

13

**GEOGRAPHY, ENVIRONMENT AND POPULATION**



## Geography, Environment and Population

### Location

The Macao Special Administrative Region (MSAR) is an integral part of the People's Republic of China. Situated at the mouth of the Pearl River Delta (PRD) and bordering Guangdong Province, Macao is 60 kilometres from Hong Kong, and located at latitude 22°12'40"N and longitude 113°32'22"E. Macao time is eight hours ahead of Greenwich Mean Time. The MSAR consists of the Macao peninsula and two islands: Taipa and Coloane. Three bridges – Nobre de Carvalho Bridge, Friendship Bridge (Ponte da Amizade) and Sai Van Bridge – link the peninsula to Taipa; while the COTAI Reclamation Area links Taipa and Coloane islands.

According to Chief Executive Notice No.128/2015 dated 20 December 2015: as stipulated in Order No. 665 of the State Council of the People's Republic of China, the Macao Special Administrative Region comprises land and marine areas, with the land area comprising the Border Gate Macao Checkpoint Building section and the Canal dos Patos section, and the marine area comprising six sections: the Inner Harbour section, Cotai channel section, southern Macao waters section, eastern Macao waters section, artificial island section, and northern Macao waters section. The boundary to the west is meridian 113°31'41.4"E, to the east 113°37'48.5"E, to the south parallel 22°04'36"N, and to the north 22°13'01.3"N.

### Area

Due to reclamation along its coastline, Macao's total land area has grown from 11.6 square kilometres in 1912, when measurements were first taken, to 32.9 square kilometres in 2019. The Macao peninsula accounts for 9.3 square kilometres (28.3 percent) of the current area; Taipa island for 7.9 square kilometres (24 percent); Coloane island for 7.6 square kilometres (23.1 percent); COTAI Reclamation Area for six square kilometres (18.2 percent); New Urban Zone Area A for 1.4 square kilometres (4.3 percent); Macao border crossing area on Zhuhai-Macao checkpoint on the Artificial Island of the Hong Kong-Zhuhai-Macao Bridge for 0.7 kilometres (2.1%), and the campus of the University of Macau for one square kilometre.

According to Chief Executive Notice No.128/2015 dated 20 December 2015: as stipulated in Order No. 665 of the State Council of the People's Republic of China, the Central People's Government explicitly determines that the area of waters of the Macao Special Administrative Region is 85 square kilometres.

### Geology and Topography

Macao mainly comprises flat land, terraces and hills. The area of flat land (including reclaimed land) is 23.8 square kilometres, accounting for 72.3 percent of the total; granite hills cover six square kilometres, or 18.2 percent; and terraces cover 1.2 square kilometres, or 3.7 percent. The terraces are historically areas of denudation, extending along St Augustine, Luis de Camoes Garden, the hill behind Mong Ha Kun Iam Tong Temple, Russa Hill, and the southern part of Taipa island. Their relatively small area, low elevation (20-25 metres) and gentle slopes mean that most of the terraces

are fully utilised. The remaining land – including reserves, monument sites and forests – occupies approximately 1.9 square kilometres, accounting for 5.8 percent of the total land area.

The elevation of Macao increases from the north to the south. Guia Hill, in the north, is the highest point on the Macao peninsula, with an altitude of 90 metres. To the south, Alto de Coloane is the highest hill on Coloane island, as well as the highest point in Macao, with an altitude of 170.6 metres. Taipa Grande, the main peak of Taipa island, has an altitude of 158.2 metres.

## Coastline Assessment

According to Executive Order No. 184/2018 enacted on 13 August, the coastline of the Macao SAR was determined by the published Macao Special Administrative Region Coastline Map, dated 1 July 2017. The total length of Macao's coastline is 76.7 kilometres, 18.4 kilometres of which are around the Macao peninsula; 49.9 kilometres are around the two islands (including Taipa Island, Cotai Reclamation Area and Coloane Island); 5.7 kilometres are around New Urban Zone Area A; 2.7 kilometres are around the Macao border crossing area on Zhuhai-Macao Port Artificial Island of the Hong Kong-Zhuhai-Macao Bridge.

There are two types of coastline in the Macao SAR: artificial and natural coastlines. Artificial coastlines predominate, representing 81.5 percent of the total coastline length, and are mainly around the Macao peninsula and fringing eastern and northern Taipa Island. The natural coastlines mainly fringe western Taipa Island and the southern tip of Coloane Island, representing 18.5 percent of the total coastline length.

## Climate

Macao is situated in a subtropical zone, with the Asian continent to the north and a wide tropical sea to the south. In winter, Macao experiences northerly winds, cold and dry weather and low rainfall, due to a cold continental high-pressure system at medium and high latitudes. In summer, Macao is mainly subject to south-westerly winds, hot and wet weather and heavy rainfall, due to the influence of oceanic tropical weather systems. The reverse of wind directions in winter and summer, together with minimal temperature variations during the day, give Macao a marine monsoon climate.

According to the climate normals of the World Meteorological Organisation (WMO), calculated with 30 years of data, the average annual precipitation in Macao between 1981 and 2010 was more than 2,000 millimetres, with most rainfall occurring between April and September. June had the most precipitation – an average of 363.8 millimetres; while January had the least – an average of 26.5 millimetres.

Macao has an average annual temperature of 22.6°C. The coolest month is January, when it averages 15.1°C. Most years, Macao has a short cold weather period when temperatures fall below 5°C. The average monthly temperature exceeds 22°C during seven months of the year, indicating that Macao has a short winter but a long summer.

Macao is frequently hit by typhoons. The typhoon season starts in May and ends in October, with July to September as its peak period.

## Weather Overview

### General Situation

In 2019, Macao’s average annual temperature and the relative humidity were slightly higher than the climate normal, while the total rainfall and the total hours of sunshine were significantly higher than the climate normal, and the total evaporation level was slightly below the climate normal.

Five tropical cyclones affected Macao in 2019. They were: Tropical Storm Mun from 1 July to 3 July, Tropical Storm Wipha from 30 July to 2 August, Severe Tropical Storm Bailu from 24 August to 25 August, Tropical Storm Podul from 28 August to 29 August, and Tropical Depression Kajiki from 1 September to 3 September. Tropical Storm Wipha was notable for being the only tropical cyclone requiring Typhoon Signal No. 8 to be issued in 2019. During Tropical Storm Wipha, strong force 6-7 winds were recorded over Macao, while gale force 8 wind was recorded over the cross-harbour bridges. The maximum 10-minute mean wind speed was 67 kilometres per hour.

Regarding storm surge warnings, blue storm surge warnings were issued as a result of Tropical Storm Mun and Tropical Storm Podul, and only one yellow storm warning was issued during the year – as a result of Tropical Storm Wipha, which caused flooding in extensive areas of the Inner Harbour, with the maximum flood height of 0.5 metres recorded on 1 August.

Summary of Severe Weather Warnings Issued in 2019			
Warning / Signal Type		Frequency	No. of Warning Reports Issued
Tropical Cyclone Warning	No. 1 Alert Signal	5	29
	No. 3 Strong Wind Signal	3	27
	No. 8 Northeast Gale Signal	1	12
	No. 8 Southeast Gale Signal	0	0
	No. 8 Southwest Gale Signal	0	0
	No. 8 Northwest Gale Signal	0	0
	No. 9 Increasing Gale Signal	0	0
	No. 10 Typhoon Signal	0	0
	All Signals Lowered	5	5
Strong Monsoon Warning (Black Ball)		19	72
Rainstorm Warning		10	36
Thunderstorm Warning		110	294

(Cont.)

<b>Summary of Severe Weather Warnings Issued in 2019</b>			
<b>Warning / Signal Type</b>		<b>Frequency</b>	<b>No. of Warning Reports Issued</b>
Storm Surge Alert		0	0
Storm Surge Warning	Blue Storm Surge Warning	3	28
	Yellow Storm Surge Warning	1	17
	Orange Storm Surge Warning	0	0
	Red Storm Surge Warning	0	0
	Black Storm Surge Warning	0	0
	All Warnings Lowered	3	3

## Temperatures

Macao had an average annual temperature of 23.6°C during 2019, which was 1.0°C higher than the climate normal, setting a record high since 1952. The highest and the lowest average temperatures were 28.7°C in July and 16.7°C in January, respectively. The hottest days were 18 July and 9 August, when the temperature rose to 35.7°C; whereas the coldest day was 1 January, when the temperature fell to 8.4°C.

## Relative Humidity

The average relative humidity during 2019 was 82 percent, which was three percent higher than the climate normal. March and May saw the highest monthly average relative humidity, at 90 percent; whereas the lowest was 70 percent in December.

## Rainfall

Total rainfall during 2019 was 2,248.0 millimetres, which was 189.9 millimetres or about 9 percent above climate normal. The highest monthly rainfall was 472.0 millimetres, recorded in August, 128.9 millimetres above normal. Only traces of rainfall were recorded in December, marking the lowest monthly rainfall of the year. The highest daily rainfall was 111.0 millimetres, recorded on 26 August.

## Evaporation

The total evaporation level in 2019 was 794.7 millimetres, which was 150.4 millimetres less than the

climate normal. The evaporation levels of all months were slightly lower than the climate normal.

## Sunshine

During 2019, Macao had 1,791.6 hours of sunshine, 17.7 hours above normal. The most hours of sunshine were recorded in November, totalling 243.9 hours, which was 71.7 hours above normal. The least hours of sunshine were recorded in February, amounting to 60.2 hours, which was 19.2 hours less than normal.

