

Chapter 18

Environment and Ecology

The government's environmental priorities include improving air quality, implementing a waste-to-resources and waste-to-energy management strategy, improving harbour water quality, promoting energy efficiency, and combating climate change. To enhance food safety and environmental hygiene, it tackles hygiene black spots, updates food safety standards, maintains public markets, facilitates the supply of fresh produce, and promotes the sustainable development of the agricultural and fisheries industries.

The Environment and Ecology Bureau oversees policies on environmental protection, conservation of natural ecology, climate actions, environmental hygiene, food safety, agriculture and fisheries, and animal welfare. It is supported by the Environmental Protection Department (EPD), Hong Kong Observatory (HKO), Food and Environmental Hygiene Department (FEHD), and Agriculture, Fisheries and Conservation Department (AFCD) in executing these policies. The Government Laboratory provides analytical and advisory services to support the enforcement of environmental protection legislation, implementation of environmental programmes and routine food surveillance by the FEHD's Centre for Food Safety.

Environmental Protection

Improving air quality and harbour water quality, managing municipal solid waste better through sustainable use of resources and promoting energy efficiency are important for improving the quality of life.

Government spending on the environment in 2022-23 was budgeted at \$26 billion, or about 3.1 per cent of total public expenditure.

The bureau and the EPD work with the government-appointed Environmental Campaign Committee to encourage the public to contribute to a better environment through campaigns and community programmes. The department's environmental resource and education centre provides the public with easy access to environmental information.

The government's Environment and Conservation Fund promotes behavioural changes and green lifestyle changes by supporting educational, research and other projects on environmental protection and conservation.

The government's \$400-million Green Tech Fund provides funding support to research and development (R&D) projects that help Hong Kong decarbonise and enhance environmental protection. Since its launch in 2020, 30 projects from local universities, public research institutes and private companies have been approved, involving total grants of about \$130 million.

Regulation and Environmental Auditing

The EPD works with the construction, catering, vehicle repair and property management sectors and other trades to promote good practices and compliance with environmental regulations. Its Compliance Assistance Centre responds to enquiries from businesses on environmental compliance, pollution prevention and environmental management. Departmental inspectors conduct site visits to enforce controls on air, noise, waste and water pollution and deal with complaints about pollution, resulting in 700 convictions and \$4.47 million in fines in 2023.

Major development projects undergo environmental monitoring and auditing to validate assumptions made during the planning stage and to monitor the effectiveness of mitigation measures, so as to ensure the project meets the environmental performance promised in its environmental impact assessment. These projects are required under their environmental permits to publish the monitoring data and auditing results on dedicated websites or the

Environmental Impact Assessment Ordinance website. In 2023, the department handled 82 monitoring and auditing programmes.

Environmental Assessment and Planning

The EPD assesses and monitors the environmental impact from projects and proposals, and provides technical advice to various planning and land applications to ensure new planning proposals and development projects meet relevant environmental performance requirements, or bring improvements to the existing environment. In 2023, the EPD handled 54 applications and provided professional advice to 1,655 planning and land applications.

In June, the EPD completed a review of the Environmental Impact Assessment Ordinance, which proposed updates to the list of designated projects and amendments to the process of environmental impact assessment to enhance operational efficiency, and focus on environmental outcomes. To complement the review, the EPD also launched the Central Environmental Database in 2022, which uses a geographic information system and mapping platform to include environmental baseline data in environmental impact assessment reports to improve accuracy, efficiency and consistency.

Sustainable Development

The bureau promotes sustainable development in the government and the community. All government bureaus and departments must conduct sustainability assessments for their major initiatives and present the implications to the Policy Committee and Executive Council.

The Sustainable Development Fund provides grants for projects that enhance public awareness of sustainable development and encourage sustainable practices. Since 2003, 82 projects have been approved, involving grants totalling about \$85 million.

The government's Sustainable Development School Outreach Programme and Sustainable Development School Award Programme offer interactive dramas, seminars, workshops and field trips to secondary and primary school students and attendees of the Elder Academy. Schools are also encouraged to promote and implement the concept of sustainable development on campus and in the community. The latest programme themed 'Promoting Zero-carbon Energy, Energy Saving and Decarbonisation' has reached about 140,000 participants.

The Environment and Ecology Bureau's e-learning platform on long-term decarbonisation for senior secondary school students, launched in cooperation with the Education Bureau, enhances knowledge about low-carbon living and provides new learning and teaching materials. The 'Climate Action' Online Quiz Competition, held via the platform between November 2022 and January 2023, attracted the participation of more than 13,400 students from 172 secondary schools. It brought the total number of visitors of the platform to more than 100,000 visitors.

Cross-boundary Cooperation

Hong Kong collaborates with Guangdong and Macao on environmental matters. The Hong Kong Special Administrative Region (HKSAR) and Guangdong governments work together to improve regional air quality, combat regional ozone problems and forecast air quality.

The Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network comprises 23 air monitoring stations. Results have shown substantial reductions in most pollutants in recent years. From 2013 to 2022, the average annual concentrations of sulphur dioxide, nitrogen dioxide and respirable suspended particulates decreased by 65 per cent, 38 per cent and 46 per cent respectively. The concentration of fine suspended particulates has decreased by 38 per cent since the pollutant was first monitored in 2015. The ozone level increased by 24 per cent over the past 10 years, indicating regional photochemical pollution must be reduced.

The Cleaner Production Partnership Programme helps Hong Kong-owned factories in Hong Kong and Guangdong adopt cleaner production technologies and practices to reduce air pollutant emissions, solid waste generation, effluent discharge and carbon dioxide emissions while saving energy and production costs. From June 2020 to end-2023, about 750 projects had been approved. The programme has been extended to March 2025.

Hong Kong and Shenzhen work together to protect the quality of adjoining waters and cooperation in marine pollution prevention and control has been strengthened through a mechanism to share data on marine and river water quality, discharge flow and effluent quality of sewage treatment plants, as well as evaluate land-based pollutants entering Deep Bay. Over the past two decades, the compliance rate with water quality objectives and long-term water quality of Deep Bay have shown significant improvement, while the water quality of Mirs Bay has remained consistently good and largely complied with all applicable objectives.

To protect the water quality of the Pearl River Estuary, alert systems operated by the Hong Kong-Guangdong Marine Environmental Management Special Panel and the Hong Kong-Shenzhen Task Force issue notifications in response to heavy rainfall, a potential surge of marine refuse or other environmental incidents, enabling government departments to react quickly. As at end-2023, it had been activated 47 times since its launch in 2017.

Physical Characteristics, Flora and Fauna

Topography, Geology and Landforms

Hong Kong's natural terrain is characterised by rugged uplands flanked by steep slopes. The highest point is Tai Mo Shan (957 metres above Principal Datum) in the central New Territories, and the lowest point (66 metres below Principal Datum) is in Lo Chau Mun (the Beaufort Channel) to the north of Po Toi Island. The mountains are predominantly formed of volcanic rocks, whereas the lower hills and low-lying areas are generally underlain by granite or sedimentary rocks. A layer of soft, weathered rock covers the bedrock in most places, slope debris mantles the natural hillsides, and alluvium fills many of the valleys. Offshore, the seabed is covered with marine mud, with sand sheets occurring near the coast and in channels.

Despite its small size, Hong Kong has a great variety of coastal landforms, including sea cliffs, sea caves, sea arches, geos, tombolos, wave-cut platforms, sea stacks, notches and blowholes.

Flora

Hong Kong, situated near the northern boundary of the distribution of tropical southeast Asian flora, has a rich flora with about 3,300 species of vascular plants, of which 2,100 are native to the city. The major types of vegetation cover comprise woodland, shrubland and grassland. Remnants of the original forest cover can still be found in steep ravines or behind traditional villages in rural areas. They have survived as a result of their location in precipitous topography and the moist micro-climate, or because they are protected for cultural reasons.

The government has made continual afforestation efforts with conservation measures. Besides greening and beautifying the countryside, woodlands are important habitats for wildlife and are essential to protect water catchments from soil erosion.

Fauna

Terrestrial

The climate and physical environment provide a wide range of habitats and support for a rich and varied fauna that includes over 578 species of birds, 55 species of terrestrial mammals, 25 species of amphibians, 90 species of reptiles, 196 species of freshwater fish, 245 species of butterflies and 132 species of dragonflies.

Some species, such as the Bogadek's burrowing lizard, have been recorded only in Hong Kong. The territory is also home to a number of globally threatened species, such as the big-headed turtle, yellow-breasted bunting, short-legged toad, Chinese pangolin and Chinese tiger dragonfly.

