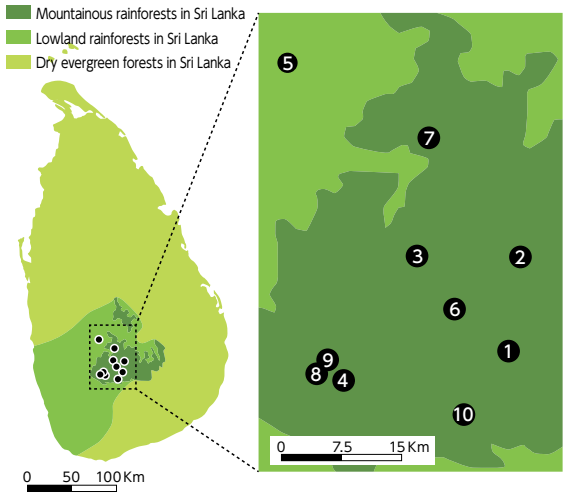
We have been using Sri Lankan tea leaves in Kirin *Gogo-no-Kocha* for more than 30 years since this product's release, and we use this fact in our marketing. Compared with many other products, this product could be described as extremely dependent on the area where raw materials are produced.

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

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 asesses of 10 targeted farms.

Mountainous rainforests in Sri Lanka		Lowland rainforests in Sri Lanka
■■■■■■■■■	Applicable number of farms studied	■
Uva, Nuwara Eliya, Dimbula	Tea farm regions	Kandy
●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	●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
●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	●Ecosystem damage by illegal logging of natural forests
●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	●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$_T$ (threat mitigation score), STAR$_R$ (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)

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, famers 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	●Decline in yield due to lower water supply ●Conflict over water rights with local communities	●Ensuring the availability of sustainable water by protecting water sources	●Conservation activities for water sources on farms
	Genetic Material			
Regulating and maintenance services (Functions to aid production)	Water purification			
	Flood mitigation	●Decline in yield due to poor drainage ●Occurrence of disasters	●Flood mitigation and improvement in drainage as Nature-based Solutions ●Improvement of water source recharge function	●Appropriate wastewater treatment in farms, factory and residence areas.
	Soil quality regulation			
Regulating and maintenance services (Protection from impact)	Soil and sediment retention	●Decline in fertility and yield due to soil runoff ●Occurrence of disasters	–	●Cover crops on the farm lands
	Local climate regulation	–	–	
	Biological controls (pest controls, etc.)	●Disease outbreak/ expansion	●Reduced use of pesticides based on "Nature-based Solutions (NbS)	●Planting plants that pests don't like

Risks and opportunities related to "impact"

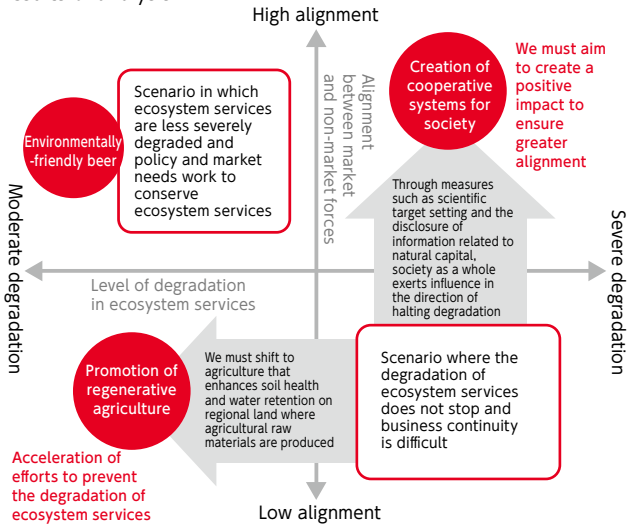
Category	Impact drivers	Risks	Opportunities	Existing activities*2
Use of ecosystems	Land ecosystem use	●Loss of biodiversity through land use	●Preventing deforestation through proper land use and improved agricultural practices	●Ban on deforestation, cover crops, pesticide and fertiliser management
Use of resources	Water use	●Depletion of water resources due to overuse ●Conflict over water rights with local communities	●Maintaining the availability of sustainable water and protecting yields by protecting water sources	●Conservation of Water Sources in Tea Farms
Pollution	Soil pollution	●Long-term environmental pollution caused by the use of chemical fertilizers and pesticides ●Short-term decline in yield due to pesticide regulations	●Use of organic fertilizers to improve the environment and protect yields	●Appropriate use and recording of pesticides and chemical fertilisers
	Solid waste	–	–	●Waste management
	Water pollution	–	–	●Appropriate wastewater treatment in farms, factory and residence areas.
Climate change	Greenhouse gas emissions	–	–	
Invasive alian species, etc.	Disturbance	–	–	

