

CHAPTER 7

Development Bureau Lands Department

**Provision of map products and spatial data
services to the public by the Lands Department**

**Audit Commission
Hong Kong
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This audit review was carried out under a set of guidelines tabled in the Provisional Legislative Council by the Chairman of the Public Accounts Committee on 11 February 1998. The guidelines were agreed between the Public Accounts Committee and the Director of Audit and accepted by the Government of the Hong Kong Special Administrative Region.

Report No. 80 of the Director of Audit contains 8 Chapters which are available on our website at <https://www.aud.gov.hk>



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PROVISION OF MAP PRODUCTS AND SPATIAL DATA SERVICES TO THE PUBLIC BY THE LANDS DEPARTMENT

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PROVISION OF MAP PRODUCTS AND SPATIAL DATA SERVICES TO THE PUBLIC BY THE LANDS DEPARTMENT

Executive Summary

1. Maps are closely related to daily lives of the public and are effective tools for location-searching and route-planning. They are also used for public administration, town planning, housing, land management and development, as well as leisure purposes by the Government, private sectors and the public. Spatial data refers to any data with reference to a specific geographical location. With the development of technology and the popularity of smartphones, spatial data has been integrated into daily lives and continues to change the lifestyles and habits of the public. Spatial data touches almost every aspect of daily lives and is indispensable for smart cities.

2. The Survey and Mapping Office (SMO) of the Lands Department (LandsD), among other duties, is responsible for the provision of map products (in digital and paper forms) and spatial data services to the public (including professionals from different sectors). These map products and spatial data are disseminated to the public through various channels and geospatial portals. In 2021-22, a total of 30,011 copies of map products were sold to the public (with total revenue of about \$1,773,000) and the total download numbers of various digital map products and spatial data were about 3,648,000.

3. In late 2017, the Government announced the Smart City Blueprint for Hong Kong and put forward the strategy to encourage the use of open data for smart city innovations and facilitate the sharing of geospatial data and support various smart city applications. Three-dimensional (3D) digital map is one of the core components of the digital infrastructure underpinning Hong Kong's smart city development. LandsD is responsible for the development of 3D digital map. The Audit Commission (Audit) has recently conducted a review of the provision of map products and spatial data services to the public by LandsD.

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Maintenance of map products

4. *Scope for improvement in updating of 1:1000 topographic map.* The 1:1000 topographic map (also known as basic map) covering the whole territory of Hong Kong is the largest scale topographic map. According to LandsD, SMO (through its 10 District Survey Offices (DSOs)) adopts continuous updating approach to update the 1:1000 topographic map (comprising 3,331 map sheets as of November 2022). DSOs identify changes of map details in the basic map based on data collected from various sources and their change identification work. DSOs carry out the consequential map updating work on a job basis. A job arises when map details in a basic map are found to have changed. DSOs update the changes in the basic map as soon as practicable (paras. 1.5(a) and 2.2(a)). Regarding the updating of 1:1000 topographic map:

- (a) according to LandsD's guidelines, change identification work should be scheduled for all map sheets for execution at intervals of 1 to 5 years. In other words, change identification work for each map sheet should be carried out at least once every 5 years. However, Audit noted that, as of November 2022, the latest change identification work for 96 map sheets was carried out more than 5 years and up to 12.3 years (averaging 6.4 years) ago (i.e. not meeting the stipulated timeframe in LandsD's guidelines). According to LandsD, the areas covered by the 96 map sheets were non-active or remote areas. The change identification work for 23 (24%) map sheets had been carried out between December 2022 and February 2023. For the 73 (76%) remaining map sheets, it would accord priority for the change identification work (para. 2.3(a));
- (b) Audit noted that there was no time limit set for completion of basic map updating jobs by DSOs. As of December 2022, the 10 DSOs had a total of 749 outstanding basic map updating jobs, of which 305 (41%) had remained outstanding for more than 1 year and up to 7 years (averaging 2 years) after job creation between 2015 and 2021 (para. 2.3(b));
- (c) according to LandsD, DSOs maintain management information (under their own templates and not standardised) on the updating status of each map sheet and the progress of basic map updating jobs. Audit noted that DSOs had not regularly provided such management information to senior management of LandsD (para. 2.3(c)); and

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- (d) between August and December 2022, SMO awarded three 1-year service contracts for outsourcing some basic map updating work of the 10 DSOs at a total contract sum of \$3.7 million. For 16 (80%) of the 20 basic map updating jobs ordered under the service contracts and with deadlines for submission of deliverables by the contractors in 2022, there were delays in submission of deliverables by the contractors, ranging from 1 to 84 days (averaging 31 days) (para. 2.3(d)).

5. ***Scope for implementing early automatic map generalisation for updating medium to small-scale topographic maps.*** Based on the 1:1000 topographic map, SMO updates by means of map generalisation other medium to small-scale topographic maps (i.e. scales of 1:5000, 1:10000, 1:20000, 1:50000 and 1:200000). According to LandsD, the current practice of manual map generalisation leads to long revision cycle of maps (about half year) and ineffective generalisation among maps in various scales. In October 2022, LandsD obtained funding approval of \$17.2 million for a project on the implementation of automatic map generalisation workflow for 1:10000 topographic map. According to LandsD, with the successful implementation of the automatic map generalisation workflow, it is anticipated that the 1:10000 topographic map dataset could be updated and released in 3 months or less after the update of the 1:1000 topographic map dataset. The project is targeted to be completed in December 2024 and was under tender preparation stage as of January 2023. In Audit's view, LandsD needs to take measures to ensure that the project is completed as scheduled with a view to implementing early automatic map generalisation for all scales of topographic maps (paras. 2.5 and 2.6).

6. ***Some digital orthophotos not updated for a long time.*** The digital orthophoto DOP5000 series and DOPM50-L0 series cover the whole territory of Hong Kong in 192 tiles and one single image respectively. They are updated as and when necessary and there is no minimum updating frequency for the two series. Audit noted that as of November 2022, 107 (56%) of the 192 tiles of DOP5000 series had not been updated for 7 or more years (up to 7.6 years) and the DOPM50-L0 series had not been updated for 6.4 years (para. 2.7).

7. ***Need to closely monitor the service conditions of large format digital aerial camera system and take measures to ensure the timely replacement of the system.*** LandsD uses a large format digital aerial camera (LFDAC) system to take aerial photographs in the territory of Hong Kong and produces photogrammetric products from these aerial photographs for usage including updating of the 1:1000 topographic

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map. The digital aerial camera will be mounted on two fixed-wing aircraft of the Government Flying Service (GFS) for performing aerial photography work on a shared-use basis. Audit noted that LFDAC system was approaching its end-of-service-life in May 2023. According to LandsD: (a) with regular maintenance and supply of essential consumables and spare parts, LFDAC system is expected to maintain service in the coming years up to December 2026; and (b) replacement of LFDAC system was being planned. As the new LFDAC system needs to be compatible with GFS aircraft, LandsD started discussions with GFS in February 2022 for the replacement plan. In this connection, Audit noted that LandsD took about 4 years in the previous procurement, including installation, airworthiness certification and testing before commissioning of LFDAC system in December 2016. In Audit's view, LandsD needs to closely monitor the service conditions of LFDAC system and take measures to ensure the timely replacement of the system with a view to continuing the provision of quality aerial photography service (paras. 2.14 to 2.16).

Dissemination of map products and spatial data to the public

8. According to LandsD, opening up digital map products would enable the public, academia and businesses to make greater use of spatial data in research and application development. Since 2012, LandsD has been identifying suitable digital map products and spatial data for opening up to the public for free browsing and downloading. As of December 2022, certain paper and digital map products were available for sale at a charge to the public through various sales channels (i.e. Hong Kong Map Service 2.0 (HKMS 2.0), SMO Map Sales Outlets and reseller outlets), while most digital map products and spatial data were released to the public for free browsing and downloading for commercial and non-commercial uses (paras. 3.2 and 3.3).

9. ***Scope for digitising more paper map products and further opening up digital map products for free downloading.*** In general, paper map products are facing diminishing demand in recent years, while the demand for digital map products and spatial data had significantly increased since opening up for free downloading. Audit noted that, as of December 2022, there was no digital version for certain paper map products (e.g. countryside maps), and digital aerial photograph (Series:DAP) products were still for sale at a charge and not opened up for free downloading. According to LandsD, it had reviewed the need for digitisation of countryside map, and needs to evaluate the financial and technical implications of opening up digital aerial

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photograph (Series:DAP) products for free downloading due to their huge volume and file size. In Audit's view, LandsD needs to keep under review the need for digitising more paper map products and further opening up digital map products for the public's free browsing and downloading (paras. 3.5 to 3.7).

10. ***Need to keep under review the need for closing down SMO Map Sales Outlets.*** LandsD's reviews in May and June 2021 found 7 SMO Map Sales Outlets with more obvious drop in sales activities after the launch of HKMS 2.0 in August 2018. In the event, 4 Map Sales Outlets were closed down in December 2021. Audit noted that, as of January 2023, LandsD was considering whether the remaining 3 Map Sales Outlets at Central, Fanling and West Kowloon would be closed down. In Audit's view, LandsD needs to make early decision on whether and when to close down the remaining 3 SMO Map Sales Outlets and keep under review the need for closing down other SMO Map Sales Outlets (paras. 3.9 and 3.10).

11. ***Scope for enhancing stock management.*** Paper map products were classified as either printed map (printed by the Government Logistics Department based on LandsD's printing order) or print-on-demand maps (printed in-house by LandsD upon receipt of sales order). According to LandsD, printed map becomes unserviceable upon revision to new edition and unserviceable printed maps can no longer be sold to the public. Audit noted that, as of November 2022, the stock levels of certain types of printed maps far exceeded their respective annual sales volumes in 2021-22. For example, while the sales volume of two-dimensional Topographic Map 1:100000 (colour version) was 127 copies in 2021-22, it had stock of 1,021 copies as of November 2022 (paras. 3.11 and 3.12).

12. ***Decreasing usage and low download number of VoiceMapHK.*** According to LandsD, VoiceMapHK (a mobile app) was developed to support the digital inclusion initiative for the visually impaired community with a population of 175,000 in Hong Kong. However, Audit noted that the actual number of usage sessions of VoiceMapHK decreased from 1,511 in 2017-18 to less than 70 in both 2020-21 and 2021-22, and the accumulated number of downloads of the mobile app as of November 2022 was only about 9,000 (para. 3.18).

Development of three-dimensional digital map

13. 3D digital map is one of the core components of the digital infrastructure underpinning Hong Kong's smart city development. LandsD is responsible for the development of 3D digital map (including territory-wide 3D digital map, 3D pedestrian network and 3D indoor map) with a funding of \$150 million. It aims to develop high-quality 3D digital map by phases and strives to cover the whole territory by end of 2023 (paras. 4.2 and 4.3).

14. *Need to continue to closely monitor the implementation progress of territory-wide 3D digital map.* Audit noted that the implementation of territory-wide 3D digital map (comprising 6 phases) was behind schedule: (a) Phase 1 (Kowloon East) was completed 11 months later than the original target completion date; and (b) for the 5 remaining phases (involving 5 areas), as of December 2022, they were either in progress or under tender assessments, and their expected completion dates were 2 to 6 months later than their original target completion dates. According to LandsD, based on the experience gained from Phase 1 project, enhanced measures had been taken for the 5 remaining phases, such as strengthening the manpower of project consultants for monitoring the progress and improving the communication among LandsD, consultants and contractors. In Audit's view, LandsD needs to continue to closely monitor the implementation progress of territory-wide 3D digital map with a view to ensuring its timely completion (paras. 4.5 to 4.7).

15. *Need to keep under review the utilisation of 3D pedestrian network.* According to LandsD, the 3D pedestrian network is a set of 3D line features capable of supporting innovative applications. Its dataset was published and made free to the public in December 2020, and was further updated in September 2022. The numbers of downloads for 3D pedestrian network dataset were 200, 1,971 and 2,569 in 2020 (from December 2020), 2021 and 2022 (up to November 2022) respectively. In Audit's view, LandsD needs to keep under review the utilisation of 3D pedestrian network and step up promotional activities as needed to encourage more users to utilise the 3D pedestrian network (paras. 4.8 and 4.9).

16. *Need to closely monitor the implementation progress of 3D indoor map.* In 2020, LandsD commissioned a pilot project on creation of 3D indoor maps, which covered 158 buildings mainly located in Kowloon East. After the completion of the pilot project in March 2021, LandsD aims to develop the 3D indoor map by phases

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to cover the accessible interior of buildings and structures for 1,250 buildings across the territory by end of 2023. As of January 2023, contracts for Phase 1 (covering 390 buildings) and Phase 2 (covering 420 buildings) were expected to be completed by March and December 2023 respectively. The contract for Phase 3 (covering 440 buildings) was planned to be awarded in third quarter of 2023 with target completion date in second quarter of 2024 (i.e. behind the scheduled date of end of 2023) (paras. 4.11 to 4.13).

17. ***Need to obtain consents from property owners/property management companies for opening up the 3D indoor map.*** According to LandsD: (a) the data of 3D indoor map was intended to be shared with government bureaux/departments for internal uses and further study. It subsequently reviewed the opening up of the 3D indoor maps of the 158 buildings under the Kowloon East pilot project and planned to release the 3D indoor maps for those buildings (with consents obtained) to the public in December 2022. As of March 2023, it was still obtaining consents of property owners/property management companies of the 158 buildings and planned to open up those 3D indoor maps upon their consents; and (b) for those 1,250 buildings across the territory (see para. 16), it would obtain consents from relevant property owners/property management companies before and during the course of project implementation period. In Audit's view, LandsD needs to take measures to early obtain consents from the property owners/property management companies for opening up their buildings' 3D indoor maps to the public (paras. 4.14, 4.16 and 4.17).

