

## LAND, INFRASTRUCTURE, HOUSING AND PUBLIC UTILITIES



## **Land, Infrastructure, Housing and Public Utilities**

### **Urban Planning**

To satisfy the needs arising from Macao's rapid urban development, the Government has drawn up a long-term plan for major infrastructure, traffic and transportation and other urban development projects, under the policymaking principles of "putting people first" and "sustainable development". This aims to upgrade infrastructure, transportation and related facilities and improve the quality of life of the community.

### **Lands, Public Works and Transport Bureau**

The Lands, Public Works and Transport Bureau (DSSOPT) is a public administrative authority that provides support to other branches of government in matters of land utilisation and management, urban planning, infrastructure, and basic services. It strives to develop Macao into a sustainable modern city with a favourable environment for both living and working.

In 2012, the DSSOPT actively promoted projects under the Guangdong-Macao Cooperation Framework Agreement, which included compiling the Action Plan for the Bay Area of the Pearl River Estuary, the Plan for the Coordinated Development of Macao and Zhuhai, and the Western Pearl River Delta Development Plan. The DSSOPT also published a digest of the second-phase public consultation on the Master Plan for Macao's New Districts, following completion of the consultation, and held exchange sessions and expert forums in the second half of the year. The third-phase of the public consultation would be launched by the end of 2013, to enrich the plan.

In 2012, the DSSOPT continued to launch and follow up on various plans for smaller areas and studies on key projects. These included detailed planning of the shipyard at Lai Chi Vun, Coloane; planning of Hac Sa Village in Coloane; the overall conceptual urban design of the Border Gate checkpoint and its surrounding environment; the plan for urbanisation of Seac Pai Van in Coloane; the overall urban design of A-Ma district; the Inner Harbour redevelopment plan; the overall plan for the heart of the Historic Centre (Ruins of St Paul's); a planning study for northwest Macao; a study on the Urban Climatic Map of Macao; a study on the adaptive re-use of the area around Lilau Square and the Mandarin's House; a land categorisation study; and an in-depth study on land utilisation.

Regarding the management of urbanisation: the DSSOPT created 290 street alignment charts, of which 218 are for streets on the Macao Peninsula, 37 for streets on Taipa, and 35 for streets on Coloane. In addition, it sent out 492 proposals regarding construction plans.

### **Construction Companies and Contractors**

According to statistics from the Lands, Public Works and Transport Bureau, the numbers of construction contractors and construction companies that have either registered or renewed their registrations by the end of 2012 were as follows:

Category	New registration	Renewed registration	Total
<b>Construction Contractors</b>	17	164	<b>181</b>
<b>Companies (construction)</b>	175	592	<b>736</b>
<b>Companies (fire)</b>	6	53	<b>5,539</b>
<b>Companies (gas)</b>	13	6	<b>19</b>
<b>Total</b>	<b>180</b>	<b>815</b>	<b>995</b>

## Engineers and Architects

According to statistics from the Lands, Public Works and Transport Bureau, the numbers of architects and engineers that had registered or renewed their registrations by the end of 2012 were as follows:

Category	New registration	Renewed registration	Total
<b>Architect</b>	69	197	266
<b>Engineer (urban construction)</b>	251	577	828
<b>Engineer (gas)</b>	7	20	27
<b>Engineering Technician</b>	5	19	24
<b>Total</b>	<b>332</b>	<b>813</b>	<b>1145</b>

## Infrastructure Development Office

The Infrastructure Development Office is responsible for facilitating and coordinating the execution, maintenance, modernisation and development of major construction projects in Macao. It also researches, follows up and develops cooperative construction projects with the Greater Pearl River Delta region.

The Infrastructure Development Office is responsible for planning and launching a number of public projects. Examples of traffic and transportation projects during 2012 included the Taipa Ferry Terminal, the Cotai underground roundabout on the Taipa-Coloane Causeway, Coloane-Ka Ho Tunnel, a study on the construction of Taipa Grande Tunnel, and the Hong Kong-Zhuhai-Macao Bridge.

Regarding public housing, a number of projects were expedited to meet the housing demands of the residents, while public facilities and car parks were also included in these projects in order to cater to the needs of the community.

Projects	No. of residential units	Other facilities
Seac Pai Van Public Housing Estate	8,649	Car park, social facilities
Edificio do Lago, Taipa	2,703	Car parking spaces, motorcycle parking spaces, public transport interchange, dry markets and social facilities
Fai Chi Kei Public Housing Estate	737	Public car park with car and motorcycle parking spaces
Rua Central De Toi San Public Housing Estate	578	Public car park with a total of about 200 car and motorcycle parking spaces
Bairro da Ilha Verde Public Housing Estate, Lot 1, 2	2,356	Public car park with 1,190 car and 1,600 motorcycle parking spaces, bus interchange, commercial and social facilities
Bairro da Ilha Verde Public Housing Estate, Lot 3	770	Public car park with about 400 parking spaces, commercial and social facilities

## Hengqin Campus of the University of Macau

The construction of the new campus of the University of Macau (UM) on Hengqin island started in November 2010, and completed by the end of 2012. Final inspections and preparation for the relocation of UM were made in early 2013.

