

Mapping and Geospatial Data



Maps are used for public administration, town planning, housing, land management and development, as well as leisure purposes by the Government, private sectors and the general public. The Survey and Mapping Office (SMO) of the Lands Department (LandsD) is committed to the provision of accurate and up-to-date maps on a wide selection of topics and scales to support the rapid and intensive development of Hong Kong. Special maps are also produced to meet the requirements of different sectors. Digital maps and geospatial data are proving increasingly important in supporting daily life. Through the web map services, both the locals and tourists can have convenient access to information on Hong Kong's geography, buildings, roads, natural environment and public facilities. The SMO is developing a full-fledged 3D Digital Map and providing technical support for the development and implementation of the Common Spatial Data Infrastructure (CSDI) so as to help bring smarter living to the community.

Hong Kong Geodetic Datum: The Hong Kong 1980 (HK1980) Grid coordinates based on the Hong Kong 1980 Geodetic Datum are shown on most topographic maps. As for 1:20 000 maps and other maps of smaller scales, the geodetic coordinates (latitude and longitude) and the Universal Transverse Mercator (UTM) Grid coordinates based on the World Geodetic System 1984 (WGS84) are also shown. A booklet "Explanatory Notes on Geodetic Datums in Hong Kong" published by the SMO describes the map projection formulae and datum conversion parameters. It can be downloaded free of charge from the SMO Geodetic Survey webpage (https://www.geodetic.gov.hk/en/gi/grid_index.htm). Map users can use the information in the booklet to convert the positional reference of a point from one datum to another. In addition, the web-based transformation tools on the website (<https://www.geodetic.gov.hk/en/gi/transformation.htm>) and the coordinates transformation API via the Public Sector Information Portal (<https://data.gov.hk>) can provide instant conversion among different geodetic datums.

1:1 000 Basic Mapping: Early mapping of urban Hong Kong and Kowloon was at 1:600 scale, and showed no height or contour information. In the early 1950s, the New Territories areas were mapped at a scale of 1:1 200 with the intention to replace the old Demarcation District sheets surveyed in the early 1900s. The mapping evolved as a predominantly planimetric record, eventually supplementing rather than replacing the sheets.

A mapping contract for the whole territory by aerial photography and photogrammetric plotting commenced in 1962 and was completed in 1971. It provided mapping at 1:600 scale, with five-foot contours, covering the then Hong Kong Island, Kowloon and New Kowloon. All but the hilly areas and outlying islands of the New Territories were covered at 1:1 200 scale, with 10-foot contours.

Following the adoption of the metrication policy in the early 1970s, the SMO converted some 3 000 sheets to the metric scale of 1:1 000, with metric contours and spot levels. For the previously unmapped hilly areas and remote islands, the SMO embarked on a mapping programme to survey these unmapped areas by photogrammetric method. It started in 1994 and was completed in early 1997. The 1:1 000 basic map sheets covering the entire territory of Hong Kong are available in both paper and digital forms.

Topographic Maps: While the 1:1 000 maps produced by the SMO are essential for planning and land administration, smaller-scale topographic maps are also required by government departments and the public for various purposes. Medium and small-scale topographic maps are derived from large-scale maps by means of cartographic generalisation. Symbolisation and generalisation can enhance the legibility of map details on small-scale maps.

The 1:5 000 topographic maps were published in mid-1970. These maps started with the urban districts and then extended to cover the New Territories.

Since its publication in the 1970s, the 1:20 000 topographic map series (HM20C) has become popular. Printed in colour and with contours depicted at 20-metre intervals, this map series serves many purposes. It is often used by schools in teaching map reading and preferred by scouts and hikers for hiking and orienteering.

The 1:50 000 map, which is the first bilingual topographic map of Hong Kong published by the SMO, depicts a generalised view of the whole territory of Hong Kong on a single sheet coloured map. Contours are depicted at 50-metre intervals with hill shading and layer tinting.

The bilingual 1:100 000 map showing Hong Kong on one sheet features elevation tints and hill shading. Another single sheet map at 1:200 000 scale which shows more generalised views of the territory's topography is also available.

Special Maps: Since its first publication in 1988, the *Hong Kong Guide* has always been one of the best sellers among various map products. The *Hong Kong Guide*, about the size of A4, is published at the beginning of each year. This guidebook contains a wealth of information featuring a content page and a set of indexes in bilingual format that most users will find useful.

Since the first publication of the popular countryside series in 1971, the demand for this map series has been great and steady. There are five sheets in this series, each showing detailed information on leisure amenities and footpaths. Besides, this map series is printed on waterproof paper for higher durability to cater for outdoor activities.

A series of street maps at 1:10 000 scale (SM10C) covering the whole territory of Hong Kong has been made available since 1998. To date, 59 sheets are available.