Audit recommendations

18. **Audit recommendations are made in the respective sections of this Audit Report. Only the key ones are highlighted in this Executive Summary. Audit has *recommended* that the Director of Lands should:**

Maintenance of map products

- (a) **regarding 1:1000 topographic map, take measures to ensure that DSOs carry out the change identification work for all map sheets in accordance with the timeframe in LandsD's guidelines (para. 2.12(a)(i));**

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- (b) regarding basic map updating jobs, take measures to ensure that such jobs (particularly those long outstanding ones) are completed as early as practicable and consider setting a time limit for their completion (para. 2.12(b));
- (c) require DSOs to provide regular management information on the updating status of each sheet of the 1:1000 topographic map and the progress of basic map updating jobs under a standard template to LandsD's senior management for monitoring purposes (para. 2.12(c));
- (d) regarding basic map updating work under related service contracts, step up measures to ensure the timely submission of deliverables by the contractors (para. 2.12(d)(i));
- (e) take measures to ensure that the project on the implementation of automatic map generalisation workflow for 1:10000 topographic map is completed as scheduled (para. 2.12(f));
- (f) consider setting updating frequency for digital orthophoto DOP5000 series and DOPM50-L0 series (para. 2.12(g)(i));
- (g) closely monitor the service conditions of LFDAC system and take measures to ensure the timely replacement of the system (para. 2.20(a));

Dissemination of map products and spatial data to the public

- (h) keep under review the need for digitising more paper map products and further opening up digital map products for the public's free browsing and downloading (para. 3.15(a) and (b));
- (i) make early decision on whether and when to close down SMO Map Sales Outlets at Central, Fanling and West Kowloon, and keep under review the need for closing down other SMO Map Sales Outlets (para. 3.15(d));
- (j) make estimates of the print quantities of printed map as inventory as accurately as possible (para. 3.15(e));

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- (k) **review whether the stocks of printed maps on hand are still serviceable and consider the disposal methods for those unserviceable printed maps (para. 3.15(g));**
- (l) **keep under review the usage and download number of LandsD's mobile apps with a view to enhancing the mobile apps (para. 3.23(a));**

Development of three-dimensional digital map

- (m) **continue to closely monitor the implementation progress of territory-wide 3D digital map with a view to ensuring its timely completion (para. 4.18(a));**
- (n) **keep under review the utilisation of 3D pedestrian network and step up promotional activities as needed to encourage more users to utilise the 3D pedestrian network (para. 4.18(b));**
- (o) **closely monitor the implementation progress of 3D indoor map with a view to ensuring its timely completion (para. 4.18(c)); and**
- (p) **take measures to early obtain consents from the property owners/property management companies for opening up their buildings' 3D indoor maps to the public (para. 4.18(d)).**

Response from the Government

19. The Director of Lands accepts the audit recommendations.

PART 1: INTRODUCTION

1.1 This PART describes the background to the audit and outlines the audit objectives and scope.

Background

1.2 Maps are closely related to daily lives of the public and are effective tools for location-searching and route-planning. They are also used for public administration, town planning, housing, land management and development, as well as leisure purposes by the Government, private sectors and the public. The Government has a long history in producing map products (e.g. Hong Kong Map of 1897). Map products have evolved over the years (e.g. evolving from black and white maps in the 1960s, full-colour maps in the 1970s to computerised mapping since the mid-1990s).

1.3 Spatial data refers to any data with reference to a specific geographical location. With the development of technology and the popularity of smartphones, spatial data has been integrated into daily lives and continues to change the lifestyles and habits of the public. Spatial data touches almost every aspect of daily lives and is indispensable for smart cities (see para. 1.10).

1.4 The Survey and Mapping Office (SMO) of the Lands Department (LandsD), among other duties (Note 1), is responsible for the provision of map products and spatial data services to the public (including professionals from different

Note 1: *SMO is the survey, mapping and geospatial data agency of the Government. Apart from the provision of map products and spatial data services, SMO is also responsible for other duties, including: (a) provision of support to the Land Survey Authority (i.e. the Director of Lands) in administering the Land Survey Ordinance (Cap. 473); (b) provision of land boundary survey services in support of the Government's land administration functions (e.g. permanent and short term land disposals, government land allocation, small house application, land acquisition and clearance, land exchange, land control and management, lease modification and lease enforcement); (c) provision of land boundary advisory services to other government bureaux/departments in support of their discharge of statutory functions and enforcement actions; and (d) establishment and maintenance of a territory-wide positioning infrastructure for Hong Kong.*

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sectors) (Note 2). SMO provides the public with various types of map products in digital and paper forms, and geospatial data (Note 3) of Hong Kong. It is committed to the provision of accurate and up-to-date map products and geospatial data to support the rapid development of Hong Kong. SMO is organised into four divisions, under which there are a number of supporting sections and 10 District Survey Offices (DSOs — Note 4). An extract of SMO's organisation chart as at 30 November 2022 is at Appendix A. SMO had 1,352 staff (including both civil servants and contract staff) as of November 2022 and its total expenditure in 2021-22 was \$862.6 million (Note 5).

Maintenance of map products

1.5 SMO provides various types of map products in digital and paper forms for various purposes for use by the public and is responsible for the maintenance of these map products. Categories of map products include:

Note 2: *According to LandsD, government bureaux/departments can also make use of the map products and spatial data services provided to the public. In this connection, SMO also provides mapping and spatial data services to government bureaux/departments upon their requests in support of their operations, including: (a) mapping advisory services, which ensure that the geographic information on maps prepared for use in legislation is represented accurately and delivered effectively from cartographic perspective; (b) reprographic services, which mainly cover aerial photography, desktop publishing, image manipulation, graphic and motion design, video production, large format scanning, printing and lamination, wall map production and exhibits presentation; (c) Geospatial Information Hub, which supports the internal operation and information sharing within the Government; and (d) geospatial information project advisory services (e.g. collaboration on geo-enabling the data or implementing initiatives in geospatial-related applications).*

Note 3: *The terms “spatial data” and “geospatial data” are used interchangeably in this Audit Report.*

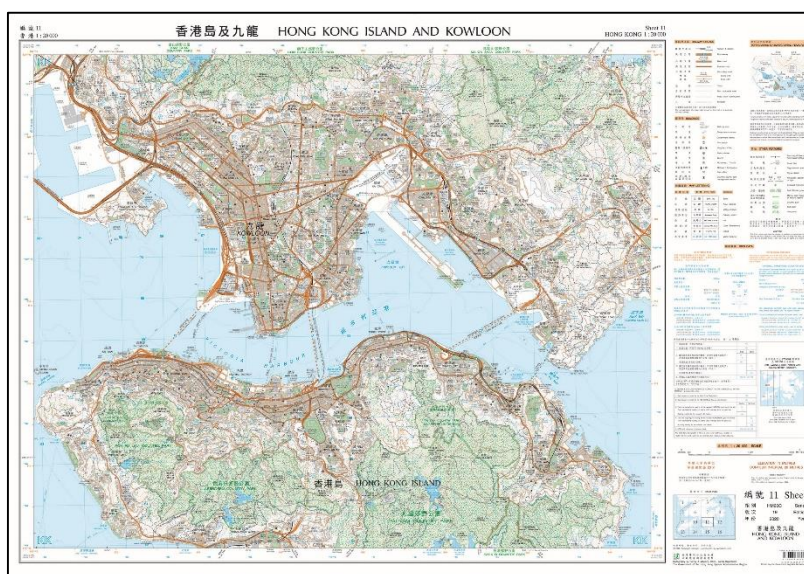
Note 4: *The 10 DSOs are DSO/Hong Kong, DSO/Islands, DSO/Kowloon, DSO/North, DSO/Sai Kung, DSO/Shau Tin, DSO/Tai Po, DSO/Tsuen Wan and Kwai Tsing, DSO/Tuen Mun and DSO/Yuen Long.*

Note 5: *According to LandsD: (a) apart from the provision of map products and spatial data services to the public, SMO is also responsible for other duties (see Note 1 to para. 1.4) and provides mapping and spatial data services to government bureaux/departments (see Note 2 to para. 1.4); and (b) breakdown of staff resources and expenditure solely for the provision of map products and spatial data services to the public is not available.*

- (a) **Two-dimensional (2D) topographic maps.** SMO provides a comprehensive set of 2D topographic maps in different scales to the public. The 1:1000 topographic map (also known as basic map — Note 6) covering the whole territory of Hong Kong is the largest scale topographic map. Based on the 1:1000 topographic map, SMO also provides by means of map generalisation (see Note 20 to para. 2.2(b)) other medium to small-scale topographic maps, such as scales of 1:5000, 1:10000, 1:20000 (see Figure 1 for an example), 1:50000 and 1:200000. Digital form of the above topographic maps (see Figure 2 for an example) has become open data and the public can use them for both commercial and non-commercial purposes;

Figure 1

**1:20000 paper topographic map
(May 2020)**

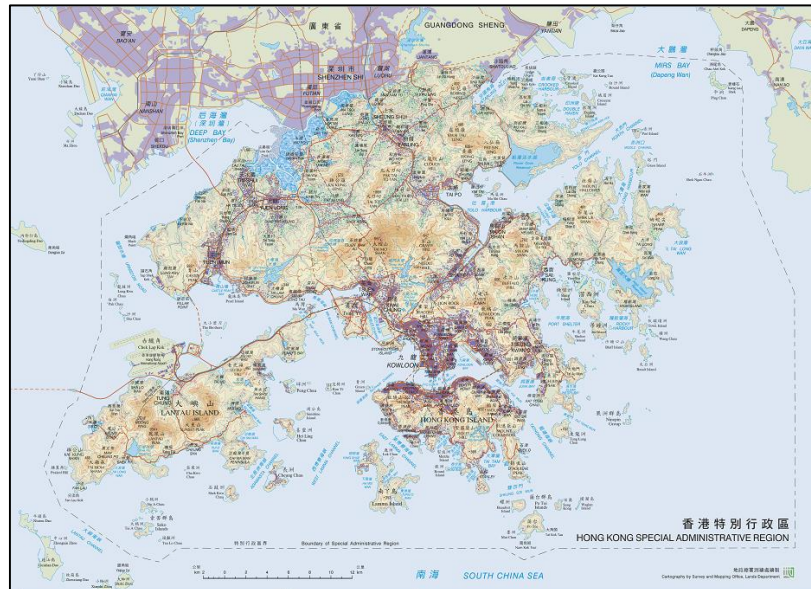


Source: LandsD records

Note 6: The terms “1:1000 topographic map” and “basic map” are used interchangeably in this Audit Report.

Figure 2

1:200000 digital topographic map
(October 2022)

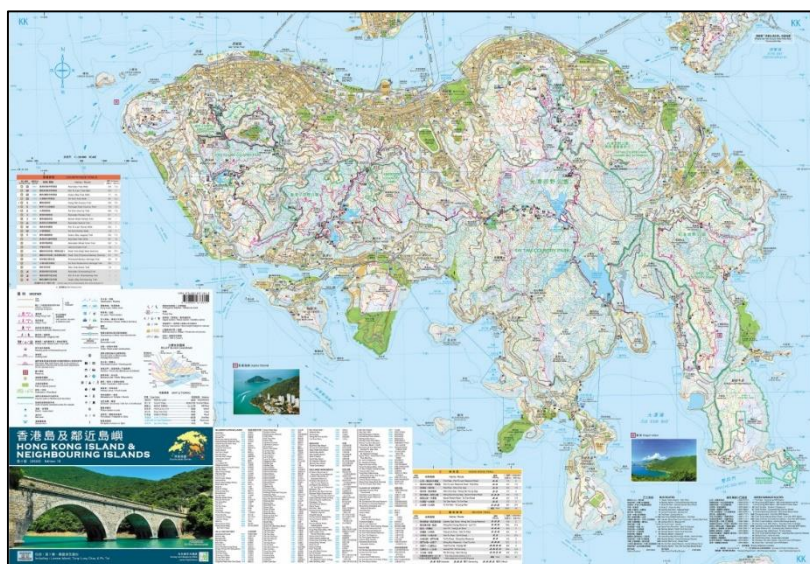


Source: LandsD records

- (b) **Thematic maps.** SMO provides various thematic maps to the public. The major ones include:
- (i) **Countryside maps.** This is a series of footpath maps comprising five sheets (see Figure 3 for an example). Each map shows detailed information of leisure amenities and footpaths. This map series helps hikers and nature lovers explore rural areas and country parks. It is printed on water-proof paper on both sides and folded; and

Figure 3

**Countryside map: Hong Kong Island and Neighbouring Islands
(July 2022)**

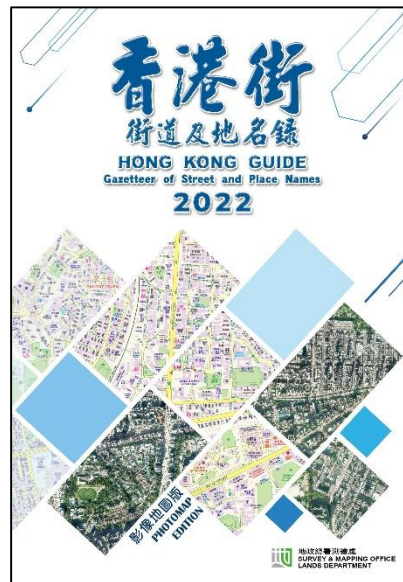


Source: *LandsD records*

- (ii) ***Hong Kong Guide.*** The Hong Kong Guide (see Figure 4 for an example) is a comprehensive guide to streets and places of Hong Kong. It consists of maps covering the whole territory of Hong Kong; and

Figure 4

**Hong Kong Guide
(January 2022)**

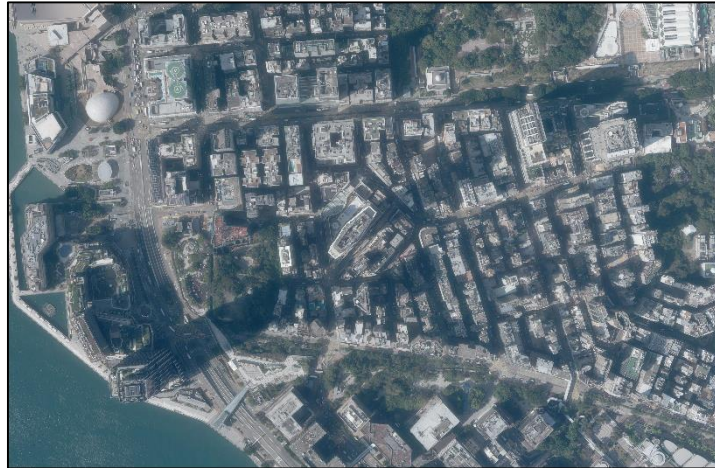


Source: LandsD records

- (c) ***Aerial photographs and image products.*** Apart from maps, SMO also provides various aerial photographs and image products to the public, including:
- (i) ***Aerial photographs.*** SMO undertakes aerial photography in the territory of Hong Kong at different altitudes for producing various types of aerial photographs including vertical and oblique aerial photographs (see Photographs 1 and 2 for examples). It provides aerial photographs in digital form. Copies of these aerial photographs in the form of duplicate and enlargement are also available upon order; and

Photograph 1

**A vertical aerial photograph of Tsim Sha Tsui
(January 2022)**



Source: LandsD records

Photograph 2

**An oblique aerial photograph of the Victoria Harbour
(January 2018)**



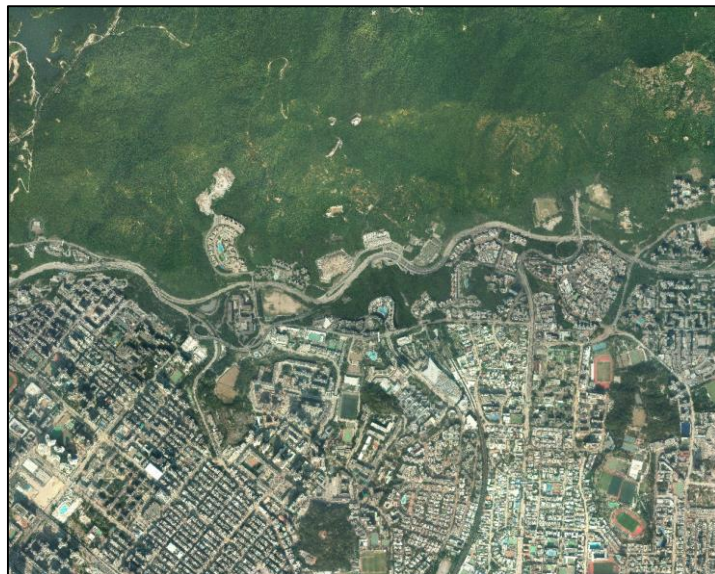
Source: LandsD records

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- (ii) ***Digital orthophotos.*** Digital orthophoto (see Photograph 3 for an example) is an image map produced by SMO featuring pictorial information of ground features as contained in geometrically rectified aerial photographs and has a uniform scale. With the use of digital photogrammetry technology, the rectification process applied to the original aerial photographs aims to remove the geometric distortions of the photographic images caused by topographic relief and camera tilt.