The Mai Po Marshes form one of the most important wildlife conservation sites in Hong Kong. Together with the Inner Deep Bay area, the Mai Po Marshes area is listed as a Wetland of International Importance under the Ramsar Convention. About 1,500 hectares of inter-tidal mudflats, fish ponds, tidal shrimp ponds, marshes, reed beds and mangroves provide a rich habitat for migratory and resident birds, particularly water birds. Around 440 species of birds have been observed in this area. About 50 species are considered globally threatened or near threatened, including the black-faced spoonbill, Baer's pochard, Nordmann's greenshank and spoon-billed sandpiper. The AFCD implements a wetland conservation and management plan to conserve the ecological value of the area.

Traditional *fung shui* woods near old villages and temples and secondary forests provide important habitats for many woodland birds. Warblers, flycatchers, robins, thrushes, bulbuls and tits are among the birds that have been sighted.

Areas around the Kowloon reservoirs are inhabited by monkeys descended from individuals released there in the early 20th century. These monkeys include the rhesus macaque and hybrids of the rhesus macaque and long-tailed macaque. Some have migrated to the forested areas of Shing Mun Reservoir and Tai Po Kau. The feeding of monkeys is prohibited, to make them forage for natural food in the countryside.

Other mammals that are very common in the countryside include the red muntjac and East Asian porcupine, while the leopard cat, small-toothed ferret badger and small Indian civet are less commonly seen. Cave-dwelling bats such as the greater bent-winged bat and Chinese horseshoe bat are found in caves and water tunnels, while the short-nosed fruit bat enjoys roosting under the Chinese fan palm. Sightings of rare species, such as the Eurasian otter and crab-eating mongoose, are reported occasionally.

The territory is home to 115 species of amphibians and reptiles, of which the Hong Kong cascade frog, Hong Kong newt, Romer's tree frog and Burmese python are protected under the Wild Animals Protection Ordinance. Most of the 53 species of snakes are non-venomous, and reports of people being bitten by highly venomous snakes are rare. Among the five species of sea turtles recorded in Hong Kong waters, only the green turtle is known to be breeding locally.

Marine

Hong Kong's subtropical marine environment supports species found in both tropical and temperate climates. Situated on the eastern bank of the Pearl River Estuary, Hong Kong receives fresh water from the river, especially in its western waters. The waters on the eastern side, on the other hand, are little influenced by the Pearl River outflow and are predominantly oceanic in nature. This unusual hydrography contributes to the high diversity of marine life.

Despite being close to the northern geographic limit for their growth, Hong Kong supports 84 species of hard corals. This diversity is quite rich by international standards. A variety of marine fish also breeds in local waters, with the red pargo typical in the eastern waters. .

Two marine mammal species can be found throughout the year. The Indo-Pacific humpback dolphin, also known as the Chinese white dolphin, is the better known of the two. It prefers an estuarine environment and inhabits the western waters, while the Indo-Pacific finless porpoise lives in the eastern and southern parts, where the waters are predominantly oceanic.

The government's Marine Parks programme is important for protecting and conserving sites of special ecological and conservation value. In addition, resources enhancement measures such as artificial reefs are deployed in suitable waters to improve inshore marine and fisheries resources, as well as biodiversity.

Conservation and Biodiversity

The Director of Agriculture, Fisheries and Conservation, who also chairs the Country and Marine Parks Authority, oversees the conservation of terrestrial and marine ecological resources and the enforcement of legislation on nature conservation issues.

United Nations Convention on Biological Diversity

The United Nations Convention on Biological Diversity, which covers Hong Kong, aims to conserve biodiversity, ensure the sustainable use of its components, and ensure the fair and equitable sharing of benefits deriving from the use of genetic resources.

The Cartagena Protocol on Biosafety, adopted under the convention, seeks to ensure the safe transfer, handling and use of genetically modified organisms that may affect biodiversity adversely. Hong Kong implements the protocol through the Genetically Modified Organisms (Control of Release) Ordinance.

Protected Areas

The AFCD manages country parks, special areas including Hong Kong Wetland Park, marine parks, the marine reserve and Hong Kong Unesco Global Geopark.

About 40 per cent of Hong Kong's total land area is designated as country parks and special areas for conservation and recreation. There are 24 country parks and 22 special areas covering 44,312 hectares of scenic hills, woodlands, reservoirs, islands, indented coastlines, marshes and uplands. They are carefully protected for nature conservation, education and scientific studies.

Management responsibilities include the protection of woodland and vegetation against hill fire, control of development, tree planting, litter collection, the provision of educational and recreational facilities, and the promotion of a better understanding of the countryside.

There are seven marine parks covering about 6,100 hectares of scenic coastal areas, seascapes and important biological habitats. The marine reserve is about 20 hectares, dedicated to conservation, education and scientific studies.

Fishing in some marine parks is regulated through a permit system and banned in the other marine parks and marine reserve. Publicity and educational activities are organised for students and other members of the public.

Besides designating protected areas, the government identifies and conserves sites of special scientific interest (SSSI), such as areas with special geological features and natural habitats of rare plants or animals, by exercising strict land use planning and development controls. Sixty-seven sites are listed on the SSSI Register.

Hong Kong Wetland Park

The 61-hectare Hong Kong Wetland Park stretches from the northern part of Tin Shui Wai to the southern tip of the Mai Po Inner Deep Bay Ramsar Site. It is a special area designated under the Country Parks Ordinance. The park promotes wetland conservation, education and nature-based tourism, and gives visitors the opportunity to appreciate wetlands and local wildlife in an open and natural setting.

Hong Kong Unesco Global Geopark

The Hong Kong Unesco Global Geopark extends from Sai Kung to the northeastern New Territories and comprises spectacular hexagonal volcanic rock columns of a size and composition rarely found elsewhere in the world. It was selected as one of the first 100 International Union of Geological Sciences Geological Heritage Sites. There are also sedimentary rocks that are 400 million years old and of great geological and educational interest.

The Volcano Discovery Centre in Sai Kung town centre is an ideal starting point to visit the geopark. Visitors can also explore the Story Rooms at geopark communities to learn more about the history and intangible cultural heritage of these villages.

Countryside Conservation

The Countryside Conservation Funding Scheme provides funding to non-profit-making organisations for implementing conservation and revitalisation projects in countryside areas, including natural environment and habitats, non-graded built heritage and cultural and historic assets. Since its launch, the scheme had approved 45 projects with total funding of about \$236 million.

To support eco-tourism, better serve visitors and help revitalise desolate villages, the bureau's Countryside Conservation Office works with relevant bureaus and departments to develop licensing requirements and procedural guidelines designed especially for guesthouses and catering businesses in countryside areas, reflecting the special nature and restrictions of rural settings.

Climate

Hong Kong has a subtropical climate. January and February are cloudier with cold spells, while March and April are milder and humid with fog. From May to August, it is hot and humid with occasional heavy rain and thunderstorms. Tropical cyclones usually occur between June and October, bringing high winds, heavy rain and sometimes storm surges. November and December are generally fine and dry with pleasantly cool weather, and may on occasion be relatively cold at night and in the early morning.

The Year's Weather

It was one of the second-warmest years in Hong Kong since records began in 1884, with an annual mean temperature of 24.5 degrees Celsius, 1 degree above average. The summer mean temperature of 29.7 degrees for June to August was the hottest on record and the yearly total of 54 days with daily maximum temperatures of 33 degrees or higher was one of the highest on record. The total annual rainfall of 2,774.5mm was about 14 per cent above average.

Five tropical cyclones affected the territory in 2023. Super Typhoon Saola necessitated the issuance of the highest tropical cyclone warning, the No 10 Hurricane Signal for the first time since 2018. During the passage of Severe Typhoon Koinu and Typhoon Talim, the No 9 Increasing Gale or Storm Signal and the No 8 Gale or Storm Signal were issued respectively.

A trough of low pressure associated with Tropical Cyclone Haikui brought prolonged torrential rain to Hong Kong on 7 and 8 September and necessitated the issuance of the highest rainstorm alert, the Black Rainstorm Warning, for 16 hours and 35 minutes, setting the longest record since the introduction of the warning system in 1992. During the downpour, the Observatory registered an hourly rainfall of 158.1mm from 11pm to midnight on 7 September, the highest since records began in 1884. The September rainfall of 1,067.1mm broke the month's previous record of 844.2mm set in 1952. Tropical Cyclone Koinu also brought squally

heavy showers on 8 and 9 October and the rainfall recorded on 9 October reached 369.7mm, the highest daily rainfall on record for October.

Climate Change

Carbon Neutrality

Hong Kong's Climate Action Plan 2050 sets out four major strategies and targets – net-zero electricity generation, energy saving and green buildings, green transport and waste reduction – to reduce carbon emissions by half before 2035 compared with the 2005 level, and to achieve carbon neutrality before 2050.

The government has set up a new Office of Climate Change and Carbon Neutrality to strengthen coordination and promote deep decarbonisation. The Council for Sustainable Development was reorganised to become the Council for Carbon Neutrality and Sustainable Development to offer advice on decarbonisation strategies.

