



# Water Resources



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## Background to initiatives

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

## We will create together

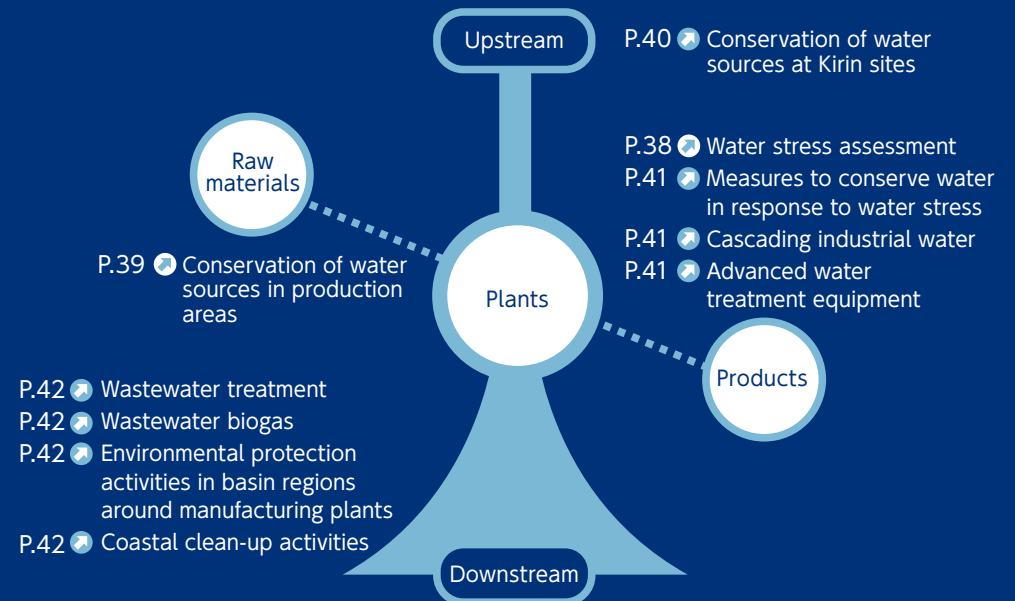
## A society that values sustainable water resources



Bring water, used as a raw material, to a sustainable state



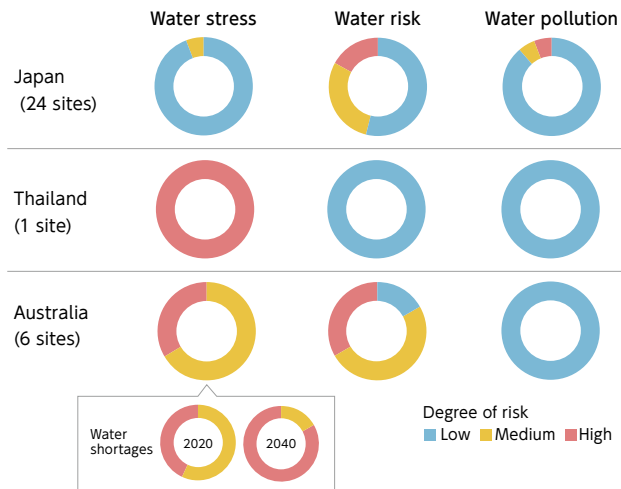
Solve issues with water in a way that suits the characteristics of basin regions where our business bases are located



## Points

- We had completed the conservation of water sources at 12 locations in tea farms in Sri Lanka as of the end of 2021, and we are currently implementing conservation activities at 2 more locations.
- We are participating in the Corporate Engagement Program held by the Science Based Targets Network to develop scientific approaches and rules for setting targets related to water resources.
- In our third group-wide water risk survey, we reaffirmed that water stress is high in Australia and Thailand, and that water risk is high in China, Australia, and Japan.