*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.

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 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 March2023. 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

Scenario analysis axes proposed by the TNFD and results of analysis



※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 CO_2, 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	●Sharing flood knowledge ●Equipment and facility measures against flooding ●Sharing drought knowledge ●Development and deployment of water usage reduction technology		●Brewing technology that does not rely on barley ●Mass plant propagation technologies ●Support for farms to acquire certification for sustainable agriculture	●Carbon storage ●Biofuel	●Promotion of PET-to-PET ●Creation of more lightweight containers	●Reduce GHG emissions in Scope1 and 2 ●Reduce GHG emissions in Scope3	●Provision of products to address this issue	●Provision of non-alcoholic beverages that prevent heatstroke
Progress	●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	●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	●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	●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)	●Enhancement of product lineup ●Supply of materials to partner companies	●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	●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.	●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).	●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.	●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	●Continued developing applications for bag-type culture vessel technology, which enables mass plant propagation with a minimal amount of water.	● Introduced advanced water treatment using reverse-osmosis membranes at Lion, where water stress levels are high.	●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.	● 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

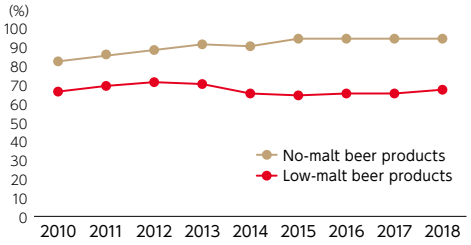
In scenario analysis related to climate change, we have utilized multiple research findings and included differing views, but taken as a whole, scenario analysis shows that the impact of climate change on agricultural products and water is inevitable. Although we have judged that there will be no major 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 flacvoring 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 requestsare 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 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.

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)

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 companies in Japan and overseas and companies outside the Group.


Institute for Packaging Innovation


Bag-type culture vessel system

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

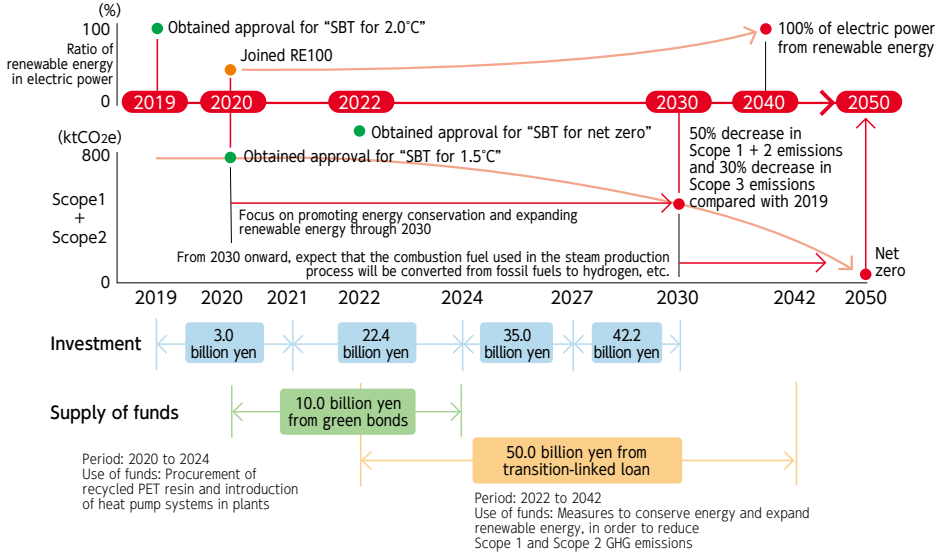
Net zero transition plan

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.