Meteorological and Geophysical Services

Weather Forecasting and Information Services

The Hong Kong Observatory provides weather forecasts, warnings and information through a variety of channels, including the media, social media, its website, mobile application MyObservatory, Dr Tin chatbot service and the Dial-a-Weather telephone service. It also produces regular weather television programmes and an educational series, *Cool Met Stuff*.

In 2023, MyObservatory was enhanced to forecast traffic conditions of strategic and major roads. The Observatory also enhanced the Very Hot Weather Warning service with an updated set of precautionary actions and a new Special Weather Tips message to alert the public of extremely hot weather. The 'Earth Weather' function on the website and app was also enhanced, adding weather forecast products based on artificial intelligence-based prediction models, and extending the forecast range to 15 days.

The Observatory also offers professional advice to government departments and other sectors. For instance, it provides aviation weather services to the airport and the Hong Kong Flight Information Region; offers flight crew the latest inflight weather information through its mobile application MyFlightWx; and issues forecasts of wind, weather, waves and swells for the marine community and container terminals.

In 2023, MyFlightWx was upgraded to display low visibility and strong wind conditions at aerodromes as well as the runway conditions at Hong Kong International Airport. The Observatory continued to implement aviation meteorological facilities in support of the full operation of the airport's Three-runway System project.

As the Backup Centre of the Asian Aviation Meteorological Centre, the Observatory takes over from the main centre in Beijing for one week every quarter to issue hazardous weather forecasts and warnings to aviation users in the Asian region.

Climate Services and Studies

The Observatory provides government departments and those involved in disaster prevention and risk reduction with climatological information and predictions. It conducts research on past trends and projections of temperature, rainfall, sea level and extreme weather in Hong Kong and provides the latest climate change information and scientific input to support initiatives to combat climate change.

Radiation Monitoring and Assessment

The Observatory monitors ambient radiation levels and measures the amount of radioactivity in environmental samples. It enhances its monitoring and assessment capabilities through collaboration with Mainland and international counterparts. In the unlikely event of a nuclear incident, the Observatory would step up radiation monitoring, provide decision-makers with assessments of radiological consequences and advice on actions to take, and provide information on radiation levels and developments to the public.

In 2023, in response to the discharge of nuclear-contaminated water from Fukushima in Japan, the radiation monitoring of sea water samples in local waters was enhanced and the results were made available online.

Geophysical Services

The Observatory monitors earthquakes and tsunamis in the vicinity of Hong Kong and around the world. In 2023, the Observatory recorded 10 locally felt tremors.

An updated cooperation agreement was signed with the Guangdong Earthquake Agency in September while the Backup South China Sea Tsunami Advisory Centre (Hong Kong), designated by the National Marine Environmental Forecasting Centre, officially began operation in March. It took over from the main centre in Beijing to provide a tsunami advisory service to nine countries around the South China Sea for two weeks in December. Geomagnetic measurements were made at Hong Kong International Airport, Chi Ma Wan and Ma On Shan in mid-2023.

Time Services

As Hong Kong's official timekeeper, the Observatory maintains a time standard accurate to within one-hundred-millionth of a second per day and contributes to the determination of Coordinated Universal Time by the International Bureau of Weights and Measures. The public can check the time through the Observatory's online time service, web clock, Dial-a-Weather and radio stations. The Observatory's internet time service recorded about 100 billion visits in 2023.

Cooperation with Other Meteorological Services

In 2023, Observatory representatives attended the 19th World Meteorological Congress in Geneva, Switzerland to discuss the direction and the strategy of meteorological work worldwide.

During the year, the Observatory signed agreements with the official meteorological services of Thailand, Indonesia and Papua New Guinea to strengthen cooperation on data exchange, and weather forecasting technology, as well as the safety and efficiency of international civil air navigation. The Observatory also signed an agreement with the China Meteorological Administration to cover the Belt and Road initiatives and to enhance Guangdong-Hong Kong-Macao Greater Bay Area (GBA) cooperation.

Public Education and Engagement

To celebrate its 140th anniversary in 2023, the Observatory organised a series of activities, including launching a thematic webpage, publishing a book *Stories Under Passing Storms* and producing a series of educational videos and a feature programme *Time Travel Climate Mission* jointly with Radio Television Hong Kong. It also organised campaigns to raise awareness of the threats posed by tropical cyclones and thunderstorms.

The Observatory promotes awareness of climate change and its impact through school talks, online quizzes, educational videos and publishing articles and the latest international research findings on its website. It organised activities in 2023 through the Science in the Public Service campaign, Public Weather Observation Course, Community Weather Information Network and Gamma-Go, and also participated in the InnoCarnival 2023, organised by the Innovation and Technology Commission, which included scientific talks and guided tours of the Observatory's facilities.

Energy

The government's energy policy is to provide a reliable supply of energy at reasonable prices and promote its economical and safe use, while minimising the environmental impact of its production and usage.

Electricity

The Hongkong Electric Company Limited (HK Electric) supplies electricity to Hong Kong Island and the neighbouring islands of Ap Lei Chau and Lamma. CLP Power Hong Kong Limited (CLP Power) supplies Kowloon and the New Territories, including Lantau and several other outlying islands. The electricity supply to consumers is 50 hertz alternating current, while the voltage is 220 volts single-phase and 380 volts three-phase.

Both power companies are investor-owned. The government monitors them through mutually agreed Scheme of Control Agreements, which require the companies to seek the government's approval for certain aspects of their development plans, including projected basic tariff levels, to ensure the continued supply of reliable, safe and efficient electricity at reasonable prices. The agreements do not give the companies any exclusive rights to supply electricity. They are not franchises, nor do they define a supply area for either company or exclude newcomers to the market. The companies receive a return on their average net fixed assets at the permitted rate of return specified in the agreements.

HK Electric has a total installed capacity of 3,402 megawatts at its Lamma Power Station. CLP Power receives its electricity supply from the Castle Peak Power Company Limited's power

stations at Black Point (3,250MW), Castle Peak (3,758MW), Penny's Bay (300MW) and West New Territories Landfill (10MW).

Each company owns its respective transmission and distribution systems. The two transmission systems are connected by a cross-harbour link, which provides emergency backup and some sharing of generating capacity reserves between the two systems. The link has a total capacity of 720 megavoltamperes.

CLP Power's transmission system is also connected to the Guangdong electricity network which allows electricity exports and imports to and from the province. The company imports about 70 per cent of the power generated by the Daya Bay nuclear power station, which has two 984MW pressurised water reactors. In addition, it will import another 10 per cent of Daya Bay's electricity until 2028.

CLP Power also has the right to use up to half of the 1,200MW capacity of the Guangzhou Pumped Storage Power Station phase 1 at Conghua. It stores off-peak electricity from Castle Peak Power's stations and the Daya Bay station in the Conghua plant, which generates hydroelectricity to meet Hong Kong's demand during peak periods.

Electricity generation is the largest contributor to carbon emissions in Hong Kong. Coal currently makes up about a quarter of Hong Kong's fuel mix for electricity generation, down from about half in 2015. Under Hong Kong's Climate Action Plan 2050, the government has pledged to cease using coal for daily electricity generation by 2035 and the target is to achieve net-zero electricity generation.

Other Fuels

Town gas and liquefied petroleum gas (LPG) are the main types of fuel gas used for domestic, commercial and industrial purposes. Hong Kong has 2.3 million gas customers in the domestic, commercial and industrial sectors, and town gas and LPG respectively accounted for 89 and 11 per cent of the total fuel gas sold in these sectors in terms of heating values in 2023 .

Town gas is manufactured at plants in Tai Po and Ma Tau Kok, which have daily throughput capacities of about 10 million and 2.6 million cubic metres respectively. It is channelled to customers via a pipe network of about 3,700km.

LPG is imported into Hong Kong mainly by sea and stored at five terminals in Tsing Yi before being distributed to customers, including 70 auto-LPG filling stations.

CLP Power and HK Electric import natural gas from the Mainland through submarine pipelines to Black Point Power Station and Lamma Power Station respectively, and also directly purchase liquefied natural gas (LNG) from the international market for power generation.

To provide a long-term alternative gas supply source and enhance the diversity and security of gas supply, the power companies jointly constructed the offshore LNG terminal to the east of the Soko Islands, which went into service in July. The terminal can receive, store and regasify LNG before it is piped to Black Point Power Station and Lamma Power Station.

Natural gas is also sent to the Tai Po plant, and onward from Tai Po to the Ma Tau Kok plant via underground pipelines, for the production of town gas. Separately, CLP Power draws natural gas from the Mainland's Second West-East Natural Gas Pipeline through the submarine Hong Kong Branch Line facilities.

Renewable Energy

As pledged in the climate action plan, the government will drive the development of renewable energy, seeking to increase its share in the fuel mix for electricity generation through facilitating local renewable energy projects, regional cooperation and joint ventures. The government also strives to increase the share of zero-carbon energy in the fuel mix for electricity generation to about 60 to 70 per cent before 2035.