Photograph 3

**A digital orthophoto of Cheung Sha Wan, Shek Kip Mei and Kowloon Tong
(December 2019)**



Source: LandsD records

Dissemination of map products and spatial data to the public

1.6 ***Dissemination of map products.*** As of December 2022, 31 paper map products and 4 digital aerial photograph (Series:DAP) products (Note 7) from SMO were available for sale at a charge to the public through the following channels:

Note 7: *Digital aerial photograph (Series:DAP) products are the digital format of an aerial photograph produced from its original aerial film by means of scanning or captured by the large format digital aerial camera, and with resolution of 1,800 dots per inch or above.*

- (a) ***Hong Kong Map Service 2.0 (HKMS 2.0).*** HKMS 2.0 (developed and maintained by SMO — Note 8) is a website providing round-the-clock service to the public for searching and ordering different types of map products, and downloading digital map products;
- (b) ***SMO Map Sales Outlets.*** The SMO Map Sales Outlets (Note 9) provide another channel to the public for ordering the map products. According to LandsD, staff at SMO Map Sales Outlets will also assist the public to order or download the digital map products through HKMS 2.0 where necessary; and
- (c) ***Reseller outlets.*** Some popular paper map products (e.g. countryside maps) are also available for sale at reseller outlets (e.g. designated post offices, country park visitor centres and bookshops).

1.7 ***Opening up of digital map products and spatial data to the public for free use.*** According to LandsD:

- (a) opening up the digital map products enables the public, academia and businesses to make greater use of spatial data in research and application development. In light of the Government's Open Data Policy promulgated by the Office of the Government Chief Information Officer (OGCIO), SMO has been identifying suitable map products and spatial data for releasing to the public for free use;

Note 8: *HKMS 2.0 replaced the Hong Kong Map Service website, which had been operated since 2010, as the new one-stop platform for map products for the public in August 2018. Compared to Hong Kong Map Service, HKMS 2.0 has streamlined the ordering process (e.g. no registration is required for purchasing paper map products), and is also connected with the Hongkong Post's delivery service to allow delivery of paper map products to designated locations.*

Note 9: *As of December 2022, there were 8 SMO Map Sales Outlets, including: (a) 2 SMO Map Publications Centres (located at North Point and Yau Ma Tei); and (b) 6 DSOs (located at West Kowloon, Sai Kung, Tai Po, Yuen Long, Fanling and Central).*

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- (b) since April 2021, except 4 digital aerial photograph (Series:DAP) products which are still available for sale at a charge (see para. 1.6), most digital map products previously available for sale at a charge (e.g. digital 2D topographic maps and three-dimensional (3D) spatial data) have been released to the public for free browsing and downloading; and
 - (c) as of December 2022, 28 digital map products/spatial datasets were opened up and available for free browsing and downloading on HKMS 2.0 (see para. 1.6(a)), the Hong Kong GeoData Store (see para. 1.9(d)), the Common Spatial Data Infrastructure (CSDI) portal (Note 10), and/or the Public Sector Information Portal (“data.gov.hk”) (Note 11).
- 1.8 ***Sales and downloading of map products and spatial data.*** In 2021-22:
- (a) a total of 30,011 copies of the 31 paper map products and 4 digital aerial photograph (Series:DAP) products were sold to the public (Note 12) (with total revenue of about \$1,773,000); and
 - (b) the total download numbers of various digital map products and spatial data (except those 4 digital aerial photograph products available for sale at a charge) were about 3,648,000.

Note 10: *The Development Bureau takes the lead in developing CSDI which operates as a one-stop data portal where the public (including government bureaux/departments) can search and view a wide range of data, and also download the data as raw materials and tap the data in innovative uses through value-added products. CSDI portal was made available for public use in December 2022.*

Note 11: *The Public Sector Information Portal (“data.gov.hk”) is coordinated by OGCI with the participation of government bureaux/departments and public/private organisations to disseminate various types of Public Sector Information for free re-use for both commercial and non-commercial purposes.*

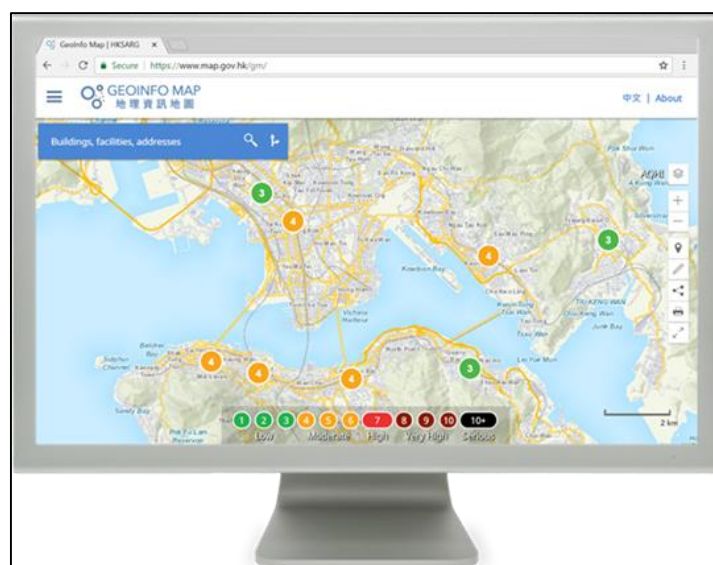
Note 12: *According to LandsD, government bureaux/departments can also order and purchase these map products through HKMS 2.0 or make direct requests to SMO using specific government forms. A total of 82,353 copies of various map products were distributed to government bureaux/departments in 2021-22 (with total revenue of about \$278,000).*

1.9 **Geospatial portals.** LandsD integrates vast amount of spatial data from various sources and provides web-based geospatial information services to the public. It aims at improving accessibility and availability of geospatial information. In view of the rising geospatial awareness and increasing public needs for open spatial data, LandsD has developed and launched different geospatial portals to the public. Major geospatial portals provided to the public include:

- (a) **GeoInfo Map.** The GeoInfo Map is a public web-map service (see Figure 5), which provides free and convenient public access to maps of Hong Kong, and the location and related information about various public facilities and services. Government bureaux/departments (B/Ds) can release their latest geospatial data to the public through this platform;

Figure 5

GeoInfo Map

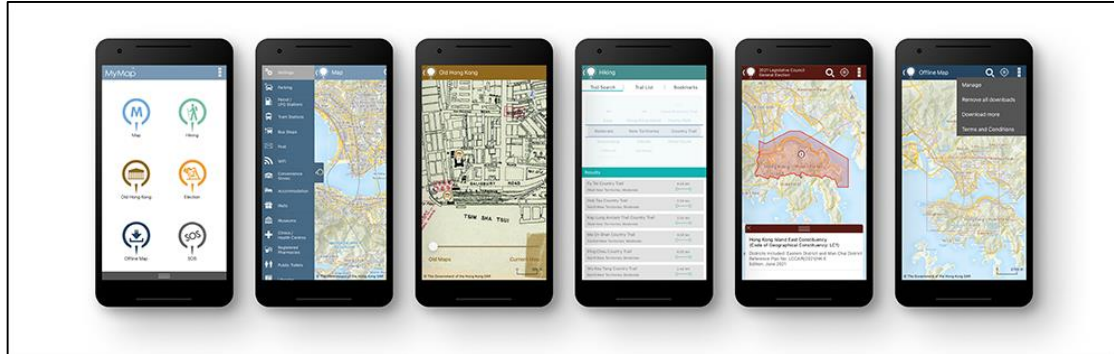


Source: LandsD records

- (b) **MyMapHK.** MyMapHK is an all-in-one mobile map app (see Figure 6), which provides the public with a convenient and on-the-go access to maps published by LandsD and integrated geospatial information about public facilities in Hong Kong;

Figure 6

MyMapHK



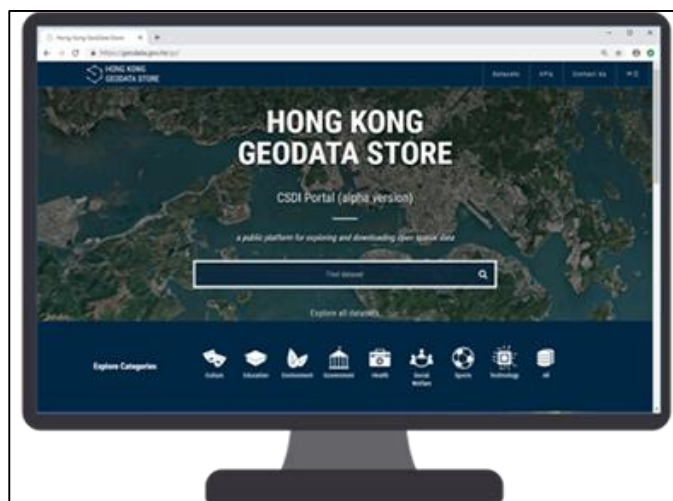
Source: LandsD records

- (c) **VoiceMapHK.** VoiceMapHK is a digital inclusion mobile map app, which provides visually impaired people with a one-stop access to geospatial information in Hong Kong, and facilitates them to retrieve location information; and
- (d) **Hong Kong GeoData Store.** The Hong Kong GeoData Store (see Figure 7) is the alpha version portal for CSDI (Note 13) and open spatial data initiative to facilitate the sharing of geospatial data. According to LandsD, as CSDI portal was made available for public use in December 2022 (see Note 10 to para. 1.7(c)), the Hong Kong GeoData Store will cease operation in August 2023.

Note 13: According to LandsD, the alpha version portal refers to the early version of the portal demonstrating the concepts of CSDI portal.

Figure 7

Hong Kong GeoData Store



Source: LandsD records

Development of 3D digital map

1.10 In late 2017, the Government announced the Smart City Blueprint for Hong Kong and put forward the strategy to encourage the use of open data for smart city innovations and facilitate the sharing of geospatial data and support various smart city applications. 3D digital map is one of the core components of the digital infrastructure underpinning Hong Kong's smart city development (Note 14). LandsD is responsible for the development of 3D digital map. According to LandsD, 3D digital map can support a wide range of functions including urban planning, land management, project development, environmental studies, traffic studies, landscape design as well as other technical assessments. It also promotes the development of various applications and enables users' better grasp of the spatial information of a specific location. To meet the increasing needs of 3D applications and better understand a modern city like Hong Kong, SMO aims to develop a full-fledged 3D digital map covering the whole territory by end of 2023.

Note 14: *Apart from 3D digital map, CSDI portal (see Note 10 to para. 1.7(c)) is also a core component of the digital infrastructure underpinning Hong Kong's smart city development.*

Introduction

Audit review

1.11 In October 2022, the Audit Commission (Audit) commenced a review of the provision of map products and spatial data services to the public by LandsD. The audit review has focused on the following areas:

- (a) maintenance of map products (PART 2);
- (b) dissemination of map products and spatial data to the public (PART 3); and
- (c) development of 3D digital map (PART 4).

Audit has found room for improvement in the above areas and has made a number of recommendations to address the issues.

Acknowledgement

1.12 Audit would like to acknowledge with gratitude the full cooperation of the staff of LandsD during the course of the audit review.

PART 2: MAINTENANCE OF MAP PRODUCTS

2.1 This PART examines LandsD's work in maintenance of map products, focusing on:

- (a) updating of map products (paras. 2.2 to 2.13); and
- (b) other related issues (paras. 2.14 to 2.21).

Updating of map products

2.2 SMO provides various types of map products in digital and paper forms for various purposes for use by the public (see para. 1.5). According to LandsD, SMO's major map products for use by the public (Note 15) include 2D topographic maps in different scales, thematic maps of countryside maps and Hong Kong Guide, aerial photographs and digital orthophotos. The datasets for 2D topographic maps in different scales and thematic maps of countryside maps and Hong Kong Guide are stored and maintained in LandsD's computer mapping systems (Note 16). Aerial photographs and digital orthophotos are stored and maintained in another system. SMO updates these major map products, as follows:

- (a) **1:1000 2D topographic map.** This map product covers the whole territory of Hong Kong (comprising 3,331 map sheets (source files) as of November 2022) and is the largest scale topographic map. According to LandsD, SMO (through its 10 DSOs) adopts continuous updating approach to update the 1:1000 topographic map (which serves as the basic map for updating other medium to small-scale topographic maps (see (b) below)). DSOs identify changes of map details in the basic map based on data

Note 15: *According to LandsD, other SMO's map products for use by the public include street maps, flying charts and satellite image maps.*

Note 16: *According to LandsD, the datasets for 2D topographic maps in different scales and thematic maps of countryside maps and Hong Kong Guide are stored and maintained in two computer mapping systems, namely the Land Information System (for the 1:1000 and 1:5000 topographic map datasets) and the Mapping System (for the datasets for small-scale topographic maps (i.e. scales of 1:10000, 1:20000, 1:50000 and 1:200000) and thematic maps of countryside maps and Hong Kong Guide).*

Maintenance of map products

collected from various sources (Note 17) and their change identification work (Note 18) which is scheduled for all map sheets at intervals of 1 to 5 years. DSOs carry out the consequential map updating work on a job basis. A job arises when map details in a basic map are found to have changed (Note 19). DSOs update the changes in the basic map as soon as practicable;

- (b) ***Medium to small-scale 2D topographic maps.*** According to LandsD, the 1:1000 topographic map, which covers the whole territory of Hong Kong and is the largest scale topographic map, serves as the main data source for updating and deriving topographic maps in smaller scales. Based on the 1:1000 topographic map, SMO (through its Mapping Section) updates by means of map generalisation (Note 20) other medium to small-scale topographic maps (i.e. scales of 1:5000, 1:10000, 1:20000, 1:50000 and 1:200000);
- (c) ***Thematic maps (including countryside maps and Hong Kong Guide).*** According to LandsD, SMO (through its Mapping Section) collects relevant data or information for updating and providing thematic maps according to the updating frequency of map products;

Note 17: *The data is collected from various sources, including: (a) photogrammetric products; (b) as-built drawings and engineering layouts or data of major infrastructure and building projects from relevant B/Ds or their consultants; (c) field surveys; and (d) news and the media.*

Note 18: *According to LandsD, change identification work refers to desktop study performed by DSOs to identify the changes in the 1:1000 topographic map, with reference to data collected from various sources (such as aerial photographs and as-built drawings).*

Note 19: *According to LandsD: (a) updating jobs for major infrastructure are accorded with the highest priority; and (b) other updating jobs are prioritised according to the amount and types of new map features involved. High priorities are given to jobs of updating man-made features (e.g. building related features, roads, railways and artificial slopes). Lower priorities are given to jobs of updating natural features and minor details (e.g. relief, spot heights and contours).*

Note 20: *According to LandsD, map generalisation is a process of reducing the amount of details on a map in a meaningful way. Due to the limited available space on the smaller scale maps, features are generalised or simplified to maintain the legibility of map details of each map scale.*

- (d) ***Aerial photographs.*** According to LandsD, SMO (through its Photogrammetric and Aerial Survey Section) takes aerial photographs annually covering the whole territory of Hong Kong at various altitudes; and
- (e) ***Digital orthophotos.*** With the use of digital photogrammetry technology, SMO (through its Photogrammetric and Aerial Survey Section) produces digital orthophotos from aerial photographs. Digital orthophoto products have four series (i.e. DOP5000, DOP1000-1963, DOP1000-1982 and DOPM50-L0), which are classified based on the sizes of image resolution and the types of source photographs used.