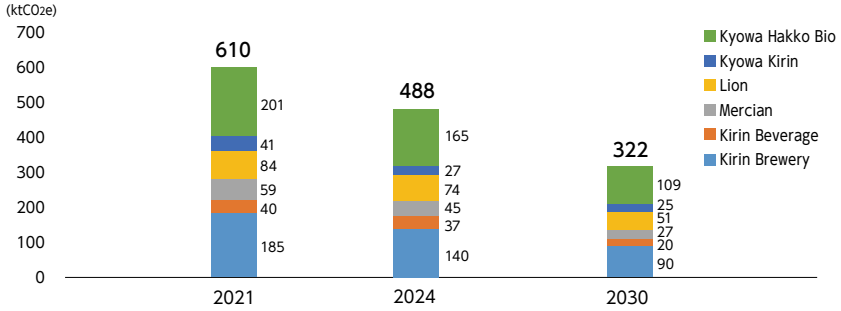
Reduction of Scope 1 and Scope 2 emissions

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.”

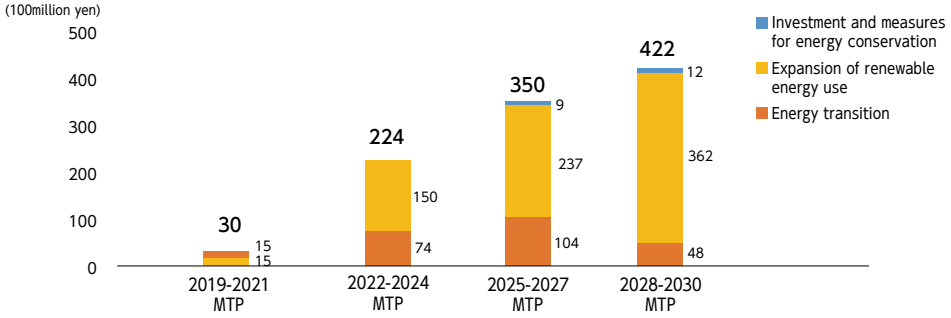
Roadmap to net zero



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

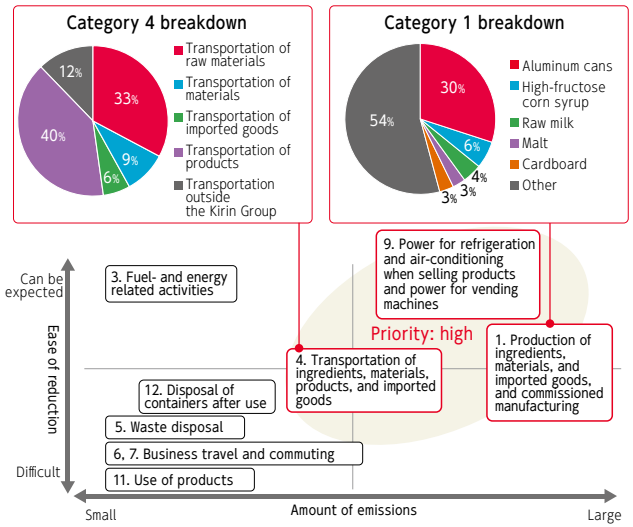
Investment plans related to net zero

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.