For the public sector, the government leads in developing renewable energy, including large-scale projects in reservoirs and restored landfills. The government is planning a large-scale floating solar farm at Plover Cove Reservoir with a generating capacity of 5MW. It is expected to supply 6 million kilowatt hours per annum of electricity upon its completion in 2026, equivalent to the annual electricity consumption of around 1,800 households, and could reduce carbon emissions by 4,200 tonnes per annum, for direct use by the nearby waterworks facilities.

To assess the feasibility of generating solar energy at restored landfills, a medium-scale pilot solar energy generating system with a generating capacity of 150kW at Jordan Valley Landfill was commissioned in February, while another pilot solar farm project with a capacity of 1MW is being implemented at the South East New Territories Landfill in Tseung Kwan O.

The government has also developed advanced waste-to-energy facilities at O • Park1 (Organic Resources Recovery Centre Phase 1) and T • Park (Sludge Treatment Facility), which generate surplus electricity from organic waste and sludge respectively.

Apart from large-scale renewable energy systems, the government has earmarked a total of \$3 billion to install small-scale systems on government premises since 2017-18, with more than \$1.9 billion approved for about 222 projects which can generate about 25 million kWh of electricity per annum.

As for the private sector, the Feed-in Tariff scheme provides financial incentives for the installation of private renewable energy systems. Between 2018 and 2023, the two power companies approved over 25,000 applications. Systems already approved could generate about 400 million kWh of electricity each year.

Solar energy generation systems have been installed at about 670 schools and non-governmental welfare organisations under the government's support scheme, Solar Harvest. Other measures to assist the development of renewable energy by the private sector include facilitating the installation of solar energy generation systems in open car parks, relaxing restrictions on installing solar systems in New Territories Exempted Houses and legislative amendments relevant to Feed-in Tariff payments.

Both power companies use renewable energy. HK Electric operates an 800kW wind turbine on Lamma and a 1MW thin film solar energy generation system at Lamma Power Station, while CLP Power runs a 200kW renewable energy generation system of solar panels and wind turbines on Town Island in Sai Kung and a 10MW landfill gas power generation system at the West New Territories Landfill.

Energy Saving

Energy consumption is related closely to greenhouse gas emissions. Improving energy efficiency helps combat global climate change. End-users consumed 279,907 terajoules in 2021, with the commercial, transport, residential and industrial sectors taking up 43, 29, 24 and 4 per cent respectively.

The Energy Saving Plan for Hong Kong's Built Environment 2015~2025+ sets a target of reducing energy intensity by 40 per cent by 2025, and outlines the policy, strategies and key action plans to achieve that target. By end-2021, the city had lowered its energy intensity by more than 30 per cent.

The Electrical and Mechanical Services Department's Energy Efficiency Office promotes efficient use of energy through legislation and public education. Its Mandatory Energy Efficiency Labelling Scheme requires prescribed products to bear labels informing consumers of the products' energy efficiency performance. The scheme, now in its fourth phase, regulates 11 types of household electrical appliances covering about 80 per cent of energy consumption in the residential sector.

The E&M InnoPortal promotes energy-related innovation and technology. It lists the service needs of various government departments, public organisations and the trade. Universities and start-ups can propose solutions to meet these needs. At end-2023, the portal had collected more than 500 service needs and over 1,100 suggested solutions. More than 190 field trials have started, with 45 of these related to energy efficiency and renewable energy.

District cooling systems can save electricity by up to 35 per cent compared with traditional central air-conditioning systems in individual buildings. They will be increasingly incorporated in new development areas to reduce energy consumption. The district cooling systems in the Kai Tak Development will be completed in phases, providing chilled water to non-domestic developments in the area for air-conditioning. Buildings served by these systems include the Kai Tak Cruise Terminal, Trade and Industry Tower, Hong Kong Children's Hospital, schools and shopping centres. The government is also constructing district cooling systems at Tung Chung New Town Extension (East) and Kwu Tung North New Development Area.

Energy-efficient Buildings

Buildings account for about 90 per cent of the electricity consumed, so promoting their efficient use of energy is paramount to reducing carbon emissions. The Building Energy Code stipulates the minimum energy efficiency standards for four major types of building services installations, namely air conditioning, electrical installations, lifts and escalators, and lighting installations. Commercial buildings must also conduct energy audits at least once every 10 years in accordance with the Energy Audit Code. The codes are reviewed every three years

and the latest editions were gazetted at end-2021, improving the energy efficiency standards by more than 15 per cent compared with 2015.

The government aims to improve the overall energy performance in government buildings and infrastructure by more than 6 per cent¹ by 2024-25.

For private buildings, the capital cost of buying renewable-energy installations and building energy-efficient installations is tax deductible.

Retro-commissioning is a cost-effective and useful means of saving energy in existing buildings. The Electrical and Mechanical Services Department organises seminars to help building owners and relevant trades carry out retro-commissioning. Since 2019, \$215 million has been earmarked to retro-commission government buildings. About 250 government buildings had participated as at end-2023.

Under the current Scheme of Control Agreements, the power companies manage their own energy-efficiency fund to support the retrofitting and retro-commissioning of private buildings.

Pollution Prevention

Air Pollution

The government has been implementing measures to reduce air pollutant emissions from local electricity generation, vehicles and vessels. Between 2010 and 2021, emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x), respirable suspended particulates (RSP), fine suspended particulates (FSP), carbon monoxide and volatile organic compounds dropped by between 31 per cent and 87 per cent.

New air quality objectives (AQOs) which took effect in 2022 tightened the 24-hour AQO for SO₂, and the annual and 24-hour AQOs for FSP. In 2022, the ambient concentrations of major air pollutants broadly complied with the new objectives.

From 2013 to 2022, ambient concentrations of RSP, FSP, nitrogen dioxide (NO₂) and SO₂ dropped 51 per cent, 55 per cent, 43 per cent and 62 per cent respectively, while roadside concentrations of the same fell 49 per cent, 51 per cent, 47 per cent and 64 per cent respectively. Regional ozone background, however, remained relatively high, indicating that the regional photochemical smog problem remains challenging. The EPD is collaborating with the Guangdong and Macao governments on a three-year joint regional ozone study to tackle the problem.

Land Transport

Vehicle emissions are the major source of roadside air pollution. The government's policy is to apply the most stringent motor vehicle fuel and emission standards practicable. Nearly all taxis and about 80 per cent of public light buses run on LPG. Further to the phasing out of about

¹ The government met its earlier target of reducing consumption in 2018-19, with a final saving of 7.8 per cent. This will be the baseline for the further reductions.

82,000 pre-Euro IV diesel commercial vehicles, an incentive-and-regulatory programme has been implemented to phase out some 40,000 Euro IV diesel commercial vehicles by 2027. About 21,500 Euro IV diesel commercial vehicles had been retired under the programme as at end-2023.

Controls are in place to curb excessive smoke from diesel vehicles and excessive emissions from petrol and LPG vehicles due to poor maintenance. During the year, 635 diesel vehicles with excessive smoke were reported and 2,596 petrol and LPG vehicles with excessive emissions were identified by roadside remote sensors. Such vehicles must pass a chassis dynamometer emission test within 12 days to prove the problem has been rectified.

The Hong Kong Roadmap on Popularisation of Electric Vehicles promotes the use of electric vehicles (EVs). The key measures include ceasing new registration of fuel-propelled and hybrid private cars in 2035 or earlier, promoting trials for electric public transport and commercial vehicles, expanding and promoting the EV charging network, training for technicians and mechanics on EV maintenance, formulating a producer responsibility scheme for retired EV batteries, and establishing a task force to examine the high-end development of new decarbonisation technologies globally.

At year end, the number of EVs, including government and special-purpose vehicles, was more than 76,000 – about a 60 per cent increase on 2022 – while 7,415 public chargers were available, including 1,151 quick and 4,225 medium chargers. The EV-charging at Home Subsidy Scheme, introduced in 2020, promotes the installation of EV charging-enabling infrastructure in car parks of existing private residential buildings. The government had received 788 applications covering more than 152,900 parking spaces at the close of application period on 31 December 2023.

The trial and application of green commercial transport technologies is subsidised under the New Energy Transport Fund. Around 290 trials have been approved since the fund's inception, with subsidies totalling about \$253 million.

To promote mass transit systems that are pollution-free at the street level, the government gives priority to rail over road and encourages innovation.

Marine Transport

Marine vessels are a major air pollutant emission source. The government caps the sulphur content in locally supplied marine light diesel at 0.05 per cent. All vessels in Hong Kong waters are required to use compliant fuel, such as fuel with sulphur content not exceeding 0.5 per cent and LNG.

