



# 2022

## Sustainability Report

Towards a Sustainable Energy Future

# Environment

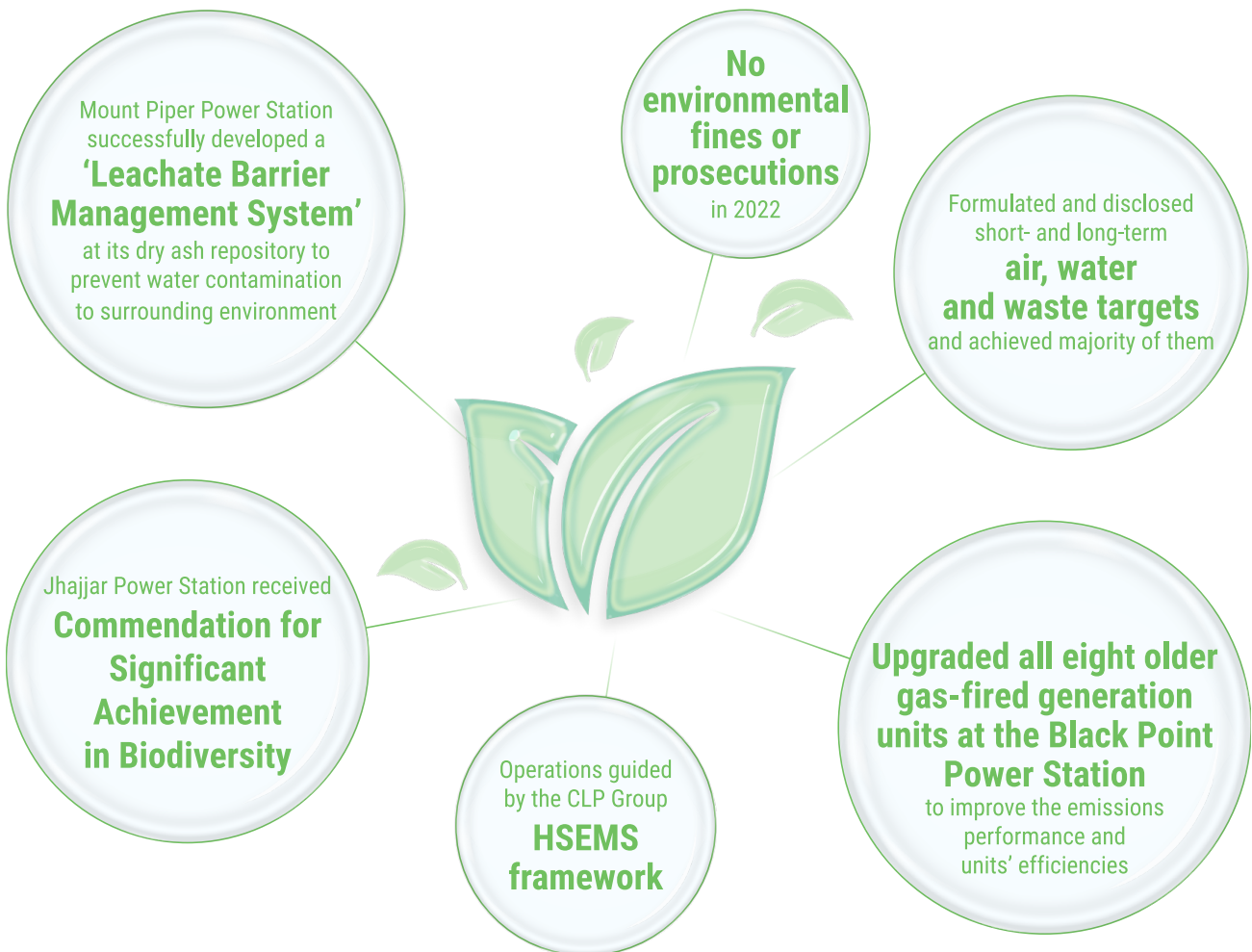


## Overview

Stakeholders' areas of interest	Relevant material topics
<ul style="list-style-type: none"> <li>• Environmental management and compliance</li> <li>• Air emissions</li> <li>• Biodiversity and land use</li> <li>• Waste</li> <li>• Water</li> </ul>	<p><b>Shaping and executing the transition to net zero</b></p> <ul style="list-style-type: none"> <li>• Partnering in the clean energy transition</li> <li>• Clean electricity infrastructure</li> <li>• Environment and biodiversity</li> </ul>



### Outcome for stakeholders



## Environmental management and compliance

### Our approach

CLP strives to manage the environmental impact of electricity generation responsibly. CLP has in place an established and effective environmental management system and process to improve its resource efficiency and environmental performance.

This Group-wide environmental management system is contained within the CLP Group Health, Safety and Environment Management System (HSEMS), which is driven by the new integrated Group HSE Policy.

The policy declares CLP's aim of building individual, team and organisational capabilities and capacities to prevent harm to its people, its assets and the communities in which it operates. CLP's HSEMS sets out how it implements the policy.

Having an environmental management system supports CLP's endeavours to maintain full compliance with applicable environmental laws and regulations in the jurisdictions in which it operates. Established processes are in place to review relevant environmental laws and regulations for new investments, or other updates to existing regulations.

GRI reference: 2-23

The CLP Group HSEMS provides a framework to identify and manage significant environmental issues arising from new investments, project planning and operations.

Following the 'plan, do, check, act' (PDCA) cycle, the environmental processes in the HSEMS manage the environmental pillar of the Group's HSE Improvement Strategy. They also require the environmental risks and opportunities associated with a project's operational life cycle to be appropriately managed.

#### The environmental tools and processes covered in the HSEMS include:

- Project Inception/Planning Stage:
  - Environmental impact assessments
  - Environmental due diligence and climate risk assessment
- Project Construction Stage:
  - Environmental monitoring and audit
- Project Operation:
  - Environmental Management System (EMS) and associated data management platform

At the project planning stage, environmental due diligence and climate risk assessment are conducted to identify potential environmental risks, liabilities and impacts of proposed projects, as part of CLP's Pre-investment Environmental Risk Assessment.

CLP considers the Environmental Impact Assessment (EIA) a crucial step in ensuring all relevant environmental impacts such as air quality and biodiversity have been properly considered and addressed by effective mitigation measures. CLP has processes in place to fulfil the strict EIA requirements and recommendations stipulated by local regulators and it follows these same assessment requirements in countries where regulations are not as stringent. For instance, CLP mandates an EIA for all major generation projects in India, even though it is not a statutory requirement for renewable energy projects in the country.

[Read about how environmental aspects are considered in new projects](#)



Over the years, CLP has diligently managed environmental impacts in line with international best practices. For example, under the HSEMS, all power generation assets of which CLP has operational control or joint operational control are required to achieve third-party certification to the international standard, ISO 14001:2015 Environmental Management Systems, within two years from the commencement of operation or acquisition. In 2022, all assets in this category have successfully certified their EMS to the ISO 14001: 2015 standard.

[Learn more about CLP's HSEMS](#)



## Initiatives and progress

Driven by the Group's HSE Improvement Strategy, CLP develops performance indicators with goals and targets to help monitor the progress and effectiveness of its environmental strategies, plans and programmes.

### Environmental targets and data management

In 2022, CLP developed a new set of group-wide annual environmental targets covering air emissions, waste and water management for its fossil fuel plants, which account for the majority of CLP's emissions and resource consumption. To drive continuous improvements and meet external stakeholder expectations, CLP's group-wide environmental targets are tracked and reviewed on an annual basis. Details of the targets are discussed in the respective environmental sections.

Digital technology in data management is deployed to ensure data integrity and measure progress against targets, as well as facilitate the follow-up actions for each asset for continual improvement. In addition to CLP's customised Group Operations Information System (GOIS), CLP has been implementing MonitorPro, an environmental data management system across all its operational assets in Australia. The tool is designed to safeguard environmental data, automate trend analysis and data reporting and support compliance and risk management.

## Environmental regulations and compliance

SASB reference: IF-EU-140a.2; GRI reference: 2-27, 306-3 (2016), 307-1

CLP closely monitors developments in environmental regulatory requirements. In Hong Kong, the emission allowances of CLP's power plants have been progressively tightened over time through the Technical Memorandums (TM) of the Air Quality Control Ordinance. Since 2022, a new set of emission caps requires CLP Power Hong Kong Limited (CLP Power) to further reduce the emissions of sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and Respiratory Suspended Particulates (RSP) by 12% to 27% compared with the 2021 level which CLP Power has achieved. Discussion with the Hong Kong Government on the review of the latest TM is in progress, as the new 2028 emissions caps will be promulgated in 2023.