## Risk assessment of water resources

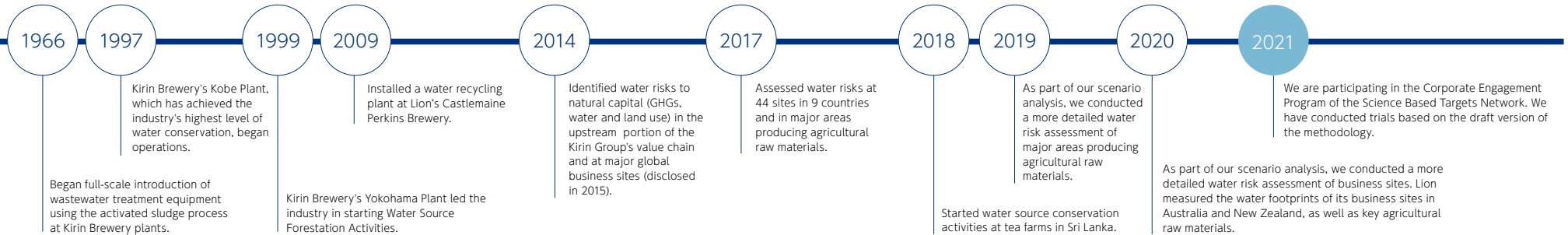
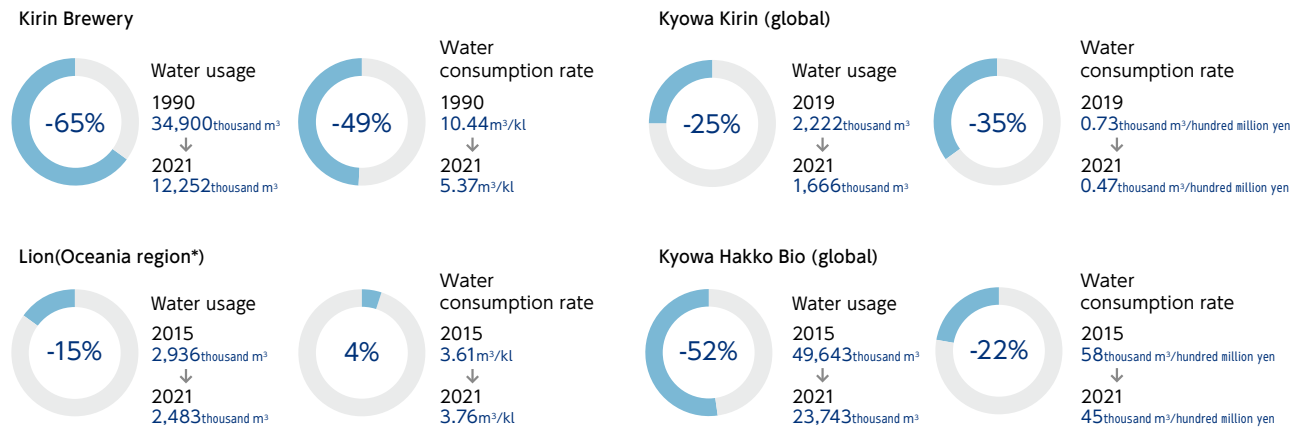


More information on water risk assessments of business sites→P.81

## Overview of initiatives

Initiative	Issue	Progress
Initiatives to achieve our vision	Risk assessment	We conducted new water risk surveys for two brewing sites at New Belgium Brewing from 2021 to 2022. We also identified our water footprint in relation to key agricultural raw materials.
	Rule making	We are participating in the Corporate Engagement Program of the Science Based Targets Network.
	Kirin Brewery	In 2021, Kirin Brewery reduced unit water consumption by 49% (compared with 1990), and reduced water usage by 65%.
Bring water, used as a raw material, to a sustainable state	Lion	In 2021, Lion increased unit water consumption by 4% (compared with 2015), and reduced water usage by 15% (Oceania region*).
	Kyowa Kirin (global)	In 2021, Kyowa Kirin reduced unit water consumption by 35% (compared with 2019), and reduced water usage by 25%.
	Kyowa Hakko Bio (global)	In 2021, Kyowa Hakko Bio reduced unit water consumption by 22% (compared with 2015), and reduced water usage by 52%.
	Domestic water source forestation	In 2021, we only conducted conservation activities in two locations as a result of the spread of COVID-19. In 2019, 1,192 people participated at 12 locations nationwide.
Solve issues with water in a way that suits the characteristics of basin regions where our business bases are located	Value chain upstream	We had engaged in water source conservation activities at Sri Lankan tea farms in 12 locations through the end of 2021, since commencing these activities in 2018, and activities are ongoing at two locations. We will continue these activities after 2022.
	Response to torrential rain	In response to disruptions to logistics networks caused by the 2018 West Japan Torrential Rain Disaster, we prepared a manual for responding to similar disasters. In 2019, we successfully minimized the impact of Typhoon Faxai and Typhoon Hagibis.

## Progress



\* This region covers the Oceania region where Lion conducts business activities, excluding New Belgium Brewing.