Scope for improvement in updating of 1:1000 topographic map

2.3 As of November 2022, the 1:1000 topographic map had 3,331 map sheets. The updating work for these map sheets is based on data collected from various sources and the change identification work which is scheduled for all map sheets at intervals of 1 to 5 years. A job arises when map details in a basic map are found to have changed (see para. 2.2(a)). Regarding the updating of 1:1000 topographic map:

- (a) according to LandsD's guidelines, change identification work should be scheduled for all map sheets for execution at intervals of 1 to 5 years. In other words, change identification work for each map sheet should be carried out at least once every 5 years. However, Audit noted that, as of November 2022, the latest change identification work for 96 map sheets was carried out more than 5 years and up to 12.3 years (averaging 6.4 years) ago (i.e. not meeting the stipulated timeframe in LandsD's guidelines). The dates of the latest change identification work for the 96 map sheets were between September 2010 and November 2017. In March 2023, LandsD informed Audit that:
 - (i) change identification work was scheduled at intervals of 1 to 5 years and high priority would be given to major infrastructure and areas with man-made features (e.g. building related features, roads, railways and artificial slopes); and

Maintenance of map products

- (ii) the areas covered by the 96 map sheets were non-active or remote areas (e.g. hilly areas, outlying coastal areas, countryside, sea and border). The change identification work for 23 (24%) of the 96 map sheets had been carried out between December 2022 and February 2023. For the 73 (96 – 23) (76%) remaining map sheets, it would review the existing resources and accord priority for the change identification work;
- (b) according to LandsD, DSOs review all available information and the outstanding basic map updating jobs quarterly and determine whether internal deployment, external assistance and/or other resources are required for completing the outstanding jobs. Audit noted that:
 - (i) there was no time limit set for completion of basic map updating jobs by DSOs; and
 - (ii) as of December 2022, the 10 DSOs had a total of 749 outstanding basic map updating jobs, of which 305 (41%) had remained outstanding for more than 1 year and up to 7 years (averaging 2 years) after job creation between 2015 and 2021;
- (c) according to LandsD, DSOs maintain management information (under their own templates and not standardised) on the updating status of each map sheet and the progress of basic map updating jobs. Audit noted that DSOs had not regularly provided such management information to senior management of LandsD. In Audit's view, there is merit for LandsD to require DSOs to provide regularly such management information under a standard template to its senior management for monitoring purposes;

- (d) between August and December 2022, SMO awarded three 1-year service contracts (Contracts A to C) for outsourcing some basic map updating work (Note 21) of the 10 DSOs at a total contract sum of \$3.7 million (Note 22). Since contract commencement and up to December 2022, DSOs issued a total of 17 work instructions under Contracts A and B (Note 23) ordering 20 basic map updating jobs (Note 24) with deadlines for submission of deliverables by the contractors in 2022. Audit noted that:
- (i) ***Delays in submission of deliverables by the contractors.*** According to Contracts A and B, the contractors were required to complete basic map updating jobs and submit deliverables to LandsD within the required timeframe (Note 25) from the date of issuance of the corresponding work instruction. For 16 (80%) of the 20 updating

Note 21: *According to LandsD, the outsourcing arrangement is to cope with staff redeployment in DSOs to facilitate the transformation of SMO from a traditional mapping agency to geospatial data agency and authority contributing to the development of smart city in Hong Kong. SMO adopted a progressive approach in outsourcing the basic map updating work, as follows: (a) in 2021, SMO awarded two 6-month service contracts (covering the period from 22 February 2021 to 21 August 2021) as pilot projects for outsourcing some basic map updating work of 4 DSOs (i.e. DSO/Kowloon, DSO/North, DSO/Tai Po and DSO/Yuen Long). The two service contracts were completed in October 2021 at a total cost of \$0.7 million. According to LandsD, the delays in completion were mainly due to a “warm-up period” for the contractors to get familiarised with SMO’s basic map updating workflow (which was outsourced for the first time) and insufficient staff resources of the contractors in light of the coronavirus disease (COVID-19) epidemic in 2021; and (b) after reviewing the implementation of the two pilot projects, SMO decided to continue the outsourcing arrangement and extend the coverage to all DSOs.*

Note 22: *Each contract covered 3 or 4 DSOs and had a contract sum ranging from \$1.1 million to \$1.4 million.*

Note 23: *As of December 2022, for Contract C, no work instruction was issued since contract commencement in December 2022.*

Note 24: *Basic map updating jobs include identification of changes based on aerial photographs or orthophotos, acquisition and compilation of spatial data from as-built drawings or engineering layouts, and field surveys.*

Note 25: *The time allowed for completion of updating jobs and submission of deliverables to LandsD varied, depending on the types of updating job ordered under work instructions and ranging from 7 to 15 working days from the date of issuance of the corresponding work instruction.*

Maintenance of map products

jobs, there were delays in submission of deliverables by the contractors, ranging from 1 to 84 days (averaging 31 days);

- (ii) ***Delays in notification of comments on deliverables by DSOs.***
According to Contracts A and B, DSOs would normally notify the contractors their comments (if any) within 15 working days counting from the date of receipt of the contractors' submitted deliverables. For 3 (27%) of 11 updating jobs with notification deadlines in 2022, there were delays in notification of comments on deliverables by DSOs, ranging from 8 to 16 days (averaging 11 days); and
- (iii) in this connection, according to LandsD, it would review the effectiveness of the outsourcing arrangement under Contracts A to C and consider the way forward for outsourcing strategy (e.g. including 2D and 3D map updating) in the fourth quarter of 2023; and

1:1000 paper topographic map

- (e) the 1:1000 paper topographic map (comprising 3,319 map sheets as of November 2022 — Note 26) is created based on the database in the computer mapping system for dissemination via print-on-demand services. Regarding the updating of 1:1000 paper topographic map:
 - (i) LandsD provides a list showing the creation date of each sheet of the 1:1000 paper topographic map on its website. According to LandsD, after carrying out the change identification work, if the consequential map updating work for a sheet of the 1:1000 paper topographic map is not required, DSOs would not revise the map sheet's creation date; and

Note 26: *According to LandsD, the number of paper map sheets of 3,319 sheets is fewer than that of 3,331 map sheets (source files) as mentioned in paragraph 2.2(a). The slight difference arises because 12 (3,331 – 3,319) map sheets cover only water areas in reservoirs or beaches and no features are to be presented on maps in paper form. Therefore, the number of topographic maps in paper form is slightly different.*

- (ii) Audit noted that, as of November 2022, for 207 sheets of the 1:1000 paper topographic map, their creation dates were between May 2012 and November 2017. However, after their creation dates, change identification work was carried out for them between May 2018 and November 2022. In this connection, LandsD has not provided in any source (e.g. its website) the date of the latest change identification work for a map sheet. Audit considers that providing such information could facilitate users to better understand the updating status.

2.4 In Audit's view, LandsD needs to:

- (a) regarding 1:1000 topographic map, take measures to ensure that DSOs:
 - (i) carry out the change identification work for all map sheets in accordance with the timeframe in LandsD's guidelines; and
 - (ii) complete the change identification work for the 73 map sheets as mentioned in paragraph 2.3(a)(ii) as early as practicable;
- (b) regarding basic map updating jobs:
 - (i) take measures to ensure that such jobs (particularly those long outstanding ones) are completed as early as practicable; and
 - (ii) consider setting a time limit for their completion;
- (c) require DSOs to provide regular management information on the updating status of each sheet of the 1:1000 topographic map (e.g. when change identification work was carried out and when it was updated) and the progress of basic map updating jobs (e.g. long outstanding jobs) under a standard template to its senior management for monitoring purposes;
- (d) regarding basic map updating work under related service contracts:
 - (i) step up measures to ensure the timely submission of deliverables by the contractors;

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- (ii) timely notify the contractors of its comments on deliverables submitted by them; and
- (iii) complete the review of the effectiveness of outsourcing arrangement for basic map updating work as scheduled with a view to setting the way forward for outsourcing strategy; and
- (e) consider providing further information on the updating status (e.g. date of the latest change identification work) of map products (e.g. 1:1000 paper topographic map) with a view to facilitating users to better understand the updating status.

Scope for implementing early automatic map generalisation for updating medium to small-scale topographic maps

2.5 Regarding the updating of medium to small-scale topographic maps (i.e. scales of 1:5000, 1:10000, 1:20000, 1:50000 and 1:200000):

Manual map generalisation leads to long revision cycle

- (a) based on the 1:1000 topographic map, SMO updates by means of map generalisation (see Note 20 to para. 2.2(b)) other medium to small-scale topographic maps (Note 27). According to LandsD:
 - (i) its current practice of updating medium to small-scale maps from larger scale maps requires lots of generalisation operations which are carried out manually; and
 - (ii) the current practice of manual map generalisation leads to long revision cycle of maps and ineffective generalisation among maps in various scales. Under the current practice, after the update of the 1:1000 topographic map dataset, it takes about half year to have the

Note 27: *According to LandsD, the 1:5000 and 1:10000 topographic maps are generalised from the 1:1000 topographic map dataset while the 1:20000, 1:50000 and 1:200000 topographic maps are generalised from the 1:10000 topographic map dataset.*

map revised manually for the whole territory of Hong Kong in all smaller scale topographic map datasets;

Automatic map generalisation

- (b) to enhance the map updating process and shorten the revision cycle, SMO explored the feasibility on streamlining the map generalisation workflow. In March 2021, SMO awarded a service contract to conduct a feasibility study on deriving small-scale map from large-scale map using automatic map generalisation. In March 2022, the feasibility study was completed at a cost of \$7.8 million (Note 28). According to the final study report of the feasibility study, an acceptable result of automated map generalisation would be achievable subject to the enrichment of the source data, enhancement of the mapping specifications and development of automated generalisation tools. On this basis, the final study report provided some recommendations for the next steps to be taken by SMO, including source data assessment and enrichment in the short term, automated map generalisation and creation for 1:10000 topographic map in the mid term and generalisation for all scales of topographic maps in the long term. According to LandsD, it would make reference to the experience gained and recommendations in the feasibility study to implement automatic map generalisation for all map scales in phases; and
- (c) in October 2022, LandsD obtained funding approval of \$17.2 million (Note 29) for a project on the implementation of automatic map generalisation workflow for 1:10000 topographic map. The scope of the project also includes reviewing source data, recommending the aspects on enrichment of source data and recommending actions to be taken for full-scale implementation of automatic map generalisation for other map scales. According to LandsD:

Note 28: *The amount was funded under the TechConnect (block vote), which was set up in 2017 by the then Innovation and Technology Bureau to support government departments in implementing technology projects so as to enhance operational efficiency and improve public services.*

Note 29: *The amount is funded under a block allocation (i.e. Subhead A007GX — New administrative computer systems) under the Capital Works Reserve Fund Head 710 (Computerisation). The Government Chief Information Officer can authorise expenditure under the block allocation under delegated authority.*

Maintenance of map products

- (i) with the successful implementation of the automatic map generalisation workflow, it is anticipated that the 1:10000 topographic map dataset could be updated and released in 3 months or less after the update of the 1:1000 topographic map dataset; and
- (ii) the project is targeted to be completed in December 2024 and was under tender preparation stage as of January 2023.

2.6 In Audit's view, LandsD needs to take measures to ensure that the project on the implementation of automatic map generalisation workflow for 1:10000 topographic map is completed as scheduled with a view to implementing early automatic map generalisation for all scales of topographic maps so as to shorten the revision cycle of maps and achieve effective generalisation among maps in various scales.

Some digital orthophotos not updated for a long time

2.7 Audit noted that some digital orthophotos were not updated for a long time, as follows:

- (a) ***Digital orthophoto DOP5000 series.*** The DOP5000 series (Note 30) covers the whole territory of Hong Kong and is compiled mainly from the recent aerial photographs taken at various flying heights (from 2,000 feet to 9,000 feet). The DOP5000 series is supplied on tile basis and a full set of the series has 192 tiles. Regarding the updating work, according to LandsD:
 - (i) the DOP5000 series is updated as and when necessary and there is no minimum updating frequency for this series. In this connection, Audit noted that, as of November 2022, 107 (56%) of the 192 tiles of DOP5000 series had not been updated for 7 or more years

Note 30: *The DOP5000 series has an image resolution of 0.2 metres in terms of ground sample distance per pixel and is commonly used as a 1:5000 map for general purpose by architects, engineers, planners, developers, etc.*

(up to 7.6 years). The last update dates of the 107 tiles of DOP5000 series were between May and December 2015 (Note 31); and

(ii) a service contract was awarded in October 2021 for partial updating of DOP5000 series (covering northern New Territories region) and was completed at a cost of \$1.1 million (Note 32) in February 2022. The updated tiles were expected to be released in the first quarter of 2023. In this connection, Audit noted that:

- according to the minutes of supervisory staff meetings of the Photogrammetric and Aerial Survey Section held between October 2021 and September 2022, submissions from the contractor were rejected by SMO for three times and the target release date of the next update of DOP5000 series was revised from February 2022 to the first quarter of 2023; and
- as of January 2023, the updated tiles of DOP5000 series had not yet been released; and

(b) ***Digital orthophoto DOPM50-L0 series.*** The DOPM50-L0 series (Note 33) shows the whole territory of Hong Kong in one single image with grid lines and text information maintained. According to LandsD, the DOPM50-L0 series is updated as and when necessary and there is no minimum updating frequency for this series. In this connection, Audit noted that, as of November 2022, the DOPM50-L0 series had not been updated for 6.4 years (i.e. last updated in June 2016).

Note 31: *The 85 (192 – 107) remaining tiles of DOP5000 series were last updated between August 2018 and December 2019.*

Note 32: *The amount was funded under LandsD departmental vote.*

Note 33: *The DOPM50-L0 series has an image resolution of 5 metres in terms of ground sample distance per pixel.*

Maintenance of map products

- 2.8 In Audit's view, regarding digital orthophoto, LandsD needs to:
- (a) consider setting updating frequency for digital orthophoto DOP5000 series and DOPM50-L0 series;
 - (b) take measures to ensure that the updated tiles of digital orthophoto DOP5000 series are released as scheduled; and
 - (c) take measures to ensure that submissions from contractors for updating digital orthophotos meet its required quality.