Power Generation

The government tightens statutory emission caps on the power sector progressively and encourages the power companies to further develop and utilise more zero-carbon energy to reduce air pollutant and emissions.

Indoor Air Quality

The government's voluntary Indoor Air Quality Certification Scheme for Offices and Public Places encourages property owners and management companies to enhance indoor air quality at their premises.

Ozone Layer Protection

The Montreal Protocol for controlling substances that deplete the ozone layer applies to Hong Kong. The Ozone Layer Protection Ordinance prohibits the manufacture of these substances and their import for local consumption. The import of hydrochlorofluorocarbons for local consumption has been banned since 2020, with only a small amount permitted to service refrigeration and air-conditioning equipment until 2029.

Non-road Mobile Machinery

Non-road mobile machinery newly supplied for use in Hong Kong is required to meet statutory emission requirements, namely the Euro Stage IIIA emission standard for machines such as crawler cranes, air compressors and excavators. The statutory emission standards for newly approved non-road vehicles have been tightened in phases since 2019 to Euro VI, which is in line with the emission standards for newly registered road vehicles. All machinery to be used in specified activities or locations, such as Hong Kong International Airport, container terminals and construction sites, must bear EPD-issued labels.

Noise Pollution

In 2023, the government completed a public consultation for proposals to control domestic renovation noise and the use of loudspeakers on the street, and introduce a fixed penalty system to effectively control noise nuisance. Legislative amendment proposals will be put forward to the Legislative Council.

Construction Noise

The department controls noise from general construction works between 7pm and 7am and at all times on public holidays through construction noise permits. These permits restrict the use of equipment and the conduct of noisy manual activities in built-up areas. Percussive piling is prohibited at night and on public holidays, and requires a permit during the day on non-public holidays. The use of noisy diesel, steam and pneumatic piling hammers is generally banned, while hand-held percussive breakers and air compressors used in construction must meet noise standards and be issued with noise emission labels. In 2023, newly developed populated built-up areas were included as designated areas and noise emission standards for air compressors and hand-held percussive breakers were tightened. Apart from these legal controls, the department also promotes quiet construction equipment and techniques to the construction industry.

Quiet Renovation

To mitigate noise nuisance from domestic renovation, the EPD launched a two-year quiet renovation pilot scheme in 2021 to provide administrative and technical support through property management companies. The scheme assists these companies to formulate quiet renovation house rules, and provides free rental of quiet renovation equipment to renovation

companies or qualified workers. As of end-2023, the scheme had been introduced to more than 1,400 trade practitioners.

Road Traffic Noise

To mitigate the impact of traffic noise on residents, proponents of development projects are required to assess traffic noise impact when planning new roads and residential developments, provide direct mitigation measures such as noise barriers and low-noise road surfacing for new roads, and adopt innovative noise mitigation designs such as acoustic balconies and windows. All newly registered vehicles must comply with internationally recognised noise standards. As regards existing roads, the government installs noise barriers and lays low-noise road surfacing materials, with 129 road sections enhanced through these efforts as at end-2023. About 180 new residential development projects, involving 50,000 units, had adopted innovative noise mitigation designs by the end of the year.

Noise from Industrial or Commercial Activities

The EPD serves noise abatement notices requiring the owners or occupants of premises causing excessive noise from industrial or commercial activities to tone down within a given period.

Railway Noise

In planning new railway projects, the MTR Corporation Limited must comply with a statutory environmental impact assessment. The department will request the company to make improvements if noise emitted from existing railways exceeds the relevant standards.

Aircraft Noise

The Hong Kong Planning Standards and Guidelines restricts new residential developments from being built in areas with aircraft noise levels exceeding the planning standard. The impact of aircraft noise on residents in the vicinity of flight paths at the airport should also be within the planning standards.

Waste Management

Waste Statistics

Over the past five years, the municipal solid waste dumped at landfills has decreased by 3 per cent, while the mid-year population has shrunk by 1.4 per cent. In 2022, the daily per capita disposal rate was 1.51 kilograms. About 60 per cent of 4.06 million tonnes dumped at landfills was domestic waste, and the remainder was commercial and industrial waste. Food waste accounted for about 30 per cent of the total municipal solid waste.

During the same five-year period, the amount of overall construction waste disposed of at landfills has increased by 1 per cent. In 2022, the overall construction waste disposed of at landfills was 1.51 million tonnes.

Waste Reduction

The *Waste Blueprint for Hong Kong 2035* outlines the strategies, goals and measures for waste management up to 2035. The government works with the industry and the community to move towards two main goals. The medium-term goal is to reduce the per capita municipal solid waste disposal rate by 40 to 45 per cent and raise the recovery rate to about 55 per cent by implementing municipal solid waste charging, alongside other policies and legislation, while the long-term goal is to move away from the reliance on landfills for direct waste disposal by developing adequate waste-to-energy facilities. To achieve the goals, the government promotes six major areas of action: waste reduction; waste separation; resources circulation; industry support; innovation and cooperation; and education and publicity.

Municipal solid waste charging is central to the government's waste reduction strategy, which aims to incentivise the public and enterprises to practise waste reduction at source and clean recycling, thereby reducing overall waste disposal. The government is working toward implementing the Waste Disposal (Charging for Municipal Solid Waste) (Amendment) Ordinance.

The government also provides additional recurrent resources to strengthen support for waste reduction and recycling. When municipal solid waste charging is implemented, the additional provision will increase to no less than \$800 million every year.

Various producer responsibility schemes have been introduced to reduce waste at source and facilitate the development of a circular economy, including the Plastic Shopping Bag Charging Scheme, which levies a charge of \$1 on plastic bags with limited exemptions, a scheme for waste electrical and electronic equipment (WEEE) and another for glass beverage containers, which was fully implemented in May. In 2023, more than 21,300 tonnes of regulated WEEE and around 22,000 tonnes of waste glass containers were collected and treated.

The Product Eco-responsibility (Amendment) Bill 2023 for regulating disposable plastic tableware and other plastic products was passed on 18 October. To allow the trade to get prepared, the government will commence the first phase of regulation from 22 April 2024. The amendment bill also expands the scope of the WEEE producer responsibility scheme to include refrigerators and washing machines of larger capacities, as well as tumble dryers and dehumidifiers, and removes the requirement for sellers to provide consumers with recycling labels. These enhancements will take effect in July 2024.

Waste Recycling

The government supports the recycling industry and educates the public to reduce and separate waste at sources, so as to improve the quality of the recyclables collected and to streamline the subsequent treatment process.

The Programme on Source Separation of Waste managed by the EPD covers about 2,700 housing estates and buildings and 1,200 commercial buildings, enabling citizens to deposit paper, plastic and metal in recycling bins close to their homes and workplaces.

The Green@Community network collects nine common types of recyclables. It consists of 11 recycling stations that provide both recycling and education services, 34 recycling stores –

including three new ones set up in 2023 in public housing estates – and over 130 mobile recycling spots that operate on a weekly schedule at fixed locations. To reach out to the community, Green Outreach under the EPD provides on-site assistance and support, as well as organising educational activities, on waste reduction and recycling to property management companies and residents.

A pilot scheme on waste plastics collection and recycling has been implemented in nine districts. The service covers about half of the population and the total collection exceeded 6,000 tonnes in 2023.

The government extended the Pilot Scheme on Food Waste Collection to the whole territory from April. A free collection service is provided to public and private premises where larger quantities of food waste are generated, including food factories, wet markets, hospitals, hotels and shopping malls.

The EPD completed the installation of smart bins for food waste collection for 100 blocks of public housing estates in September, and the service will be expanded to all such estates in 2024. The department also provided subsidies to private residential buildings to install food waste smart bins through different funding schemes. It is also conducting various trials to expand the food waste collection network by setting up collection bins in places such as areas with concentrated street-level restaurants, refuse collection points and back lanes. As at end-2023, the average daily quantity of food waste collected was close to 200 tonnes.

Between 2018 and 2022, an average of 78 per cent of solid waste, including municipal solid waste and construction waste, was recovered each year, amounting to an annual average of 19 million tonnes. Among the municipal solid waste, the annual average recovery rates of paper, metal and plastics were 38 per cent, 91 per cent and 10 per cent respectively.

EcoPark

Though gradually declining, an annual average of about 80 per cent of recyclable municipal solid waste has been delivered outside Hong Kong for recycling over the past five years, with plastics, paper and metals contributing 90 per cent of the recovered waste. The 20-hectare EcoPark in Tuen Mun promotes development of the recycling industry by providing long-term land at affordable rents to encourage investment in advanced technologies and value-added recycling processes. Private recyclers in EcoPark recycle cooking oil, scrap metal, wood, WEEE, plastics, construction materials, glass, rubber tyres, batteries and paper.

Recycling Fund

The \$2 billion Recycling Fund supports the recycling industry to enhance operational capabilities and efficiency, and the application of technology. As of end-2023, about \$800 million had been approved.