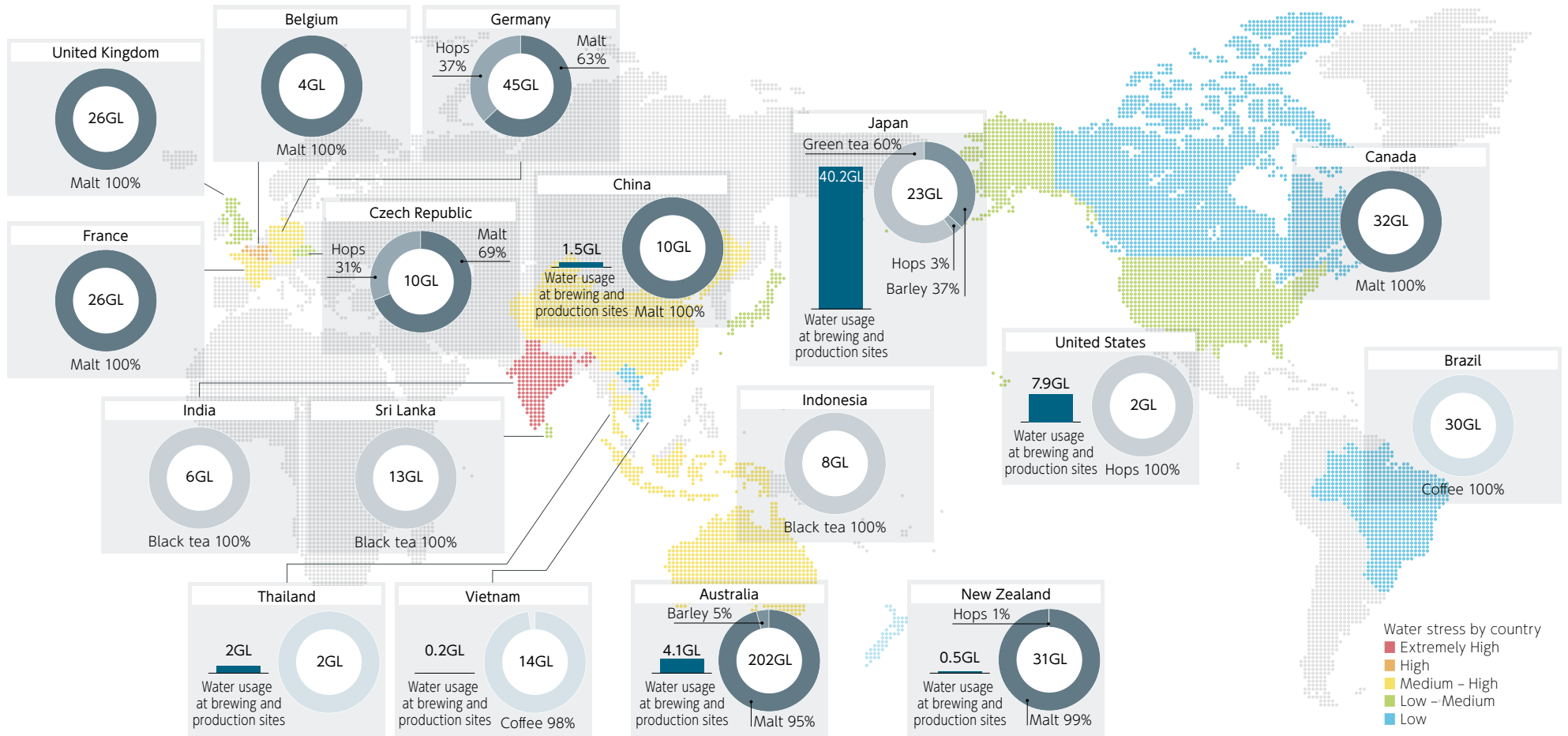
# Water stress (drought) assessment

The Kirin Group uses a large amount of water for applications such as cleaning pipes in brewing and production processes. Water is also essential for agriculture to produce agricultural raw materials, which uses more water than the brewing and

production bases of Group companies. It is not easy to respond to water resource issues in the upstream of the value chain, but we start by identifying water risk and water stress and understanding the issues.

Below, we have shown water stress by country with the colors on the map, water usage at brewing and production sites in each country with bar graphs, and water usage in areas producing agricultural raw materials with pie charts.

[More information on water stress at basins for brewing and production sites→P.81](#)



The survey of agricultural raw materials covered barley, malt, and hops that Kirin Brewery and Lion sourced, and green tea, black tea, and coffee that Kirin Beverage sourced (data for Kirin Brewery and Kirin Beverage are as of 2021; Lion data is as of 2018). Water stress due to drought is based on the country score for Baseline Water Stress used in WRI Aqueduct.