## Transportation Infrastructure Office

On 1 November 2007, the Government established the Transportation Infrastructure Office, aiming to foster the modernisation and improvement of transportation infrastructure as well as the construction of the Macao Light Rail Transit (LRT) System, to provide comfortable and highly efficient modern transportation for citizens and tourists.

After the public bidding and evaluation of bids, the office awarded the contract for the supply of Rolling Stock and Systems of Macao LRT Phase I to Mitsubishi Heavy Industries, Ltd. on 3 March 2011 at a contract value of 4.688 billion patacas.

The foundation works of the Light Rapid Transit System (LRT) depot commenced on 23 November 2011, followed by the project on the central Taipa section, which commenced on 21 February 2012, and later, construction of the Cotai and Taipa terminal sections commenced on 13 June 2012. By then the construction of LRT in Taipa was in full swing. Moreover, on 7 August 2012 a ceremony was held for the commencement of the construction of the public transport interchange at Estrada Governador Albano de Oliveira in Taipa.



## Infrastructure Projects

### Private Construction Projects

According to statistics from the Lands, Public Works and Transport Bureau, 30 building projects providing 2,443 private flats with a total floor area of 325,050 square metres, 98 commercial units with a total floor area of 10,536 square metres, and 2,218 parking spaces in car parks with a total area of 73,026 square metres were completed in 2012. Also during the year, construction commenced on 26 private projects providing 2,279 units with a total floor area of 267,093 square metres.

Furthermore, by the end of 2012, 30,698 units were pending approval, of which 29,527 were residential units with a total floor area of 3,949,147 square metres, 1,163 were commercial units with a total floor area of 30,334 square metres, eight were office units with a total floor area of 8,340 square metres, and the remainder were industrial units with a total floor area of 57,195 square metres, and 32,644 parking spaces in car parks with a total area of 1,000,697 square metres. By 2012, a total of 7,636 units were still under construction, of which 7,254 were residential units with a total floor area of 991,112 square metres, 246 were commercial units with a total floor area of 566,441 square metres, 136 were office units with a total floor area of 26,255 square metres, and the remainder were industrial units with a total floor area of 38,250 square metres, and 8,786 parking spaces in car parks with a total area of 294,236 square metres.

### Public Construction and Infrastructure Projects

To meet the needs arising from social development, the DSSOPT put forward a number of projects in 2012, including the first-phase expansion of the Emergency Service Building and ancillary facilities of Conde S. Januario Hospital, the Rua de Francisco Xavier Pereira public housing project, the first-phase construction of the new Coloane Prison, construction of the Cheang Kun Ying Memorial Hall, maintenance of the Kun Iam Statue, construction of the Pou Tai Social Service Building, installation of barrier-free facilities in the car park at Alameda Dutor Carlos d'Assumpcao, and the first-phase construction of a vehicle examination centre in Cotai.

With regard to infrastructure, to support implementation of the Government's public housing policy and the plan for urbanisation of Seac Pai Van in Coloane, public drainage systems, and tap water and recycled water pipelines were built in the area, slope upgrading and greening works were carried out, and pedestrian footbridges and road-crossing facilities were built in tandem with the development of public housing estates. Furthermore, basic ancillary facilities including two temporary carriageways and a walkway were constructed near Edificio do Lago (TN27) in Taipa. To facilitate public transportation, road networks were developed. In 2012, Rua Lei Pou Chon and Avenida do Ouvidor Arriaga were opened to traffic, and Avenida Marginal do Patane was extended to connect Travessa dos Estaleiros and Avenida Marginal do Lam Mao, providing linkage between districts.

### Macao Civil Engineering Laboratory

The Macao Civil Engineering Laboratory was established in 1988, and is a non-profit public legal body engaged in science and technology, which is autonomous in terms of technology, budget and

assets. The chairpersons of the Board of the General Assembly and Board of Directors are both appointed by the Government.

The responsibilities of the Macao Civil Engineering Laboratory are to provide civil engineering and related technical support to the Government, public and private civil engineering firms, and any net value companies in related fields.

## **Housing**

### **Housing Bureau**

The main functions of the Housing Bureau are to ensure the execution of public housing policies, projects and work, as well as to assist with and support the management of the common areas of buildings.

### **Home-Ownership Scheme Housing**

Under Decree-Law No. 13/93/M of 12 April 1993, the Housing Bureau invited contractor companies in Macao to build homes on land granted by the Government under Home-Ownership Scheme Housing Development Contracts, the land-grant contracts between the companies and the Government. When a development was completed, some units were reserved for the Government, to repay the costs of concessions and subsidies of land grants. The rest were sold to families on the Housing Bureau's waiting list, in accordance with terms and prices stipulated in the land grant contracts by the bureau.

Under Law No. 10/2011 of 1 October 2011, the construction of Home-Ownership Scheme Housing is led by the government and executed by the Housing Bureau or other public authorities appointed by the Chief Executive.