## Wind

During 2019, Macao was subject to predominantly north-northeasterly winds in January, March and from September to December; southerly winds in April, June and July; easterly winds in May, and south-southwesterly winds in August. Wind speeds averaged 10.4 kilometres per hour.

## Weather Services

### Meteorological and Geophysical Bureau

The Meteorological and Geophysical Bureau (SMG) is supervised by the Secretary for Transport and Public Works. It provides weather reports, monitors air quality and radiation, and conducts research into climate, climate change and earthquakes.

Apart from hourly real-time weather information, the SMG issues various types of daily weather forecasts for the public, government departments and private institutions. These include five weather reports and forecasts, two marine and weather forecasts for the Macao coastal area, as well as daily weather reports over the past year, which are broadcast daily for the public. The SMG provided 1,825 weather forecasts and 730 weather forecasts for the Macao coastal area during 2018.

The SMG continued cooperating with the Macau Broadcasting Company's (TDM). Every day, SMG officers explain the day's weather conditions and the forecast for the following day during the Macau Broadcasting Company's morning TV programme. The SMG forecasters also record weather information regularly, or when necessary, and upload it to the Internet for download and use by various media. This information includes a weather review of the day, a two-day weather forecast and air quality report; a weekly weather forecast; and special weather information (on typhoons, rainstorms, very hot and cold weather).

Whenever a tropical cyclone signal is issued, the SMG will provide a warning signal forecast for the following one to two days, based on a table with forecasts for tropical cyclones and storm surges that is released on its official website. Citizens can learn about the potential impact of tropical cyclones during particular hours and make necessary preparations as soon as possible. When Typhoon Signal No.3 or above is issued, TDM uses split-screen views to announce the latest tropical cyclone news.

In response to special weather conditions (such as a forecast of a substantial drop in temperature), the SMG sends special weather notifications to registered users, social welfare organisations and

schools via WeChat, mobile applications and SMS.

Through the round-the-clock Automatic Air Quality Monitoring Network, the SMG announces real-time concentration of air pollutants and summarises daily air quality on its website every day. In addition, an air quality forecast for the following day is reported to the public.

The SMG Aeronautic Meteorological Center at Macau International Airport provides half-hourly weather observations and special reports to aviation organisations and flight crews.

The aeronautical meteorological documents include meteorological maps for every route, as well as upper wind and temperature charts, aviation weather reports and forecasts, and volcanic ash and tropical cyclone advisory information. All international flights departing Macao can receive the most update aeronautical meteorological documents of international standards via the Aviation Weather Information System (AWIS). In 2019, a total of 39,745 aeronautical meteorological documents were downloaded from the system, which typically operated at 100 percent efficiency.

In recent years, the SMG has introduced the Mobile WebWeather Service, Macao SMG mobile app and the official WeChat account, “Macao SMG”. An SMS service and the 1311 Telephone Voice Response Weather Information Enquiry Service provide a wide array of weather information and air quality indices. An updated version of the SMG website and mobile app were also launched in 2019, offering citizens easy access to the latest weather, air quality and geophysical information. The SMG also cooperates with relevant departments to display up-to-date tropical cyclone and rainstorm warnings on the electronic monitors in the Border Gate checkpoint building and the Outer Harbour Ferry Terminal, in order to help border-crossing commuters to promptly respond to changes in weather. In addition, the Weather Service Centre was established at the Outer Harbour Ferry Terminal, to provide travellers with the latest weather advice and information.

The SMG also offered the 48-hour Automatic Weather Forecast and Real-time Air Quality Index services, providing the public with temperature, humidity, wind speed and direction, and weather forecasts for the following two days and a more timely air quality index on the website.

After Typhoon Hato in 2017, the SMG carried out a series of refinements and promotions to educate citizens about adverse weather conditions.

Following the two amended administrative orders regarding tropical cyclones and storm surges in 2018, the SMG launched “20 millimetres rainfall alert” to warn the public of forthcoming or current heavy rain before issuing the rainstorm warning. Citizens should be aware regarding their safety, adjust their travelling plans accordingly, and pay attention to the latest announcements on the weather.

The SMG also strived to educate the public about weather and disaster relief, and cooperated with other organisations in holding talks to introduce common adverse weather conditions and corresponding safety measures. In 2019, the SMG released two promotional videos, promoted responses and safety measures for tropical cyclones and storm surges, and collaborated with Macao Science Center to release the Walking Together video series and organise the “Meteorological Science Game Programming Competition”.

In 2019, the SMG continued providing Weather Forecasts for Holidays. Many images were used to present detailed weather information to the public. The forecasts now provide information

specifically for festivals and holidays. For example, special notice of rain and humidity would be given during the Dragon Boat Festival, to alert dragon boat race competitors regarding changes in the weather; and notifications are given regarding the time for enjoying the moon and night time weather during the Mid-Autumn Festival. As for 2019 National Day, historical measurements were included in the weather forecast, to provide seasonal enhancement and help citizens enjoy the celebration.

In 2019, the SMG optimized the telephone enquiry service and retained the service for answering questions from the public by professional staff.

During 2018, the SMG posted the Storm Surge Alert labels onto the Civil Protection CCTV poles in low-lying areas, to more clearly inform citizens regarding the potentially affected areas and the severity of flooding, enabling prompt response measures when storm surge alerts are issued. Labels were also posted in car parks, to alert car owners and drivers about the potential for storm surges. The second phase of label posting commenced in 2019. Advertisements were also displayed on certain buses, promoting storm surge warnings and related measures to citizens.

## Monitoring Network

The SMG collects weather data 24 hours a day via its Automatic Weather Station Network of 15 weather-observation stations in key locations around Macao. Three of these automatically send information every 15 minutes to destinations worldwide, using the international SYNOP code and the Global Telecommunications System (GTS). This forms part of the Pearl River Delta Real-time Automatic Weather Station Network, which was jointly established to exchange meteorological data by the Guangdong Provincial Meteorological Bureau, the Hong Kong Observatory and the Macao SMG.

The SMG also teamed up with the Hong Kong Observatory to establish a substation of the Pearl River Delta Lightning Location Network in Macao. The system operates around the clock, and provides real-time lightning information for the Pearl River Delta. Two lightning systems with real-time monitor interface were also established in 2018.

Regarding meteorological telemetry, the SMG has two ground meteorological reception and processing systems to receive Japanese Himawari-8 satellite information and Chinese FY-2E and FY-2G satellite information, respectively; two dual-polarisation Doppler weather radars; three low-level wind profilers; two microwave radiometers; a cloud height meter; three visibility measuring devices; and two lightning sensors to monitor lightning in the skies over Macao and the vicinity. In addition, the SMG joined hands with the Zhuhai Meteorological Bureau to install four X-band phased array weather radars in Zhuhai, forming a network of phased array radars to monitor weather conditions over Macao and nearby regions.

The SMG cooperates with related departments to establish the Water Level and Tide Monitoring Network, to provide round-the-clock real time data on flooding and tides in flooding black spots and coastal area. The network includes 18 land water level monitoring stations set up at flooding black spots in various districts of Macao, two tide monitoring stations set up along the coast, and one inshore wave monitoring station.

In addition, the SMG cooperated with the Pearl River Water Conservancy Science Academe to commence work on marine meteorological observations. Real-time monitoring data was received from the marine buoy stations in the Macao and Pearl River Water regions, expanding monitoring from land-based meteorology to include nearby sea areas, including hydrology, and providing real-time data as a reference for storm surge monitoring and issuing alerts.

**Air quality monitoring:** The SMG established the Air Quality Monitoring Project in partnership with Companhia de Electricidade de Macau (CEM). The SMG employs a fully automated air monitoring network to measure major pollutants that jeopardise Macao's air quality. Macao has six automatic air quality monitoring stations, a light detection and ranging (LIDAR) system for monitoring suspended particulates and boundary layers above Macao and two mobile air monitors to monitor air quality of different districts in Macao. Moreover, in July 2012 the SMG adopted a new air quality standard, raising the air quality standard to WHO interim target-1 (IT-1).

**Seismological monitoring:** The SMG has a seismological monitoring station in its Taipa Grande headquarters on Taipa, equipped with a digital seismograph and a deep shaft (30 metres from ground level) digital seismograph. In 2014, the deep shaft digital seismograph was upgraded and became a monitoring station of the Pearl River Delta Earthquake Early Warning Network. In addition, a seismic information sharing portal was introduced, to receive earthquake information for the entire country.

**Environmental radiation monitoring:** The SMG's headquarters is equipped with an environmental radiation monitoring station, mainly for detecting Gamma radiation dose rates in the atmosphere and announcing the results on the website. A baseline survey on Macao's atmospheric radiation began in 2013. Regular monitoring of Macao's atmospheric radiation is conducted every year in different districts.

## Regional and International Cooperation

The SMG is a member of the WMO. It actively participates in promoting technology, research, training and applications relating to meteorology. Every year, it sends delegations to meetings, seminars, workshops and training programmes arranged by the WMO, mainland China and overseas meteorological agencies and academic organisations.

The SMG is also a member of the ESCAP/WMO Typhoon Committee. The committee secretariat moved to Macao in 2007.

The SMG keenly takes part in meteorological science meetings and exchange activities conducted by its mainland China and overseas counterparts. Every year, it participates in the Guangdong-Hong Kong-Macao Seminar on Meteorological Science and Technology and the Guangdong - Hong Kong - Macao Meeting on Cooperation in Meteorological Operations organised alternately by the three parties.