The 1:50 000 Helicopter Flying Chart (2 sheets) and the 1:100 000 Local Flying Chart are produced to show the flight areas in Hong Kong. Relevant aeronautical information is overprinted in red and blue on topographic base maps.

The SMO also produces other smaller page-sized maps on thematic topics in government publications such as the *Hong Kong Yearbook*.

All the above maps are available for purchase by the general public.

e-HongKongGuide: The *e-HongKongGuide*, first published in 2017, is an annual electronic map book available for download free of charge (<https://www.landsd.gov.hk/en/resources/mapping-information/ehkg.html>). Apart from PDF readers, these electronic maps can also be read offline via different applications on desktop computers and mobile devices. By using free or paid web tools, users can search coordinates, text and information, track positions with a GPS device and add personalised images and geographic information.

Satellite Image Maps: A series of satellite image maps at various scales showing Hong Kong and its nearby regions are also available. Place names are added to the image to help identify locations.

Orthophoto Maps: A series of orthophoto maps at scales 1:50 000 and 1:100 000 (OPM50 and OPM100) covering the whole territory of Hong Kong is available in both paper and digital forms. These orthophoto maps are produced from aerial photographs using digital photogrammetric technology for data processing, ortho-rectification and mosaicking. The general public can obtain and use the digital version of the 1:100 000 orthophoto map free of charge.

Geological Maps: The SMO has produced for the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department the HGM20 series of geological maps at scale 1:20 000. This 15-sheet series depicts both the solid and superficial geology of Hong Kong. Another 1:20 000 series on solid geology, namely HGM20S, consists of two sheets covering areas such as Yuen Long, San Tin, Sham Tseng, etc. The GEO has also produced three

series of geological survey plans, namely HGP5, HGP5A and HGP5B, showing the solid and superficial geology in selective areas such as Yuen Long, Sha Tin, Chek Lap Kok, etc. The map base of these geological maps is provided by the SMO while the geological data are from the GEO.

Digital Maps and Geospatial Data: The SMO provides Topographic Maps, Orthophotos, Aerial Photographs, Land Boundary Maps, Geo-reference Database and GeoCommunity Database in digital form. Many utility companies, engineering consultants, IT consultants, education institutes and government departments have established their own automated mapping, facilities management, customer support and geographic information systems using the digital maps and geospatial data provided by the SMO as common reference.

The i-Series Digital Maps, including iB1000, iB5000, iB10000 and iB20000 Digital Topographic Map, iC1000 Digital Land Boundary Map, iG1000 Geo-reference Database and iGeoCommunity Database, provide more comprehensive datasets in new data formats and enable users to select the seamless version so that they do not need to combine discrete tiles of digital maps into one single file for their work.

The 1963 Orthophoto, a high resolution orthophoto compiled from aerial photographs taken in early 1963 covering most Demarcation Districts in the New Territories, was launched in 2013. The 1963 Orthophoto can be used for various applications requiring identification of old ground features.

Digital aerial photos are captured by the large format digital aerial camera since 2016 (UltraCam Eagle, UE series). The dynamic range of colour information is higher than 12-bit. Each shot of photography captures five spectral bands information and each photo is used to produce a total of three products suitable for photogrammetric measurement.

3D Digital Maps: 3D Digital Maps enhance understanding of multi-level spaces of a modern city and support applications such as 3D spatial analysis, visualisation and works project design presentation in different developments.

The 3D Spatial Data was published in 2012 to show the building, infrastructure and terrain models over the territory with different levels of details in geometrical shape and appearance. The 3D Visualisation Map, a high quality digital surface model of the built environment covering part of the built-up area, was available for download in 2020. The SMO is preparing the full-fledged 3D Digital Map, which is one of the building blocks of the CSDI, to facilitate the opening and sharing of government geospatial data. The SMO aims to develop the 3D Digital Map in phases and strives to cover the whole territory by the end of 2023. To demonstrate the technical capability of 3D indoor map, the SMO will also generate these maps for about 1 250 buildings. The 3D pedestrian network covering the pedestrian walkways in the urban areas of Hong Kong was published at the end of 2020 to support the routing application for the benefit of the general public, the visually impaired and the wheelchair users. The two spatial datasets in machine-readable formats are now available for previewing and downloading on the **Hong Kong**

GeoData Store (<https://geodata.gov.hk>) and the Public Sector Information Portal (<https://data.gov.hk>).

Geospatial Portals and Services: In view of the growing spatial awareness and increasing public needs for open spatial data, the LandsD has developed and launched different geospatial portals and services.

The **GeoInfo Map**, a common geospatial information platform, integrated geospatial data from different sources for convenient access by the public through the Internet. It offers a geographic search engine with detailed maps and useful map tools. It also supports the GovHK portal and government departments' websites. GeoInfo Map can be accessed at (<https://www.map.gov.hk>) or via the map buttons on certain departments' webpages.