Need to keep under review the publication of Hong Kong Guide

2.9 The Hong Kong Guide is a comprehensive guide to streets and places of Hong Kong. It consists of maps covering the whole territory of Hong Kong and was first published in 1976. The electronic version of Hong Kong Guide (i.e. e-HongKongGuide) has been available for free browsing and downloading since 2017. It provides map users a convenient means of accessing geographic and community facilities information via computer and mobile devices.

2.10 Both Hong Kong Guide and e-HongKongGuide are updated and published once a year and the 2022 edition was released in January 2022. In view of the increasing trend of using maps in digital form and the need to make better use of available resources, SMO conducted a review of the publication of Hong Kong Guide in May 2022 and decided to cease the publication of Hong Kong Guide 2023 while maintaining and enhancing e-HongKongGuide continuously. According to LandsD, enhancements of the 2023 edition of e-HongKongGuide include increasing the updating frequency from once to twice a year, resizing the page to facilitate printing and producing interactive story telling maps.

2.11 The 2023 edition of e-HongKongGuide was released on 31 January 2023. According to LandsD, it will conduct a review in 2023 to decide the way forward for the publication of Hong Kong Guide (both the book and electronic versions) taking into account feedback from users. In Audit's view, LandsD needs to complete the review of the publication of Hong Kong Guide as soon as possible with a view to further enhancing its map products.

Audit recommendations

- 2.12 **Audit has *recommended* that the Director of Lands should:**
- (a) **regarding 1:1000 topographic map, take measures to ensure that DSOs:**
 - (i) **carry out the change identification work for all map sheets in accordance with the timeframe in LandsD's guidelines; and**
 - (ii) **complete the change identification work for the 73 map sheets as mentioned in paragraph 2.3(a)(ii) as early as practicable;**
 - (b) **regarding basic map updating jobs:**
 - (i) **take measures to ensure that such jobs (particularly those long outstanding ones) are completed as early as practicable; and**
 - (ii) **consider setting a time limit for their completion;**
 - (c) **require DSOs to provide regular management information on the updating status of each sheet of the 1:1000 topographic map (e.g. when change identification work was carried out and when it was updated) and the progress of basic map updating jobs (e.g. long outstanding jobs) under a standard template to LandsD's senior management for monitoring purposes;**
 - (d) **regarding basic map updating work under related service contracts:**
 - (i) **step up measures to ensure the timely submission of deliverables by the contractors;**
 - (ii) **timely notify the contractors of LandsD's comments on deliverables submitted by them; and**
 - (iii) **complete the review of the effectiveness of outsourcing arrangement for basic map updating work as scheduled with a view to setting the way forward for outsourcing strategy;**

Maintenance of map products

- (e) **consider providing further information on the updating status (e.g. date of the latest change identification work) of map products (e.g. 1:1000 paper topographic map) with a view to facilitating users to better understand the updating status;**
- (f) **take measures to ensure that the project on the implementation of automatic map generalisation workflow for 1:10000 topographic map is completed as scheduled with a view to implementing early automatic map generalisation for all scales of topographic maps so as to shorten the revision cycle of maps and achieve effective generalisation among maps in various scales;**
- (g) **regarding digital orthophoto:**
 - (i) **consider setting updating frequency for digital orthophoto DOP5000 series and DOPM50-L0 series;**
 - (ii) **take measures to ensure that the updated tiles of digital orthophoto DOP5000 series are released as scheduled; and**
 - (iii) **take measures to ensure that submissions from contractors for updating digital orthophotos meet LandsD's required quality; and**
- (h) **complete the review of the publication of Hong Kong Guide (both the book and electronic versions) as soon as possible with a view to further enhancing LandsD's map products.**

Response from the Government

2.13 The Director of Lands accepts the audit recommendations. He has said that LandsD will:

- (a) **endeavour to carry out the change identification work for 1:1000 topographic map at an interval of 1 to 5 years and accord priority for completing the change identification work for the 73 map sheets as mentioned in paragraph 2.3(a)(ii);**

- (b) review the departmental guidelines and consider setting target timeline to ensure that basic map updating jobs are completed as early as practicable;
- (c) review and enhance the current reporting mechanism in respect of the updating of 1:1000 topographic map with the use of information technology for strengthening the monitoring of work progress by the senior management;
- (d) review the departmental guidelines and mechanism for enhancing the efficiency of contract administration. It will also complete the review of the effectiveness of outsourcing arrangement for basic map updating work before the expiry of the existing contracts;
- (e) consider showing the dates of the latest change identification work on topographic map sheets so as to facilitate map readers to understand the updating status;
- (f) closely monitor the progress of the project on automatic map generalisation workflow for 1:10000 topographic map with a view to implementing early automatic map generalisation for all scales of topographic maps;
- (g) review and streamline the current procedures of updating digital orthophotos, and also consider setting up a cycle for this updating work;
- (h) review and enhance the requirements for deliverables in future contracts for updating digital orthophotos and closely monitor the quality of submissions for meeting its requirements; and
- (i) complete the review of the publication of Hong Kong Guide (both the book and electronic versions) by mid-2023 with a view to further enhancing its map products.

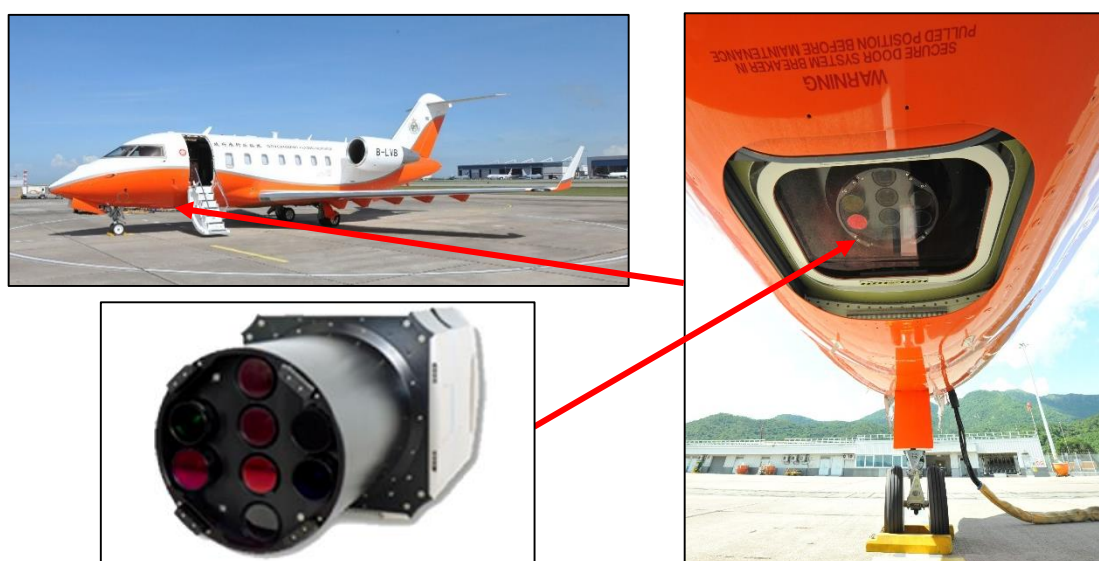
Other related issues

Need to closely monitor the service conditions of large format digital aerial camera system and take measures to ensure the timely replacement of the system

2.14 LandsD uses a large format digital aerial camera (LFDAC) system to take aerial photographs in the territory of Hong Kong and produces photogrammetric products (e.g. digital orthophotos) from these aerial photographs. One of the usage of these photogrammetric products is updating of the 1:1000 topographic map. LFDAC system comprises a digital aerial camera, photogrammetric software and hardware system, and an office-based digital image data offline storage system. The digital aerial camera will be mounted on two fixed-wing aircraft of the Government Flying Service (GFS) for performing aerial photography work on a shared-use basis. Before performing aerial photography work, LandsD needs to apply for flight in GFS aircraft, and prepares a proposed flight diagram for GFS. On the day of flying, LandsD will install the digital aerial camera on GFS aircraft (see Photograph 4). Upon completion of the flight, LandsD will dismount the digital aerial camera from the aircraft. Table 1 shows the cost of LFDAC system and related software for the production of photogrammetric products.

Photograph 4

Digital aerial camera installed on GFS aircraft



Source: LandsD records

Table 1

LFDAC system and related software

Particulars	Commissioning date	Expected life span	Cost (\$)	2022 maintenance cost (\$)
LFDAC system (including interchangeable lens system)	19.12.2016	10 years from delivery date of May 2013 (Note)	13,900,383	1,016,906
Image processing software	2.2.2018	5 years from commissioning date	1,380,651	831,636
Automatic digital surface model generation software	1.2.2019		460,000	
Automatic orthophoto mosaic generation software	2.2.2021		1,058,000	

Source: LandsD records

Note: According to LandsD, LFDAC system was delivered in May 2013 and its service life will end in May 2023.

2.15 Audit noted that LFDAC system was approaching its end-of-service-life in May 2023. According to LandsD:

- (a) LFDAC system had been suffering from various technical problems (e.g. voltage problem) due to ageing and LandsD had requested for maintenance service from the manufacturer whenever necessary. With regular maintenance and supply of essential consumables and spare parts, LFDAC system is expected to maintain service in the coming years up to December 2026; and
- (b) replacement of LFDAC system was being planned. As the new LFDAC system needs to be compatible with GFS aircraft, and fixation, fitting out and modification work will need to be fully assessed and studied of its compatibility with GFS aircraft, LandsD started discussions with GFS in February 2022 for the replacement plan. In this connection, Audit noted that LandsD took about 4 years in the previous procurement, including installation, airworthiness certification and testing before commissioning of LFDAC system in December 2016.

Maintenance of map products

2.16 In Audit's view, LandsD needs to closely monitor the service conditions of LFDAC system and take measures (including drawing up an implementation timetable and system transition plan) to ensure the timely replacement of the system with a view to continuing the provision of quality aerial photography service.

Need to make good use of unmanned aerial vehicle and continue to explore and use new technologies in updating map products

2.17 Apart from LFDAC system, LandsD has explored other new technologies (e.g. unmanned aerial vehicle (UAV) and airborne light detection and ranging (Note 34)) in updating map products. LandsD uses UAV to take aerial photographs for measurement purposes and production of survey products (e.g. orthophoto). Due to the relatively low flying heights, the process of photograph capturing by UAV is not affected by cloud layers. According to LandsD, UAV is a more cost-effective means for small areas and UAV orthophoto is an alternative tool in basic map updating which can provide efficient support for urgent tasks.

2.18 As of December 2022, DSOs had 41 UAVs, ranging from 3 to 7 UAVs in each DSO, in support of their operations, including basic map updating work. Audit noted that, during the period from 2018 to 2022:

- (a) 8 DSOs made use of UAVs in updating basic maps. The number of times of using UAVs in updating basic maps by each DSO varied, ranging from 6 to 221 times. While the total number of times of using UAVs in updating basic maps by the 8 DSOs generally increased from 44 times in 2018 to 284 times in 2021, it decreased to 126 times in 2022; and
- (b) 2 DSOs had not made use of UAVs in updating basic maps (Note 35).

Note 34: *According to LandsD, airborne light detection and ranging is a highly effective airborne laser scanning method for acquiring height data over a large area for modelling the terrain or surface of land features.*

Note 35: *According to LandsD, the 2 DSOs had made use of UAVs for other purposes (e.g. taking aerial photographs) during the period from 2018 to 2022.*

2.19 In Audit's view, LandsD needs to:

- (a) make good use of UAV in basic map updating work as far as practicable; and
- (b) continue to explore and use new technologies in updating map products.

Audit recommendations

2.20 **Audit has *recommended* that the Director of Lands should:**

- (a) **closely monitor the service conditions of LFDAC system and take measures (including drawing up an implementation timetable and system transition plan) to ensure the timely replacement of the system with a view to continuing the provision of quality aerial photography service;**
- (b) **make good use of UAV in basic map updating work as far as practicable; and**
- (c) **continue to explore and use new technologies in updating map products.**

Response from the Government

2.21 The Director of Lands accepts the audit recommendations. He has said that LandsD will:

- (a) reinforce the monitoring of the service conditions of LFDAC system and work with GFS to draw up an implementation plan and relevant transitional arrangements for timely replacement of the system;
- (b) scale up the use of UAV in basic map updating amongst DSOs; and
- (c) continue to look into and engage new technologies in updating map products by keeping abreast of emerging mapping technologies.

PART 3: DISSEMINATION OF MAP PRODUCTS AND SPATIAL DATA TO THE PUBLIC

3.1 This PART examines LandsD's work in dissemination of map products and spatial data to the public, focusing on:

- (a) releasing of map products and spatial data for public use (paras. 3.2 to 3.16); and
- (b) provision of geospatial portals (paras. 3.17 to 3.24).

Releasing of map products and spatial data for public use

3.2 ***Open Data Policy.*** In light of the Government's Open Data Policy, SMO has been identifying suitable map products and spatial data for releasing to the public for free use (see para. 1.7(a)). According to LandsD:

- (a) its digital map products have been widely used by businesses and educational entities for various uses including land boundary surveys, town planning, engineering design, environmental studies, transportation management, publications, online maps, academic research and various types of data analysis;
- (b) opening up digital map products would enable the public, academia and businesses to make greater use of spatial data in research and application development. Free digital map data would facilitate the development of a digital economy, thereby realising the visions of the Smart City Blueprint for Hong Kong (see para. 1.10) and bringing benefits to society as a whole;
- (c) since 2012, it has been identifying suitable digital map products and spatial data (previously not for sale), together with those newly developed digital map products and spatial data, for opening up to the public for free browsing and downloading, for example:

Dissemination of map products and spatial data to the public

- (i) 3D visualisation map (2017 version) (Note 36);
 - (ii) e-HongKongGuide;
 - (iii) historical maps;
 - (iv) old photos of Hong Kong; and
 - (v) 3D pedestrian network (see para. 4.3(b)); and
- (d) since 13 April 2021, except the 4 digital aerial photograph (Series:DAP) products (see Note 7 to para. 1.6) still for sale at a charge, all digital map products (previously for sale at a charge) were released for free browsing and downloading by the public, for example:
- (i) digital 2D topographic maps (at different scales);
 - (ii) digital land boundary maps;
 - (iii) Geo-reference database (Note 37);
 - (iv) digital orthophotos;
 - (v) digital aerial photographs (L0 Version) (which is a compressed image of the digital aerial photograph (Series:DAP) and with resolution of 300 dots per inch); and

Note 36: *The 3D visualisation map (2017 version) dataset was created mainly by aerial imageries taken in 2017 and 2018, which shows topographical and exterior features terrains, buildings and infrastructures of selected areas of the New Territories and part of Kowloon. The dataset was released to the public for free downloading by batch since 2020.*

Note 37: *Geo-reference database is a database storing building name and address, site polygon and road centre line in various formats.*

Dissemination of map products and spatial data to the public

- (vi) 3D spatial data (Note 38).