Waste Treatment and Disposal

Refuse Transfer Stations

Municipal solid waste is mainly collected by refuse collection vehicles and delivered to refuse transfer stations for compression, then packed into specially designed containers and taken to

strategic landfills by sea or land. In 2023, the network handled 3.14 million tonnes of such waste, which translates to 79 per cent of Hong Kong's total.

Landfills

Hong Kong has three strategic landfills, which serve as the final disposal sites for most of the solid waste. The design and operation of these landfills adopt different measures to reduce the impact on the environment. With the South East New Territories Landfill Extension accepting only construction waste, all municipal solid waste is disposed of at the North East New Territories Landfill and West New Territories Landfill.

The North East New Territories Landfill and West New Territories Landfill need to be extended to ensure an uninterrupted disposal service for municipal solid waste. Site formation and construction work is under way at the North East New Territories Landfill Extension. The contract for the West New Territories Landfill was awarded in 2023 and early site preparation work is under way.

Hong Kong has 13 restored landfills and the government promotes their development into recreational or nature conservation facilities.

Planned Infrastructure

To move away from reliance on landfills for municipal solid waste disposal by around 2035, the government will develop a network of advanced modern waste-to-energy incinerators. The EPD is building the first such incinerator, I • Park1, near Shek Kwu Chau, targeted for commissioning in 2025; and planning the development of a second, I • Park2, in Tuen Mun.

O • Park1, with a capacity of 200 tonnes daily, uses biological technology to turn food waste into useful resources. Since its commissioning in 2018, it has treated about 220,000 tonnes of food waste, converting it into 52 megawatt hours of electricity and about 11,000 tonnes of compost for agricultural and landscaping use. O • Park2, with a capacity of 300 tonnes daily, is under construction for commissioning in 2024.

The anaerobic co-digestion trial scheme at the Tai Po Sewage Treatment Works can process about 50 tonnes of food waste a day. The trial was extended to the Sha Tin Sewage Treatment Works in November, with a similar treatment capacity.

Another recycling centre, Y • Park in Tuen Mun, can treat 60 tonnes of suitable yard waste a day, turning it into products such as wood chips and wooden boards. A pilot biochar production plant in EcoPark that converts woody waste into biochar started trial production in the second half of 2023. The plant is expected to process around 6,000 tonnes of woody waste and produce about 1,200 tonnes of biochar a year.

Chemical, Clinical and Special Waste

All chemical and clinical waste producers are required to pack, label and store their waste properly before disposal at licensed treatment facilities. A trip ticket system tracks the waste movement from its origin to the final disposal point. The Chemical Waste Treatment Centre in

Tsing Yi treated a daily average of 19.6 tonnes of chemical waste and 8.5 tonnes of clinical waste in 2023. Waste producers using its services pay part of the treatment cost.

The government's policy is to return radioactive waste to the original suppliers as much as possible, hence only some low-level radioactive waste needs to be transferred to a dedicated facility on Siu A Chau, an uninhabited island southwest of Lantau, for long-term storage. The facility is purpose-built to meet stringent international standards for the safe storage of low-level radioactive waste.

T • Park, the sludge treatment facility in Tuen Mun, employs an advanced treatment process to treat up to 2,000 tonnes per day of sludge generated from sewage treatment. It has waste-to-energy facilities to convert the incineration heat to sufficient electricity to power the entire facility and exports the surplus to the power grid. The facility treated about 407,300 tonnes of sewage sludge and exported 14.2 million kWh of electricity in 2023. Its environmental education centre has attracted over 350,000 visitors since opening in 2016.

Construction Waste

The Construction Waste Disposal Charging Scheme provides economic incentives to reduce construction waste, recover and reuse inert materials, and reduce their disposal at landfills. An annual average of 19 million tonnes of overall construction waste was generated from 2018 to 2022. The reuse rate was 92 per cent in 2022, having remained above 90 per cent in recent years.

Marine and Shoreline Refuse

Marine refuse in Hong Kong waters is cleared by the Marine Department, which deploys about 42 vessels to scavenge for floating refuse and collect domestic refuse from vessels in the anchorages and typhoon shelters. In 2023, the department collected about 2,400 tonnes of such refuse.

Shoreline refuse is cleared by the AFCD, FEHD, Leisure and Cultural Services Department and other government bodies. The Inter-departmental Working Group on Marine Environmental Management coordinates the efforts of different departments in handling marine refuse and marine environmental incidents.

The government also leverages community efforts to protect the marine environment through the Clean Shorelines Liaison Platform. Since 2015, over 3,900 participants from schools, non-profit-making organisations and commercial companies have been engaged in the Shorelines Cleanup Day programme through the platform. There have also been more than 3,200 coastal clean-up activities carried out by voluntary groups and activists in the past eight years.

Livestock Waste

The Waste Disposal Ordinance bans the keeping of livestock in new towns and environmentally sensitive areas. Where they are allowed, livestock farms must have proper waste treatment systems. The government provides a free livestock waste collection service, which collected about 28,900 tonnes of waste in 2023.

Sewage Treatment and Disposal

The public sewerage system covers the entire urban area and serves over 93 per cent of the population. It collects about 2.8 million cubic metres of waste water daily, over 99 per cent of which receives chemical or higher levels of treatment before being discharged.

Victoria Harbour and Harbour Area Treatment Scheme

Under the Harbour Area Treatment Scheme, all sewage from both sides of Victoria Harbour is intercepted and conveyed through a network of deep tunnels to the Stonecutters Island Sewage Treatment Works for treatment and disinfection before discharge.

The government also implements other measures to alleviate pollution caused by the discharge of residual pollutants through the storm water systems. These include rectifying misconnected sewers; installing dry-weather flow interceptors in some storm water culverts; rehabilitating ageing sewers; and applying Malodour Control Hydrogel at storm water outfalls with odour problems.

Sewage Disposal in Rural Areas

As at end-2023, more than 17,800 village houses had been connected to public sewers. Eligible households can apply for loans and grants to help them connect their buildings to public sewers.

Sewage Charges

All water users who discharge sewage into a communal drain or sewer pay a charge of \$2.92 per cubic metre of water supplied, with each domestic account exempt from paying for the first 12 cubic metres per four-month consumption period. Twenty-seven trades whose effluent strength is higher than that of domestic sewage pay a surcharge. These charges are used to recover the operating and maintenance costs of sewage collection, treatment and disposal facilities, whose construction is government-funded.

Water Quality

The water quality of Victoria Harbour has improved markedly under the Harbour Area Treatment Scheme. In 2023, the harbour's overall compliance with the statutory water quality objectives was 100 per cent.

By controlling pollution at source, river water quality remains good. During the year, 79 per cent of the river monitoring stations were categorised as 'good' or 'excellent', while only 6 per cent belonged to the 'bad' category.

Bathing Beaches

Beach water quality is assessed through an established system which ranks a beach according to the level of the *Escherichia coli* bacteria in its water, to reflect the corresponding swimming-associated health risks. As of 2023, all 42 gazetted beaches had complied with the statutory bacteriological water quality objective for bathing waters for 14 consecutive years, among which 26 beaches were ranked as 'good' and the remaining 16 were ranked as 'fair'. No beaches fell into the 'poor' or 'very poor' categories.

Licensing of Food Premises and Other Trades

The FEHD issues licences for food businesses and permits for the sale of restricted foods. It also issues permits for karaoke establishments in licensed restaurants and licences for places of public entertainment, private swimming pools, commercial bathhouses, funeral parlours, undertakers of burials and offensive trades. It also provides executive and secretarial support to the Liquor Licensing Board, an independent statutory body that issues liquor licences, including those for clubs.

During 2023, the department issued 7,274 full, provisional and temporary food business licences; 1,546 permits for the sale of restricted foods, including 403 online restricted food permits; 2,681 licences for places of public entertainment; 33 licences for other trades; and eight permits for karaoke establishments in licensed restaurants. The Liquor Licensing Board issued 1,105 liquor and club liquor licences.

In March, the FEHD implemented measures to improve the food business licensing regime, including the introduction of the Professional Certification System, which adopts a 'licence first, inspection later' approach, applicable first to light refreshment restaurants and food factories. The department also relaxed restrictions on food items sold by light refreshment restaurants.

Food Safety and Facilitation of Food Importation

The Centre for Food Safety (CFS) ensures that the food sold in Hong Kong is safe and fit for consumption. It tested about 65,000 samples of food at import, wholesale and retail levels for chemical, microbiological and radiological examination in 2023. The overall satisfaction rate of these tests was 99.8 per cent.

In 2023, the Man Kam To Animal Inspection Station inspected 27,492 vehicles carrying live food animals including pigs, cattle and goats, and examined 1,033,275 live food animals.