### **Rationale for Home-Ownership Scheme Housing**

Home-Ownership Scheme Housing is intended to assist Macao residents of a particular income level and financial situation to meet their housing needs, and to promote a housing supply that suits the practical needs and purchasing power of Macao residents.

### **Eligibility for Home-Ownership Scheme Housing**

Residents wishing to purchase Home-Ownership Scheme Housing need to file applications with the Housing Bureau. Applicants must be at least 18 years old or be released from parental authority, and have lived in Macao for at least five years. In addition to a maximum permissible total income, there are strict regulations regarding family financial status. Applicants cannot own any private residential property or land including Home-Ownership Scheme Housing, and may not give up a flat received under the Home-Ownership Scheme Housing or sell their purchased Home-Ownership Scheme Housing flat or mortgage subsidy of private property in any form within five years prior to signing the housing purchase certificate. Multiple applications from one or more family members

are not permitted. Moreover, applicants involved in cases in which the pre-sale contract of the Home-Ownership Scheme housing unit of a family member has been annulled or declared void over the past two years, or in which an application has been rejected due to false declarations or deception, were ineligible for re-application.

## **Housing Allocation**

In 2012, 8,585 applications were processed, of which 5,431 were allocated Home-Ownership Scheme housing units. At present, there are 3,615 families on the waiting list.

## **Public Housing**

Public housing refers to units built by the Government or by private developers on land granted to them by the Government. Upon completion, a stipulated number of units are handed over to the Government for leasing to low-income families and those in adverse circumstances. Methods for the allocation and management of public housing are governed by By-law No. 25/2009.

Public housing is distributed to families of weak financial standing in the form of leasing. Families of weak financial standing are defined as those whose household incomes fall beneath the legally stipulated levels.

## **Requirements for Applications for Public Housing**

Applications for public housing will open at a time deemed appropriate by the Housing Bureau. Households applying to lease public housing should fulfil the following requirements: the applicant should be aged at least 18, have resided in Macao for at least seven years, and be a holder of a Macao permanent resident identity card. The applicant and the members of the household should not be the owner or the appointed buyer of any buildings or independent units during the three years before the application, the owner or lessee of any private land, the member of another household which have purchased Home-Ownership Scheme housing, the member of another family that was granted housing through the regulations of the Home Acquisition or Renting Loan Subsidy Scheme and the Home Purchase Loan Subsidy Scheme, or the member of a family that has been punished for violating public housing regulations. In addition, the total monthly income and the total net assets of the household should not exceed the limit stipulated by law.

## **The Upper Limit of Monthly Household Income and Total Net Assets**

Under Executive Order No. 297/2009, the monthly household income and the total net assets of households applying for renting public housing should not exceed the amounts in the following table:



Monthly Household Income and Total Net Assets		
Household size (No. of family members)	Monthly household income (in patacas)	Net assets (in patacas)
1	7,570	163,520
2	11,840	255,750
3	14,640	316,230
4	16,510	356,620
5	17,870	386,000
6	21,080	455,330
7	22,440	484,710

### Granting of Public Housing

Since 1996, public housing leases have been awarded through five rounds of open bidding. In 2012, 1,943 applications were processed, 666 of which were successful. There are currently 6,207 families on the waiting list.

In addition to open applications, people seeking public housing may also apply in writing. In accordance with By-law No. 25/2009, families facing mental or physical danger in their present residences are exempted from the application process and granted public housing directly.

In 2012, the bureau received 729 applications under this category. Of these, 4.9 percent were determined to fall within its legal definition and were granted public housing.

### Temporary Subsidies for Families on the Waiting List for Public Housing

In the wake of economic inflation, in September 2012, the Government renewed the Subsidy Scheme for Families Awaiting Public Housing to relieve the housing burden of families on the waiting list for public housing. A family awaiting public housing with a total monthly income not more than the statutory cap is eligible for one of the following: a monthly subsidy of 1,350 patacas for a family of one or two people; or a monthly subsidy of 2,050 patacas for a family of three or more people. In 2012, 224 applications were approved. Together with the 4,536 applications approved from 2008 to 2011 that remained eligible for the subsidies, housing subsidies disbursed amounted to 89 million patacas.

### Building Management

According to the laws and regulations of the Home-Ownership Scheme, the Housing Bureau is

empowered to monitor and supervise the operation of Home-Ownership Scheme Housing, including building maintenance and property management. In accordance with relevant laws, the bureau can also impose penalties on tenants or management entities that violate its regulations.

The Housing Bureau also assists owners of Home-Ownership Scheme Housing units with setting up management committees, for better housing management through direct participation by homeowners. At the end of 2012, there were 54 such management committees. The Housing Bureau also assists owners of Home-Ownership Scheme Housing units with resolving disputes about building management – providing analyses and advice as a third party, in order to achieve settlement of disputes through reasoning and negotiations. In 2012, it assisted management committees with handling 1,258 disputes.