In India, the Ministry of Environment, Forest and Climate Change issued the E-Waste (Management) Rules, 2022, which will be effective from April 2023. These rules require the bulk consumers of electrical and electronic equipment, including solar PV panels/cells, to ensure their e-waste will be handed over only to the registered producer, refurbishing entity or recycler. A gap assessment is under progress to ensure compliance of all applicable statutory requirements by March 2023.

Emerging policy changes in relation to GHG emissions are discussed in the [Climate-related Disclosures Report](#).

A table outlining the Company's environmental regulatory performance is featured below.

### Environmental regulatory non-compliance and licence exceedances

	2022	2021	2020	2019	2018
Environmental regulatory non-compliances resulting in fines or prosecutions (number) <sup>1</sup>	0	0	0	0	0
Environmental licence limit exceedances & other non-compliances (number) <sup>1</sup>	6 <sup>2</sup>	5 <sup>3</sup>	4	10	2

<sup>1</sup> Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2022 numbers.

<sup>2</sup> The number excludes eight cases of short-term licence limit exceedances from Jhajjar. Details on the incidences are outlined below.

<sup>3</sup> The number was restated to align the calculation methodology across years.

In Australia, there were six environmental licence breaches recorded in 2022.

Three of them were relevant to marginal air emissions exceedances. One related to particulate matter emissions at Mount Piper Power Station, and two others related to particulate matters and SO<sub>2</sub> emissions at Yallourn Power Station.

Another two breaches were from Mount Piper Power Station during a 21-day emergency discharge event. One related to the exceedance of the daily limit of discharge volume, while another one related to missing oil and grease test in the weekly water samples.

The local Environment Protection Authority (EPA) was notified of these five incidents. Associated corrective and preventive active actions have been taken by EnergyAustralia to prevent recurrence of similar incidents. None of them resulted in any actions by EPA.

The other licence limit exceedance case related to oil spillage from Jeeralang Power Station due to the failure of one of its unit transformers. The oil contamination was cleaned up by using vacuum tankers and removing the contaminated soil. EnergyAustralia notified EPA and is currently liaising with them for a case review.

In India, there were eight cases of short-term SO<sub>2</sub> licence limit exceedances at Jhajjar Power Station in 2022. In all these incidents, Jhajjar Power Station had requested a loading reduction or shutdown of the unit to control SO<sub>2</sub> emissions. However, the State Load Dispatch Centre of India denied permission to reduce the loading or shutdown of the unit due to the state's high power demand. Subsequently, Jhajjar Power Station continued to run the unit and recorded exceedances. All these exceedances were reported to the regulatory authorities (the Central Pollution Control Board (CPCB) and Haryana State Pollution Control Board (HSPCB)) which have not imposed any penalties or taken any further action.

## Air emissions

### Our approach

Air quality remains a challenge in many of the geographies in which CLP operates. CLP reduces its air pollutant emissions while it expands its renewable and nuclear energy portfolio. Nonetheless, further emission reductions from existing fossil fuel power stations remain a high priority in the Group's strategy.

### Strategies and procedures

CLP's Power Plant Air Emissions Standard stipulates that any fossil fuel-based power plant developed after October 2018 (when the Standard became effective) is required to operate within CLP's prescribed limits on sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and total particulate matter (total PM), or they must fully comply with local regulations, whichever is more stringent.

In addition to incorporating state-of-the-art air emissions mitigation measures into plant management, CLP also designs new gas-fired power stations with advanced generation technologies. These new technologies produce electricity more efficiently, and assist in further lowering air pollutant and GHG emissions.

### Monitoring and follow-up

The Company monitors air emissions (NO<sub>x</sub>, SO<sub>2</sub>, and total PM) from facilities under its operational control using a continuous emissions monitoring system and/or stack sampling and mass-balance calculation methodologies. CLP is also cognisant of the increasing focus on mercury emissions from coal-fired power plants and has reported mercury quantities from its coal-fired power plants since 2021.

### Initiatives and progress

CLP has a long-term commitment dedicated to managing its fuel mix and various mitigating measures to respond to climate change and air quality improvements.

SASB reference: If-EU-120a.1; GRI reference: 305-7

Depending on the asset type, different environmental metrics are material to CLP's portfolio. Coal-fired power plants, such as Yallourn, Mount Piper, Jhajjar and Castle Peak Power Stations, are the key contributors to the Group's air emissions, and the emissions metrics are heavily influenced by the performance of these plants.

CLP has set intensity targets for air emissions, namely NO<sub>x</sub>, SO<sub>2</sub> and PM, where short-term targets are set annually based on the three-year average performance of the fossil fuel plants. Further performance improvements can be driven by the long-term commitment of decommissioning; hence, asset retirement planning is considered when determining long-term targets.

The 2022 target scope covers fossil fuel plants under operational control, which accounts for the majority of CLP's emissions. The emission targets and the year-end achievements are shown in the following table:

	2022 Target	2022 Performance	Achievement	2030 Target
Air Emission Intensity	NO <sub>x</sub> (t/GWh)	0.77		0.65
	SO <sub>2</sub> (t/GWh)	0.93		0.69
	PM (t/GWh)	0.13		0.04

During the year, CLP achieved all three air emission targets by optimising its diversified fuel mix and maintaining the effectiveness of its emissions control facilities. Compared to 2021, the NO<sub>x</sub>, SO<sub>2</sub>, and PM emission intensity of fossil fuel assets reduced by 1%, 4% and 7% respectively.

The key programmes in 2022 included:

- Air emission control measures and upgrading**

CLP has been implementing various air emission control measures and upgrading its infrastructure with advanced emissions reduction technology in its fossil fuel plants. In Hong Kong, CLP Power completed a multi-year project to upgrade eight older gas-fired generation units at Black



Point Power Station in January 2022. The project reduced NO<sub>x</sub> emissions, while increased operational efficiency of the upgraded generation units, leading to an improved performance on carbon emissions.

Further, Black Point Power Station's new gas-fired generation unit D1, commissioned in 2020, uses a selective catalytic reduction system to reduce NO<sub>x</sub> emissions. The same technology will be deployed in another new gas-fired unit (Unit D2) currently being constructed at the power station, further reducing NO<sub>x</sub> emissions after its full operation in 2024. Flue gas desulphurisation (FGD) units were deployed at Jhajjar Power Station in India and Fangchenggang Power Station in Mainland China which not only lower SO<sub>2</sub> emissions but also further reduce PM and mercury emissions, a co-benefit of FGD.

• **Hazardous emissions assessment and monitoring programmes**

EnergyAustralia assessed Class 3 air quality indicators, which classify the most hazardous air pollutants under Victorian environmental legislation, at Yallourn Power Station to evaluate its impacts on local air quality. The assessment covered the hazardous chemicals of dioxins, furans, and metals. Extensive stack emissions testing and a detailed air quality impact modelling assessment were conducted. Compared with Air Pollution Assessment Criteria (APAC), the Class 3 air quality substances assessment results showed that Yallourn Power Station has made insignificant contributions of hazardous chemical emissions to the air.

Starting from 2022, Jhajjar Power Station successfully complied with United States EPA standard methods for mercury sampling at its chimneys to estimate the mercury quantities.

• **Upgrade of emissions monitoring systems**

CLP continuously reviews its emissions monitoring system to align with industry best practices in air emissions controls.

At Mount Piper Power Station, a Particulate Matter Continuous Emissions Monitoring System (PM-CEMS) has been successfully installed, calibrated and commissioned according to the United States EPA PS11 Standard. This is the first PM-CEMS of its type to be calibrated to this standard at a coal-fired power station in Australia with a baghouse filter. This filter enables reliable and accurate data for monitoring and improved control of PM. The control of PM emissions also improved the overall maintenance and management of the baghouse filter.

At Yallourn Power Station, the Continuous Emissions Monitoring System has also been upgraded to enhance its capacity for monitoring NO<sub>x</sub> and SO<sub>2</sub> emissions alongside particulates and CO emissions which were already installed across all operating units.