# Conservation of water sources in production areas

## Water resource issues in the upstream of the value chain

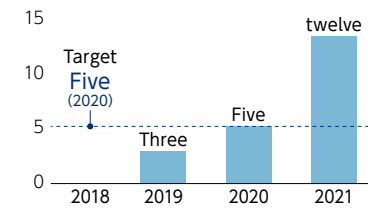
As a first step in solving water issues in areas where we source our agricultural raw materials in the upstream of our value chain, the Kirin Group began water source conservation activities at Sri Lankan tea farms in 2018. The COVID-19 pandemic resulted in difficulties for our activities, but as of the end of 2021, we had completed conservation activities at 12 sites, and we are currently implementing conservation activities at two more sites. We have provided group training to 1,750 people living near water sources in order to support understanding of the necessity of conserving water sources. In addition, we have distributed pamphlets on water conservation and basin protection to 15,000 residents as part of measures to raise awareness.

## Conservation activities for water sources on tea farms

In a 2017 assessment of water risks and water stress in the value chain and scenario analysis in 2019, it was evident that climate change will cause water stress and flood risks to increase in areas producing agricultural raw materials in the future. It is not easy to respond to water resource issues in the upstream of the value chain. Therefore, the Kirin Group decided to start addressing this issue with Sri Lanka, where we have been providing assistance for obtaining sustainable tea farm certification, and where we have developed strong partnerships with local tea farms and NGOs. As such, we are working to accumulate knowledge in this area. At the tea farms in the Sri Lankan highlands, there are many

areas with tea trees on steep slopes. In such places, it is said that the level of water recharge is not high because even if it rains, the rainwater flows down the slope. In places with good conditions such as strata, however, rainwater penetrates into the ground and gushes out as springs in certain places in tea farms. These places are known as micro watersheds. Micro watersheds on tea farms can be found in the highlands of central Sri Lanka, and, in almost all cases, they are headstreams of rivers flowing through coastal cities. For this reason, while they occupy only a tiny area, they are very precious water sources. In our yearly efforts to engage with local farms managers, we learned that although the Sri Lankan government went as far as mapping micro watersheds in order to support understanding of their importance and make them easier to conserve and manage, these efforts were held up owing to a lack of funds. Therefore, in order to further enhance the sustainability of tea farms whose acquisition of certification we supported and the surrounding areas, we began activities to conserve water sources at farms in 2018. These activities involve fencing off micro watersheds of the farms so that they are not used for other purposes, and planting unique regional native species around them. This provides a diversity of vegetation at tea farms, which have a single crop, and prevents soil from flowing down the mountain slope into water sources as a result of torrential rain, etc.

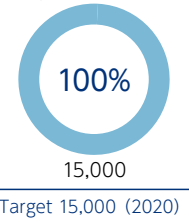
Number of areas where water sources were conserved among Sri Lankan tea farms



## Education programs to teach the value of water

Owing to the history of large Sri Lankan tea farms, going back to when the plantations were first established under British colonial rule, many people still live on the vast tea farms who make a living by doing work that has nothing to do with the tea farms themselves. These residents have been generally allowed to use empty plots that are not being used to grow tea for their living. For this reason, there have been cases in which these residents, not recognizing the micro watersheds as water sources, have converted those areas to vegetable patches or grazing pasture, or have cut down the trees around the watersheds for firewood. In order to protect the water sources, instead of merely fencing off the micro watersheds to keep the tea farms' residents away, there is a need to educate them that those areas are water sources that we should protect. The Kirin Group is conducting an education program to teach residents living near target water sources about such matters as the importance of water and the functions of micro watersheds. At some farms, we are also working to incorporate our educational programs as part of the curriculums of day care centers and elementary schools attended by the children of tea pickers, etc.

Number of residents to educate about the importance of water



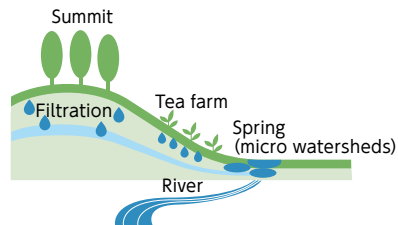
Flyer for water education

## Contribution to water-efficient agriculture

The bag-type culture technology that Kirin has developed for the practical application of mass plant propagation technology is expected to be used in water-efficient agriculture. With the resin film-based bag-type culture vessel system, we allow plants to grow by aerating a solution containing nutrients necessary for plant growth inside a small bag, making it easier to use water more effectively than in soil cultivation. This system may have applications in cultivation in dry areas, for example.