The Housing Bureau also keeps abreast of all necessary renovation and improvement works for public housing. In addition to public facilities of housing estates, it strives to improve indoor facilities, so as to improve the quality of life of its tenants, particularly for elderly single people.

During 2006, the Housing Bureau started to further strengthen the public-area management function of private buildings. By the end of 2012, the bureau had followed up on 1,304 cases.

## **Building Maintenance Fund Schemes**

To encourage and help homeowners to perform their duties regarding maintenance of common building areas, to improve the living environments and enhance the property value of old buildings, in March 2007 the Housing Bureau established the Building Maintenance Fund to provide for private building maintenance and repair work that ensure safety and adequate levels of environmental hygiene. Schemes under the funding programme include: the Interest-free Loan Scheme for Building Maintenance; Subsidy Scheme for Building Maintenance; Subsidy Scheme for Building Management; Provisional Subsidy Scheme for Common Parts Maintenance of Low-rise Buildings; and Building Maintenance Projects Support Scheme.

There were 274 enquiries concerning the various schemes of the Building Maintenance Fund by the end of 2012.

## **Joint Centre for Building Leakage Issues**

Building leakage caused by blocked drains is a long-standing problem in residential environments and is a concern for many residents. Through cross-departmental cooperation among the Lands, Public Works and Transport Bureau, Civic and Municipal Affairs Bureau, Health Bureau, Legal Affairs Bureau and Housing Bureau, along with technical evaluations carried out by the Civil Engineering Laboratory, the Government established the Joint Centre for Building Leakage Issues on 1 February 2009. Led by the Housing Bureau, the centre provides a one-stop platform for filing and handling residents' complaints, to address and solve building leakage issues simply and efficiently. By the end of 2012, 1,961 cases had been filed for investigation. With the cooperation of the Housing Bureau staff, property management companies, homeowners' councils, and the owners of the affected units, 1,048 cases were successfully resolved.

## **Squatter Area Clearance**

To comply with Macao's urban planning policies and the reallocation of land use, the Housing Bureau is committed to clearing squatter camps and relocating affected residents. In 2012, 23 squatters' dwellings were demolished. By the year-end, 509 squatters dwellings remained, of which 229 were on the Macao peninsula and 280 on the two islands.

## **Land Management**

### **Lands Committee**

The Lands Committee is a consultative body whose work is supervised by the Secretary for Transport and Public Works. The committee is responsible for advising on land use by recipients of land grants, in terms of legal and contractual obligations. It also advises on:

- i) Fines or other penalties on land grant recipients who fail to comply with the laws and terms of their contracts;
- ii) Cases concerning the public use of granted land; and
- iii) Granting, renewing, renouncing or cancelling temporary land-occupation licences.

### **The Consultative Committee on the Renewal of Macao's Old Districts**

The Consultative Committee on the Renewal of Macao's Old Districts was established under Executive Order No. 354/2005. The committee is in charge of gauging public opinion at all levels on various issues on redevelopment, as well as producing analyses and making recommendations to the Government or relevant institutions.

## **Land Concessions**

According to the DSSOPT's statistics, a total of 223,272 square metres of land out of 6117,998 square metres of developed floor area was granted in 2012; the total premiums amounted to 3,435,807,279 patacas. In all, 48 land grant contracts were signed in 2012. They involved eight aspects of land grants: leases and grants, amendments to leases, amendments to long-term leases, grants of public housing, transferrals, return of land, land designation for public/private use, and unification of the legal system.

Most of this land was granted for residential, commercial and industrial uses, offices, hotels, car parks and facilities; land was also granted for other uses. Income from land premiums in 2012 totalled 2,900,334,991 patacas. There were no overdue payments in 2012.

## **Water Disposal System**

Macao's water disposal system includes the independent networks of the Macao peninsula and Taipa and Coloane islands. Specific data are as follows:

## Water Drainage Systems in 2012

Type Area	Public sewer system (metres)				Rainwater drains (units)	Public sewage inspection pit (manhole) system (units)	Public rainwater pipe outlets (units)	Outlets valves (units)	Pumping stations (units)
	Sewage piping	Rainwater piping	Combined piping	Flow interceptors (rainwater and sewage)					
<b>Macao</b>	92,656.08	101,900.35	63,071.44	17,127.13	13,757	11,395	170	39	22
<b>Taipa</b>	25,981.06	51,027.38	363.94	22,251.83	3,797	3,306	72	18	13
<b>Coloane</b>	8,318.39	26,732.09	0.00	14,418.17	2,183	1,095	53	6	13
<b>Total</b>	<b>126,955.53</b>	<b>179,659.82</b>	<b>63,435.38</b>	<b>53,797.13</b>	<b>19,373</b>	<b>15,796</b>	<b>295</b>	<b>63</b>	<b>48</b>

The Drainage Division of the Civic and Municipal Affairs Bureau is responsible for cleaning and dredging the drainage systems of Macao, inspecting and monitoring their operations, making improvements, and registering relevant information.

During 2012, the Drainage Division received 15 complaints regarding street flooding caused by rainstorms. There were 151 complaints about silting of main drains. In 2012, there were 23 prosecutions concerning violation of the General Regulations Governing Public Places, and 226 subpoenas were issued to illegal polluters.