• **Risk management on emissions impact**

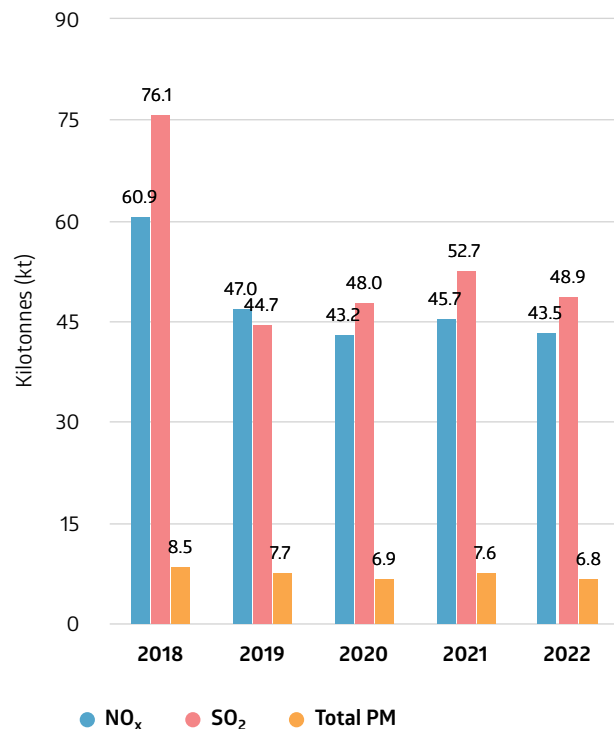
As air emission levels are largely correlated to the types of fuel used, whenever there are changes of fuel used at the power plants, CLP will undergo a risk management process to assess any changes of air emission levels and its impacts on the local vicinity.

During the year, there was a significant gas shortage in Australia which triggered the need for EnergyAustralia's gas assets to fire gas turbines on diesel fuel. As the change of fuel source can potentially create visible emissions, comprehensive risk management processes were carried out at the gas-fired power stations of Newport and Jeeralang to ensure operations remained as clean as possible. EnergyAustralia also commissioned monitoring studies to collect emissions performance data and informed communities of the potential of more visible emissions than firing on natural gas.

**Group-level air emissions**



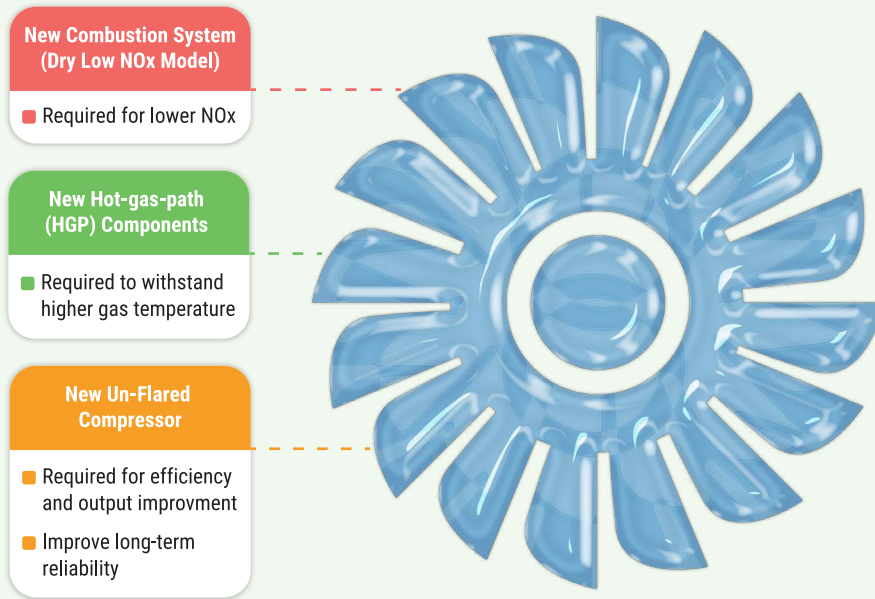
Total emissions in 2022 decreased mainly due to reduced coal-fired power generation and less emissions from Yallourn Power Station, Mount Piper Power Station and Castle Peak B Power Station.



**Case study**

## Improvement of Hong Kong's air quality through the Black Point Power Station gas turbine upgrade project

### Components of the gas turbine unit upgrade



Since 2015, CLP Power has been upgrading gas turbines for all eight older gas-fired generation units at the Black Point Power Station. The project was successfully completed in early 2022. The upgrades improve unit efficiency, reduce NO<sub>x</sub> and CO<sub>2</sub> emissions and bring about an incremental increase of unit capacity that supports improvements to Hong Kong's air quality.

The gas turbine upgrade project involved upgrading and replacing several components to achieve state-of-the-art design. It included upgrading the entire combustion system with a complete change-out of associated fuel systems, all hot-gas path components and an un-flared compressor. One of the major environmental benefits of the upgrade is the performance guarantee of NO<sub>x</sub> emission reduction from 50 mg/Nm<sup>3</sup> to 30 mg/Nm<sup>3</sup> by the advanced low NO<sub>x</sub> burner, which leads to a significant decrease in NO<sub>x</sub> emissions intensity. The increase in thermal efficiency also lowers carbon intensity which aligns with CLP's vision on decarbonisation.

In addition to the environmental benefits, the upgraded system also improves fuel flexibility, lowers turndown periods and extends maintenance inspection intervals. All these benefits translate to consumer savings in terms of operating costs.

Having signed a memorandum of understanding (MoU) agreement with GE Gas Power (GE) in 2021, CLP is currently working collaboratively with GE to explore the feasibility of using a variable blend of natural gas and hydrogen at Black Point Power Station, with the aim of further reducing its carbon emissions in the future.

### Emissions avoided after the gas turbine unit upgrade

**300kt CO<sub>2</sub> & 0.4kt NO<sub>x</sub>**  
avoided in 2022



## Biodiversity and land use

### Our approach

CLP strives to preserve and enhance natural resources while encouraging biodiversity with the Group's goal of "no net loss of biodiversity". Targets are site-specific and depend on the different levels of regulatory controls on biodiversity, from assessment requirements through to ecological compensation.

GRI reference: 304-1, 304-2, 304-4

### Strategies and procedures

CLP's internal Environmental Impact Assessment (EIA) standard mandates an environmental assessment for all new projects. During the EIA stage, CLP partners with qualified personnel to conduct a biodiversity impact assessment in accordance with the CLP Biodiversity Impact Assessment Guideline. The Guideline applies to power generation, transmission and distribution, mines and other power-related projects, and provides a framework for a systemic assessment of biodiversity impacts.

The Guideline takes into consideration the IUCN Red List of Threatened Species and national conservation lists of threatened species, and provides guidance on managing biodiversity risks. Any new operations that could affect the IUCN Red List of Threatened Species and a country's national conservation list of threatened species are flagged well ahead of any investment decision.

The biodiversity impact assessment observes local legislative requirements and references the [International Finance Corporation Sustainability Framework](#). It describes the baseline conditions, evaluates the magnitude and significance of project impacts, and investigates options for mitigation. The assessment only contemplates offsets after considering options relating to avoidance, minimisation, and restoration or rehabilitation.

See CLP's holistic approach to assessing new investments



### Initiatives and progress

While there is no one-size-fits-all approach to managing biodiversity impacts, CLP continues its ongoing efforts in biodiversity conservation and land remediation, considering factors such as location and level of development in the vicinity.

GRI reference: 304-3, EU13

Biodiversity enhancement programmes in 2022 included:

- **Vegetation management**

The Predictive Vegetation Management System (PVMS), developed by CLP Power, was rolled out in March 2022. The system monitors the growth and condition of trees and vegetation that may affect overhead line operations. In around 210 locations, the PVMS and CLP Power's existing tree inventory record have identified tall trees near CLP Power's transmission and distribution overhead lines for replacement by native short trees throughout its Tree Replacement Programme. This treatment aligns with the Hong Kong Government's 'Right Tree & Right Place' Policy and Nature Conservation Policy.

- **Aquaculture and fisheries conservation**

Set up by the Hong Kong Offshore LNG Terminal Project in Hong Kong in 2020, the [Marine Conservation Enhancement Fund \(MCEF\)](#) and the [Fisheries Enhancement Fund \(FEF\)](#) continue to support marine conservation and fisheries enhancement projects. The funds have since granted

approximately HK\$31.4 million to support 27 projects and HK\$23.2 million to support 12 projects respectively. The funded projects under MCEF relate to marine conservation, habitat restoration and rehabilitation, as well as education and ecotourism. For the FEF, the funded initiatives relate to fisheries education and tourism, enhancement of fisheries resources, and sustainable fishery development.