In 2019, the SMG also attended various regional and international meetings, including:

- The 51st Session of ESCAP/WMO Typhoon Committee; the 18th World Meteorological Organisation Meeting;

- The ICAO Meteorological Information Exchange Model (IWXXM) Workshop;
- The 23rd Meeting of the Meteorology Sub-group of the Asia Pacific Air Navigation Planning and Implementation Regional Group;
- The Typhoon Committee Tropical Cyclone High Level Session and Meeting of Meteorological Working Group;
- The 14th Typhoon Committee Integrated Workshop and Roving Seminar;
- The 10th Meteorology Technical Conference – CMA, SMG, IPMA;
- The international workshop entitled “Nowcasting, Seamless Forecasting and Warning Services” of the WMO; and
- The meeting of the Parties to the United Nations Framework Convention on Climate Change and the meeting of the Parties to the Paris Agreement.

## Air

Population density, scarcity of land, narrow streets and busy traffic all affect Macao’s air quality. However, this is offset to some extent by the low discharge of industrial pollutants. The air quality is therefore generally quite good. Every winter, a comparatively high level of airborne pollutants raises the air pollution index; while in summer the air quality improves, with lower pollution index readings, as the convective precipitation of the tropical climate dispels pollutants.

During 2019, roadside monitoring stations in Macao recorded “good” air quality on 58.5 percent of days, “acceptable” air quality on 39.6 percent of days, and “poor” air quality on 1.9 percent (seven days). In the high-density residential area of the Macao peninsula, the air quality was “good” on 63.9 percent of days, “acceptable” on 33.6 percent of days, and “poor” on 2.5 percent (nine days).

In the high-density residential area on Taipa, the air quality was “good” on 68.8 percent of days, “acceptable” on 28.2 percent of days and “poor” on 3.0 percent of days (11 days). Ambient monitoring stations on Taipa recorded “good” air quality on 49.9 percent of days, “acceptable” air quality on 38.9 percent of days, and “poor” air quality on 11.2 percent of days (41 days). Ambient monitoring stations on Coloane recorded “good” air quality on 46.8 percent of days, “acceptable” air quality on 48.5 percent of days, and “poor” air quality on 4.8 percent of days (17 days). The Ka Ho roadside monitoring station recorded “good” air quality on 42.3 percent of days, “acceptable” air quality on 46.4 percent of days, and “poor” air quality on 11.3 percent of days (41 days).

In 2019, fine suspended particulates (PM<sub>2.5</sub>) and ozone (O<sub>3</sub>) were the main pollutants that led to “poor” air quality in Macao, with the former primarily affecting Macao in winter while the latter mainly affected Macao in summer and autumn. The ambient monitoring stations on Taipa and Ka Ho roadside monitoring station recorded most of the “poor” and “bad” air quality, on 11.2 and 11.3 percent of days respectively (41 days). Overall, over 94.2 percent of days met the air quality standards (“good” to “acceptable”) in 2019. As compared to 2018, concentrations of ozone showed a slightly increase, while concentrations of other pollutants were largely unchanged.

### Average Pollutant Concentrations in 2019

Monitoring Station	Respirable suspended particulates ( $\mu\text{g}/\text{m}^3$ )	Fine suspended particulates ( $\mu\text{g}/\text{m}^3$ )	Sulphur dioxide ( $\mu\text{g}/\text{m}^3$ )	Nitrogen dioxide ( $\mu\text{g}/\text{m}^3$ )	Ozone ( $\mu\text{g}/\text{m}^3$ )	Carbon monoxide ( $\text{mg}/\text{m}^3$ )
Roadside	47.5	24.4	---	59.1	---	0.9
High-density residential area of Macao peninsula	58.7	24.3	1.0	51.8	33.6	0.7
High-density residential area of Taipa island	58.4	26.7	3.0	32.0	36.6	0.7
Taipa ambient	35.6	17.5	2.9	25.7	65.1	0.6
Coloane ambient <sup>i</sup>	41.1	24.0	2.7	32.4	58.9	0.7
Ka Ho roadside <sup>a</sup>	39.9	22.6	1.0	26.2	72.7	0.7

### Comparisons between Pollutant Concentrations and the Daily Air Pollution Index (adopted since 2 July 2012)

Air quality index	Respirable suspended particulates 24-hour average ( $\mu\text{g}/\text{m}^3$ )	Fine suspended particulates 24-hour average ( $\mu\text{g}/\text{m}^3$ )	Sulphur dioxide 24-hour average ( $\mu\text{g}/\text{m}^3$ )	Nitrogen dioxide 24-hour average ( $\mu\text{g}/\text{m}^3$ )	Ozone 8-hour average ( $\mu\text{g}/\text{m}^3$ )	Carbon monoxide 8-hour average ( $\text{mg}/\text{m}^3$ )
0	0	0	0	0	0	0
50	100	35	40	100	80	5
100	150	75	125	200	160	10
200	350	150	660	750	350	17
300	420	250	1,300	1,500	600	34
400	500	350	1,700	2,000	800	46
500	600	500	2,120	2,500	1,000	57

Air Pollution Index						
Air quality index	0 ~ 50	51 ~ 100	101 ~ 200	201 ~ 300	301 ~ 400	401 ~ 500
Air quality level (Macao standards)	Good	Acceptable	Poor	Bad	Severe	Harmful
Symbol						

## Noise

There are many reasons for noise pollution in Macao. Urban characteristics – such as population density, busy traffic, narrow streets and the large number of high-rise buildings – create conditions for noise transmission.

In 2019, the Environmental Protection Bureau and the Public Security Police received 8,968 complaints about ambient noise, about 1.1 percent more than the 2018 figure. The Environmental Protection Bureau received 1,353 of these complaints, representing a drop of 0.7 percent compared with 2018; whereas the Public Security Police received the remaining 7,615 cases, a figure that was 1.5 percent more than in 2018.

Complaints received by the Environmental Protection Bureau and the Public Security Police were primarily related to “public areas” (37.5 percent or 3,361 cases), “activities of daily life and pets in residential buildings” (30.4 percent or 2,722 cases), and “industry, commerce and services” (14.5 percent or 1,299 cases).

## Environmental Noise Monitoring Network

Currently, Macao has six environmental noise monitoring stations to assess the ambient noise level in different districts – three on the Macao peninsula, one on Taipa island, one in the COTAI Reclamation Area and one in Coloane. These monitoring stations conduct round-the-clock monitoring of ambient noise; road traffic noise; and noise from the residential zones, by means of an automated network. Data on such noise readings are published monthly in the Environmental Geographic Information System on the Environmental Protection Bureau’s website. The 2018 Annual Report on Data Collected by Environmental Noise Monitoring Stations of Macao was also published in 2019.

## Water Quality and Wastewater Treatment

### Water Quality

Situated at the mouth of the Pearl River, Macao occupies a peninsula and nearby islands facing Lingdingyang to the east and the South China Sea to the south; there is a wide expanse of water.

Water exchanges resulting from tidal flows dilute pollutants entering the area. The Inner Harbour to the west of Macao is a favourite berthing place for Zhuhai and Macao fishing boats. The sluice of the Zhuhai Qianshan River lies upstream of the Inner Harbour channel, and when this is closed the area is partially blocked off. The poor exchange of its waters with the sea results in conditions in which pollutants can accumulate. When the sluice is open, Macao's water quality is determined by the quality of the water in the Qianshan River. Pollutants that have accumulated will then flow to neighbouring waters.

Based on the geographic features of Macao, the Public Health Laboratory of the Health Bureau adopts Category 3 Water Quality Standard of the Sea Water Quality Standard of China (GB3097-97), to assess individual indicators, nutrition indicators and comprehensive indicators of the water quality at each monitoring station.

## Water Quality Monitoring Network

Three automatic water quality monitoring stations are under the management of the Environmental Protection Bureau at Ilha Verde Dockyard, Inner Harbour and Cotai Nature Reserves. Round-the-clock monitoring of water quality is conducted through an automated network. Data on the water quality readings are published monthly in the Environmental Geographic Information System on the Environmental Protection Bureau's website. The 2018 Annual Report on Data Collected by Automatic Water Quality Monitoring Stations of Macao was also published in 2019.

## Monitoring Drinking Water Quality

The Laboratory Division of the Municipal Affairs Bureau is responsible for the public water supply network; inspecting the water quality of public water sources and wells; and – if necessary – recommending the closure of these facilities in the public interest. It regularly monitors the quality of water processed by the water supply company, and other water supply networks and reservoirs in the territory, to verify whether the quality complies with the requirements stipulated in the Rules and Regulations on Water Supply and Drainage in Macao (Decree-Law No. 46/96/M).

Since being awarded the ISO/IEC 17025 Certificate of Laboratory Accreditation by the China National Accreditation Committee for Laboratories (CNAL; now China National Accreditation Service for Conformity Assessment) in 2003, the Laboratory Division has enhanced its analytical performance and its quality management system. The laboratory also continued to participate in proficiency tests held by renowned organisations in mainland China and countries including the United States, the United Kingdom and Australia. The laboratory's inspection technology has fulfilled international requirements. Currently, it possesses 91 and 205 accreditations on water quality certificates and various food certificates, respectively.

## Wastewater Management

The five sewage treatment facilities in Macao – the Macao Peninsula Sewage Treatment Plant, Taipa Sewage Treatment Plant, Coloane Sewage Treatment Plant, Macau International Airport Sewage Treatment Plant, and Crossborder Industrial Zone Sewage Treatment Plant – can handle 356,000

cubic metres of sewage per day.