## Slopes

According to the Lands, Public Works and Transport Bureau, at the end of 2012, Macao had 193 dangerous slopes.

Number of slopes / risk	High	Medium	Low	Total
<b>Macao peninsula</b>	2	25	52	<b>79</b>
<b>Taipa island</b>	0	19	34	<b>53</b>
<b>Coloane island</b>	3	24	34	<b>61</b>
<b>Total</b>	<b>5</b>	<b>68</b>	<b>120</b>	<b>193</b>

The Lands, Public Works and Transport Bureau and the Civic and Municipal Affairs Bureau are responsible for maintaining roadside slopes and slopes in public parks, respectively. In 2012, the Lands, Public Works and Transport Bureau carried out nine slope upgrading projects.

## **Surveying and Mapping**

### **Cartography and Cadastre Bureau**

The Cartography and Cadastre Bureau is supervised by the Secretary for Transport and Public Works. It specialises in setting up and maintaining the Government's Geodetic Control Network and Geometric Levelling Network. In addition, the bureau supports land-management activities, drafts maps of various types and scales, and maintains the cadastre management.

### **Cadastre Management**

The Cadastre Division of the Cartography and Cadastre Bureau has operated a cadastral database since 1983. The bureau also produces cadastral maps in accordance with the provisions of the Cadastre Law (Decree-Law No. 3/94/M issued on 17 January 1994). The division continuously updates and organises related information and strives to improve its management. The Cartography and Cadastre Bureau launched the Cadastral Information Net in 2008 and an online shop for cadastral maps in 2011.

The Cadastre Division also provides survey information from its database to land owners who need to re-measure land boundaries for valuation, transaction or development purposes.

### **Land Surveying and Cartography**

The Cartography and Cadastre Bureau provides a wide range of land survey and cartography services. It also provides topographical maps at various scales with Chinese and Portuguese footnotes, digital cartography of Macao, printed aerial survey photos taken in 1941, 1980, 1988, 1993 and 1998, posters, the map of the Macao SAR and its peripheral regions, and thematic maps.

In 2012, the Cartography and Cadastre Bureau introduced the new version of Macao Special Administrative Region and Adjacent Regions Map, which includes the entrance of The Guangzhou-Macau Expressway at Jinding Town to the north, Changlanwan at Hengqin to the south, the Zhuhai Bridge to the west, and waters of the Pearl River estuary to the east, covering the Macao Special Administrative Region, Zhongshan, Hengqin, Qiao and the Jiuzhou Islands.

### **GPS Reference Station**

The Cartography and Cadastre Bureau opened three Global Positioning System (GPS) reference stations, in Mount Fortress, Alto de Coloane and Taipa Grande on Taipa island in 2002, 2005 and 2008, respectively. The reference stations use a dual-satellite system that can receive GPS signals as well as data from the Russian GLONASS system (Global Navigation Satellite System). By integrating signals from these three stations, it is possible to effectively cover the whole of Macao,

further enhancing land, cadastral and engineering surveys of Macao, as well as data collection for the Geographic Information System (GIS).

In 2009, the Macao Satellite Positioning Reference Station Service ([www.dscc.gov.mo/mosref](http://www.dscc.gov.mo/mosref)) was launched, making satellite reference data officially available to the public, through registration. In addition, an NTRIP (Networked Transport of RTCM via Internet Protocol) service was launched in 2012. Real Time Kinematic (RTK) corrections were provided to professional users through 3G mobile communication and internet technologies, enabling them to use real-time GPS applications accurate to within a centimetre.

## **Geographic Information System**

In response to society's needs, the Cartography and Cadastre Bureau has introduced various kinds of geographic information systems, including the Cadastre Information Web ([adastre.gis.gov.mo](http://adastre.gis.gov.mo)), a comprehensive land information platform that combines information from various departments on land and buildings. Users can inquire about buildings, locations, drawing easement, street alignment, district planning, property registration and other relevant regulations and orders. In addition, the website contains statistical data, executive procedures and laws related to land. By the end of 2012, the website had received over 280,000 visitors since its launch in 2008.

The Macao Online Map ([webmap.gis.gov.mo](http://webmap.gis.gov.mo)) provides geographical information to meet citizens' everyday needs in traditional Chinese, simplified Chinese, Portuguese and English. Users can search for all buildings, streets, and various categories of location including government departments, tourist spots and banks in Macao. Since its launch in 2001, it has received more than one million visitors.

Apart from viewing a map and searching for locations, users of the Macao Map – Personal Computer Version can also search for the shortest route and driving directions with the electronic road maps. The geographical information in the Macao Map is updated every half-year, and is free for citizens and tourists to download.

In line with the development of information technology and in response to the demand of the public, in 2012 the Cartography and Cadastre Bureau introduced the Macao Map iOS / Android (Apps) and the mobile version of the Macao Online Map. Its major functions include map browsing, searching for landscapes, searching for nearby tourist spots, measuring distances and areas, GPS positioning, favourite tourist spots and offline caching.