- **Combatting desertification**

Recognising the threats to wildlife by desertification and land degradation, CLP China carried out annual tree planting activities at the Jinchang Solar Farm in the Gobi Desert and made tremendous efforts to maintain good tree conditions under extreme weather. CLP China also actively participated in the tree planting programmes organised by the Government in Jinchang. Various species of trees, including pine and *Amygdalus triloba*, were planted at the Xipo shelterbelt near the Jinchang Solar Power Station, which helped build a local ecological barrier to combat the environmental hazards. The programme has contributed to windbreak and sand fixation for Jinchang. Other assets in Mainland China, such as Lingyuan, have also planted trees near power stations for a green and sustainable environment.

- **Habitat restoration programme**

CLP strives to increase the populations of local species and enhance local biodiversity through various habitat restoration programmes. During the year, EnergyAustralia

established a Biodiversity Conservation Agreement (BCA) over a parcel of land adjacent to the Thompson Creek Reservoir. The BCA guarantees the protection of the native vegetation and habitat on the land from clearing and future development, even if the property is sold. Yallourn Power Station also rehabilitated 34.4 hectares of land within its mined area in 2022 by establishing either native seed or

pasture grass to help stabilise exposed landforms. With power generation and mining set to cease in 2028 at Yallourn, EnergyAustralia has embarked on developing rehabilitation and remediation plans for both the Yallourn Power Station and Mine aiming at repurposing the site to provide local amenities for community development including conservation and recreation areas.

## Case study

### A 10-year forest restoration programme partnered with Kadoorie Farm and Botanic Garden Corporation (KFBG) to build science-informed capacity for combating climate change

CLP is sponsoring KFBG for a forest restoration programme. It is expected to contribute to ecological research, provide insights into carbon sequestration potential of science-informed reforestation, and build CLP's knowledge of nature-based solutions.

Nature-based solutions are increasingly seen as a vital part of the global efforts to achieve the Paris Agreement goals on climate change.

These involve actions to conserve, restore, and manage natural ecosystems in a sustainable manner, with both societal and biodiversity benefits. Recognising that forest conservation and restoration is one of the key strategies for tackling climate change, CLP entered a signature 10-year partnership with KFBG to support a native forest restoration programme in Hong Kong. KFBG's ecological restoration efforts have been recognised by Botanic Gardens Conservation International.

The partnership programme consists of a HK\$10-million sponsorship that will support KFBG in planting up to 25,000 native trees of 200 different species or more, and numerous understorey plants to help restore 10 hectares of diverse upland tropical forest in KFBG's nature reserve.

The programme is expected to contribute to nature recovery and biodiversity with the potential to enable the reintroduction of critically endangered native plants, with anticipated positive knock-on effects for pollinators and other wildlife. Throughout the programme, research will be conducted with the aim of helping to establish global best practices in forest restoration.

The programme will help build CLP's knowledge and capacity in reforestation, ecosystem recovery, and nature-based solutions for carbon offsetting, which can potentially be applied to its business operation across regions and contribute to its longer-term decarbonisation goals. Knowledge gained from this programme will be shared with authorities, the academic community, and a broad range of stakeholders through regular engagement. The research findings from this programme may also inform relevant biodiversity-related policy and regulations as needed.



(From left to right): KFBG Acting Executive Director and Head of Fauna Conservation Department Dr Gary Ades, CLP Holdings Director – Group Sustainability Mr Hendrik Rosenthal, CLP Holdings Chief Strategy, Sustainability and Governance Officer Mr David Simmonds, KFBG Head of Flora Conservation Department Dr Stephan Gale and CLP Power Chief Corporate Development Officer Ms Quince Chong kick off the tree planting phase of the partnership.

**Case study**

## Delineation of nature-related risks and opportunities through baseline biodiversity assessment at Jhajjar Power Station



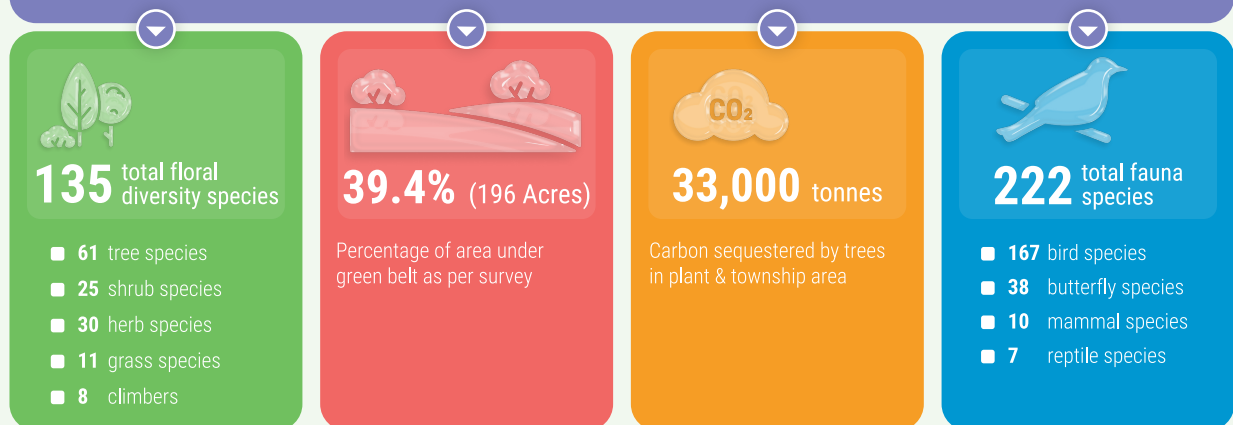
In India, Jhajjar Power Station engaged the Confederation of Indian Industries (CII) to carry out a baseline biodiversity survey and assessment in 2022. The initiative followed Apraava Energy's Natural Capital Action Plan (NCAP) aimed at mitigating biodiversity loss. The project received a "Commendation for Significant Achievement in Biodiversity" in the CII ITC Sustainability Awards 2022 (Award category: Domain-Biodiversity).

The baseline assessment was conducted at Jhajjar's major ecosystems and habitats, including about 496 hectares of plant area, the township, nearby villages and eco-sensitive areas, across three seasons as per India Business & Biodiversity Initiative (IBBI) directives. The assessment scope includes site surveys, ecosystem services risk mapping, supplier surveys, biodiversity indexing, and NCAP development. Critical ecosystems and ecosystem services were identified, and dependency on ecosystem services was evaluated.

The biodiversity at Jhajjar was measured in terms of the biodiversity index that depicted the project area's biodiversity status, enlisting four critical ecosystems/habitats greenbelt plantation, ash dyke, reservoir, and natural forest. It further assessed the carbon sequestration potential of the trees planted in the power plant and the township areas based on the volumes and biomass of the tree species. It was assessed that the amount of carbon sequestered by trees planted so far was about 33,000 tonnes over their lifespan. Further, the assessment result showed that the number of flora and fauna species is far higher than that reported in the previous EIA of the studied area, indicating an improvement of biodiversity.

Overall, Jhajjar's biodiversity value is considered the highest in the region. Through the Baseline Biodiversity Assessment with the NCAP, it enables the maintenance of the diversity of species, habitats, ecosystems, and the integrity of ecological functions, seizing opportunities for enhancing biodiversity.

### Ecosystem Preservation Outcomes at Jhajjar Power Station



## Waste

### Our approach

CLP endeavours to reduce both the hazardous and non-hazardous waste it generates as part of its operations. Whenever possible, CLP works with qualified parties and partners to reuse or recycle materials.

SASB reference: IF-EU-150a.1 and IF-EU-150a.2; GRI reference: 301-2, 306-1, 306-2, 306-3, 306-4, 306-5

### Strategies and procedures

CLP follows a waste management hierarchy (i.e. prevent, reduce, reuse, recycle, replace, treat and dispose) which prioritises the most preferred actions that minimise waste generation in daily operations. CLP seeks to avoid using hazardous materials and replaces them with alternatives wherever possible. All hazardous and non-hazardous waste is managed in accordance with local regulations, and is either collected for disposal by licensed contractors or sold for recycling.

At CLP's coal-fired power stations, coal ash from coal combustion and gypsum from the flue gas desulphurisation process constitute the majority of by-products from operations. CLP endeavours to reuse them for construction

and other applications in line with local regulations and practices rather than dispose of them. While the volume of solid and liquid waste generated by regular CLP operations is relatively small, projects involving demolition and construction usually increase the amount of non-hazardous solid waste.

In addition to the measures at power stations, CLP also drives employees' behavioural changes in waste management by setting up recycling facilities at power stations and office premises. E-learning courses on waste management are available to enhance employee knowledge of the latest waste trends and recycling best practices.

### Monitoring and follow-up

CLP monitors waste generation on a monthly basis through tracking the solid and liquid forms of hazardous and non-hazardous waste produced and recycled at its facilities.