In 2019, the Macao Peninsula Sewage Treatment Plant handled 54,694,306 cubic metres of sewage; Taipa Sewage Treatment Plant handled 9,116,171 cubic metres; Coloane Sewage Treatment Plant handled 18,822,893 cubic metres; the sewage treatment plant at Macau International Airport processed 41,930 cubic metres; and the Crossborder Industrial Zone Sewage Treatment Plant handled 886,920 cubic metres.

Improvement works for the Macao Peninsula Sewage Treatment Plant were launched in early 2019. The works will take about 28 months, and are expected to be completed during 2021. Work on the preliminary design for upgrading the original site of Coloane Sewage Treatment Plant was basically completed during the year, while ground investigations are progressing, and will be followed by tender processes for construction projects.

To align with the planning and development of Macao's New Urban Area, the preliminary design and environmental impact assessment of the sewage treatment plant construction in Zhuhai-Macao Port Artificial Island of Hong Kong-Zhuhai-Macao Bridge were completed in 2018. The geological survey for the sewage treatment plant and pipes was completed in 2019, and tender documents are currently being drafted. The remaining tender procedure would commence upon the completion of various preliminary works.

## Waste Management

Companhia de Sistemas de Resíduos, Lda. (CSR) has been contracted to undertake Macao's household waste collection and conveyance, urban cleaning operations and the cleaning and maintenance of public waste containers, under the Government's supervision. According to statistics provided by the Municipal Affairs Bureau, in 2019 the CSR collected about 313,788 tonnes of household waste in Macao, an average of about 859.7 tonnes a day.

Work continued on introducing the policy of "Waste reduction at source, sorting and recycling" to implement the Macao Solid Waste Resources Management Programme (2017-2026). The Recycling Industry Equipment and Vehicles Subsidy Scheme was introduced by the Environmental Protection Bureau in 2018, with the application deadline extended to 25 November 2020 according to Order No. 42/2019 from the Secretary for Transport and Public Works, to help the recycling industry purchase about 20 items of equipment for dismantling, sorting, compressing, transporting and weighing waste, and light vehicles, in order to improve techniques and foster development of the industry. The draft law on Macao Construction Waste Management System was submitted to the legislature by the end of 2018.

## Waste Classification

The Municipal Affairs Bureau continued to optimise public sorting and recycling facilities in the community. The number of public collection points for waste recycling in Macao was increased to 365. The bureau also invited schools, government departments, associations, private organisations and buildings to participate in the reusable waste sorting and recycling programme, aiming to provide the public with convenient ways to recycle waste. During 2019, 2,356.6 tonnes of waste

paper, 270.4 tonnes of metals and 254.9 tonnes of plastic were recycled through various reusable waste sorting and recycling programmes.

The Municipal Affairs Bureau continued its glass bottle recycling programme. A total of 294.6 tonnes of waste glass were recycled during 2019. To reduce the volume of organic waste, a wet market food waste recycling programme, a school food waste recycling programme and a community food waste recycling (pilot) programme were launched; they processed a total of 15.7 tonnes of food waste during the year. Also, a programme for reusing clothes was jointly launched with the Macau Salvation Army, to improve the system for reusing clothes in Macao; about 652.2 tonnes of used clothes were collected during the year.

During 2018, the Restaurant Food Waste Recycling Pilot Project was launched by the Environmental Protection Bureau, to recycle food waste from small to medium-size restaurants that were unable to afford food waste treatment equipment. By the end of 2019, the Macao Central Incineration Centre had installed five food waste processing machines, with a total processing capacity of 3,000 kilogrammes per day. Moreover, the bureau acquired composting machines in 2019, to convert the soil conditioner from treated food waste into organic fertiliser by fermentation. As a result, 22,000 bags of free fertilisers were distributed to the public by the end of 2019.

The Environmental Protection Bureau again organised the “Recycling Red Packets is Very Easy” event during Chinese New Year, setting up more than 800 collection points across Macao. About 2.74 million red packets were collected (weighing about 6,200 kilogrammes) in 2019. After sorting, about 530 thousand red packets (weighing over 1.5 tonnes) could be distributed to the public for free in the following year for reuse, while the rest were sent for recycling treatment.

The Environmental Protection Bureau continued organising the “Recycling Mooncake Boxes is Very Easy” event during Mid-Autumn Festival, setting up over 800 mooncake box collection points across Macao. In 2019, a total of 17,000 used mooncake boxes (totalling about 6,400 kilogrammes) was recycled.

## **Macao Waste Incineration Centre**

Macao Incineration Centre is responsible for processing all Macao’s solid waste. It comprises a new plant and an old plant, each with three incineration facilities, with a total processing capacity of 1,728 tonnes of waste per day. During 2019, the centre processed 572,577 tonnes of municipal solid waste, an average of 1,569 tonnes a day.

The waste heat produced during the treatment of the municipal solid waste can be recovered and used for power generation. The power generated by the centre can supply up to 28.7MW per hour of electricity at full load, of which 7MW are used for operation, and the remaining 21.7MW are transferred to the public grid – sufficient to meet the needs of over 33,000 households in Macao. During 2019, the incineration centre supplied 17,497 units (17,497 kWh) of electricity to the public grid.

An open tender for design and construction of the third-phase expansion of the incineration centre commenced in 2019, and was carried out in phases.

## Special and Hazardous Waste Treatment

The Macao Special and Hazardous Waste Treatment Centre commenced operation in 2007. It uses superheating techniques to treat waste materials that cannot be processed by the incineration centre, including discarded tyres, solid and liquid hazardous waste, carcasses of animals such as horses and dogs, slaughterhouse waste, medical waste, oil residue, and other special and hazardous wastes.

In 2019, the waste treatment centre's processed a total of 2,639 tonnes of waste (including medical waste), with discarded tyres comprising 46 percent of the total.

Since the Environmental Protection Bureau introduced the Used Battery Collection Scheme, over 1,100 collection points have been set up in schools, merchants, shops, residential and commercial zones, public departments and public refuse tips in various districts of Macao. To date, over 39,000 used batteries have been collected, over 14,800 of which were pre-treated primary batteries and were exported to Japan via Hong Kong at the end of 2018, for reuse and recycling treatment, following procedures according to the stipulations of the Basel Convention.

The "Disposing Used Lamps is Very Easy" event was introduced in 2019, with over 700 buildings, supermarkets and merchants participating and setting up collection points for used lamps, including fluorescent tubes and lamps, LED lamps, incandescent lamps, halogen lamps, high-intensity discharge (HID) lamps and other mercury-containing lamps. The pre-treated lamps will be exported to qualified treatment plants for recycling to harmless materials.

The Computer and Communication Products Recycling Programme has collected over 77,000 used electronic products by the end of 2019, and donated used newer models of computers, which met the bureau's donation requirements and had received some maintenance, to charities. The remaining computers were collected by the programme contractors for dismantling. The reusable components and materials would be transferred to other regions for recycling treatment, according to the Basel Convention, accounting for a total recycling rate of 90 percent.

The Environmental Protection Bureau began to take over the management of the glass bottle crushing facility in 2019, and introduced the "Recycling Glass Bottles is Easy" event to facilitate recycling of glass bottles from hotels, restaurants, higher education institutions and commercial organisations. By the end of 2019, a total of 96 organisations had participated in the event. The crushed glass bottles will be used as road construction materials or exported to qualified treatment plants for recycling.

## Treatment of Construction Waste

Since the construction waste landfill commenced operations in 2006, it has been mainly used for the disposal of non-combustible inert solid waste produced through excavation, demolition, and construction. The solid waste includes debris, cement blocks, soft soil, marine clay and furnace slag. In 2019, about 2.49 million cubic metres of construction waste were disposed of in the landfill.

In 2019, the Environmental Protection Bureau began a project to improve construction waste landfill soil. Silt at the bottom of the waste landfill will be consolidated through civil engineering means, to stabilise sediments and create more space for landfill.

The Environmental Protection Bureau refurbished relatively good quality furniture items from the landfill, and donated them to social service associations, community organisations and people in need; while some would be used in Environmental Protection Bureau facilities, achieving the goal of waste recycling and reduction, and relieving pressure on the landfill.

## Automatic Solid Waste Collection System

The automatic solid waste collection located in the Areia Preta New Reclamation Zone (NATAP) has been in use for over 10 years. The system comprises waste collection points and a number of inlet valves connected to a network of underground pipes. The solid waste is transported through the tubes to the collection station. The compressed waste is taken by trucks to the incineration centre.

In 2019, due to the increasingly ageing underground pipes and related equipment, as well as the building management personnel and cleaners being accustomed to the waste collection mode, the entire system will be optimised and upgraded in phases. The preliminary upgrade design commenced during the year.