[More information on mass plant propagation technology→P.33](#)

Mechanism of micro watersheds



Tea bushes planted on steep slopes



A fenced off micro watershed



A stream in a tea farm

# Conservation of Kirin water sources

## Water source forest conservation activities

Our Water Source Forestation Activities, which are an activity to protect the water sources of our breweries and plants, began in the forest of the Tanzawa district of Kanagawa Prefecture, which is the water source for Kirin Brewery's Yokohama Plant in 1999. We have since adopted this initiative, which was a pioneering initiative in the industry, in 11 locations across Japan. Under medium and long-term agreements with the local governments and other relevant parties that manage the water source forests, the program includes tree planting, undergrowth cutting, pruning, and thinning. Today, many of the forests are bright, luxuriant forests. In some locations, some of our customers have volunteered to take part in the activities. In 2019, 1,192 people participated in a total of 15 activities, but starting in 2020, we ceased our activities in most locations in response to the COVID-19 pandemic. At the end of 2020, scoria terrain particular to Mt. Fuji crumbled and fallen trees, etc., were found in the Kirin Mt. Fuji water source forest, a water source for Kirin Distillery. Accordingly, in 2021, Tsuchi ni Kaeru Ki Forestation Society (NPO), Shizuoka Prefecture, Gotemba City, and Kirin Distillery concluded the "Shizuoka Future Forest Supporter Agreement," and began forestation activities covering a total of approximately 2.7 ha, including not only the water source forest but also the Takane Regeneration Forest nearby. In 2021, 70 employees planted trees, and 11 junior high school students from the Gotemba Special Needs School Junior High School planted trees and learned about the forest environment.

At the Kyowa Hakko Bio Yamaguchi Production Center, we engaged in activities that were possible even amid the COVID-19 pandemic, such as the participation by eight employees in forest conservation activities organized by the Water Utilization Council at water intake sites.

### Voice of Stakeholder

"Forestation" helps store water, prevent soil runoff, absorb carbon dioxide, and contribute to mitigating climate change through the promotion of forest maintenance activities such as planting seedlings, clearing undergrowth, cutting, thinning, and regeneration cutting. At the Kirin Mt. Fuji water source forest, in 2021, Kirin Distillery, Tsuchi ni Kaeru Ki Forestation Society (NPO), Gotemba City, and Shizuoka Prefecture concluded the "Shizuoka Future Forest Supporter Agreement." With the support of the local government, we are working to create forests for passing on people's wishes and the rich natural environment to future generations.

Tsuchi ni Kaeru Ki Forestation Society (NPO)

## Grassland conservation activities to recharge groundwater

In the "Aso Area Grassland Regeneration Project Aimed at 'World Cultural Heritage' Status," we are providing "support for the resumption of open burning" to preserve the grassland landscape of Aso. These activities are part of the support that we provide based on the comprehensive tri-party support agreement related to the Kirin KIZUNA Relief-Support Project concluded between Kumamoto Prefecture, the Nippon Foundation, and the Kirin Group in 2018, with the aim of achieving a creative recovery from the 2016 Kumamoto Earthquake. Preserving the vast grasslands of Aso, which recharge large amounts of groundwater, will help protect the water that we use as a raw material at the Mercian Yatsushiro Plant. In 2021, six people from the Yatsushiro Plant participated in this activity. In 2021, we cut paths in the grass around areas for controlled burning, then burned the cut grass a few days later to create firebreaks to control fires. The maintenance of grasslands is also important for the survival of rare plants adapted to grasslands.



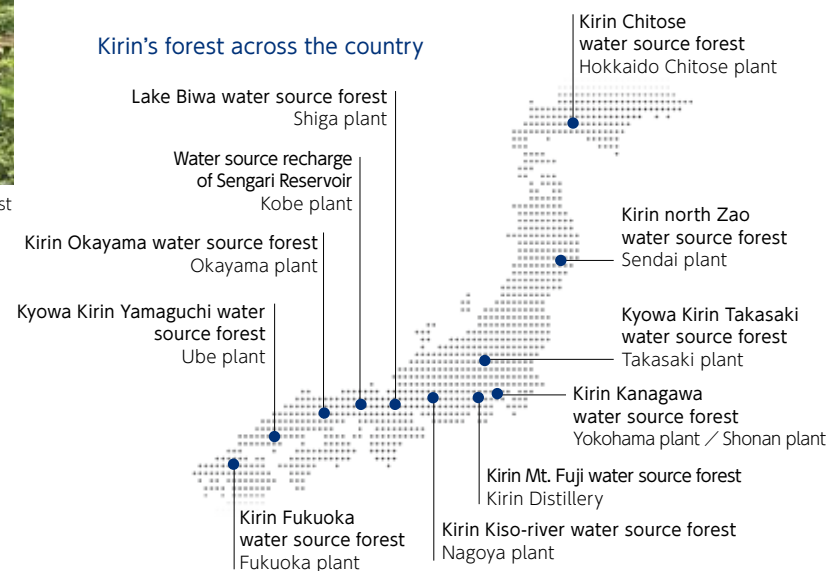
Water source forest activities at Kirin Mt. Fuji water source forest



Cutting paths around areas for controlled burning

Controlled burning

### Kirin's forest across the country



# Production

## Measures to conserve water in response to water stress

Reducing the amount of water we use in our breweries and plants is a major issue. The Kirin Group has pursued water conservation through recycling and other means, in addition to initiatives based on using water only when and as much as needed.