3.3 As of December 2022, certain map products (including both paper and digital map products) were available for sale at a charge to the public, while most digital map products and spatial data were released to the public for free browsing and downloading for commercial and non-commercial uses, as follows:

- (a) ***Saleable map products.*** 31 paper map products (Note 39) and 4 digital aerial photograph (Series:DAP) products were available for sale and disseminated to the public through HKMS 2.0 (Note 40), SMO Map Sales Outlets and reseller outlets (see para. 1.6). In 2021-22, total sales volume of saleable map products to the public were 30,011 copies, with total revenue of about \$1,773,000. Table 2 shows the sales of map products to the public by category from 2017-18 to 2021-22; and

Note 38: *3D spatial data is a set of territory-wide digital 3D model data created in 2011 to represent the shape, appearance and position of various types of ground features including building, infrastructure and terrain.*

Note 39: *The 31 paper map products available for sale at a charge included 11 2D topographic maps in different scales, 11 thematic maps and 9 aerial photographs and image products.*

Note 40: *According to LandsD, HKMS 2.0 had been operated since August 2018 (see Note 8 to para. 1.6(a)) with development cost amounting to \$9.65 million, which was then maintained in-house.*

Dissemination of map products and spatial data to the public

Table 2

Sales of map products to the public (2017-18 to 2021-22)

Map product	Sales volume (copies)				
	2017-18	2018-19	2019-20	2020-21	2021-22
(A) Paper map products (31 products)					
(i) 2D topographic maps (11 products)					
2D topographic maps	24,546 (49%)	23,075 (56%)	19,947 (58%)	15,138 (47%)	16,404 (55%)
(ii) Thematic maps (11 products)					
Countryside maps	19,681 (39%)	12,591 (30%)	9,873 (29%)	13,185 (41%)	10,139 (34%)
Hong Kong Guide	855 (2%)	1,294 (3%)	824 (2%)	587 (2%)	679 (2%)
Other thematic maps (Note 1)	2,124 (4%)	1,317 (3%)	876 (3%)	1,311 (4%)	814 (2%)
(iii) Aerial photographs and image products (9 products)					
Paper aerial photographs	2,340 (4%)	1,704 (4%)	1,186 (3%)	684 (2%)	982 (3%)
Other image products (Note 2)	175 (1%)	185 (1%)	120 (1%)	61 (1%)	71 (1%)
(B) Digital aerial photograph (Series:DAP) products (4 products)					
Digital aerial photographs (Series:DAP)	348 (1%)	1,216 (3%)	1,302 (4%)	992 (3%)	922 (3%)
Total	50,069 (100%)	41,382 (100%)	34,128 (100%)	31,958 (100%)	30,011 (100%)

Source: LandsD records

Note 1: Other thematic maps include street map, flying charts, photo books, thematic maps for HK Annual Report, urban maps and town maps.

Note 2: Other image products include satellite image maps, orthophoto maps and HKSAR false colour infrared aerial photo mosaic.

- (b) **Digital map products and spatial data opened up for free browsing and downloading.** As of December 2022, 28 digital map products and spatial data were opened up and available for free browsing and

Dissemination of map products and spatial data to the public

downloading (Note 41) on HKMS 2.0, Hong Kong GeoData Store, CSDI portal and/or Public Sector Information Portal (“data.gov.hk”) (see para. 1.7(c)). In 2021-22, the total number of downloads of major digital map products and spatial data were about 3,648,000. Table 3 shows the number of downloads of major digital map products and spatial data by the public from 2017-18 to 2021-22.

Table 3
Number of downloads of major digital map products and spatial data
by the public
(2017-18 to 2021-22)

Digital map product and spatial data	Number of downloads				
	2017-18	2018-19	2019-20	2020-21	2021-22
14 products (previously not for sale) released for free downloading (see para. 3.2(c))					
3D visualisation map (2017 version)	— (0%)	— (0%)	— (0%)	378,164 (61%)	2,855,666 (78%)
e-HongKongGuide	113,430 (80%)	89,423 (61%)	89,193 (48%)	124,133 (20%)	142,425 (4%)
Others (Note 1)	— (0%)	13,373 (9%)	46,598 (25%)	80,243 (13%)	145,102 (4%)
Sub-total (A)	113,430 (80%)	102,796 (70%)	135,791 (73%)	582,540 (94%)	3,143,193 (86%)
14 products (previously for sale at a charge) released for free downloading since April 2021 (see para. 3.2(d))					
Digital 2D topographic maps	19,448 (14%)	29,153 (20%)	29,094 (16%)	24,998 (3%)	199,479 (5%)
Digital aerial photographs (L0 Version)	969 (1%)	1,194 (1%)	533 (1%)	1,027 (1%)	182,546 (5%)
3D spatial data	3,749 (2%)	3,898 (3%)	3,561 (2%)	1,432 (1%)	59,397 (2%)
Others (Note 2)	4,477 (3%)	8,589 (6%)	14,843 (8%)	7,543 (1%)	63,127 (2%)
Sub-total (B)	28,643 (20%)	42,834 (30%)	48,031 (27%)	35,000 (6%)	504,549 (14%)
Total (A+B)	142,073 (100%)	145,630 (100%)	183,822 (100%)	617,540 (100%)	3,647,742 (100%)

Source: LandsD records

Note 1: Others included, for example, historical maps, old photos of Hong Kong and 3D pedestrian network.

Note 2: Others included, for example, digital land boundary maps, digital orthophotos and Geo-reference database.

Note 41: The 28 digital map products and spatial data available for free browsing and downloading included 14 products previously not for sale (see para. 3.2(c)) and 14 products previously for sale at a charge (see para. 3.2(d)).

Scope for digitising more paper map products and further opening up digital map products for free downloading

3.4 As shown in Tables 2 and 3, Audit noted that:

- (a) ***Decrease in sales volume of paper map products.*** Sales of paper map products (i.e. 31 paper map products available for sale — see para. 3.3(a)) had decreased from 2017-18 to 2021-22, in particular, the two most popular paper map products (i.e. 2D topographic maps (at different scales) and countryside maps, which accounted for over 85% of the total sales volume during the period), as follows:
 - (i) ***2D topographic maps.*** From 2017-18 to 2021-22, the sales volume of 2D topographic maps decreased by 33%, from 24,546 copies to 16,404 copies; and
 - (ii) ***Countryside maps.*** From 2017-18 to 2021-22, the sales volume of countryside maps decreased by 48%, from 19,681 copies to 10,139 copies (Note 42); and
- (b) ***Significant increase in download numbers of digital map products and spatial data since opening up for free downloading.*** The download numbers of digital map products and spatial data since opening up for free downloading increased significantly as follows:
 - (i) the number of downloads of products previously not for sale (see para. 3.2(c)) increased significantly from 113,430 in 2017-18 to 3,143,193 in 2021-22; and

Note 42: *Countryside maps are maps with detailed information of leisure amenities and footpaths, which helps hikers and nature lovers explore rural areas and country parks. According to LandsD, a hiking module had been developed in MyMapHK (see para. 1.9(b)) since it was launched in 2014 to: (a) provide digital map at various scales with detailed information of hiking trails to the public; and (b) help hikers plan and explore the rural areas and country parks in a more interactive manner.*

- (ii) while the number of downloads of products previously for sale at a charge remained steady during the period 2017-18 to 2020-21, it had significantly increased from 35,000 in 2020-21 to about 505,000 in 2021-22 since opening up most digital map products in April 2021 (see para. 3.2(d)).

3.5 *Need to keep under review the need for digitising more paper map products and further opening up digital map products for free downloading.* In general, paper map products are facing diminishing demand (see para. 3.4(a)), while the demand for digital map products and spatial data had significantly increased since opening up for free downloading (see para. 3.4(b)). Audit noted that, as of December 2022, there was no digital version for certain paper map products (e.g. countryside maps, urban map and town map), and digital aerial photograph (Series:DAP) products were still for sale at a charge and not opened up for free downloading (Note 43).

3.6 According to LandsD:

- (a) it had reviewed the need for digitisation of countryside map. It decided not to produce e-countryside map but to continue to enhance the hiking module in its mobile app MyMapHK which provides digital map at various scales with detailed information of hiking trails and value-added functions (e.g. searching hiking trails) to the public; and
- (b) digital aerial photograph (Series:DAP) products are huge in volume and file size. It needs to evaluate the financial and technical implications of opening them up for free downloading.

3.7 As the opening up of digital map products would enable the public, academia and businesses to make greater use of spatial data in research and application development, and the availability of free digital map data would facilitate the development of a digital economy (see para. 3.2(b)). Furthermore, there was

Note 43: *Audit noted that, since LandsD opened up digital aerial photographs (L0 Version) for free browsing and downloading in April 2021 (see para. 3.2(d)), the respective number of downloads had increased significantly by 17,675% from 1,027 in 2020-21 to 182,546 in 2021-22.*

Dissemination of map products and spatial data to the public

considerable demand for the printed countryside maps in recent years (sales volume ranged from 9,873 to 13,185 copies from 2019-20 to 2021-22, accounting for about 30% to 40% of total sales volume of map products — see Table 2 in para. 3.3(a)). In Audit's view, LandsD needs to keep under review the need for:

- (a) digitising more paper map products (e.g. countryside maps, urban map and town map); and
- (b) further opening up digital map products (i.e. digital aerial photograph (Series:DAP)) for the public's free browsing and downloading.

Scope for improvement in management of sales channels

3.8 As of December 2022, the sales channels of LandsD's map products to the public were HKMS 2.0, SMO Map Sales Outlets and reseller outlets (see para. 1.6). HKMS 2.0 (launched in August 2018) provides round-the-clock service to the public for searching and ordering different types of map products, streamlines the ordering process and enhances the delivery service (see para. 1.6(a)). Table 4 shows the sales of map products to the public by sales channel from 2018-19 to 2021-22.

Table 4

Sales of map products to the public by sales channel (2018-19 to 2021-22)

Sales channel	Sales volume (copies)			
	2018-19	2019-20	2020-21	2021-22
SMO Map Sales Outlets	29,768 (72%)	21,776 (64%)	17,757 (56%)	18,274 (61%)
Reseller outlets	8,930 (22%)	6,923 (20%)	8,713 (27%)	7,432 (25%)
HKMS 2.0	2,684 (6%) (Note)	5,429 (16%)	5,488 (17%)	4,305 (14%)
Total	41,382 (100%)	34,128 (100%)	31,958 (100%)	30,011 (100%)

Source: LandsD records

Note: The sales volume covered August 2018 (i.e. month of launching HKMS 2.0) to March 2019 only.

3.9 According to LandsD:

HKMS 2.0

- (a) Upon the launch of HKMS 2.0 in August 2018, it has encouraged visitors at the Map Sales Outlets to browse map information and place orders through HKMS 2.0 anytime and anywhere;

SMO Map Sales Outlets

- (b) there were 12 Map Sales Outlets before December 2021 (Note 44). In view of the drop in sales volume of certain Map Sales Outlets as found in LandsD's reviews in 2021 (see (c) and (d) below), LandsD closed down 4 Map Sales Outlets (see (d)(i) below) in December 2021. Since then, the number of SMO Map Sales Outlets has been reduced from 12 to 8 (Note 45);

Reviews of SMO Map Sales Outlets

- (c) in May 2021, after analysing the changes of sales in the 12-month period before and after the launch of HKMS 2.0 in August 2018, and past sales statistics of all Map Sales Outlets, it was noted that the overall sales of Map Sales Outlets had been reduced after the launch of HKMS 2.0. In particular, the drop of sales activities of 7 Map Sales Outlets under 7 DSOs located at Fanling, Central, Wan Chai, Sha Tin, Tsuen Wan, Tuen Mun and West Kowloon was more obvious than others; and

Note 44: *Before December 2021, there were 12 SMO Map Sales Outlets, including: (a) 2 SMO Map Publications Centres and 6 DSOs, which were still in operation as of December 2022 (see Note 9 to para. 1.6(b)); and (b) 4 DSOs (located at Wan Chai, Sha Tin, Tsuen Wan and Tuen Mun), which were closed down in December 2021.*

Note 45: *According to LandsD, the breakdown for the office area, number of staff and related costs for operating each Map Sales Outlets is not available as: (a) Map Sales Outlets are part of office space used for daily operations; and (b) staff would not standby at the counter table to wait for customer. They are also responsible for other daily duties (e.g. plan production, updating land information and preparing various sales report and statistics). When there is customer, staff would then attend the counter table to provide sales and related services.*

- (d) after conducting further review in June 2021, LandsD formulated the following plans for the 7 SMO Map Sales Outlets with more obvious drop in sales:
- (i) ***Closure of 4 Map Sales Outlets in the first stage.*** The first stage would include closing down the Map Sales Outlets under 4 DSOs located at Wan Chai, Sha Tin, Tsuen Wan and Tuen Mun. In December 2021, these 4 Map Sales Outlets were closed down;
 - (ii) ***Further review of 2 Map Sales Outlets in the second stage.*** The decision on whether to close down the Map Sales Outlets under 2 DSOs located at Central and Fanling would be determined after the implementation of the first stage; and
 - (iii) ***SMO Map Sales Outlet under DSO at West Kowloon.*** The sales volume generated from the Map Sales Outlet under DSO at West Kowloon remained at a low level. However, in view of the consideration of changing the Map Publications Centre at Yau Ma Tei (another Map Sales Outlet which is near the Map Sales Outlet under DSO at West Kowloon) into a promotional venue for mapping and spatial data services in future, LandsD decided not to close down the Map Sales Outlet under DSO at West Kowloon at this stage.

3.10 Audit noted that there was scope for improvement in management of sales channels, as follows:

- (a) ***Need to further encourage the use of HKMS 2.0 for browsing and placing orders for map products.*** The proportions of sales volume of map products disseminated through HKMS 2.0 remained relatively low in recent years (i.e. ranged from 14% to 17% from 2019-20 to 2021-22) and the majority of sales volume was still generated from SMO Map Sales Outlets (see Table 4 in para. 3.8). In Audit's view, LandsD needs to take measures to further encourage the public to use HKMS 2.0 for browsing and placing orders for map products; and

- (b) *Need to keep under review the need for closing down SMO Map Sales Outlets.* LandsD's reviews found 7 SMO Map Sales Outlets with more obvious drop in sale activities. In the event, 4 Map Sales Outlets were closed down in December 2021. Regarding the remaining 3 Map Sales Outlets (2 at Central and Fanling — see para. 3.9(d)(ii) and 1 at West Kowloon — see para. 3.9(d)(iii)), as of January 2023, LandsD was considering whether they would be closed down. In Audit's view, LandsD needs to make early decision on whether and when to close them down and keep under review the need for closing down other SMO Map Sales Outlets.

Scope for enhancing stock management

3.11 According to LandsD:

- (a) of the 31 paper map products available for sale to the public (see Note 39 to para. 3.3(a)):
- (i) 12 products were classified as printed map (printed by the Government Logistics Department (GLD) based on LandsD's printing order), with prices ranging from \$16 to \$175; and
 - (ii) 19 products were classified as print-on-demand map (printed in-house by LandsD upon receipt of sales order), with prices ranging from \$50 to \$1,110;
- (b) for printed map, it estimates the print quantities required as inventory based on the revision cycle (to revise map to new edition), past sales volume and stock level on hand;
- (c) printed map becomes unserviceable upon revision to new edition and unserviceable printed maps can no longer be sold to the public; and
- (d) printed maps which have remained unsold for more than three years are identified as dormant stock, but would not be disposed of unless becoming unserviceable.