The bureau and the CFS, making reference to the food safety standards of the Codex Alimentarius Commission and other economies, and taking into account local dietary practices and risk assessment results, review and update Hong Kong's food safety standards and regulatory arrangements. The Harmful Substances in Food (Amendment) Regulation 2021 came into effect in two phases in 2023. Provisions stipulating the maximum levels of certain harmful substances in food came into operation on 1 June, while provisions relating to specifying partially hydrogenated oils, the main source of industrially produced trans fatty acids, as a prohibited substance in food, took effect on 1 December. The bureau and the CFS have also started the legislative review exercise of the Preservatives in Food Regulation, with a public consultation conducted from May to September.

With effect from 1 July, the CFS extended the scope of fresh produce imports via the Hong Kong-Zhuhai-Macao Bridge to cover the same categories of food that are imported via the Man Kam To Boundary Control Point. Vehicles carrying fresh food may enter Hong Kong via the bridge from 9pm to 5am the next day, for inspection by CFS staff. The centre has also expedited the processing of import licence applications for frozen meat and poultry from three to two days since February.

Public Markets and Cooked Food Markets

The FEHD operates 96 public markets, including Sunlight Market in Tung Chung Town Centre, formerly known as Tung Chung Temporary Market, which was commissioned in March and Aberdeen Market, the pioneering project of the Market Modernisation Programme, which was reopened in May. There are 22 free-standing cooked food markets and some 13,500 stalls mainly selling fresh provisions, cooked food, light refreshments and household items. As at end-2023, the overall occupancy rate at these markets was 84 per cent.

A number of new public market projects, including those in Tin Shui Wai, Tseung Kwan O, and Kwu Tung North New Development Area, are at different stages of planning.

Lai Wan Market was closed in February for overhaul works that will take about a year. The FEHD is carrying out the preparatory and consultation work for the proposed overhaul or redevelopment of a few other markets. In addition, the FEHD has carried out minor refurbishment or improvement works in 16 markets, of which 14 have been completed.

Hawkers

The FEHD regulates hawking and as at end-2023, there were 5,053 licensed fixed-pitch hawkers and 270 licensed itinerant hawkers.

Shopfront Extension

During the year, the FEHD and police conducted 1,612 joint enforcement operations against shopfront extensions. They not only prosecuted the offenders, but also removed the obstructive items, thereby enhancing the deterrent effect. The government raised the fixed penalty for shopfront extension offences to \$6,000, and raised the maximum penalty to be imposed by the court to a fine of \$25,000 and imprisonment for three months.

Slaughterhouses

The FEHD oversees the hygiene standards of licensed slaughterhouses in Sheung Shui and Tsuen Wan. Meat supplied by the slaughterhouses has to pass inspection before delivery to markets.

During the year, a total of 1,132,854 pigs, 10,974 head of cattle and 771 goats were slaughtered in the two slaughterhouses; 29,613 samples were taken from food animals for testing of veterinary drug residues.

Public Cleansing Services

Under the Government Programme on Tackling Hygiene Black Spots, the FEHD conducted more than 10,000 special cleansing operations at 244 black spots and strengthened inspection and enforcement. Over 90 per cent of these black spots have now been eliminated.

The FEHD takes enforcement action against littering, spitting and other unhygienic practices in public. In 2023, some 44,400 fixed penalty notices were issued. To support enforcement against

fly-tippers, internet protocol cameras have been installed at 443 illegal refuse dumping black spots.

The amended Fixed Penalty (Public Cleanliness and Obstruction) Ordinance took effect on 22 October, raising the fixed penalty for depositing litter or waste, spitting, displaying bills or posters without permission in public places, and fouling of street by dog faeces to \$3,000. The fixed penalty level for shopfront extension and illegal disposal of construction waste or a large amount of other wastes was raised to \$6,000.

The FEHD provides street cleansing, household waste collection and public toilet services. All streets are swept one to eight times a day and are washed regularly, from daily to fortnightly or whenever the need arises, depending on the conditions of individual locations. The department also deploys mechanical sweepers to sweep flyovers and highways.

Household waste is collected all year round. In 2023, about 5,820 tonnes of household waste were collected daily by the department and its contractors, of which 80 per cent was collected by the latter. As well as managing public refuse collection points, the FEHD has been enhancing the hardware of refuse collection facilities in rural areas. By end-2023, 241 fully enclosed refuse collection facilities with new designs, such as solar-powered mobile refuse compactors and aluminium refuse collection points, had been installed.

The department manages some 800 public toilets and toilet attendant services are provided at the heavily used ones. The FEHD has been developing a smart system at public toilets with the support of the Electrical and Mechanical Services Department. By end-2023, 14 public toilets had been installed with smart devices for trial. The department is also implementing the Enhanced Public Toilet Refurbishment Programme. In 2023, 44 public toilets were refurbished, of which three were at major tourist spots.

Abatement of Sanitary Nuisances

The FEHD issues nuisance notices requiring those responsible to stop sanitary nuisances arising from refuse accumulation, dripping air conditioners and water seepage on private premises. In 2023, it issued 8,846 such notices and secured 214 convictions against those who failed to comply.

Pest Control

Preventing vector-borne diseases is one of the FEHD's important tasks. In 2023, the department's anti-mosquito teams conducted 800,789 inspections of potential mosquito breeding spots and eliminated 76,855 breeding places. No local case of dengue fever was recorded during the year.

In addition to regular operations to tackle rodent infestation, the FEHD has implemented a series of targeted rodent control measures, which include forming overnight rodent control roving teams, applying new anti-rodent tools and strategies, and extending a trial scheme that allows food businesses to use large bins to store refuse temporarily in rear lanes. The department caught 63,344 live rodents in 2023, about 39 per cent more than in 2022.

Cemeteries, Crematoria and Columbaria

The FEHD manages six government crematoria, 10 public cemeteries, 12 public columbaria, 13 gardens of remembrance, two facilities for keeping abortuses and one abortuses cremation facility, and monitors the management of 27 private cemeteries. The department also promotes green burial and seeks to provide a steady supply of public niches, allocating about 20,000 in 2023.

Under the Private Columbaria Ordinance, a specified instrument, namely a licence, an exemption or a temporary suspension of liability, must be obtained to operate a private columbarium. The Private Columbaria Licensing Board regulates the operation and management of private columbaria, and handles applications for specified instruments. As at end-2023, it had approved 11 licence and four exemption applications; given approvals in principle of applications for specified instruments from 81 private columbaria; and refused applications for specified instruments from 33 private columbaria. During the year, the FEHD carried out 370 inspections of private columbaria and investigated 23 cases of suspected contravention of the ordinance.

Guarding against African Swine Fever

In 2023, African swine fever virus was detected in pig samples from seven licensed local pig farms. While African swine fever is not a zoonotic disease and poses no food safety risk, it can cause widespread deaths among pigs within a short time. To minimise the transmission risk, all pigs from the relevant farms were culled. Biosecurity is also enhanced at pig farms, boundary checkpoints and slaughterhouses.

Local pig-carrying trucks are restricted to only carrying live pigs from a single licensed pig farm to the slaughterhouse per trip to reduce the risk of cross-contamination, and spillage and leakage prevention standards are stipulated to minimise the spread of diseases through pig waste. All such trucks are also thoroughly cleansed and disinfected every time they leave the slaughterhouses.

Measures against Avian Influenza

Government measures to keep avian influenza at bay include stringent monitoring of the poultry supply chain from farm to retail levels, compulsory vaccination of chickens against the H5 and H7 avian influenza viruses and the close surveillance of imported and local birds.

Since the constant mutations of the virus affect the efficacy of existing vaccines, the AFCD introduced a new trivalent H5 and H7 avian influenza vaccine for local poultry farms in 2022. All chickens in local poultry farms are required to receive this vaccine.

Other preventive measures include inspecting live poultry retail outlets to ensure compliance with licensing or tenancy conditions on avian influenza control; maintaining the hygiene of market stalls and ventilation systems; conducting inspections, washing and disinfection of public places where wild birds gather; and taking stringent enforcement action against the feeding of wild birds in public places.

The measures are effective in preventing human infection of avian influenza, as evidenced by the total absence of locally infected human case of the H5 or H7 viruses since the first avian influenza outbreak in Hong Kong in 1997.

Antimicrobial Resistance

The government implements the Hong Kong Strategy and Action Plan on Antimicrobial Resistance, adopting the One Health concept and seeking to alleviate the development of antimicrobial resistance and safeguard animal and public health through the joint efforts of different government bureaus/departments and organisations. The plan details AFCD measures in the food animal production sector, including livestock and fish, to alleviate the development of antimicrobial resistance and safeguard animal and public health.

The AFCD inspects food animal farms to collect data and samples to evaluate antimicrobial usage, as well as biological samples for bacterial culture and antimicrobial sensitivity testing on a regular basis. The data helps the department identify control points and devise appropriate control measures.