All ash impoundments from CLP-owned plants (i.e. the various ash lagoons holding from Castle Peak Power Station in Hong Kong, Jhajjar Power Station in India, Yallourn Power Station in Australia and Fangchenggang Power Station in Mainland China) have been reviewed and are considered as having low hazard potential with satisfactory structural integrity.

### Initiatives and progress

CLP implements various measures to reduce the waste generated during electricity generation and operation. It recycles its hazardous and non-hazardous solid and liquid waste and, where feasible, sells by-products, such as ash and gypsum, for reuse in other industries.

Individual assets generate different types of waste, whereas coal-fired assets are the key contributors and account for about 90% of the Group's total waste generated. The amount of waste produced and recycled is not related to the amount of electricity sent out but to the maintenance and construction activities as well as local waste treatment practices.

In 2022, CLP reviewed the volume, characteristics, recycling and disposal patterns of waste from its fossil fuel plants. CLP has set targets for the recycling rate of non-hazardous and hazardous solid waste, as well as hazardous liquid waste according to the best practice of waste management and local regulatory requirements. The goal is to minimise negative environmental impacts by reducing waste disposal and increasing recycling. As the amount of non-hazardous liquid waste generated in routine operations is minimal compared with other waste metrics, no targets were set regarding non-hazardous liquid waste.

The short- and long-term waste targets, covering fossil fuel plants under operational control that account for most of CLP's

waste, were set. The waste targets and achievements in 2022 are shown in the following table.

		2022 Target	2022 Performance	Achievement	Long-term Target
Waste	Hazardous Liquid Waste	95% recycling of hazardous liquid waste	Recycling of hazardous liquid waste: 66% (94.2%)		Maintain 95% recycling of hazardous liquid waste
	Hazardous Solid Waste	≥66% recycling of hazardous solid	Recycling of hazardous solid: 58%		>80% recycling of hazardous solid by 2030
	Non-hazardous Solid Waste	100% recycling of scrap metal	100% recycling of scrap metal		No landfilling by 2035
		Removal of all single-use plastics in catering facilities	100% removal of single-use plastics in catering facilities		
		Separation of construction waste and 100% recycling/reuse of inert construction waste	Separation of construction waste and 100% recycling/reuse of inert construction waste		

<sup>1</sup> Excluding the off-site treatment of 266 kl alkaline solution from a special event of the boiler chemical clean project at Castle Peak Power Station

In 2022, CLP set itself challenging targets on waste management, aiming to increase the recycling rate and reduce waste disposal quantities. During the year, the hazardous liquid waste target was missed, caused primarily by a boiler chemical cleaning project at Castle Peak Power Station (CPPS), which is a special maintenance project conducted at a 10- to 15-year interval. During such prior projects, this waste could be fully treated and recycled on site. However, in 2022, due to site and operational constraints at CPPS, 266 kl spent alkaline solution arising from the boiler chemical cleaning operation was sent to the Hong Kong's licensed Chemical Waste Treatment Centre for treatment in accordance with the local regulatory requirements. If these quantities were excluded, the overall hazardous waste recycling rate would have achieved 94% which was close to the 95% target.

The hazardous solid waste target was also slightly missed. Historical data shows that the recycling rate and quantities of hazardous solid waste fluctuates widely in accordance to the maintenance cycle, and the majority of waste generated and recycled in this category was from the Selective Catalytic Reduction (SCR) System. In 2022, CPPS had an increase in used SCR catalysts disposal quantities. Used SCR catalysts cannot be recycled in Hong Kong and have to be disposed of according to local regulatory requirements. On the contrary, used SCR catalyst recycling is possible in Fangchenggang Power Station (FCG) in Mainland China but the recycled waste volume in 2022 was lower compared to 2021. In addition, due to the divestment of FCG in 2022, the full year data of FCG has not been included. These factors are the main causes of a decrease in recycling percentage in 2022.

All targets set for non-hazardous solid waste were achieved. These included recycling scrap metal, removal of single-use plastics in catering facilities and separation of construction waste for reuse and recycling.

In an effort to implement the best practice of waste management, CLP runs various programmes to manage waste generated at different stages of the project life cycle, to contribute to the target set. The successful waste programmes will be continued and expanded across the Group in the coming years where appropriate. Learnings were shared internally and further with contractors to raise awareness and build capacity.

Looking ahead, CLP will continue to look for reduction or recycling opportunities for waste arising from its projects and operations, and other initiatives through project planning, internal waste reduction and communication programmes. As waste target-setting is an evolving process, CLP will continue to refine the waste targets and the target-setting process, aiming at improving the waste recovery value and enhancing the circularity of the products and materials used in its operations. In the medium to long term, CLP will strengthen its waste management practices according to the circular economy principles.



Key programmes and initiatives in 2022 include:

- Reducing construction waste from new gas unit project in Black Point Power Station**

During the construction period, the project team implemented a number of initiatives to eliminate, minimise or reduce waste arising from construction activities. In 2022, the excavated construction and demolition (C&D) materials were sent to landfill for reuse as topping materials, which reduced over 9,000 tonnes of inert material disposal to public fill reception facilities. In addition, over 10,000m<sup>2</sup> of recyclable plastic formwork was used for construction instead of temporary timber to minimise timber waste generation and conserve timber resources.

- Diverting legacy fuel waste for alternative use at Newport Power Station**

In 2022, the Newport Power Station removed a significant volume (circa 600 tonnes) of legacy waste heavy fuel oil to proactively prevent any potential environmental incident due to an ageing tank. The fuel oil was diverted from waste disposal upon project completion and will be reused as fuel in the shipping industry.

- Implementing zero waste to landfill initiatives at Jhajjar Power Station**

Jhajjar Power Station continued its efforts on waste minimisation with zero waste to landfill initiatives. This involves maximising the reuse of metallic waste, coal

handling plant conveyor rubber belts, electronic cards, and actuators for secondary purposes within site premises. Jhajjar also avoided single-use plastic successfully and was certified as a single-use plastic free site by the Confederation of Indian Industries from November 2022. It also transitioned to a paperless office to reduce paper consumption through digitalisation.

- Recycling damaged solar panels at Jinchang Solar Power Station**

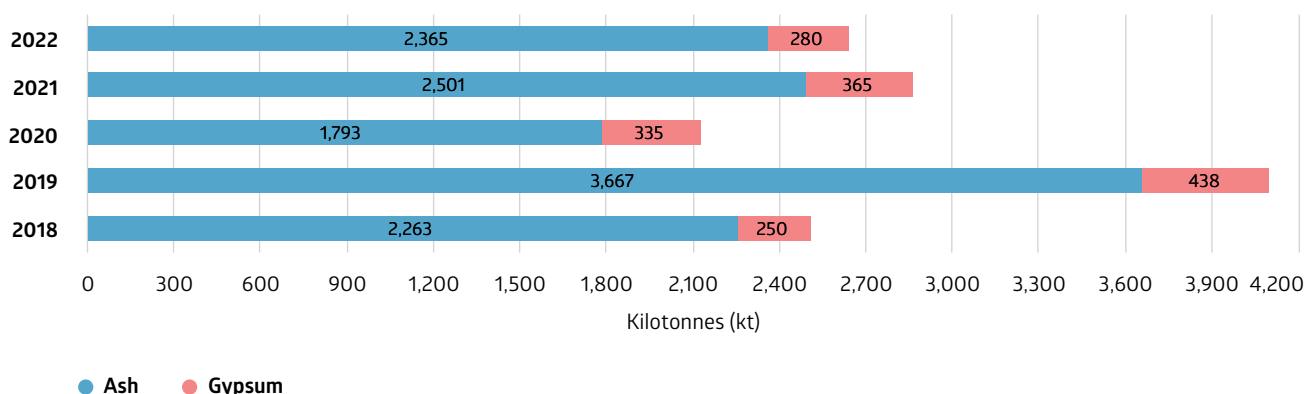
The Jinchang Solar Power Station continued its initiative of returning damaged solar panels to solar panel manufacturers for recycling. This enables the reuse of aluminium frames, which accounts for a large part of solar panel waste, and the recovery of embedded panel components, such as silicon and silver. Since 2017, over 3,718 solar panels have been returned for recycling.

- Promoting Circular Economy Principles to CLP Power staff**

During the year, CLP launched an e-learning course and an internal webpage about Circular Economy Principles in Hong Kong. The initiative enhances staff awareness of utilising resources efficiently and realising sustainable development using Circular Economy Principles. CLP Power also started collecting polyfoam waste in its major premises for recycling and initiated Food Wise Week in Hong Kong to encourage staff to bring their own containers for buying takeaway food in canteens.