Dissemination of map products and spatial data to the public

3.12 Audit noted that, as of November 2022, the stock levels of certain types of printed maps far exceeded their respective annual sales volumes in 2021-22 (see Table 5). For example, while the sales volume of 2D Topographic Map 1:100000 (colour version) was 127 copies in 2021-22, it had stock of 1,021 copies as of November 2022.

Table 5

Stock balance and sales volume of printed maps (November 2022)

No.	Product	Stock balance (copies)	Sales volume in 2021-22 (copies)
1	2D Topographic Map 1:20000 (colour version)	12,047	6,724
2	2D Topographic Map 1:100000 (colour version)	1,021	127
3	2D Topographic Map 1:200000	315	121
4	Urban maps	223	14
5	Town maps	(Note)	(Note)
6	Hong Kong Guide	2,351	679
7	Countryside maps	7,815	10,139
8	Thematic maps for HK Annual Report – Hong Kong Geology	688	31 (Note)
9	Thematic maps for HK Annual Report – Hong Kong's External Merchandise Trade in 2015	2,734	
10	Hong Kong and Pearl River Delta Satellite Image Map (1:500000)	166	26
11	Photo book – Hong Kong Now and Then	27	59
12	Photo book – Flashbacks of Two Decades in Hong Kong	2,961	45

Legend: Types of printed maps with stock levels far exceeding their respective annual sales volumes in 2021-22

Source: *LandsD records*

Note: *According to LandsD, breakdown of the figures for the two products is not available.*

Dissemination of map products and spatial data to the public

3.13 In this connection, according to GLD Circular No. 3/2022 “Disposal of Government Stores”:

- (a) when any surplus stores items are identified, B/Ds should arrange for their disposal in a timely manner so as to avoid possible wastage or further deterioration due to prolonged storage and to ensure better use of available storage space and resources;
- (b) irrespective of the proposed disposal methods (including internal transfer to other B/Ds, donation, commercial disposal (Note 46) and dumping), B/Ds should ensure that all surplus stores items pending disposal are properly accounted for; and
- (c) B/Ds should consider disposal through donation and commercial disposal in parallel if a surplus stores item is unserviceable but considered to have residual value of some kind (e.g. for display, training or preservation).

3.14 In Audit’s view, LandsD needs to:

- (a) make estimates of the print quantities of printed map as inventory as accurately as possible, taking into account their revision cycle, past sales volume and stock level on hand;
- (b) consider the feasibility of converting printed maps (e.g. 2D topographic map) to print-on-demand maps with a view to enhancing stock management; and
- (c) review whether the stocks of printed maps on hand are still serviceable and consider the disposal methods for those unserviceable printed maps (e.g. through donation and commercial disposal) in accordance with GLD’s requirements.

Note 46: *Commercial disposal includes sales by quotation/tender exercise, public auction or direct sale to term contractors.*

Audit recommendations

3.15 Audit has *recommended* that the Director of Lands should:

- (a) keep under review the need for digitising more paper map products (e.g. countryside maps, urban map and town map);
- (b) keep under review the need for further opening up digital map products (i.e. digital aerial photograph (Series:DAP)) for the public's free browsing and downloading;
- (c) take measures to further encourage the public to use HKMS 2.0 for browsing and placing orders for map products;
- (d) make early decision on whether and when to close down SMO Map Sales Outlets at Central, Fanling and West Kowloon, and keep under review the need for closing down other SMO Map Sales Outlets;
- (e) make estimates of the print quantities of printed map as inventory as accurately as possible, taking into account their revision cycle, past sales volume and stock level on hand;
- (f) consider the feasibility of converting printed maps (e.g. 2D topographic map) to print-on-demand maps with a view to enhancing stock management; and
- (g) review whether the stocks of printed maps on hand are still serviceable and consider the disposal methods for those unserviceable printed maps (e.g. through donation and commercial disposal) in accordance with GLD's requirements.

Response from the Government

3.16 The Director of Lands accepts the audit recommendations. He has said that LandsD will:

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- (a) keep under review the scope for digitising more paper map products where practicable;
- (b) having regard to relevant financial and technical implications, keep under review the scope for opening up additional digital map products for the public's free browsing and downloading where practicable;
- (c) further encourage the public to use HKMS 2.0 for browsing and placing orders for map products by organising more promotional activities in its Map Sales Outlets and other publicity events;
- (d) consider closing down other SMO Map Sales Outlets upon review of the respective sales statistics and strategy;
- (e) make more accurate estimates of the print quantities of printed map as inventory and explore the feasibility of converting printed maps to print-on-demand maps with a view to enhancing stock management; and
- (f) continue to take stock of printed maps on hand annually and review their status. It will dispose of or donate unserviceable printed maps in accordance with GLD's requirements and relevant Government regulations.

Provision of geospatial portals

3.17 LandsD develops and provides handy web-map service portals to the public (see para. 1.9). According to LandsD, there were 4 commonly used geospatial portals by the public (Note 47), namely 2 websites (i.e. GeoInfo Map and Hong Kong GeoData Store) and 2 mobile apps (i.e. MyMapHK and VoiceMapHK) (see Table 6).

Note 47: *Other geospatial portals developed by LandsD for use by the public included, for example, the Interactive Map Dashboard for COVID-19, which was jointly developed and managed by the Development Bureau and LandsD for effective dissemination of information on the latest situation of the novel coronavirus epidemic in Hong Kong. LandsD had also developed geospatial portals for use by B/Ds, for example, the Geospatial Information Hub, which supports the internal operation and information sharing within the Government by distributing and sharing geospatial data and related information among B/Ds.*

Table 6

Commonly used geospatial portals developed by LandsD

Geospatial portal	Launch date	Development cost (\$ million)	Recurring cost in 2021-22 (\$ million)	Usage in 2021-22
Website				
GeoInfo Map	26.5.2010	7.33	2.05	6.3 million (usage sessions — Note 1)
Hong Kong GeoData Store	10.12.2018	9.00	(Note 2)	3.0 million (no. of dataset downloads)
Mobile app				
MyMapHK	26.6.2014	4.40 (Note 3)	(Note 2)	2.4 million (usage sessions — Note 1)
VoiceMapHK	15.3.2016			66 (usage sessions — Note 1)

Source: LandsD records

Note 1: According to LandsD: (a) a usage session initiates when a user either visits the website or opens the mobile app; (b) a session ends after the user closes the website/mobile app or ends automatically after being inactive for 30 minutes; and (c) the number of usage sessions measures how many times a website/mobile app was used within a period of time.

Note 2: According to LandsD, Hong Kong GeoData Store, MyMapHK and VoiceMapHK are maintained in-house by deploying internal resources without a separate breakdown.

Note 3: According to LandsD, breakdown of development cost between MyMapHK and VoiceMapHK was not available.

Decreasing usage and low download number of VoiceMapHK

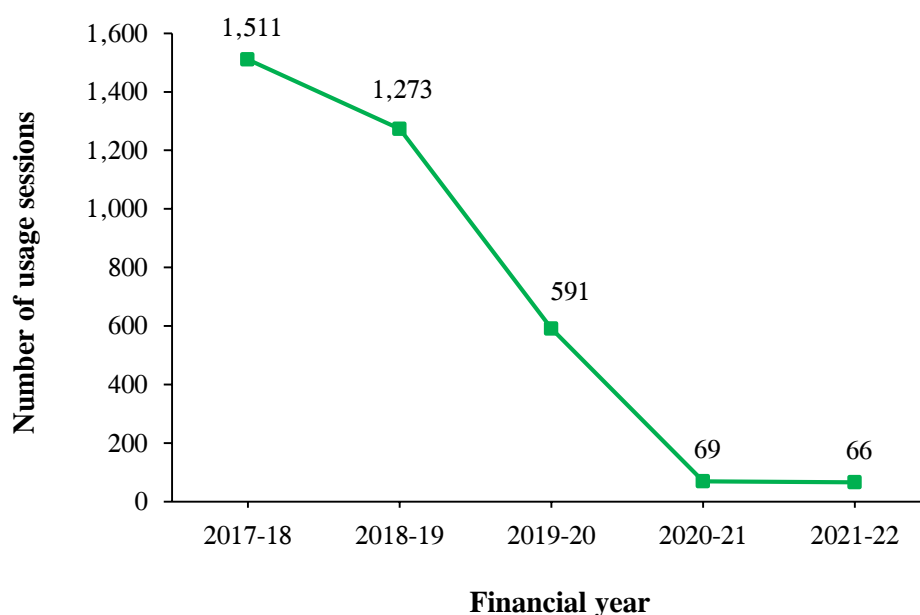
3.18 Audit noted that the decreasing usage and low download number of VoiceMapHK (a mobile app developed by LandsD) (Note 48) were as follows:

Note 48: *Regarding the usage of the 3 other commonly used geospatial portals developed by LandsD: (a) for GeoInfo Map, the number of usage sessions increased from 2.6 million in 2019-20 to 6.3 million in 2021-22; (b) for Hong Kong GeoData Store, the number of usage sessions increased from about 47,000 in 2019-20 to about 139,000 in 2021-22; and (c) for MyMapHK, the number of usage sessions increased from about 1,954,000 in 2020-21 (first year of adopting current counting algorithm of usage sessions) to about 2,374,000 in 2021-22.*

- (a) according to LandsD, VoiceMapHK was developed to support the digital inclusion initiative for the visually impaired community with a population of 175,000 in Hong Kong. However, the actual number of usage sessions of VoiceMapHK decreased from 1,511 in 2017-18 to less than 70 in both 2020-21 and 2021-22 (see Figure 8) and the accumulated number of downloads of the mobile app as of November 2022 was only about 9,000. In March 2023, LandsD advised that, due to the outbreak of the coronavirus disease (COVID-19) and the relevant anti-epidemic measures imposed, the use of VoiceMapHK by the visually impaired people for daily activities significantly decreased in 2020-21 and 2021-22; and

Figure 8

**Number of usage sessions of VoiceMapHK
(2017-18 to 2021-22)**



Legend: —■— Number of usage sessions

Source: LandsD records

- (b) at the time of launch of VoiceMapHK in March 2016, LandsD said that additional features of route planning and real-time navigation could be incorporated in future. However, as of December 2022, these additional features had still not been introduced. In December 2022, LandsD informed Audit that route planning and real-time navigation for visually impaired people requires a very high level of precision to avoid causing danger to them and it has yet to develop such technology to be incorporated to VoiceMapHK.

3.19 According to the Practice Guide for Developing Mobile Apps issued by OGCIO, a B/D should promote and market the mobile app it developed to let more people download and use it. According to LandsD, various promotional and publicity work had been conducted by LandsD since the launch of its mobile apps, including public exhibitions and school visits.

3.20 In Audit's view, LandsD needs to:

- (a) keep under review the usage and download number of its mobile apps (e.g. VoiceMapHK) with a view to enhancing the mobile apps to better meet user needs;
- (b) step up promotional and publicity activities with a view to encouraging more users to download and use its mobile apps; and
- (c) keep under review the development of new technologies and explore the feasibility of enhancing the functions of VoiceMapHK to better serve the visually impaired community's needs.

Scope for improving key performance measures

3.21 Several key performance indicators related to the commonly used geospatial portals were disclosed in LandsD's Controlling Officer's Report (COR), relating to:

Dissemination of map products and spatial data to the public

- (a) *usage rate of geospatial portals* (i.e. number of usage sessions of MyMapHK and number of requests for Application Programming Interface (Note 49) from Hong Kong GeoData Store); and
- (b) *number of datasets available on geospatial portals* (i.e. number of datasets posted onto GeoInfo Map, and number of open spatial datasets released and maintained on Hong Kong GeoData Store).

3.22 Audit noted that LandsD has regularly compiled the following information relating to usage and download numbers of geospatial portals for monitoring purpose:

- (a) usage rates of GeoInfo Map and VoiceMapHK (e.g. numbers of usage sessions of GeoInfo Map and VoiceMapHK);
- (b) download number of datasets available on Hong Kong GeoData Store; and
- (c) numbers of downloads of MyMapHK and VoiceMapHK mobile apps.

In Audit's view, there is merit for LandsD to consider including the abovementioned information as key performance measures in its COR.

Audit recommendations

3.23 Audit has *recommended* that the Director of Lands should:

- (a) **keep under review the usage and download number of LandsD's mobile apps (e.g. VoiceMapHK) with a view to enhancing the mobile apps to better meet user needs;**
- (b) **step up promotional and publicity activities with a view to encouraging more users to download and use LandsD's mobile apps;**

Note 49: *Application Programming Interface is a computer programming approach for facilitating exchange of information and executing instructions between different computer systems.*

- (c) **keep under review the development of new technologies and explore the feasibility of enhancing the functions of VoiceMapHK to better serve the visually impaired community's needs; and**
- (d) **consider including the information on usage and download numbers of LandsD's geospatial portals as mentioned in paragraph 3.22 as key performance measures in LandsD's COR.**

Response from the Government

3.24 The Director of Lands accepts the audit recommendations. He has said that LandsD will:

- (a) keep monitoring the usage and download information of its mobile apps (e.g. VoiceMapHK) and continue to enhance the apps as necessary;
- (b) step up promoting the mobile apps in various publicity channels and arrange promotional activities as appropriate;
- (c) liaise with organisations relating to visually impaired to better understand their needs and introduce corresponding enhancements to its map products; and
- (d) consider including additional usage and download information of its geospatial portals as key performance measures in its COR.

PART 4: DEVELOPMENT OF THREE-DIMENSIONAL DIGITAL MAP

4.1 This PART examines LandsD's work in the development of 3D digital map.

Three-dimensional digital map

4.2 In June 2019, the Development Bureau informed the Panel on Development of the Legislative Council that:

- (a) on a strategic level, CSDI (see Note 10 to para. 1.7(c)) and 3D digital map are core components of the digital infrastructure underpinning Hong Kong's smart city development;
- (b) to meet the increasing needs of 3D applications and better understanding of multi-level spaces of a modern city like Hong Kong, a full-fledged 3D digital map would be developed as the basemap and container for CSDI covering the entire territory by end of 2023; and
- (c) the proposed 3D digital map also covered the accessible interior of buildings and structures for supporting indoor-based locational and navigation applications.

4.3 LandsD is responsible for the development of 3D digital map with a funding of \$150 million (Note 50). According to LandsD, the development of 3D digital map included:

- (a) territory-wide 3D digital map which shows topographical and exterior features of terrain, buildings and infrastructures by 2023. 3D digital maps are not only for visualisation by the general public, but are also intended to

Note 50: *Approval of a commitment of \$150 million under General Revenue Account Subhead 700 General non-recurrent under Head 91 Lands Department to support the development of 3D digital map was sought in the context of the Appropriation Bill 2020, which was passed by the Legislative Council on 14 May 2020.*

be widely used by architecture, engineering, construction and planning communities;

- (b) 3D pedestrian network which covers the whole territory by 2020, including publicly accessible places (e.g. footways, footbridges, subways and parks) in urban areas of Hong Kong. It was further extended to the rural areas and hiking trails in country parks in 2022. The entire network is a set of 3D line features capable of supporting innovative applications, such as navigation (Note 51); and
- (c) 3D indoor map which covers the accessible interior of buildings and structures for 1,250 buildings across the territory by end of 2023.