The CFS conducts regular antimicrobial resistance surveillance on raw meat and ready-to-eat foods and educates the public and the trade about the additional risks associated with consuming raw or undercooked ingredients in ready-to-eat foods. The centre also promotes the Five Keys to Food Safety to address the issue of foodborne antimicrobial resistance.

Control of Animal Diseases

The AFCD regulates cross-border animal movements to prevent animal diseases from entering Hong Kong and also assesses the risk of disease in imported animals and animal products on the basis of their species, intended use, and disease status of the place of origin; and formulates quarantine measures to control the import of animals and animal products.

In 2023, about 6,000 lot-based permits were issued for animal imports, which included dogs, cats, horses, birds, zoo animals and live food animals such as pigs and cattle.

Quarantine Detector Dog Programme

The Quarantine Detector Dog Programme helps combat the illegal import of animals. The dogs are trained to detect live animals and animal products hidden in luggage at land boundary control points, Hong Kong International Airport and the airport's Air Mail Centre. In 2023, more than 126,300 travellers, 400 vehicles and 18,900 parcels and pieces of luggage were screened.

Animal Welfare and Management

The government's approach towards animal welfare and management includes strengthening public education, controlling animal trading, working with animal welfare organisations, managing stray animals, handling and preventing acts of animal cruelty and promoting responsible pet ownership and animal welfare.

The department partners with 17 animal welfare organisations to rehome dogs, cats, rabbits, birds and reptiles. It provides free desexing for the rehomed animals, and subsidises these organisations in carrying out animal welfare and management projects.

Under a cooperation mechanism established between the police, AFCD and Society for the Prevention of Cruelty to Animals (SPCA), the police may invite AFCD and SPCA officers to provide professional advice and assistance at the scene of an animal cruelty case. The AFCD and SPCA also give talks on the multi-agency approach for investigating animal cruelty cases to enhance frontline police officers' professional knowledge in handling such cases.

The AFCD inspects licensed pet shops to ensure compliance with the licensing conditions. Pet shops are required to obtain dogs for sale only from approved sources. Dog breeders and sellers are regulated under the Public Health (Animals and Birds) (Trading and Breeding) Regulations.

Sustainable Development of the Agricultural and Fisheries Industries

Hong Kong's agricultural and fisheries industries are relatively small in scale. The industries combined employed 18,157 people directly and produced \$3.477 billion of output during the year. Live poultry accounted for 100 per cent of local consumption; cut flowers, 41 per cent; seafood, 17 per cent; live pigs, 10 per cent; freshwater fish, 2 per cent; and vegetables, 1.9 per cent.

In order to promote the upgrading and transformation, modernisation and sustainable development of the agricultural and fisheries industries, the *Blueprint for the Sustainable Development of Agriculture and Fisheries* was published in December, with measures covering finance, infrastructure, land and technical support that will be rolled out in phases to raise the quantity, quality and value of local produce.

Agricultural Industry

The agricultural industry focuses mainly on producing quality fresh food crops through intensive land use. Most farming is in the New Territories and for growing crops, comprising mainly vegetables and cut flowers, with a combined output in 2023 valued at about \$391 million. The principal food animals reared are pigs and poultry, which respectively yielded earnings of about \$353 million and about \$283 million, inclusive of eggs.

The AFCD encourages crop farmers to tap niche markets and sharpen their competitiveness by cultivating quality vegetables. The department provides organic farming support to 359 farms occupying 103 hectares of land and also promotes smart greenhouse technology for intensive high-value crop production.

The department manages a voluntary Accredited Farm Scheme jointly with a statutory body, the Vegetable Marketing Organisation (VMO), to provide a stable supply of quality vegetables. A total of 305 farms in Hong Kong, Guangdong Province and Ningxia Autonomous Region, occupying 2,477 hectares of land, are accredited under the scheme.

The Controlled Environment Hydroponic Research and Development Centre at Cheung Sha Wan Wholesale Vegetable Market studies the application of state-of-the-art hydroponic cultivation techniques to enhance the output of local vegetable production.

Following the launch of phase 1 of the Agricultural Park in Kwu Tung South in 2022, the AFCD has begun the preparatory work for the first stage of the second phase, and the establishment of a modernised techno-agricultural park through public-private partnership model.

The government provides financial support to the industry through the \$1 billion Sustainable Agricultural Development Fund, so as to assist local farmers to adopt advanced technology and intensify production, and help them to seize the opportunities arising from the GBA development.

Fisheries Industry

Fresh fish is one of Hong Kong's most important primary products. In 2023, the amount of fish caught and fish reared in ponds and floating cages at sea totalled about 88,230 tonnes, with a value of \$2.45 billion.

As at the year end, some 6,260 vessels were licensed as fishing vessels under the Merchant Shipping (Local Vessels) (Certification and Licensing) Regulation. These included larger vessels operating mainly in the South China Sea and smaller vessels in local waters. There were about 10,240 local fishermen in the industry, with a quota of 4,343 Mainland deckhands. The total catch weighed about 86,580 tonnes, with an estimated wholesale value of \$2.35 billion, and provided some 33,000 tonnes of fish for local consumption.

As at the year end, 28 designated fish culture zones were in operation, which supplied consumers with some 500 tonnes of live marine fish valued at \$54 million during the year. They include newly designated zones at Wong Chuk Kok Hoi and Mirs Bay, which began operation on 13 December. Two other zones, Outer Tap Mun and Po Toi (Southeast), have also been designated.

Freshwater and brackish water fish are reared in fish ponds located mainly in the northwestern New Territories. In 2023, pond fish culture yielded some 1,050 tonnes of fish, valued at \$28 million.

The department provides credit facilities to fishermen, owners of fish-collecting vessels and fish farmers for sustainable development and general productive purposes, and offers free training courses to fishermen. The \$1 billion Sustainable Fisheries Development Fund helps fishermen adopt sustainable and high value-added methods of operation, and subsidises programmes and research to enhance the industry's competitiveness.

A total of 158 farms participated in the AFCD's voluntary Accredited Fish Farm Scheme, with their fish being tagged for easy recognition. More than 16,000kg of accredited fish were sold under the scheme in 2023.

To help the industry adopt modern and sustainable aquaculture, the AFCD has established a demonstration mariculture farm as a training centre at the Tung Lung Chau fish culture zone.

The centre provides practical training using the latest equipment to help fish farmers learn new aquaculture techniques. The AFCD is also preparing, in phases, the provision of several deep-sea cages, equipped with modernised mariculture facilities, which will be rented to fish farmers in the newly designated zones so as to reduce start-up costs.

To meet public demand for recreational fishing and to help mariculturists diversify their business, 76 mariculturists in 11 fish culture zones have the department's approval to operate recreational fishing businesses on licensed fish culture rafts.

The AFCD monitors red tides and issues red tide alerts through support groups at the fish culture zones and via its website, press releases and text messages. Thirteen red tides were recorded in Hong Kong waters in 2023.

Wholesale Markets

Fresh food produce is sold in wholesale markets managed by the AFCD, VMO, Fish Marketing Organisation (FMO) and private sector. In 2023, government wholesale markets, namely the Western Wholesale Food Market, Cheung Sha Wan Wholesale Food Market, Cheung Sha Wan Temporary Wholesale Poultry Market and North District Temporary Wholesale Market for Agricultural Products, handled 217,173 tonnes of vegetables, 67,218 tonnes of fruits, 61,336 tonnes of eggs, 38,544 tonnes of freshwater fish and fishery products and 7,966 tonnes of poultry, with a combined value of \$6.49 billion.

The VMO provides farmers and traders with wholesale marketing services, including trading facilities, accounting and transport services. In 2023, 53,163 tonnes of vegetables valued at \$464 million were sold through the VMO.

The FMO provides wholesale marketing services at its seven wholesale markets. In 2023, some 39,471 tonnes of marine fish valued at \$3.3 billion were sold through the FMO. The organisation also develops fishery products at its processing centre to enhance the quality of local products. The Local Fresh app and website enable customers to buy local agricultural and fishery products online.

Websites

Agriculture, Fisheries and Conservation Department: www.afcd.gov.hk

Centre for Food Safety: www.cfs.gov.hk

Climate Ready: www.climateready.gov.hk

Electrical and Mechanical Services Department: www.emsd.gov.hk

Environment and Ecology Bureau: www.eeb.gov.hk

Environmental Protection Department: www.epd.gov.hk

Food and Environmental Hygiene Department: www.fehd.gov.hk

Government Laboratory: www.govtlab.gov.hk

Hong Kong Observatory: www.hko.gov.hk

Hong Kong Observatory Cool Met Stuff channel: url.hko.hk/cms

Internet Memorial Service: www.memorial.gov.hk

Low Carbon Living Calculator: www.carboncalculator.gov.hk

MyObservatory mobile application: www.hko.gov.hk/en/myobservatory.htm

Science in the Public Service campaign: www.science.gov.hk