Scope 3 priority targets and emissions ratios



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

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

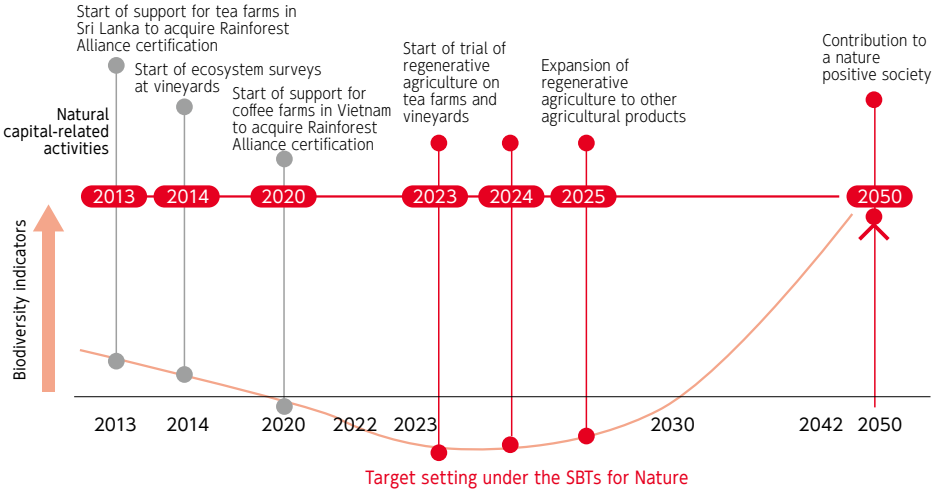
However, because the state of natural capital as well as our businesses' dependence and impact on it vary greatly depending on the location, it is difficult to consider the whole picture, and we must begin by exploring, analyzing, and evaluating the interfaces between our businesses and nature. Therefore, 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.

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/

Transition plans related to containers and packaging

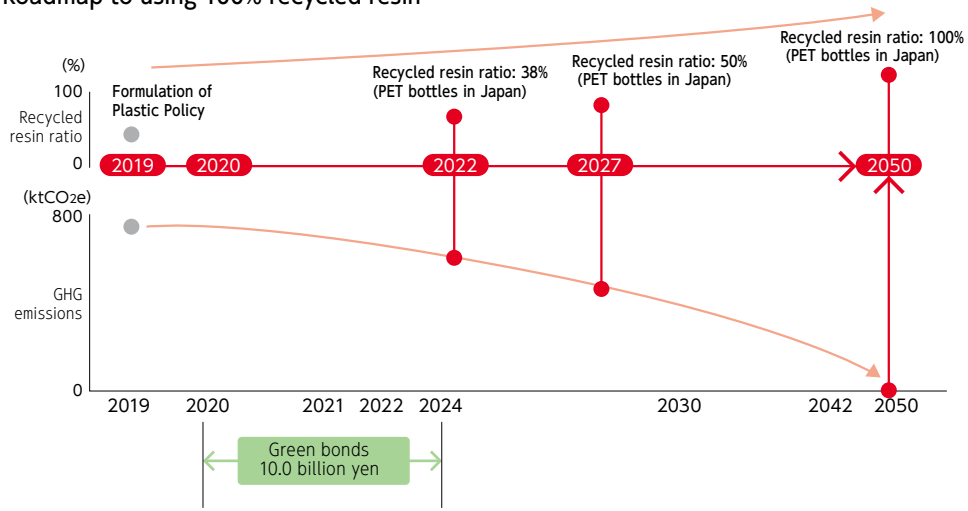
Roadmap to using 100% recycled resin

The Kirin Group has formulated a new vision, "Kirin Group Environmental Vision 2050,"a 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.