Focusing on water stress in the basin regions around our breweries and plants, we are installing and operating water-saving equipment according to the level of water stress.

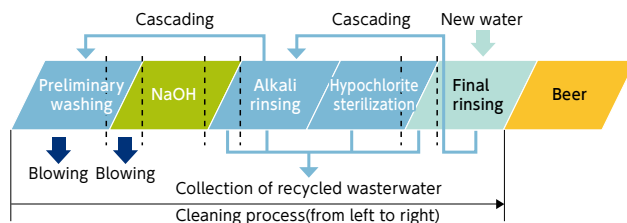
## Cascading industrial water

In plants, much of our water usage is for washing and sterilizing processes for equipment and pipes. In addition to establishing frameworks and mechanisms to confirm and assure the washing, from a quality perspective, we also strictly control water flow rate and velocity to ensure that we do not waste water. We also actively pursue the re-use of water, depending on the purpose.

For example, the rinsing water that we use in the final step of the pipe and equipment washing process is still relatively clear, so we can use it again for the initial process of pipe washing. In this way, we have implemented a cascading system of water use in which we repeatedly use water that we have previously used in washing, according to the quality of the water. In actuality, considerable knowledge on how to use equipments is necessary to guarantee that we are properly washing the equipment and pipes, such as achieving the right balance of the amount of water we can recover and the amount of water we can use, as well as the timing of recovery and use.

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

### Cascading rinse water for washing tanks



## Reuse of cooling water

Thai Kyowa Biotechnologies, which was subject to restrictions on water intake in 2020, has been promoting the reuse of cooling water for amino acid production.

In order to produce amino acids, a large amount of water is required, including cooling water for cultivation, water for making preparations for the production process, and water for washing purification resin column. The system is such that cooling water produced from piped water is drained after a certain number of uses, and new piped water is supplied. Thai Kyowa Biotechnologies has been increasing the number of times cooling water is reused to save piped water required for cooling.

## Air rinse facility

In January 2022, Kirin Beverage's Shonan Plant introduced and used a new sterile filling system for PET bottles. This system replaces water with air in the rinsing process on the non-alcoholic beverages production line. We expect the annual amount of water conserved during production to be around 130,000m<sup>3</sup>. We plan to introduce the same system in other non-alcoholic beverage lines to further reduce water consumption.



Air rinse facility introduced at the Shonan Plant

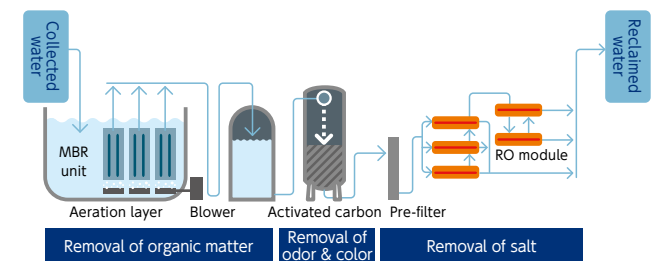
## Advanced water treatment equipment

In 2009, Lion partnered with the government of Queensland, Australia, to install a reverse osmosis (RO) plant at the Castlemaine Perkins Brewery, to recover wastewater and minimize our reliance on mains-fed town water from the area where the brewery is located. Lion has introduced a water recycling plant with the aim of reducing the amount of water used for brewing by half. We use water treated with reverse osmosis membranes in non-product related processes, such as cleaning, cooling, and pasteurizing. In 2021, Castlemaine Perkins Brewery achieved a unit water consumption rate of 2.8kl/kl, which approaches world class levels.

Lion is sharing this technology within the Kirin Group, and we are now using it at Kirin Brewery's Kobe Plant.

Lion, which faces a high level of water stress, set a target during 2021 of increasing water efficiency to 2.4kl/kl by 2025 at breweries producing large quantities of beer. At Tooheys Brewery, which uses the most water, we are considering various options for water recycling and reuse, and plan to develop an effective approach during 2022.