### Ash and gypsum by-products recycled or sold

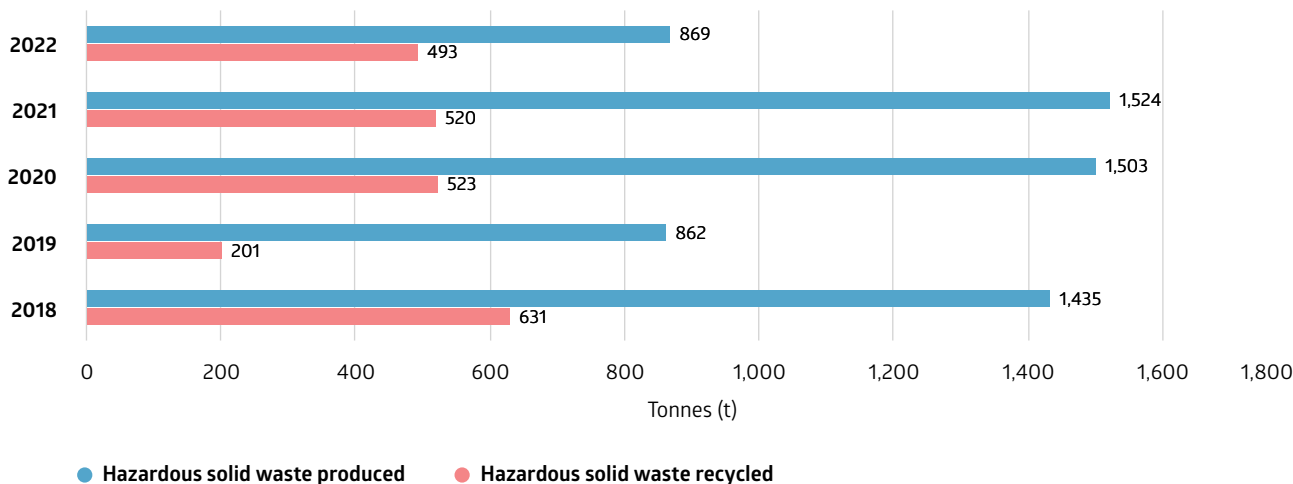
**i** Total amount of ash and gypsum by-products recycled or sold decreased in 2022 mainly due to less coal-fired power generation. The percentage of ash recycled or sold increased while the percentage of gypsum slightly decreased.





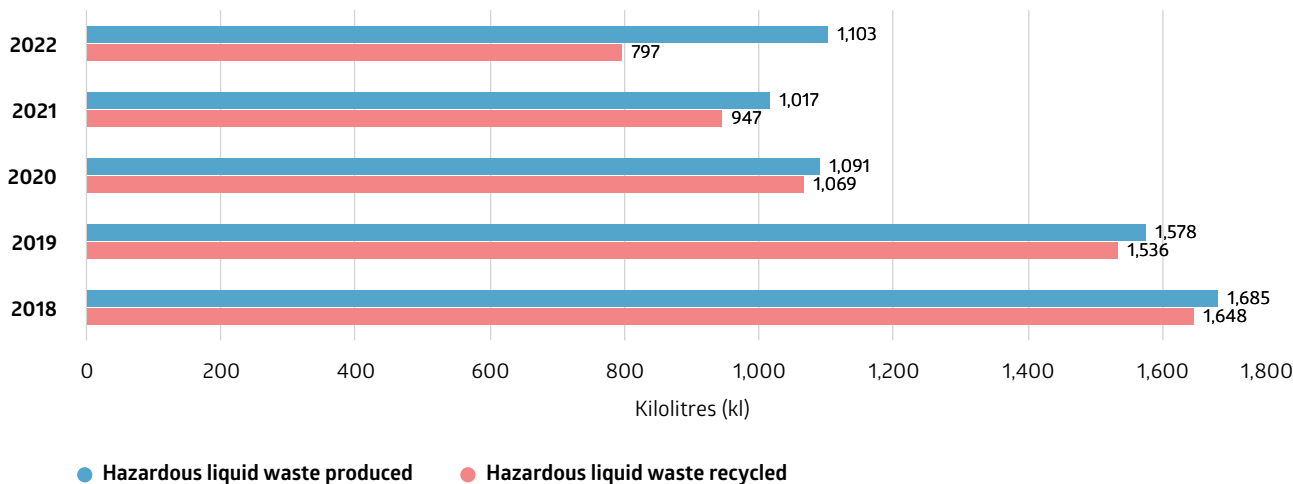
### Hazardous solid waste produced and recycled

**i** The amount of total hazardous solid waste produced and recycled decreased in 2022 mainly due to a decrease in hazardous solid waste produced from Yallourn and Jeeralang Power Stations and less amount of used SCR catalysts recycled. For details, please refer to Initiatives and progress section.



### Hazardous liquid waste produced and recycled

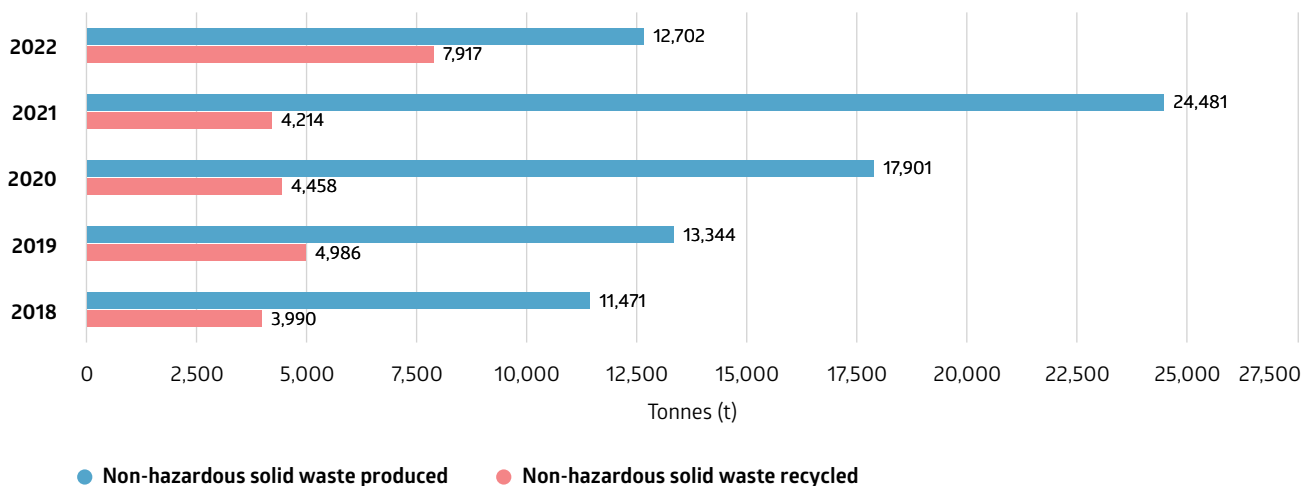
**i** In 2022, the amount of hazardous liquid waste produced increased while the recycled amount decreased because of a special event of a 10- to 15-year intervals boiler chemical cleaning project at Castle Peak Power Station (CPPS). For details, please refer to the Initiatives and progress section.



### Non-hazardous solid waste produced and recycled



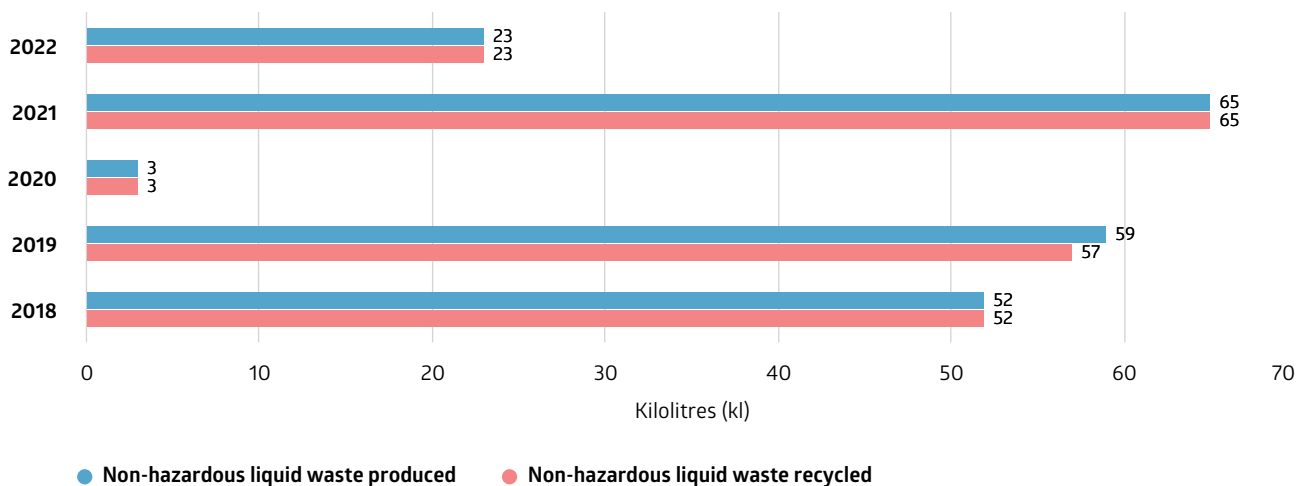
The amount of non-hazardous solid waste produced decreased and the recycled amount increased significantly because construction waste collected in Castle Peak Power Station (CPPS) and Black Point Power Station (BPPS) in Hong Kong was further classified for recycling and reuse.