The Cartography and Cadastre Bureau also introduced another mobile version of the Macao Online Map for common mobile phone web browsers ([webmap.gis.gov.mo](http://webmap.gis.gov.mo)). Its design is simple and straight-to-the-point, to help residents and tourists with browsing and viewing Macao maps.

The Traffic and Geographic Information Web ([traffic.gis.gov.mo](http://traffic.gis.gov.mo)) is a cooperative project between the Cartography and Cadastre Bureau and the Transport Bureau, providing locations of roadworks and related traffic diversions in Macao. In addition, thanks to cooperation between the two bureaus, the public can browse the point-to-point map for information about bus stops on the Public Bus Information Station of the Transport Bureau ([www.dsat.gov.mo/bus](http://www.dsat.gov.mo/bus)).

The website for the Environmental Geographic Information System (<http://www.dspsa.gov.mo/gis/Default.aspx>) was created jointly by the Cartography and Cadastre Bureau and the Environmental



Protection Bureau. The other two participating organisations are the Meteorological and Geophysical Bureau and the Macao Water Supply Company. The system uploads environmental data and related processed information through the Internet.

The Cadastral Information Net – Intranet provides real-time land information for public works, housing, land planning and management, environment supervision and municipal administration. As well as information available on the Cadastral Information Net, the intranet provides Government departments with information such as forms of land use, aerial photos (1980, 1988, 1993, 1998 and 2009), land area and housing record codes.

## **Office for the Development of the Energy Sector**

The Office for the Development of the Energy Sector (GDSE) was established on 1 January 2005 under Executive Order No. 11/2005, and it comes under the supervision of the Secretary for Transport and Public Works. Its purpose is to promote and coordinate all activities related to the energy sector, and thus help to implement the Government's energy policy. The office's major functions are to assist the Government in formulating policies for the energy sector; formulate development plans and relating laws and regulations, and follow up on and monitor their implementation; coordinate, promote the study on and monitor the efficiency, impacts on the environment, price and services, and technical regulations of energy products.

### **Electric Power**

According to the working plan of the Framework Agreement on Cooperation between Guangdong and Macao, the first two 220 kV power cables between Avenida Marginal Flor de Lotus, Cotai and Qinyun, Hengqin, went into operation in the middle of 2012, increasing the capacity of electricity transmissions between Guangdong and Macao by 50 percent. This was the second 220 kV electric transmission system installed since the power cable system between Canal Dos Patos, Macao and Gongbei, Zhuhai, came into operation in 2008, greatly improving the capacity and stability of power supplies in Macao.

In 2012, the GDSE summarised and analysed the opinions collected during the first-phase public consultation on the Electricity Tariff System and the Setting of Electricity Prices. Revisions were made to the consultation paper to include the proposal for further reducing the electricity tariffs charged to residential users and small and medium sized enterprises, before the second-phase public consultation was launched. It was hoped that the new electricity tariff system would be implemented in 2013, to alleviate the burden of electricity costs on residential users and small and medium sized enterprises.

Furthermore, to ease inflationary pressure and lower residents' burdens, the Government continued to offer the electricity fee subsidy, the amount of which was increased from 180 patacas to 200 patacas per month per household.

### **Natural Gas**

On 27 July 2012, the Government signed a 25-year natural gas supply contract with Nam Kwong

Petroleum and Chemical Company Limited, confirming the gradual introduction of natural gas to residential, industrial and commercial units, as well as its application in the transport system. It was expected that natural gas could be supplied to residents of Seac Pai Van Public Housing Estate and the Hengqin campus of the University of Macau by early 2013; and to Taipa within two years at the earliest. It would take five years to complete major natural gas networks covering all Macao.

To address the need to allocate and sell natural gas according to different types of users, the Government began studying the natural gas price structure and system during the year, in order to set a retail price in 2013 that could facilitate development of the natural gas market and promote market competition.

## **Energy Conservation**

The Energy Management System under the Public Departments and Organisations Energy Efficiency and Conservation Programme was implemented by 54 departments, to continuously promote energy conservation. Following preparatory work in 2013, the replacement of streetlights by LED lights would start in early 2013. It was expected that a total of 17,000 LED lights would be installed within five years. Moreover, the Safety Regulations on Solar Photovoltaic Grid-connected Systems were drafted, to regulate the installation and safety of solar photovoltaic grid-connected system.

The Office for the Development of the Energy Sector (GDSE) continued to organise large-scale publicity programmes, such as the fifth Macao Energy Saving Week, the Energy Efficiency Educational Programme, and the Campus Energy Conservation Programme, in order to promote energy saving.