### Flow of sophisticated water processing facility at the Kobe Plant



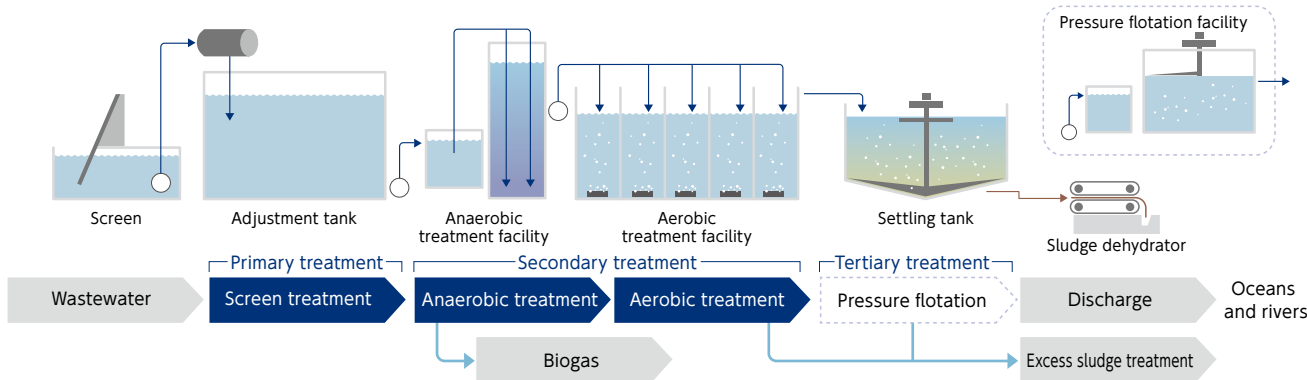
# Wastewater treatment

## Wastewater treatment

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

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

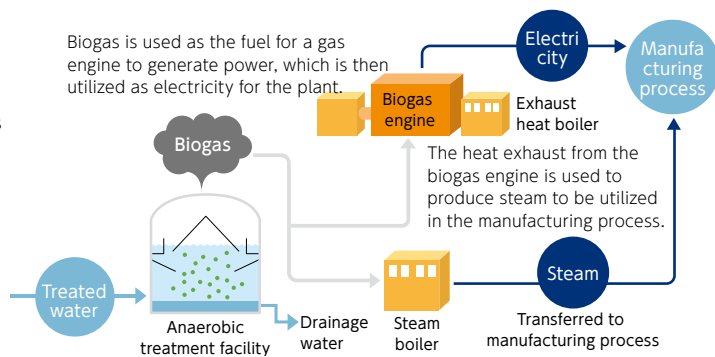
### Wastewater treatment system



### Anaerobic treatment mechanism

Drainage water is used to generate electricity and steam.

The main component of biogas is methane. Biogas is produced by putting the drainage water from the plant into a tank filled with granules of an anaerobic microorganism, and circulating the water in the tank.



## Wastewater biogas

In our breweries, we have introduced anaerobic treatment facilities to purify the wastewater generated by the production process. Unlike conventional aerobic treatment, anaerobic treatment does not require electricity for aeration. Also, the anaerobic microorganisms generate biogas as a by-product of the treatment process. This biogas, the main component of which is methane, can be utilized in biogas boilers and cogeneration systems. Derived from plant-based raw materials such as malt, biogas is a renewable energy and a CO<sub>2</sub>-free fuel.

## Environmental protection activities in basin regions around production plants

At the various production plants of the Kirin Group, we are conducting a range of environmental protection activities, particularly riverside clean-up activities in cooperation with local governments and NGOs.

The Kirin Brewery's Yokohama Plant, in cooperation with an NPO, Tsurumi River Basin Networking, continues to conduct beautification campaigns at nearby Tsurumi River, Living Species Observation Events, and other events.

At our breweries and plants, including those of Kirin Brewery, Kirin Beverage, Mercian, Kyowa Kirin, and KOIWA DAIRY PRODUCTS, we are also engaged in local environmental beautification and environmental protection activities, focusing on the rivers they draw water from and other nearby rivers.

In response to the COVID-19 pandemic, a considerable number of our plants canceled river and beach clean-up activities in 2021. In April and November, however, the Kirin Brewery's Chitose Plant took part in coastal clean-up activities along the Chitose River, while the Mercian Yatsushiro Plant did the same along the Harima River in November.

### Coastal clean-up activities

In 2021, we canceled coastal clean-up activities as a result of the COVID-19 pandemic, but employees of Mercian's Fujisawa Plant and their families participated in clean-up activities on the Katase Coast in Fujisawa.