## Legislation and Pollution Control

Legislation enacted in 2019 covering environmental issues included:	
1	Amendment to the Prevention and Control of Environmental Noise (Law No. 8/2014);
2	Restrictions on Using Plastic Bags (Law No. 16/2019);
3	Air Pollutant Emission Standards and Facility Management Regulations for Oil Storage Tanks (By-law No. 23/2019);
4	Air Pollutant Emission Standards for Power Stations (By-law No. 24/2019);
5	Application deadline for Recycling Industry Equipment and Vehicles Subsidy Scheme extended to 25 November 2020, in accordance with article 7 of By-law No. 32/2018 – Recycling Industry Equipment and Vehicles Subsidy Scheme (Order No. 63/2014 of the Secretary for Transport and Public Works);
6	Regulations on Import and Transshipment of Asbestos and Asbestos-Containing Products (Executive Order No. 48/2019);
7	Replacement of amendment to Schedule of By-law No.30/2016 – Tailpipe Emission Limits and Measurement of Exhaust Pollutants by Vehicles in-use approved by Executive Order No. 130/2018 (Executive Order No. 80/2019);
8	Replacement of amendment to Schedule 1 and 2 of Regulations on Tailpipe Emissions of New Imported Vehicles approved by Executive Order No. 258/2018 (Executive Order No. 81/2019);
9	Stipulating the amount to be charged for each plastic bag provided in retailing, subject to article 3 of Law No. 16/2019 – Restrictions on Using Plastic Bags (Executive Order No. 143/2019); and

Legislation enacted in 2019 covering environmental issues included:	
10	Prohibiting import and transshipment to the MSAR of chemicals listed in the Stockholm Convention on Persistent Organic Pollutants (Executive Order No. 164/2019;).

## International Treaties

Several international agreements and treaties to address global environmental problems have been made applicable to Macao, including:	
1	Vienna Convention for the Protection of the Ozone Layer Montreal Protocol on Substances that Deplete the Ozone Layer Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer Montreal Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer
2	United Nations Framework Convention on Climate Change Kyoto Protocol to the United Nations Framework Convention on Climate Change
3	Paris Agreement
4	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (with amendments made in 1995, 1998, 2002, 2004 and 2013)
5	Stockholm Convention on Persistent Organic Pollutants (POPs) (with amendments made in 2009, 2011 and 2013)
6	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (with amendments made in 2004, 2008, 2011, 2013, 2015 and 2017)
7	The Minamata Convention on Mercury
8	Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques
9	Plant Protection Agreement for the Asia and Pacific Region (with amendments made in 1967, 1979 and 1983)
10	International Plant Protection Convention (with amendment made in 1997)
11	Convention on Biological Diversity
12	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (with amendments made in 1979, 1983 and 2016)
13	Protocol on Environmental Protection to the Antarctic Treaty

International treaties on maritime safety related to marine environment protection applicable to Macao include:	
1	International Convention on Oil Pollution Preparedness, Response and Co-operation 1990
2	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL)
3	Amendment to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1980
4	International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
5	Convention on the Conservation of Antarctic Marine Living Resources

## Environmental Protection Bureau

The Environmental Protection Bureau (DSPA) is charged with studying, planning, executing, coordinating and promoting environment policies.

## Advisory Council on the Environment

The Advisory Council on the Environment is chaired by the Director of Environmental Protection Bureau. Members include a maximum of seven representatives of other entities or government departments, and a maximum of 20 other prominent social figures in the environmental protection field.

The major responsibility of the Advisory Council on the Environment is consulting opinions from different social sectors regarding Macao's environmental protection, and providing recommendations on the study, formulation, implementation, coordination and promotion of environmental policies.

## Environmental Protection and Energy Conservation Fund

The Government established the Environmental Protection and Energy Conservation Fund through By-law No. 21/2011, and established the Environmental Protection, Energy-saving Products and Equipment Subsidy Scheme through By-law No. 22/2011, aiming to subsidise enterprises and community groups in Macao to increase their capability for protecting the environment; and to introduce environmental protection techniques and devices for further facilitating the development of environmental protection and its industry.

The Environmental Protection, Energy-saving Products and Equipment Subsidy Scheme was the first subsidy scheme since the establishment of the Environmental Protection and Energy Conservation Fund. It targets commercial enterprises and community organisations. According to Order No. 63/2014 of the Secretary for Transport and Public Works, the application deadline

for the Environmental Protection, Energy-saving Products and Equipment Subsidy Scheme was extended to 31 December 2015, receiving over 7,600 applications for subsidies by the end of 2015. As at the end of 2019, over 99.99 percent of applications were handled, of which over 5,000 were approved, involving subsidies of more than 410 million patacas.

The Government launched the Subsidy Scheme for Elimination of Two-stroke Heavy and Light Motorcycles with By-law No. 2/2017 in February 2017. During the application period from 15 February to 30 June 2017, more than 5,736 applications were received, of which over 5,500 were approved, involving subsidies of more than 19 million patacas.

The Government established a scheme to subsidise equipment and vehicles for the recycling industry, according to By-law No. 32/2018 Promulgated in November 2018. The application period was extended to 25 November 2020 with Order No. 42/2019 of the Secretary for Transport and Public Works. As at the end of 2019, a total of 12 applications were received. All applications were handled and approved, involving subsidies of approximately 250 million patacas.

## Promotion of Environmental Protection Education

With the theme “Building a Low Carbon Macao and Embracing a Green Life”, the Environmental Protection Bureau organised 374 events in diverse forms during 2019, attended by 314,463 participants.

The law on Restrictions on Using Plastic Bags came into effect on 18 November 2019. The Environmental Protection Bureau continued its publicity activities before and after the introduction of the law, including by cooperating with the Municipal Affairs Bureau, the Consumer Council and multiple community organisations; organising legal information seminars targeting Government departments, industries (including management, front-line workers, stalls and hawkers) and various groups; and holding multiple “Plastic reduction” lectures and events through the eco-school network.

The Environmental Protection Bureau also deployed manpower across various districts of Macao to explain and answer questions from merchants, citizens and tourists. Moreover, the bureau joined hands with the Macau Government Tourist Office and the Consumer Council to deepen the understanding of the “plastic bag levy” measure among tourists through different channels.

To encourage residents to form a habit of reducing plastic bag use, the Environmental Protection Bureau has jointly organised “Use Fewer Plastic Bags” with various departments, communities and organisations for seven consecutive years. More than 300 stores participated in 2019, and more than 350,000 people participated in this campaign, which saved 350,000 plastic bags.

Since the Environmental Protection Bureau introduced the “Reducing Plastic is Very Easy” event in 2018, to promote “reducing waste at source” and encourage residents to reduce the use of disposable utensils, the number of restaurants joining the event has been rising. As at the end of 2019, the event had accumulated more than 300,000 customer requests for “plastic reduction” and saved 650,000 sets of disposable utensils, which was a huge success. The event was extended to 31 May 2020, due to the overwhelming response.

To encourage citizens to bring their own water bottles, the Environmental Protection Bureau

initiated the installation of 12 drinking water dispensers without cans or bottles in public facilities and border crossing checkpoints, and will deploy more dispensers. As at the end of 2019, more than 185,000 plastic bottles were saved. The Environmental Protection Bureau also joined hands with the Public Security Police and the Municipal Affairs Bureau to produce durable water bottles, which will be gradually introduced.

The Environmental Protection Bureau has been promoting the Scheme on Food Waste Reduction in Macao Food Festival for 10 consecutive years, requiring the food stalls to use official eco-friendly utensils and promote food waste recycling. Drinking water dispensers without cans or bottles were also installed at the food exhibition. The bureau also organised a visit to the food festival, to encourage citizens to reduce disposable utensils use and realise “waste reduction at source”.

Since the rollout of the Green School Project in 2010, the Environmental Protection Bureau has continued to introduce series of environmental education events in green schools; these include green lectures, green stories, roving dramas and panel displays. The Green Award Project has been held for four consecutive years, and the theme for 2019 was “Waste Reduction in Campus is Very Easy”. A total of 33 green school awards were distributed, eight more than in 2018, with 20 schools receiving the Green School Honour Award. In all, 24 teams of teachers and tertiary institution students received the Environment Education Pedagogical Project Award, while 46 schools received Green Campus Fun Awards.

The Macao Green Hotel Awards have been held for 12 years, with numbers of awardees significantly increasing from eight in the first year to 55, representing half of all hotels in Macao. Compared with the award-winning hotel rooms in 2012, the average electricity consumption by the winning hotel rooms this year was reduced by 28,000 units; water consumption decreased by 260 cubic metres, and waste disposal dropped by more than 1.7 tonnes.

In addition, the hotel industry took proactive measures on food waste management. About 64 percent of the award-winning hotels have been carrying out food waste recycling, with 4,600 tonnes of food waste recycled. Some award-winning hotels have also implemented appropriate measures to reduce use of disposable plastic bottles.

The Environmental Protection Bureau introduced the Plan for Recognition of Eco-Supermarkets in 2019, to reward supermarkets with significant achievements in environmental protection, promote more waste and plastic reduction and recycling measures to be implemented by the industry, and encourage citizens to form green consumption habits. As at the end of 2019, a total of 13 supermarkets and 85 shops participated in the plan.

The Environmental Protection Bureau continued implementing the Environmental Protection Fun Bonus Point Scheme. By the end of 2019, there were more than 11,000 members of the scheme. In particular, Environmental Protection Fun – waste reduction and recycling, aimed to encourage waste sorting and recycling among the public by giving award points to citizens, while Environmental Protection Fun – moving towards being environmentally-friendly, encouraged people to join the scheme’s frontline team (Environmental Protection Fans) and assisted with providing guided tour services in a nature reserve. Environmental Protection Fun also introduced online application for eCards.

Meanwhile, in October 2019 the Environmental Protection Bureau introduced nine plastic recycling machines for a pilot scheme, in the Environmental Protection Bureau, the Environmental Protection Fun corners and the Municipal Affairs Bureau facilities, with more machines to be deployed in future. The scheme was included in the Environmental Protection Fun Bonus Point Scheme.