SMO's first mobile map app service for iOS and Android platforms, **MyMapHK**, was launched in mid-2014. MyMapHK is an all-in-one map app with six themes - Map, Hiking, Old Hong Kong, Election, Emergency and Offline Map. It provides up-to-date bilingual base maps of Hong Kong and integrates more than 300 types of data related to public facilities.

A free digital inclusion mobile map application, **VoiceMapHK**, was launched in early 2016. The app makes use of the "Voice-over feature" of smartphones to facilitate the convenient retrieval of geographic information by the visually impaired users. The location information provided by the app is supplemented by orientation and distance information, which further helps the visually impaired users understand the surrounding environment.

The route searching function provided on the **GeoInfo Map**, **MyMapHK** and **VoiceMapHK** is being enhanced by adopting the 3D pedestrian network dataset, and enriched mobility information would be available to the public for supporting pedestrian navigation services and meeting the special needs of people with disabilities.

For more information about the mobile apps, please visit (<https://www.landsd.gov.hk/en/spatial-data/geospatial-information-services/geospatial-portals.html>)

In 2018, the SMO rolled out the **Map Application Programming Interface (Map API) service** for government's internal use. Part of the services, comprising Topographic Map API, Imagery Map API and Map Label API, were launched to the public in 2020. In the past, users needed to obtain, manipulate, convert, and update digital maps to support the implementation of their map applications. With the help of Map API, developers can now directly use the latest maps and spatial data in their application development without going through the above complicated process. The SMO hopes that the provision of Map API service can help reduce time and cost when using spatial data so as to encourage and support the development of innovative map applications and to promote the development of smart city.

The **District-based Spatial Information Dashboard (Dashboard)** and the **Geo-tagging Tool (Tool)** were also launched by SMO in mid-2021. The Dashboard is a web-based application comprising three prototypes, namely, "Temporary Vacant Government Sites", "Elderly Services" and "Childcare Services". It presents on a single screen the district-based analytics that are of interest to the public, using

simple interactive data visualisation tools. The Tool is also a convenient web-based tool to enable the public, who do not have advanced technical skills in operating a geographic information system, to geo-enable their own data.

Hong Kong GeoData Store: The LandsD has developed and launched the **Hong Kong GeoData Store** (<https://geodata.gov.hk>), the alpha version of CSDI Portal, since the end of 2018, to facilitate the sharing of geospatial data and to support various smart city initiatives and applications through innovative use of geospatial data and information technology.

Users may explore and download from the portal over 200 types of geospatial datasets provided by various government departments, including government premises and facilities, schools, hospitals, clinics, community and social services facilities, cultural/leisure/sports facilities, postal services facilities, job centres, population census and statistics, land-related and transportation information. The datasets are available in open and machine-readable formats. The portal also provides some API services, such as Map API, Location Search API, and Identify API to support the development of innovative map applications in a more effective and efficient way.

Sales and Dissemination of Map Products: Since 2010, the LandsD has been operating a website called **Hong Kong Map Service 2.0** (HKMS 2.0) (<https://www.hkmapservice.gov.hk/>) to provide functions of searching, e-ordering and e-payment for the purchase of different types of map products and aerial photographs. The website, revamped in 2018, offers a number of new functions including the provision of digital Cadastral Survey Records.

In addition to placing orders on HKMS 2.0, paper map products are also available for purchase at the Map Publications Centre (Hong Kong), the Map Publications Centre (Kowloon) and other Map Sales Outlets (<https://www.landsd.gov.hk/en/about-us/sales-outlets.html>). The Map Publications Centre (Hong Kong) also serves as the Map and Aerial Photograph Library for the public to inspect and purchase historical maps and aerial photographs. Popular map products are also available at designated Post Offices and some bookshops.

Opening Up Digital Map and Geospatial Data: In order to promote the use of digital maps and digital geospatial data and to align with the Government's open data policy, the SMO has made various types of digital map products, such as i-Series Digital Maps, Orthophotos, 3D Spatial Data and some geospatial data available for free commercial and non-commercial uses. Opening up these digital map products enables the public, the academia and businesses to make greater use of geospatial data in research and application development. The availability of free digital map products also facilitates the development of a digital economy, realising the visions of the Smart City Blueprint for Hong Kong 2.0 and bringing benefits to the whole society. Both the general public and private sectors may download these digital map products free of charge from HKMS 2.0, and other geospatial open data from the LandsD's website

(<https://www.landsd.gov.hk/en/spatial-data/open-data.html>)
and the Public Sector Information Portal (<https://data.gov.hk>).

Enquiry: Enquiries about the map products and services provided by the SMO can be made at 2231 3187, or through e-mail at: smohq@landsd.gov.hk. For more information, please visit the LandsD's website (<http://www.landsd.gov.hk>).