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

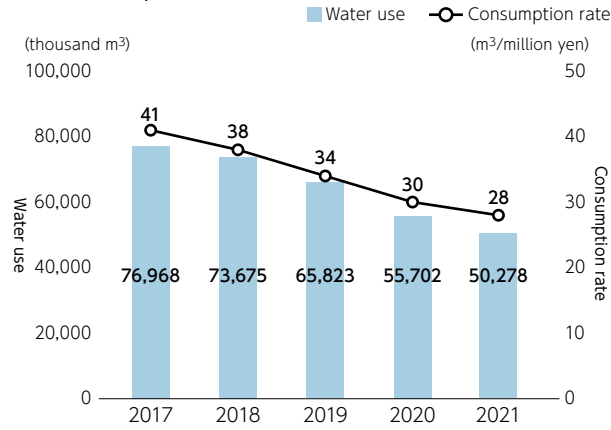


Clean-up activities off Hyakken

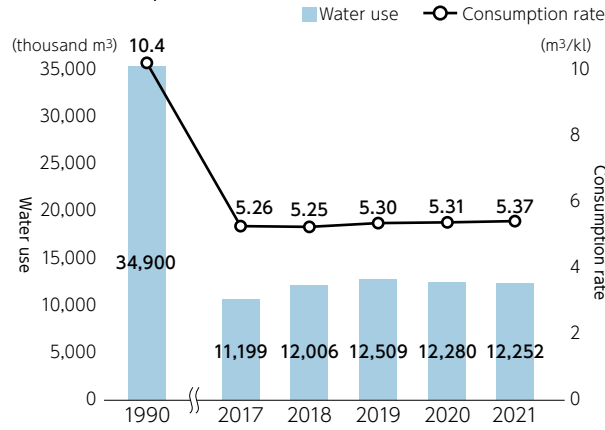
# Key data related to water resources

Related Information → P.125~P.126

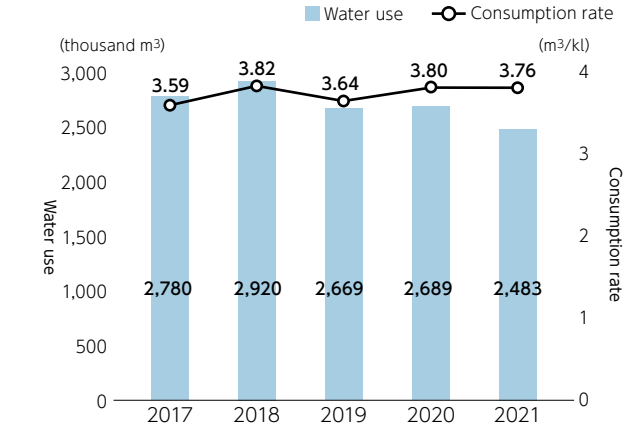
Water use and consumption rate (water use / sales revenue) of entire Group



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



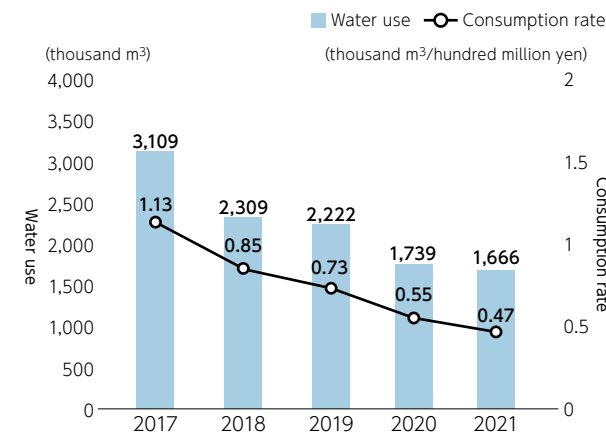
Water use and consumption rate (water use / production volume) of Lion(Oceania region\*)



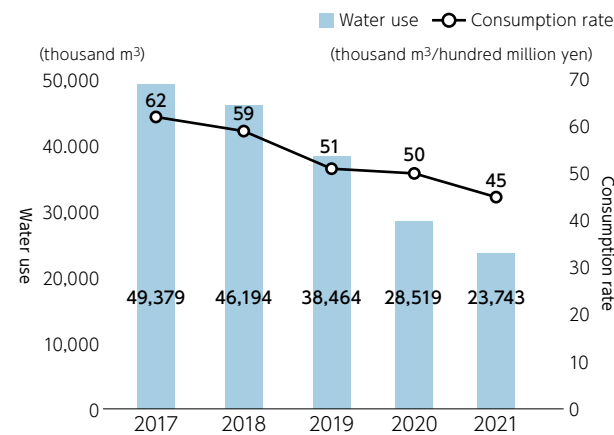
\* This region covers the Oceania region where Lion conducts business activities, excluding New Belgium Brewing.

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



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



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