In addition, they promoted environmental messages to the public during environmental festivals such as Wetland Day, Earth Day and World Environment Day, and traditional festivals such as Lunar New Year, the Mid-Autumn Festival and Christmas, and encouraged the public to participate in environmental activities and put environmental protection into practice.

## **Regional Cooperation on Environmental Protection**

The 2019 Macao International Environmental Co-operation Forum (2019 MIECF) was held from 28 March to 30 March. With the theme “Promoting Ecological Civilisation and Green Development”, the forum continued leveraging its position as an international green platform, to facilitate environmental interaction and cooperation between “governments, industries, universities, research institutes, users, and financial sectors”.

Regarding green forums, eight green forums and one special event were held in 2019, inviting 70 guest speakers from all over the world to lead discussions on ecological civilisation, green finance, water resources and marine pollution. The Department of Social Development of the Ministry of Science and Technology and the Environmental Protection Bureau co-organised Macao Ecological Environment Investigation Conference, and announced the preliminary results during a forum.

Regarding environmental cooperation in the Pan-Pearl River Delta Region, in July and August 2019 the Environmental Protection Bureau attended the 15th Coordinator Working Meeting of the Joint Conference on Pan-Pearl River Delta Regional Environmental Protection Cooperation, and the 15th meeting of the Joint Conference on Pan-Pearl River Delta Regional Environmental Protection Cooperation, respectively.

In June 2019, Guangdong, Hong Kong and Macao jointly announced the 2018 Report of the Guangdong-Hong Kong-Macao Pearl River Delta Regional Air Quality Monitoring Network. The parties will continue to manage and maintain the regional air quality monitoring network.

In addition, the bureau attended the fourth Guangdong-Hong Kong-Macao Wetland Ecological Conservation Symposium in September 2019, which facilitated connections within the Guangdong-Hong Kong-Macao Greater Bay Area and established a communication mechanism regarding jointly protecting the wild fauna and flora in the bay area.

Under the Framework Agreement on Cooperation Between Guangdong and Macao in Environmental Protection, the cross-border transfer of scrap motorcycles and vehicles was trialled in 2019.

Regarding Hong Kong-Macao environmental cooperation, the two parties attended the 11th Meeting on Environmental Protection Cooperation between Hong Kong and Macao in July 2019. Representatives discussed plans for cooperation and exchanged experiences and views on environment conditions, air pollution, marine waste management, environmental exhibitions

and seminars. The Environmental Protection Bureau also attended the 14th Eco Expo Asia in Hong Kong.

Under the framework of the Zhuhai-Macao Environmental Protection Cooperation Agreement, the Zhuhai-Macao Environmental Cooperation Working Group Meeting 2019 was held in August 2019. The two parties reviewed the environmental cooperation projects in the past year, and exchanged views on marine pollution governance, environmental monitoring, communication on environmental emergencies, exchanges on ecological issues, environmental protection industry and promotion of environmental protection education. There were also discussions on plans for cooperation in the coming year. The Environmental Protection Bureau also attended the commemorative events of “5 June” World Environment Day.

As construction of the Guangdong-Hong Kong-Macao Greater Bay Area fully commenced, regional environmental cooperation became closer, and has continued to enhance communication and collaboration, progress towards a low-carbon bay area, and improve regional environmental quality.

## Environmental Protection Planning in Macao

In 2019, the Environmental Protection Bureau continued implementing the long-term tasks in the Environmental Protection Plan of Macao (2010-2020), and commenced a study on the Environmental Protection Plan of Macao (2021-2025).

## Environmental Data

Complaints received by the Environmental Protection Bureau in 2019:

Category	Number of cases
Noise	1,224
Air pollution	443
Noise and air	97
Noise and other	32
Air and other	32
Environmental hygiene	63
Other	68
<b>Total</b>	<b>1,959</b>

Technical advice provided at the request of other departments in 2019:

Department	Premises and projects	Nos.
Tourist Office	Premises including karaoke bars, bars, hotels, restaurants, sauna and massage establishments, dance halls and health clubs.	292
	Inspections before issuance or renewal of licences	131
Economic Services Bureau	Technical advice	4
	Inspection of industrial sites	5
	Technical advice on applications for import of HCFCs defined as controlled substances under Decree-Law No. 62/95/M	187
Lands, Public Works and Transport Bureau	Projects including piling foundations, environmental protection projects and applications for extension of construction time, construction plans, expansion plans, modification of / legalisation on construction projects	181
Municipal Affairs Bureau	Technical advice on licensed premises	364
	Site inspections	165
Economic Services Bureau	Technical advice on applications for import of HCFCs defined as controlled substances under Decree-Law No. 62/95/M	9

Moreover, the Environmental Protection Bureau received 70 technical recommendations on environmental impact assessment areas, and 22 environmental impact assessment reports on new projects and related information in 2019.

## Flora

Macao abounds in plant species. More than 1,500 species of vascular plants have been identified in Macao. These are mainly found in woodlands, parks and leisure grounds. Most of Macao's vegetation belongs to the evergreen broad-leaf woodland, tree, shrub and coastal bush groups, including such species as Rose Myrtle (*Rhodomyrtus tomentosa*), Blood-red Melastoma (*Melastoma sanguineum*), Oblong leaved Litsea (*Litsea rotundifolia* var. *oblongifolia*), Pop-gun Seed (*Bridelia tomentosa*), Hong Kong Hawthorn (*Rhaphiolepis indica*) and Linear Forked Fern (*Dicranopteris pedata*). The most common species of cultivated plants are the Chinese Hibiscus (*Hibiscus rosa-sinensis*), Hong Kong Orchid Tree (*Bauhinia blakeana*), Sunshine Tree (*Cassia surattensis*) and False Groundnut

(*Desmodium heterocarpon*). Also, according to research conducted until 2010 by the Civic and Municipal Affairs Bureau and researchers from the Shenzhen Fairy Lake Botanical Garden, Macao has 104 species of bryophytes which belong to 34 genera and 63 families. Rare species include *Fissidens macaoensis*, *Kurzia sinensis*, *Phaeoceroa laevis*, *Notothylas japonica* horik, *Micromitrium* and *Vesicularia*. *Fissidens macaoensis* is a new species to science which was officially announced in 2011. As it was discovered in Macao, its Latin name includes “Macao”.

The terrestrial vegetation in Macao has a relatively diverse plant community. Types of vegetation can be identified: coniferous forests, mixed conifer–broadleaf forests, evergreen broadleaf forests, mixed evergreen -deciduous plants and scrublands. Forest areas on Taipa and Coloane have undergone a compositional transformation. A firebreak was set up, and many indigenous tree species were introduced, including *Melia*-leaved *Evodia* (*Tetradium glabrifolium*), Hong Kong *Gordonia* (*Gordonia axillaris*), *Acronychia* (*Acronychia pedunculata*), Morris’s Persimmon (*Diospyros morrisiana*), India *Carallia* (*Carallia brachiata*), Yanmin (*Dracontomelon duperreanum*), Persimmon-leaved *Litsea* (*Litsea monopetala*), *Michelia chapensis*, Burmese Rosewood (*Pterocarpus indicus*), Heterophyllous Winged-seed Tree (*Pterospermum heterophyllum*), Silver-back *Artocarpus* (*Artocarpus hypargyreus*), *Pinus elliottii*×*Pinus oaribaea*, Common Fig (*Ficus carica*), Horse-tail Pine (*Casuarina equisetifolia*), Chinese Holly (*Ilex rotunda*), *Michelia macclurei* and Chinese Guger Tree (*Schima superba*).

In addition to leafy plants that were commonly used in the past – namely the Dwarf Yellow (*Duranta repens*), Golden Leaves (*Ficus microcarpa*), Golden Dewdrops (*Duranta repens* ‘variegata’), Purple Knight (*Alternanthera dentata*), *Fagraea ceilanica* and Painted Copper Leaf (*Acalypha wilkesiana*) – colours were added to the green belts to improve greening of streets in Macao and create a better view by growing colourful flowering shrubs, such as Indian Azalea (*Rhododendron simsii*), *Cordyline fruticosa*, Small *Allamanda*, *Lantana montevidensis* and *Ruellia brittoniana* in recent years. The view looks more layered with the addition of these flowers, accompanied by other trees such as Golden Trumpet Trees, *Terminalia mantaly*, Camel’s Foot Tree (*Bauhinia variegata*) and Chinese Banyan (*Ficus microcarpa*).

## Green Week

Green Week in Macao is an annual event organised by the Municipal Affairs Bureau with the assistance from various organisations in the community. The 38th Green Week in Macao was held from 16 March to 24 March 2019, with the theme “Flying Butterflies Throughout the Green City”. The event featured 34 activities and was attended by some 30,000 participants.

During the event, more than a thousand seedlings were planted on land, thousands of pot plants were given away, and a series of educational activities were held to encourage public participation in greening Macao.

## Fauna

Macao is small. The development of land and expansion of urbanisation affect and damage the survival and scope of activities of wild animals. The numbers of species and populations of wild

animals in Macao are decreasing.

The scarcity of unpolluted waters in Macao leads to a decrease in the diversity and numbers of amphibians. The commonest species are Asian Common Toad (*Bufo melanostictus*), Ornate Pygmy Frog (*Microhyla ornata*) and Greenhouse Toad (*Eleutherodactylus planirostris*), an invasive species discovered in 2017. In the hilly forest area of Coloane, the Municipal Affairs Bureau has constructed artificial freshwater wetlands as better habitats for amphibians.