### Non-hazardous liquid waste produced and recycled



The total amount of non-hazardous liquid waste produced and recycled decreased in 2022, because a lower amount of non-hazardous liquid waste remained from the outage of Mount Piper Power Station for recycling.





## Case study

# China's Plastic Reduction Idea Competition for waste and carbon footprint reduction

Recognising growing concerns about plastic waste, CLP China organised the Plastic Reduction Idea Competition to encourage new plastic waste reduction ideas from employees. In response, employees actively participated and shared their thoughts on substituting plastic with other reusable materials and how to avoid single-use plastics.

Reducing plastic waste requires collective efforts on rethinking plastic use habits and seizing opportunities to reduce unnecessary usage at source and substitute alternative materials whenever feasible. Through this waste management competition, CLP China built an environmentally friendly culture among employees and harnessed their commitment to implementing environmental initiatives. Employees shared their ideas of feasible alternatives for plastic usage at offices and assets.

Awarded ideas were adopted across all CLP China's offices and assets to minimise plastic waste. All canteens in CLP China assets have stopped using single-use plastic meal boxes and tableware, for example, by replacing them with metal or glass items, particularly the takeaway boxes used by shift staff. In addition, some power stations are using bamboo baskets and reusable bags when purchasing canteen supplies. This simple measure has significantly reduced the amount of single-use plastic and plastic waste at power station sites.

Assets in CLP China used to feature many safety and corporate culture signs made of plastic. They have started using metal signage when replacing the signs. This is expected to reduce plastic waste by 50 kg per year in a sub-region. Some sub-regions, through their procurement processes, have replaced plastic stationery with paper and metal options.

### Plastic alternatives at CLP China offices and assets



Single-use plastic meal boxes and cutlery



Reusable metal or glass meal boxes and cutlery



Single-use plastic bags for takeaway



Reusable bamboo baskets or shopping bags



Plastic signages



Durable metal signages

# Water

## Our approach

The CLP Group uses seawater cooling or water recirculation processes in its generation plants to minimise water consumption and environmental impacts.

SASB reference: IF-EU-140a.3; GRI reference: 303-1, 303-2

## Strategies and procedures

The quantity of water withdrawal and discharge in CLP's operations is dominated by fossil fuel plants using once-through seawater cooling. In this process, large quantities of seawater are used for cooling and returned to the sea with only a slight increase in water temperature. The total volume of water withdrawal and discharge is dependent on the total electricity generated.

Where freshwater is withdrawn for operations, CLP strives to reduce water use and reduce the freshwater intensity of the electricity generated. CLP's power stations carry out a range of water conservation initiatives depending on site conditions, operational situation and age. The amount of water which can be recycled depends on factors such as location, power station design, and regulatory requirements.

## Monitoring and follow-up

Water concern to CLP is two-fold.

On the one hand, water use in its power plants may impact local water quality and scarcity. To address this concern, impact assessments are carried out at the planning stage of new projects, in accordance with local requirements. This ensures that any impacts associated with project construction and plant operation are managed and mitigated to an acceptable level.

On the other hand, water security is a key risk managed at CLP's fossil fuel and hydropower generation assets. Four out of seven of CLP's fossil fuel plants use seawater for cooling.

Where seawater cooling is not feasible, CLP strives to reduce freshwater use and adopt water recirculation process. Solar farms also use water to clean solar panels; however, the amount required is comparatively small. As a result, CLP's risk exposure to water availability is limited.

CLP assesses water risks for new projects through systematic environmental due diligence, and annually thereafter using globally recognised tools such as WRI Aqueduct. The assessment covers parameters such as water availability, water sensitivity, water stress mapping, potential competing use with other stakeholders, and the management strategies in each region. Where a water supply risk is identified, the Company proactively engages with local stakeholders to understand their needs and with local water suppliers to mitigate or resolve the issue. The latest assessments across the Group indicate that current water supply regimes are stable, and the overall risk of substantial impact is minimal.

The quality of water discharges must also meet licensing and regulatory standards while maintaining CLP's licence to operate. Under the environmental management system (EMS), the adverse impacts of water discharges are identified, monitored and controlled under programmes which are reviewed on a regular basis. Specific emergency response plans have also been developed to prevent and address the spillage or leakage of pollutants. As a result of the water treatment processes put in place, none of CLP's operations significantly impact their respective water-receiving bodies.

To monitor water use efficiency, CLP tracks freshwater withdrawal, discharge, and intensity (based on electricity sent out). Internal targets are set each year to encourage continuous improvement in water management practices. CLP also participates in the CDP Water survey and, through disclosing water resource management data through the survey, CLP is able to benchmark its practices against industry peers.

## Initiatives and progress

CLP has taken further steps to improve water management and reduce water discharge-related impacts in daily operation.

Fossil fuel assets are the key consumers of freshwater and the amount of water consumed is heavily influenced by the performance of these plants. CLP has committed to a freshwater consumption intensity target, where the short-term target is set annually based on the 3-year average

performance. Significant improvements depend on the long-term commitment of decommissioning the key contributors and hence fossil fuel asset retirement planning is considered in determining the long-term target.

In 2022, the scope of the target covers fossil fuel plants under operational control, which account for the majority of CLP's freshwater consumption. The water target and achievements in 2022 are shown in the following table.

	2022 Target	2022 Performance	Achievement	2030 Target
Freshwater Consumption Intensity (m <sup>3</sup> /MWh)	0.71	0.52		0.49

SASB reference: IF-EU-140a.1; GRI reference: 303-3, 303-4, 303-5

In 2022, CLP achieved the target of freshwater consumption intensity through various water saving initiatives and measures. CLP continues to track the volume of water recycling in its power stations for continual improvement. Considerable emphasis is placed on sharing good practices across the Group to maximise the benefit of an individual power station's efforts.

Four out of CLP's seven fossil fuel plants use seawater for cooling. The remaining three, Mount Piper, Jhajjar and Fangchenggang power plants, operate on a zero liquid discharge basis. The water is treated internally and recycled or reused in other parts of the power generation process, or for dust control or horticulture.

Best practice examples of CLP's water management are summarised below:

- Water leakage management to minimise wastage in Hong Kong**

The main power stations in Hong Kong are primarily reliant on seawater for cooling and freshwater from municipal supply for power generation processes. While the municipal water supply from the government is currently stable, the Black Point Power Station sought to further reduce and prevent the risk of physical water losses from the plants by replacing a batch of drain valves in 2022.

- Reduction of water wastage by reuse of plant process water and adoption of innovative technology in Mainland China**

Fangchenggang Power Station continues to reuse treated wastewater for flue gas desulphurisation, dust suppression and irrigation. Other initiatives to reduce water use included deploying robotic cleaning systems for dust removal at CLP China's solar farms.

- Wastewater discharge assessment in Australia**

Following torrential rain in August 2022 at the Yallourn Power Station Mine, EnergyAustralia received approval from the Environment Protection Authority Victoria to temporarily discharge water from the Township Field Pond into the nearby Latrobe River. EnergyAustralia proactively conducted the environmental risk assessment and monitored the discharge water quality. It was concluded that there was minimal risk to the downstream environment of the Latrobe River.

- Increase of water use efficiency in India**

Jhajjar Power Station has been progressively improving water use efficiency at its site through continual improvement measures. By enhancing cycles of concentration with advanced chemical treatment in its cooling water system, Jhajjar Power Station further reduced its water consumption in 2022.