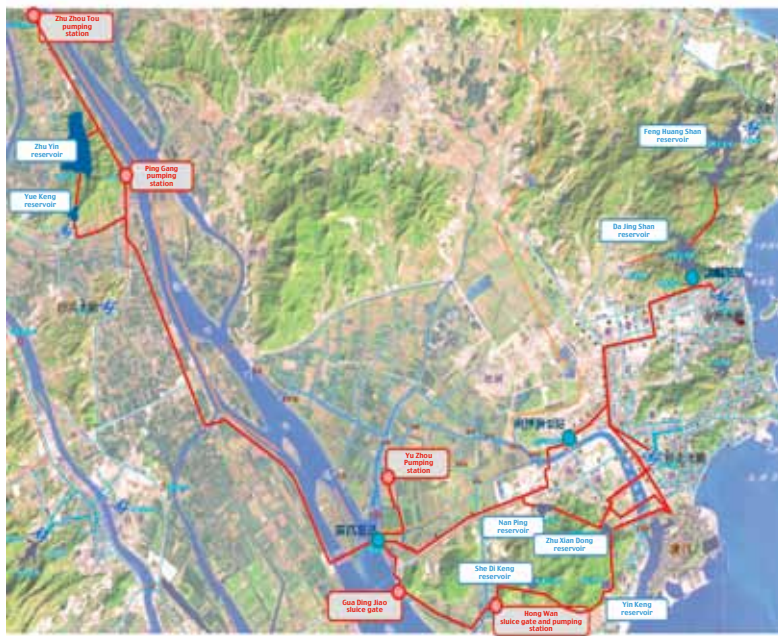
## **Drinking Water**

### **Macao Water Supply Company (Macao Water)**

The Macao Water Supply Company (Macao Water) was established in 1932, and is privately owned. Sino-French Holdings (Hong Kong) acquired 85 percent of the company's shares in 1985 and signed a 25-year water-supply concession contract with the former Portuguese administration. In 2009, the contract was extended for 20 years. Today, Sino-French Holdings (Hong Kong) is a joint venture between the French-based Suez Lyonnaise des Eaux Group (a new company formed after the merger of the French Lyonnaise des Eaux Group and Suez Group in 1997) and NWS Holdings (a subsidiary of New World Development).

## **Raw Water Supply**

Macao's raw water supply from Zhuhai has two main components: the southern pumping station opened in 1988 and part of the Zhuyin Pumping Station opened in 2007. The two stations are connected by the Guangchang Pumping Station. The layout of the whole system is shown in the map below.



On the map, the red labels mark Macao's raw water intake. Some 95 percent of Macao's raw water comes from the Modaomen estuary of the Xijiang (West River) in adjacent Zhuhai. In the recent decades, to mitigate salinity effects, the raw water intake for Zhuhai and Macao has been moved upstream. At the moment, there are five major water intake locations of Macao's raw water.

The blue labels identify reservoirs. Recently, to mitigate salinity effects, the Zhuyin Reservoir was built in Pinggang and trial operation began in autumn 2011.

Zhuhai currently supplies about 234,000 cubic metres of water to Macao each day. In 2012, it supplied a total of 85.66 million cubic metres of raw water. Other than during occasional salt tides in winter and spring resulting in a higher degree of water chloride and a slightly higher degree of faecal coliforms in some seasons, the water quality was certified as Grade II, according to mainland China's Environmental Quality Standards for Surface Water (GB3838-2002).

## Water Treatment, Storage and Transportation

Macao's water treatment capacity increased from 85,000 cubic metres per day in 1985 to 330,000 cubic metres at present. The combined storage capacity of Macao's reservoirs (including the clean water pond and high pool in the water treatment works) rose from 17,000 cubic metres in 1985 to 120,000 cubic metres at present. A total of 97 percent of all the water pipes laid prior to 1982 have been replaced. The total length of pipeline increased from 127 kilometres in 1985 to 513 kilometres in 2012.

At the end of 2012, the total volume of water stored in Macao's reservoirs (including the Main Storage Reservoir (the Outer Harbour Reservoir), the Seac Pai Van Reservoir, the Ka-Ho Reservoir

and the Hac Sa Reservoir) was 2.98 million cubic metres, including 1.9 million cubic metres in the reservoir near the Outer Harbour.

Macao has maintained a continuous 24-hour water supply since 1982. A total of 84.58 million cubic metres of water were supplied in 2012, nine percent more than in 2011. The daily average volume supplied in 2012 was around 231,000 cubic metres, with a maximum of 258,000 cubic metres recorded on 21 August. The increase was primarily due to the opening of the casino hotel Sands Cotai Central and the high temperature in summer. In 2012, the total capacity of water sales was 75.28 million cubic metres, with a daily average of 206,000 cubic metres.

## **Testing Water Potability**

The Laboratory and Research Centre of Macao Water is responsible for water quality testing and analysis, and ensuring the quality of water supply. Staff from the Civic and Municipal Affairs Bureau Laboratory and Macao Water take samples from randomly chosen water supply outlets, in order to analyse and monitor water quality. Laboratory staff from Macao Water are responsible for sampling water to monitor quality during weekends and public holidays.

Since 1985, the quality of Macao's tap water has reached the drinking water standards of European countries.