The commonest wild mammals are bats, rats and Red-bellied Tree Squirrels. Bats mainly inhabit Coloane and Taipa. The Japanese House Bat (*Pipistrellus abramus*) and Short-nosed Indian Fruit Bat (*Cynopterus sphinx*) can be found on the Macao peninsula. The former frequents gaps between buildings and lives on mosquitoes and flies, helping to limit populations of harmful insects. The latter eat fruits in parks or woods, and may help spread their seeds, contributing to the city environment and natural environment of the woods. The Red-bellied Tree Squirrel is an exotic species, formerly imported as a pet. It is now wild in Macao. Its lack of natural enemies poses a threat to other animal species, especially birds, as the squirrels eat their eggs.

Reptiles, especially snakes, play an important ecological role in controlling the number of rats. The common Chinese Rat Snake (*Ptyas korros*), Oriental Rat Snake (*Ptyas mucosa*) and Asiatic Water Snake (*Fowlea piscator*) are non-venomous, while common venomous species include White-lipped Pit Viper (*Trimeresurus albolabris*) and Taiwan Cobra (*Naja atra*). A rare species, Many-banded Krait (*Bungarus multicinctus*), was recorded again in 2019. However, Macao's dense population poses an enormous threat to their dwelling and foraging areas. In addition, some people's misunderstanding and fear about snakebites have caused the number of snakes to decrease most significantly among all wild animals in Macao.

Previous studies recorded over 300 species of birds in Macao. Dominant species were Chinese bulbul (*Pycnonotus sinensis*, terrestrial) and Little Egret (*Egretta garzetta*, waterbirds). There were 10 common species, four of which were terrestrial birds – Japanese White-eye (*Zosterops japonicus*), Crested Myna (*Acridotheres cristatellus*), Common Tailorbird (*Orthotomus sutorius*) and Eurasian Tree Sparrow (*Passer montanus*); and six species were waterbirds: Kentish Plover (*Charadrius alexandrinus*), Pied Avocet (*Recurvirostra avosetta*), Eurasian Teal (*Anas crecca*), Great Egret (*Ardea alba*), Grey Heron (*Ardea cinerea*) and Black-crowned Night Heron (*Nycticorax nycticorax*). Eurasian Bittern (*Botaurus stellaris*), Christmas Island Frigatebird (*Fregata andrewsi*), Scarlet Minivet (*Pericrocotus flammeus*), Common Pochard (*Aythya ferina*) and Rufous-gorgeted Flycatcher (*Ficedula strophiatea*) were newly recorded in 2019. Since 2006, over 268 species of birds from 15 orders and 57 families have been recorded.

There are abundant fish stocks in Macao, which can be categorised into saltwater fish, brackish fish and freshwater fish. Saltwater fish and brackish water fish mainly refer to the fish off the coast of Macao. There are approximately 200 species of these fish. Freshwater fish most need protection in the natural environment. Although the habitats of freshwater fish and amphibians are similar to each other, the former have a narrower sphere of activities. Whenever the environment is destroyed or altered by human activities, they are often affected most directly.

There are over 700 species of insects, which are widely distributed in Macao, including 150 ant species, over 100 butterfly species and more than 40 dragonfly species.

## Laws Governing Nature Conservation

Macao began to enact laws and regulations on nature conservation – including the establishment of nature reserves and the protection of flora and fauna of special interest – more than 30 years ago. New by-laws were promulgated in 2004 to replace older ones. They are as follows:

1. Decree-Law No. 33/81/M, gazetted on 19 September 1981; Decree-Law No. 30/84/M, amended on 28 April 1984; and Decree-Law No. 3/99/M, revised on 25 January 1999, which designated a 196,225-square-metre area of Seac Pai Van Country Park as a conservation area of outstanding educational, ecological, scenic and scientific value;
2. Law No. 11/2013, approved by the Legislative Assembly on 13 August 2013, and By-law No. 31/2018 and enacted on 4 May 2018, which designated part of Coloane island with an altitude of 80 metres or above as a buffer zone;
3. The Environmental Law, approved by the Legislative Assembly on 31 January 1991 and gazetted by Law No. 2/91/M on 11 March 1991, which set out general guidelines and basic principles for the formulation of environmental policies;
4. General Regulations Governing Public Places (By-law No. 28/2004) enacted on 28 July 2004, which established general principles for behaviour to be observed when using and enjoying public places; and
5. By-law No. 40/2004 on Sanitary and Phytosanitary Control enacted on 14 December 2004, which regulates the sanitary and phytosanitary control of merchandise, and implements Chief Executive Order No. 245/2014 on the List of Plant Pests for Regulation as Quarantine Pest Organisms of the Macao SAR.
6. The Animal Protection Law (Law No. 4/2016) came into effect on 1 September 2016, with regulations on keeping, managing and selling animals, and the use of animals in public exhibitions and scientific applications. In addition, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Biological Diversity, and the International Plant Protection Convention have been made applicable to Macao, thus ensuring that Macao's nature conservation policies conform to international practices.
7. To ensure the enforcement of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Macao, the Legislative Assembly of the Macao SAR deliberated and passed Law No. 2/2017 regarding the convention.

## Nature Reserve

The Taipa-Coloane Wetland Reserve managed by the Environmental Protection Bureau is situated adjacent to the Lotus Flower Bridge in Taipa and Coloane. It has a total area of 55 hectares, including a 40-hectare bird foraging area that is regarded as zone two of the reserve, on the west coast of reclaimed area between Taipa and Coloane. Next to this zone is a 15-hectare bird habitat, regarded as zone one of the reserve, which provides different bird species (including the rare Black-faced Spoonbill) with suitable habitats.

As at the end of December 2019, the Cotai Nature Reserve’s known biodiversity included 217 species of planktonic algae, 386 species land plants (*embryophytes*), 142 plankton species, 133 zoobenthos species, 502 species of insects, 81 species of fish, five species of amphibians, 21 species of reptiles and 10 species of mammals. This diversity helped attract 181 species of birds to the nature reserve, including the Black-faced Spoonbill (*Platalea minor*).

To enrich education on ecology, apart from the monthly Cotai Nature Reserves Open Day and the “Nature School” family workshop, bird watching in nature reserves was organised during migratory bird seasons, while Ichthyology Workshops were held in other seasons to raise awareness of environment protection.

## Country Parks

There are four country parks in Macao: Seac Pai Van Country Park, Taipa Grande Nature Park, Hac Sa Reservoir Country Park, and Ka Ho Reservoir Country Park.

### Seac Pai Van Country Park

Adjacent to Seac Pai Van Road in western Alto de Coloane, Seac Pai Van Country Park covers an area of about 198,000 square metres, and provides a wide range of facilities. Its animal facilities comprise the Giant Panda Pavilion, a zoo, and an aviary. Its exhibitions facilities feature the Giant Panda Information Centre and the Museum of Nature and Agriculture. Other leisure facilities include a children’s playground, a large picnic area and a snack bar.

### Giant Panda Pavilion

Set against a hill side in Seac Pai Van Park of Coloane, with a fan-shaped layout and an area of about 3,000 square metres, Macao Giant Panda Pavilion is designed to combine the terrain’s natural undulations with the architectural characteristics. The pavilion comprises two 330-square metre indoor activity quarters and a 600-square metre outdoor yard. The appearance of the Macao Giant Panda Pavilion is designed to mimic nature, and it features green elements with leisure facilities such as pools and wooden climbing frames for the pandas.

### Taipa Grande Nature Park

Taipa Grande Nature Park is on the east of Taipa island, and covers a wooded and hilly area of 13,000 square metres between Ponta da Cabrita Road, Governador Nobre de Carvalho Avenue and Padre Estevaso Eusebio Situ Road. The park houses a native fish breeding zone, Taipa Grande exhibition hall, a barbecue area, grass skiing slope, children’s playground and a memorial pavilion for Mr. Henry Fok. It is a multifunctional park for relaxation, exercise, environmental protection, education and retreat. It is also an ideal destination for Macao residents to enjoy forest scenery to the full, embrace nature and enrich their leisure time.

## Hac Sa Reservoir Country Park

Hac Sa Reservoir Country Park is situated in a hilly forest area on the southeastern slopes of the central mountain of Coloane. The park occupies 371,000 square metres between the entrance of the Westin Resort Macau on Hac Sa Road to the east, and Chu Ku Tong pond, in front of Man Hong Un, to the south. The Hac Sa aquatic plant zone and aquatic plant watching zone are for nature protection and education.

## Ka Ho Reservoir Country Park

Ka Ho Reservoir Country Park is situated on the northeast of Coloane island. The park faces Ka Ho Village to the east, separated by Barragem de Ka Ho Road. Seac Pai Van Reservoir lies to its west; and the golf course and Alto de Coloane Road lie to its south. It is bordered by a road that leads to the youth challenge centre in the north; and it stretches all the way down to a wooded and hilly area by the shoreline. Ka Ho Reservoir Country Park has an area of 81.8 hectares.

With Ka Ho Reservoir as its central point, the park boasts various facilities, including the Ka Ho Reservoir Trail, Northeast Trail, Dam Mural, Waiting Square, and Little Spring; as well as barbecue, and picnic areas; the Blossom Bridge; diversity games zone; Ka Ho Reservoir Outdoor Experimental Camp; and the Freshwater-Wetland Ecological Zone. With its educational and recreational features, Ka Ho Reservoir Country Park is an ideal place to spend leisure time.