## Water Balance

The water discharged mainly goes to marine water bodies for cooling purpose.

### Water Withdrawal

<b>Total water withdrawal (Mm<sup>3</sup>)</b>	<b>5,339.3</b>
From marine resources (for cooling) (Mm <sup>3</sup> )	5,287.0
From freshwater (for cooling) (Mm <sup>3</sup> )	42.7
From freshwater (for non-cooling)(Mm <sup>3</sup> )	4.6
From municipal sources (for non-cooling) (Mm <sup>3</sup> )	5.0
Total water withdrawal from water stressed areas (Mm <sup>3</sup> )/(%)	167.7/3%



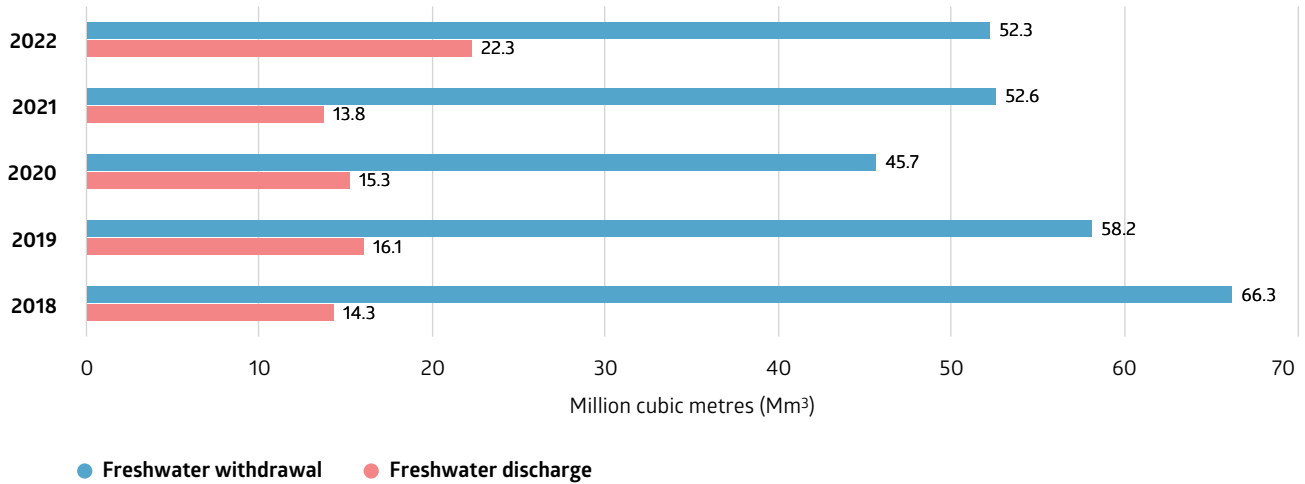
### Water Discharged

<b>Total water discharged (Mm<sup>3</sup>)</b>	<b>5,310.9</b>
To marine water bodies (from cooling) (Mm <sup>3</sup> )	5,287.0
Treated wastewater to freshwater bodies (from non-cooling) (Mm <sup>3</sup> )	21.0
Treated wastewater to marine water bodies (from non-cooling) (Mm <sup>3</sup> )	1.6
Treated wastewater to other destinations (from non-cooling) (Mm <sup>3</sup> )	1.3
Wastewater to sewerage (Mm <sup>3</sup> )	0.04

## Freshwater withdrawal and discharge



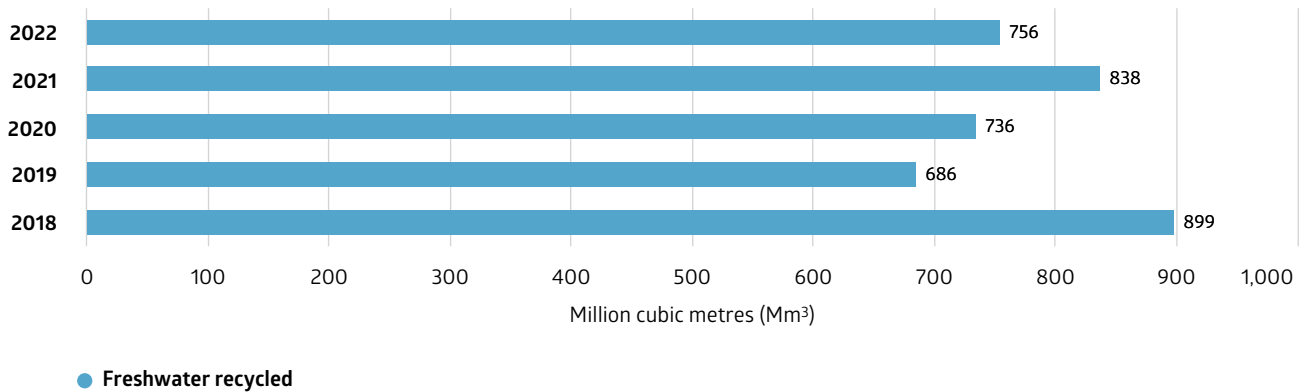
Total freshwater withdrawal (including water for cooling and non-cooling) decreased slightly in 2022 due to less freshwater withdrawal at Mount Piper and Jhajjar Power Stations. The total freshwater discharge (including water for cooling and non-cooling) increased in 2022 primarily as a result of increased freshwater discharge at Yallourn coal mine due to heavy rainfall.



## Freshwater recycled volume



The volume of freshwater recycled decreased in 2022 primarily as a result of decreased freshwater recycled volume at Mount Piper Power Station due to its lower utilisation.

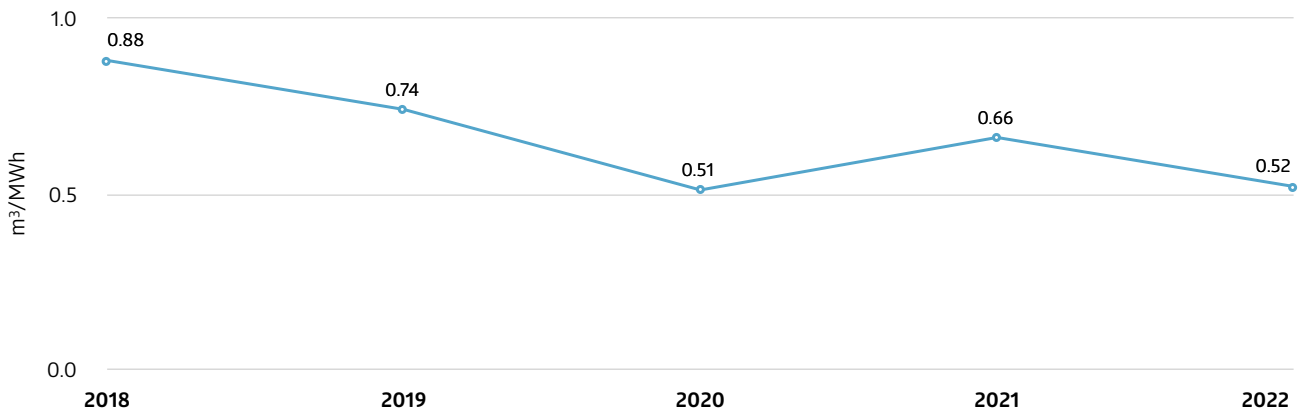




## Freshwater intensity



Freshwater intensity (including freshwater consumption for cooling and non-cooling purposes) decreased in 2022 mainly due to less freshwater withdrawal at Mount Piper and Jhajjar Power Stations and more rainwater discharged to freshwater bodies at Yallourn coal mine.



### Case study

## Engineered solution to avoid contamination of water resources in the vicinity of Mount Piper Power Station

EnergyAustralia has successfully designed and installed one of Australia's first lined dry ash repositories at its Mount Piper Power Station to prevent contamination of surface and groundwater resources in the vicinity.

Saltwater and ash are by-products from coal generation and are disposed of at a dry ash repository. EnergyAustralia designed a Leachate Barrier Management System, which involves installing a plastic liner at the base of the dry ash repository, to direct contaminated water to pass through the repository to a series of ponds for treatment and reuse. The Leachate

Barrier Management System is an engineered solution that eliminates contamination, ensures regulatory compliance, and provides the business, regulators and the community with confidence that water resources are being protected.

Mount Piper Power Station continues to source water from the Springvale Water Treatment Plant which fulfils about 80% of the plant's daily water needs, significantly reducing the need to source river water for its operations and, in turn, freshwater consumption.



Installation of the Leachate Barrier Management System at the Mount Piper Power Station