In 1997, the Laboratory and Research Centre of Macao Water participated in a quality-control test administered by laboratories of Lyonnaise des Eaux Group. The Laboratory and Research Centre achieved outstanding results and was again awarded reference laboratory status. In 2000, the centre was awarded a Certificate of Laboratory Accreditation by the China National Accreditation Committee for Laboratories (CNAL), which is equivalent to ISO 17025. It was only the fourth laboratory in China's water supply industry to be so accredited.

## **Customer Services**

Macao Water established a consolidated customer information system in 1999, to handle customer enquiries promptly and properly and support customer services. The company continues to enhance its services. As well as convenient payment and enquiry services, it also launched the building water supply pipe maintenance service, water-tank-cleaning and water-quality-testing services for buildings, and offers a waiver of fees for the first five cubic metres of water used by senior citizens and individuals who receive the Social Welfare Bureau's single-parent or medical subsidies or subsidies for the disabled. On 1 January 2011, a sliding scale of water charges was introduced.

In 2012, Macao Water established a customer service unit, which gather customers' opinions on the water supply services through personal conversations. By the end of 2012, Macao Water had 214,830 customers, including 187,380 households, 25,632 companies and 1,818 government institutions.

Macao Water was awarded an ISO 9001:2000 Quality Management System Accreditation Certificate in 2003, and OHSAS 18001:1999 Occupational Health and Safety Management System certification in 2005. In 2008, it was awarded the ISO 14000 certificate.

## **Power Supply**

### **Companhia de Electricidade de Macau**

Companhia de Electricidade de Macau (CEM) is a public utility company with the sole concession to generate, transmit, distribute, sell, import and export electricity in Macao.

From 1906 to 1972, the electricity supply service was managed by the Macau Electric Lighting Company, headquartered in Hong Kong. In 1972, the company was replaced by CEM.

CEM was restructured with the former Portuguese administration's support in 1982. In 1984, CEM was linked to the primary networks of Macao and Guangdong Province through two 110 kV overhead lines. In 2006, a second network that also comprises two 110 kV overhead lines commenced operation, increasing Macao's standby electricity supply and directly improving the reliability and flexibility of electricity supply services.

Comprising two 110 kV power cables, the third Macao-Zhuhai electricity power grid came into operation in July 2007, and was further upgraded with in June 2008, with 220 kV power capacities and 1050 MVA transmitting capacity. In June 2012, the second 220 kV power grid came into service. By that time, there were a total of five 220 kV power cables with a transmitting capacity of 1,750 MVA.

In November 2010, the Government and the CEM signed a contract stipulating a 15-year extension to power supply services. The new contract terms came into effect on 1 December 2010.

Since 1987, the Government, which was previously the largest shareholder in CEM, has reduced its holding to just eight percent. Currently, 84 percent of CEM's shares are owned by two major shareholders: the Sino-French Group which holds 42 percent, followed by EDP Asia which holds 21 percent. Moreover, Polytec Industrial Limited and Asiainvest (IP Holding) hold 11 percent and 10 percent respectively. China Power International Holding holds six percent of the shares, and local shareholders own the remaining two percent.

Electricity consumption in Macao increased rapidly during the 1990s. In 1998, CEM decided to invest in developing Coloane B Power Station, which uses multi-cycle gas turbine technology.

In 2012, CEM's capacity peaked at 757 MW on 28 August, 4.4 percent more than the peak capacity in 2011.

The Macao electricity transmission network comprises 24 primary substations and 281 kilometres of 66 kV high-voltage cables, 110 kV cables and 220 kV cables. The Guangdong-Macao electricity network included two 110 kV cables and two 220 kV cables connecting Zhuhai and Nanping, and Gongbei and Zhuhai, respectively.

The 11 kV medium-voltage electricity transmission network comprises 35 user substations and 1,245 user transformer rooms (11 kV / 400 V) connected by cables with a total length of 617 kilometres. The low-voltage transmission network is made up of 780 kilometres of cable, while the street lighting network comprises 524 kilometres of cable and 16,168 streetlights. Almost all of CEM's power network comprises underground cables.

## **Electricity Output and Consumption**

CEM generated 376 GWh of electricity during 2012, a decrease of 49.5 percent over 2011. The amount of electricity imported from mainland China was 3,855 GWh, an increase of 21.8 percent over 2011, accounting for 88 percent of total electricity consumption; and electricity purchased from the Macao Central Incineration Centre totalled 113 GWh. CEM's sales for 2011 totalled 4,142 GWh.

## **Customer Services**

CEM established the CEM Customer Liaison Committee in 2000. With its 19 members coming from 17 different community organisations, the committee serves to reflect public views of CEM's services, and to receive and make suggestions for improvement. At the end of 2012, CEM was providing services to 229,449 households. The Macao peninsula accounted for 86.31 percent of the total customer base, Taipa island 12.99 percent, Coloane island 0.69 percent, and COTAI 0.01 percent.





## Public housing

The Government expedited public housing construction projects in 2012. A total of 19,260 public housing units were planned to be built; of these, 4,189 were completed and 15,071 units were under construction by year-end. All public housing projects have public facilities and car parks to satisfy the needs of the community.