## Population

Macao's resident population was estimated to be 679,600 at the end of 2019, representing an increase of 12,200, or 1.8 percent, over the previous year. On the same date, an estimated 46.7 percent of Macao's population were males, and 53.3 percent were females.

Natural factors are among the reasons for the increase in population. In 2019, there were 5,979 newborn babies, 0.9 percent more than in 2018, and 2,282 deaths, representing an increase of 10.3 percent. Hence, the natural population growth rate was 0.55 percent, representing a drop of 0.04 percent.

On top of this increase, there was a change in immigration, another factor influencing population. The net number of immigrants was 8,500 in 2019, attributed to 4,400 more foreign employees residing in Macao and 3,757 new immigrants from mainland China who hold one-way permits.

Most residents lived in Our Lady of Fatima Parish, with 261,400 residents, comprising 38.5 percent of the total population. Coloane District saw the largest rise in population, which increased by 4.5 percent year-on-year to 30,200 residents.

## Birth and Death Rates

In 2019, the birth rate and death rate were 0.89 percent and 0.34 percent, respectively.

## Population Ageing

Macao's population is ageing because of the increasing life expectancy. Senior citizens (aged 65 or above) made up 11.9 percent of the population, 0.8 percent more than in 2018; the number of other adults (aged 15-64) dropped by 0.8 percentage points, representing 74.9 percent of the population. The ageing index increased by 6.2 percentage points to 90.3 percent of the population over the previous year, marking the 23rd consecutive year this index has increased.

The ageing in the population of Macao people is more significant, with 80,800 senior citizens (aged 65 or above), nine percent more than in the previous year; the number of other adults (aged 15-64) dropped by 0.3 percent to 384,700. The elderly dependency ratio of the population of Macao people was 21 percent, which means there was one senior citizen for every five adults.

## Identification Bureau

Under the Basic Law of the Macao SAR, the Macao Special Administrative Region Government is authorised by the central government to issue MSAR Passports to Chinese citizens who hold MSAR Permanent Resident ID cards, and to issue other types of MSAR travel permits to other legal residents of Macao. MSAR Passports and travel permits are valid for worldwide travel, and entitle their holders to return to Macao.

The Identification Bureau is under the administration of the Secretariat for Administration and Justice, and is responsible for the overall planning and work relating to the civil and criminal identification of Macao residents. It issues ID cards and certificates of criminal record, certificates to substantiate the facts stated in official record, MSAR Passports, and other travel permits to Macao residents. It also responsible for handling nationality applications from MSAR residents, receiving and handling applications for Certificate of Entitlement to Right of Abode and issuing the related certificates, arranging the registration of associations and syndicates qualified as juridical persons and issuing the related certificates, as well as other duties as vested by law.

## Personal Identity Cards

Only Chinese citizens who are permanent residents in Macao with a Macao Resident ID card are eligible to apply for an MSAR Passport. A Chinese citizen who is a Macao Resident ID cardholder, but not a permanent resident of Macao and not eligible for other travel permits, may apply for an MSAR travel permit.

By 31 December 2019, the Identification Bureau had issued 745,891 MSAR Passports and 54,086 travel permits.

Under the Nationality Law of the People's Republic of China and the Interpretation by the Standing Committee of the National People's Congress on Several Questions Relating to the Application of the Nationality Law of the People's Republic of China in the Macao Special Administrative Region, any permanent resident of Macao with Chinese nationality and a Portuguese travel document may travel to other countries or regions with the Portuguese travel document as before. Therefore, such people may hold both a Macao SAR Passport and a Portuguese travel

document at the same time.

The Identification Bureau is responsible for issuing Visit Permits for Residents of the Macao SAR to the Hong Kong SAR (also known as “Visit Permits to the HKSAR”). Residents of the MSAR who are either Chinese or Portuguese citizens and who hold a Macao Resident ID card or an MSAR Resident ID card may apply for Visit Permits to the HKSAR. The bureau had issued 446,582 such permits as at 31 December 2019.

The Identification Bureau is also responsible for issuing Macao SAR Resident ID cards. As at 31 December 2019, there were 729,388 Macao SAR Resident ID card cardholders. Between 1 January and 31 December 2019, 12,737 residents received Macao SAR Resident ID cards for the first time.

## Nationality

Under Law No. 7/1999, the Identification Bureau is responsible for handling nationality applications from MSAR residents, including applications by foreign nationals or stateless persons for naturalisation; applications by Chinese citizens to renounce Chinese nationality; applications by foreigners who previously had Chinese nationality to restore Chinese nationality; applications by MSAR residents of both Chinese and Portuguese descent to choose either Chinese or Portuguese nationality; and applications by original Macao residents who are Chinese citizens with other nationalities to adopt Chinese nationality.

Between 20 December 1999 and 31 December 2019, 1,224 applications for naturalisation were approved; 552 people restored their Chinese nationality; 96 renounced their Chinese nationality; 3,343 successfully applied to adopt Chinese nationality; 71 opted for Portuguese nationality; and there were five applications for change of nationality.

## Certificate of Entitlement to Right of Abode

A certificate of entitlement to right of abode confirms the status of a permanent resident of the MSAR. Any person who claims to have right of abode in the MSAR but does not hold a valid Macao Resident ID card or MSAR Resident ID card and who does not live in any other region of the People’s Republic of China (except the Hong Kong SAR and Taiwan) must apply for a certificate of entitlement to right of abode.

Such people include Chinese citizens who have ordinarily resided in Macao for seven consecutive years before or after the establishment of the Macao SAR; children of Chinese nationality born outside Macao whose parents are Chinese nationals and permanent residents of Macao; people of both Chinese and Portuguese descent who have ordinarily resided in Macao for seven consecutive years before or after the establishment of the MSAR; and children of Chinese nationality or children born outside Macao who have not selected a nationality but intend to reside in Macao permanently and whose parents are permanent Macao residents of either Chinese citizenship or Portuguese descent. The certificate of entitlement to right of abode indicates its date of effectiveness, prior to which holders of the certificate have no right to enter or reside in Macao.

Between 20 December 1999 and 31 December 2019, the Identification Bureau issued 82,634 certificates of entitlement to right of abode.

## Certificate of Criminal Record

In August 1996, the Identification Bureau started to issue certificates of criminal record and certificates of special record for minors. The former is the sole and sufficient document to prove whether an applicant has any criminal record; while the latter is applicable to those under 16.

Between 1 January and 31 December 2019, the bureau issued a total of 88,951 certificates of criminal record. Of these, 68,342 were public applications, and 20,609 were agency applications. Among the 71 certificates of special record for minors that were issued, 64 were to applicants through agency, and seven to public bodies.

## Immigration Controls

According to the Basic Law of the Macao SAR, the Government may impose restrictions on people from other countries or regions entering, staying in, and leaving Macao. The Immigration Department of the Public Security Police is responsible for entry and exit in Macao.

The MSAR Immigrant Department records the entry and exit of non-residents, as well as their passport, visa, or other relevant documents for reference. The period of stay is granted according to stipulations in By-law No. 5/2003.

By 31 December 2019, citizens of 81 countries enjoyed visa-free access to Macao. Valid passport holders of these countries and regions may enter and stay in Macao for 14 to 90 days, while those from the United Kingdom may stay for up to six months. PRC passport or travel permit holders who have a valid air ticket and visa issued by the country or region of destination may stay for a maximum of seven days in Macao.

## Legal Immigration

During 2019, the number of mainland China immigrants increased by 225, or 6.4 percent, totalling 3,532. Of these, immigrants from Guangdong Province increased by 339 to 2,601, with females comprising 64.8 percent of the total and persons aged below 30 representing 36.1 percent, 1.4 percentage points fewer than in 2019.

## Overstaying and Illegal Entry

In 2019, 27,695 overstayers were repatriated. They included 26,269 mainland Chinese, 62 Taiwan (China) residents, 49 Hong Kong residents, 1,315 foreign nationals, and 25,889 voluntarily repatriated mainland Chinese.

## Civil Registration

The Civil Registry is responsible for implementing regulations relating to the civil registration of births, parentage, adoption and child custody, marriage agreements, deaths, legal certification of the deaths of missing persons, and issuing relevant certified documents.

## **Birth Registration**

The Birth Registry is responsible for the registration of births in Macao, as well as the re-registration of births of people aged 14 or over. The Civil Registry should be verbally notified of any birth in Macao by the parents or guardians within 30 days. There were 6,003 registered births during 2019.

## **Marriage Registration**

The Civil Registry is responsible for handling applications for marriages, approving marriage registrations, hosting ceremonies for the signing of marriage certificates and registering marriages. A total of 3,724 marriages were registered during 2019.

## **Death Registration**

Family dependents or other relatives of a deceased person may register his or her death with the Civil Registry or its staff assigned to the registry's branches at Conde S. Januario Hospital and Kiang Wu Hospital. There were 2,378 death registrations during 2019.

## **Divorce by Mutual Consent**

The Civil Registry has the authority to process divorce by mutual consent. Applicants who have been married for over one year, have no children aged under 18, and have reached agreement on maintenance payments and ownership of their residences may submit applications to the Civil Registry. There were 727 divorce applications during 2019.



## **Water Fun Day**





Water Fun Day is a summer event hosted by the Education and Youth Affairs Bureau and co-organised by the Marine and Water Bureau and the Macao Water Supply Company Limited (Macao Water), offering 10 families a window on the water supply facilities in Macao. The participants gained knowledge about the conditions of the water resources, water supply process and knowhow through the intriguing experience, which cultivated the awareness of water conservation among children.