LandsD aims to develop high-quality 3D digital map by phases and strives to cover the whole territory by end of 2023.

Note 51: *According to LandsD, the 3D pedestrian network: (a) provides a dataset in machine-readable formats with 3D line features derived from road features and road furniture (e.g. spatially related street names, wheelchair accessibility and obstacles), which can identify ascending and descending footways and indicate the length of a footpath. This can greatly enhance the accuracy of calculating the required walking time and enable users to search for the fastest and the more straight-forward routes; and (b) can support innovative applications, such as smart navigation for the visually impaired and people with other needs (e.g. wheelchair users), walkability study in the urban design, pedestrian activity study for considering the public facilities placement and reducing traffic congestion, noise and air pollution.*

Need to continue to closely monitor the implementation progress of territory-wide 3D digital map

4.4 According to LandsD:

- (a) as the technology of 3D digital mapping is rapidly evolving in the market, an incremental approach was proposed to implement the territory-wide 3D digital mapping task (Note 52) in phases; and
- (b) Kowloon East was selected as the area for the first phase (i.e. Phase 1) in implementing the territory-wide 3D digital map. There were 5 remaining phases which involved 5 areas (see Table 7 in para. 4.5).

4.5 Audit noted that, as of December 2022, the implementation of territory-wide 3D digital map was behind schedule (see Table 7), as follows:

- (a) Phase 1 (Kowloon East) was completed 11 months later than the original target completion date; and
- (b) for the 5 remaining phases (i.e. Phases 2A, 2B and 3A to 3C), as of December 2022, they were either in progress or under tender assessments, and their expected completion dates were 2 to 6 months later than their original target completion dates.

Note 52: *3D digital mapping task involved: (a) data capturing in the project area by different survey methods; and (b) generating and compiling of datasets based on data captured.*

Development of three-dimensional digital map

Table 7

Implementation of territory-wide 3D digital map (December 2022)

Phase	Area	Original target completion date	Actual/expected completion date	No. of months later than original target completion date
1	Kowloon East	August 2021	July 2022 (Note 1)	11
2A	Kowloon Central	December 2022	March 2023 (Note 2)	3
2B	Kowloon West and Hong Kong Island	June 2023	September 2023 (Note 2)	3
3A	Islands	July 2023	September 2023 (Note 2)	2
3B	New Territories West	December 2023	June 2024 (Note 3)	6
3C	New Territories East		June 2024 (Note 3)	6

Source: LandsD records

Note 1: The related contract for Phase 1 was substantially completed in July 2022.

Note 2: According to LandsD, the related contracts were awarded and were still in progress as of December 2022.

Note 3: According to LandsD, the related contracts were under tender assessment as of December 2022.

4.6 According to LandsD:

- (a) the reasons for completing Phase 1 (Kowloon East) 11 months later than the original target completion date were as follows:
 - (i) COVID-19 pandemic and corresponding quarantine as well as work-from-home arrangements had considerably affected the shipment of equipment deployed by the contractor as well as the progress of site survey and data capturing works; and

Development of three-dimensional digital map

- (ii) it was the first territory-wide 3D digital map project undertaken by LandsD in Hong Kong;
- (b) for the 5 remaining phases (i.e. Phases 2A, 2B and 3A to 3C), their expected completion dates were later than their original target completion dates due to:
 - (i) longer-than-expected run-in time for new contractors involved in the Phases 2 and 3 work, such as performing site test for equipment which was previously used in other regions and grasping project requirements and corresponding criteria accurately;
 - (ii) COVID-19 pandemic and corresponding quarantine as well as work-from-home arrangements, which significantly undermined the work efficiency and effectiveness of both consultants and contractors; and
 - (iii) extra time required in preparing the tender document for Phase 3 work based on the experience gained from Phases 1 and 2 work (e.g. revising the tender requirements to ensure market competition) for better project implementation; and
- (c) based on the experience gained from Phase 1 project, enhanced measures had been taken for the 5 remaining phases, such as strengthening the manpower of project consultants for monitoring the progress of contractors' work and improving the communication among LandsD, consultants and contractors.

4.7 In Audit's view, LandsD needs to continue to closely monitor the implementation progress of territory-wide 3D digital map with a view to ensuring its timely completion.

Need to keep under review the utilisation of 3D pedestrian network

4.8 The 3D pedestrian network dataset was published and made free to the public through Hong Kong GeoData Store in December 2020 (which covered urban areas and 5 outlying islands), and was further updated in September 2022 (extended

to cover major hiking trails inside country parks and major footpaths inside villages). According to LandsD, the numbers of downloads for 3D pedestrian network dataset were 200, 1,971 and 2,569 in 2020 (from December 2020), 2021 and 2022 (up to November 2022) respectively.

4.9 According to LandsD, the 3D pedestrian network is a set of 3D line features capable of supporting innovative applications (see para. 4.3(b)). In Audit's view, LandsD needs to keep under review the utilisation of 3D pedestrian network and step up promotional activities as needed to encourage more users to utilise the 3D pedestrian network.

Need to closely monitor the implementation progress of 3D indoor map

4.10 The 3D indoor map is one of the key components of 3D digital map. According to LandsD, in order to pursue the 3D digital map initiative, there is a need to extend the current mapping services to provide 3D indoor maps as data infrastructure so as to facilitate the development of various types of 3D indoor and routing related applications (Note 53) for the development of a smart city.

4.11 ***Pilot project on 3D indoor map.*** In 2020, LandsD commissioned a pilot project on creation of 3D indoor maps (Note 54), which covered 158 buildings (Note 55) mainly located in Kowloon East. The pilot project was completed in March 2021.

Note 53: *Supporting the integration of information obtained from different innovative solutions and technologies, the 3D indoor map might enable new applications in the areas of public safety, emergency, guidance, indoor wayfinding, facility/asset management, workspace management, unit-based land record management and building maintenance, etc.*

Note 54: *The pilot project involved data conversion to produce interior structures of 3D indoor maps, comprising 3D floors, 3D units and 3D indoor network from scanned raster drawings of building plans. Access points of each floor, such as unit entrances and exits, would also be mapped to facilitate indoor positioning. A showcase platform for the 3D indoor maps allowing navigation would also be created in the pilot project.*

Note 55: *These 158 buildings comprised mainly commercial and industrial buildings. Others included government venues, schools and training centres, hospitals and clinics, residential buildings and other public facilities such as MTR stations.*

Development of three-dimensional digital map

4.12 After the pilot project, LandsD aims to develop the 3D indoor map by phases and strives to cover the accessible interior of buildings and structures for 1,250 buildings across the territory by end of 2023 (see para. 4.3(c)). As of January 2023, the progress was as follows:

- (a) ***Phase 1 (covering 390 buildings in Kowloon).*** The related contract was awarded in January 2022 and expected to be completed by March 2023;
- (b) ***Phase 2 (covering 420 buildings on Hong Kong Island).*** The tender of related contract was invited in November 2022, and the contract was expected to be completed by December 2023; and
- (c) ***Phase 3 (covering 440 buildings in New Territories and Islands).*** The tender of related contract was being drafted, and the contract was planned to be awarded in third quarter of 2023 with target completion date in second quarter of 2024.

4.13 Audit noted that the development of 3D indoor map was targeted to be completed by end of 2023 (see para. 4.12). However, the implementation progress of Phase 3 of 3D indoor map (see para. 4.12(c)) was behind schedule. Audit considers that LandsD needs to closely monitor the implementation progress of 3D indoor map with a view to ensuring its timely completion.

Need to obtain consents from property owners/property management companies for opening up the 3D indoor map

4.14 According to LandsD:

- (a) at the planning stage, it was not intended to open the data of 3D indoor map to the public, but to share the data with B/Ds for internal uses and further study; and
- (b) it subsequently reviewed the opening up of the 3D indoor maps of the 158 buildings under the Kowloon East pilot project (see para. 4.11), and planned to release the 3D indoor maps for those buildings (with consents obtained) to the public in December 2022.

Development of three-dimensional digital map

4.15 After the completion of the pilot project on 3D indoor maps for the 158 buildings in Kowloon East, LandsD invited property owners/property management companies of the 158 buildings to:

- (a) give their views on the 3D indoor maps developed under the pilot project;
- (b) give their consents to permit LandsD to show the 3D indoor maps of their buildings to the public for preview and download; and
- (c) provide up-to-date information for any changes to their buildings regularly.

4.16 According to LandsD:

- (a) as of March 2023, it was still obtaining consents of property owners/property management companies of the 158 buildings (Note 56), and planned to open up those 3D indoor maps upon their consents; and
- (b) for those 1,250 buildings across the territory (see para. 4.12), it would obtain consents from relevant property owners/property management companies before and during the course of project implementation period with a view to preparing for opening up more 3D indoor map data to the public and facilitating the control of data privacy.

4.17 In Audit's view, LandsD needs to take measures to early obtain consents from the property owners/property management companies for opening up their buildings' 3D indoor maps to the public.

Note 56: *LandsD received the replies from property owners/property management companies of 19 buildings, of which consents were given for 14 buildings but not the other 5 buildings.*

Audit recommendations

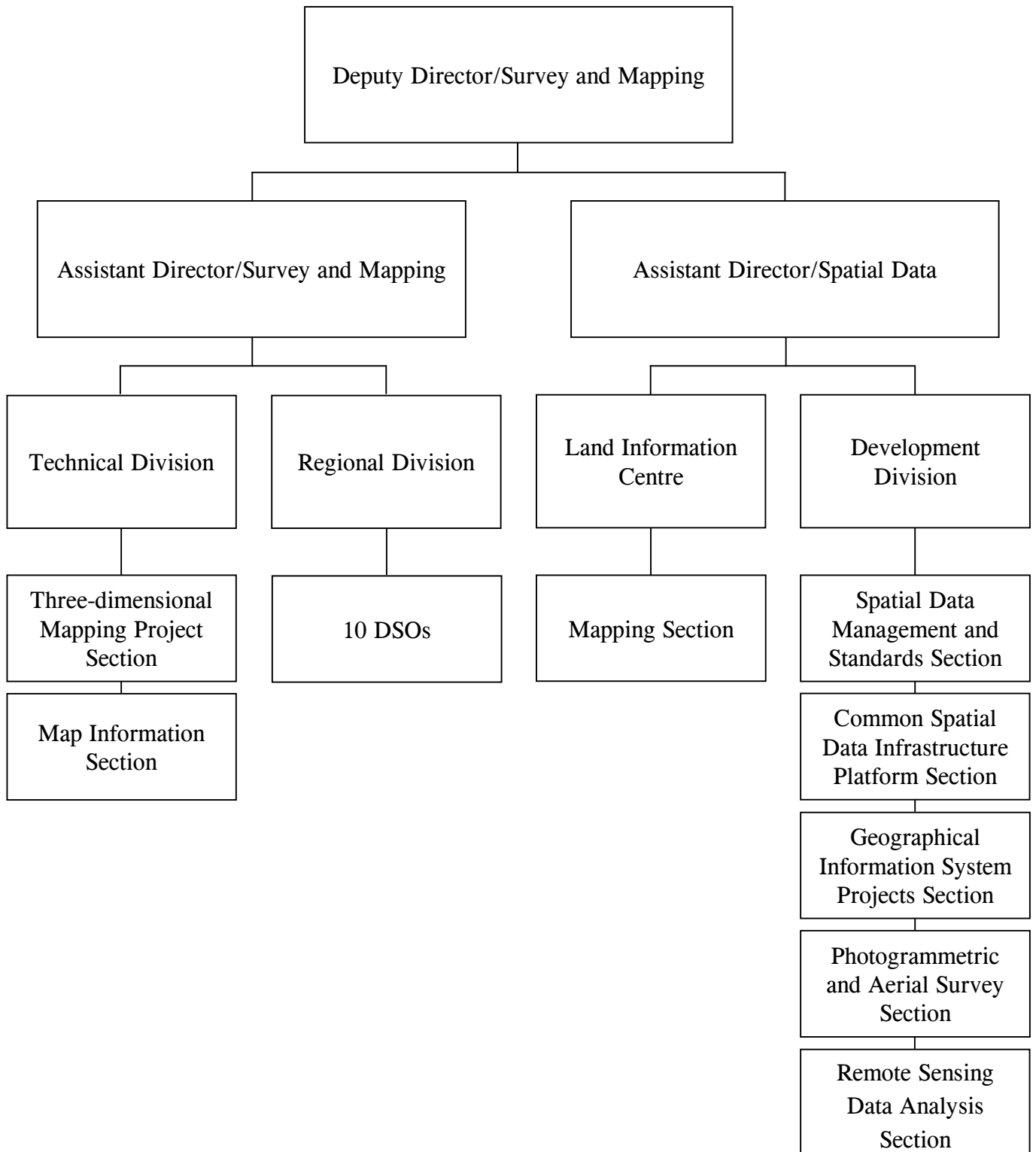
- 4.18 Audit has *recommended* that the Director of Lands should:
- (a) continue to closely monitor the implementation progress of territory-wide 3D digital map with a view to ensuring its timely completion;
 - (b) keep under review the utilisation of 3D pedestrian network and step up promotional activities as needed to encourage more users to utilise the 3D pedestrian network;
 - (c) closely monitor the implementation progress of 3D indoor map with a view to ensuring its timely completion; and
 - (d) take measures to early obtain consents from the property owners/property management companies for opening up their buildings' 3D indoor maps to the public.

Response from the Government

4.19 The Director of Lands accepts the audit recommendations. He has said that LandsD will:

- (a) continue to closely monitor the implementation progress of territory-wide 3D digital map with a view to ensuring its timely completion;
- (b) keep under review the utilisation of 3D pedestrian network and continue to promote it in various channels with a view to unleashing its potential;
- (c) reinforce the monitoring of the implementation progress of 3D indoor map for its timely completion; and
- (d) advance the seeking of consents from property owners/property management companies for opening up 3D indoor maps of their buildings to the public and clearly explain the merits of the project to them upfront.

**Survey and Mapping Office of the Lands Department:
Organisation chart (extract)
(30 November 2022)**



Source: LandsD records

Acronyms and abbreviations

Audit	Audit Commission
B/Ds	Government bureaux/departments
COR	Controlling Officer's Report
CSDI	Common Spatial Data Infrastructure
DSOs	District Survey Offices
GFS	Government Flying Service
GLD	Government Logistics Department
HKMS 2.0	Hong Kong Map Service 2.0
LandsD	Lands Department
LFDAC	Large format digital aerial camera
OGCIO	Office of the Government Chief Information Officer
SMO	Survey and Mapping Office
UAV	Unmanned aerial vehicle
2D	Two-dimensional
3D	Three-dimensional