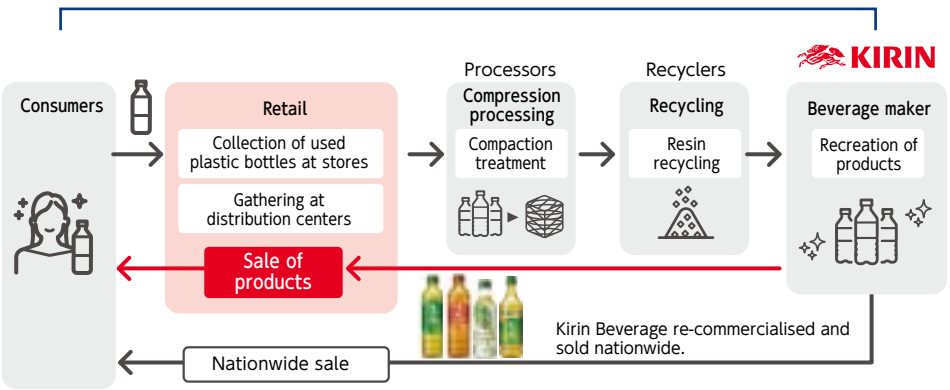
Roadmap to using 100% recycled resin



Period: 2020 to 2024
Use of funds: Procurement of recycled PET resin and introduction of heat pump systems in plants

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)	4,876ktCO2e
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)	4Large 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

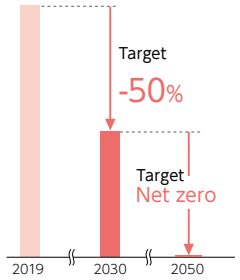
Targets related to containers and packaging	Target	Achievements
Percentage of recycled resins used in PET bottles	50% (2027)	8.3%
Percentage of FSC-certified paper used for paper containers in the domestic beverage business	Mintain 100%	100%

Investment plans and fundraising

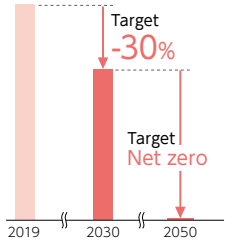
Climate-related capital investment in the 2019 medium-term plan (2019 to 2021)	3.0 billion yen
Total amount allocated from green bonds in 2022 (cumulative)	5.4 billion yen
Climate-related capital investment in the 2022 medium-term plan (2022 to 2024)	22.4 billion yen
ICP(Internal Carbon Pricing)	¥7,000/tCO2e

Target

Total emissions targets for Scope 1 and Scope 2 *1



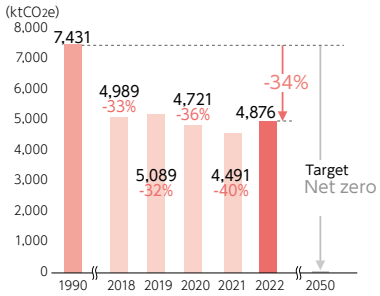
Scope 3 emissions target *1



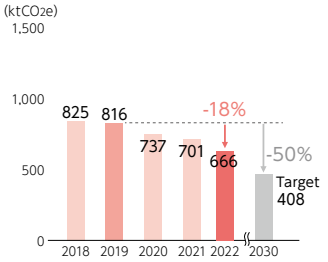
*1 In December 2020, we upgraded our previous "SBT for 2°C" target, and received approval for our "SBT for 1.5°C" target.

Progress

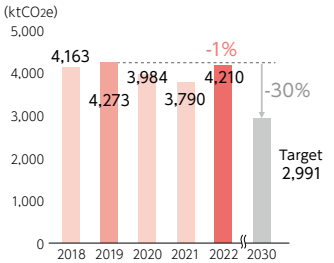
GHG emissions across the whole value chain



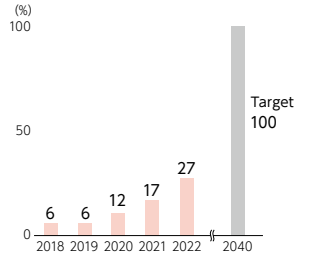
Progress towards medium-term GHG emissions reduction targets
Total emissions for Scope 1 and Scope 2



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	4,970km³
	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	16,714km³
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

*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