



## Overall update of CSDI

### CSDI portal



The beta release of “CSDI portal for Public” was open to public in November 2022, in which different stakeholders such as public organisation, academia and consultants were cordially invited to participate the testing. The portal (<https://portal.csdi.gov.hk/>) was then officially launched on 29 December 2022 ([press release](#)), which provides free downloads for over 500 datasets in open and machine-readable format, as well as associated Application Programming Interface to facilitate the development of innovative applications.

### Launch of Proof-of Concept (PoC) on Smart Navigation Tool for the Visually Impaired/People in Need

To illustrate the ideas in making use of spatial data to develop a variety of innovative web and mobile applications for bringing social benefits and improving daily lives of the general public, some identified proof-of-concept (PoC) proposals were implemented through a multi-pronged approach.

One of the PoCs is the Smart Navigation Tool for the Visually Impaired/People in Need aiming to facilitate both indoor and outdoor navigation in a seamless journey with audio instruction. With the support from various NGOs, MTR Corporation, iconic shopping malls in Kowloon East, Spatial Data Office (SDO) of Development Bureau (DEVB) together with Energizing Kowloon East Office (EKEO) of DEVB and Lands Department (LandsD) collaborated and developed the PoC. This PoC has been integrated, as one of the modules named “Walk Assistant”, in the “My Kowloon East” (“MyKE”) App developed by EKEO. The launch ceremony was held at Geospatial Lab (GeoLab) on 11 January 2023.



## Thematic Topic:

### Framework Spatial Data Theme - Coordinate Reference System



Framework Spatial Data Theme (FSDT) provides a standard geographic framework for geocoding or referencing other data sets. For example, address, once standardised and geo-coded to location, can be further analysed geospatially in ways that would have never been possible otherwise. In this issue, we would like to introduce one of the FSDTs, Coordinate Reference System.

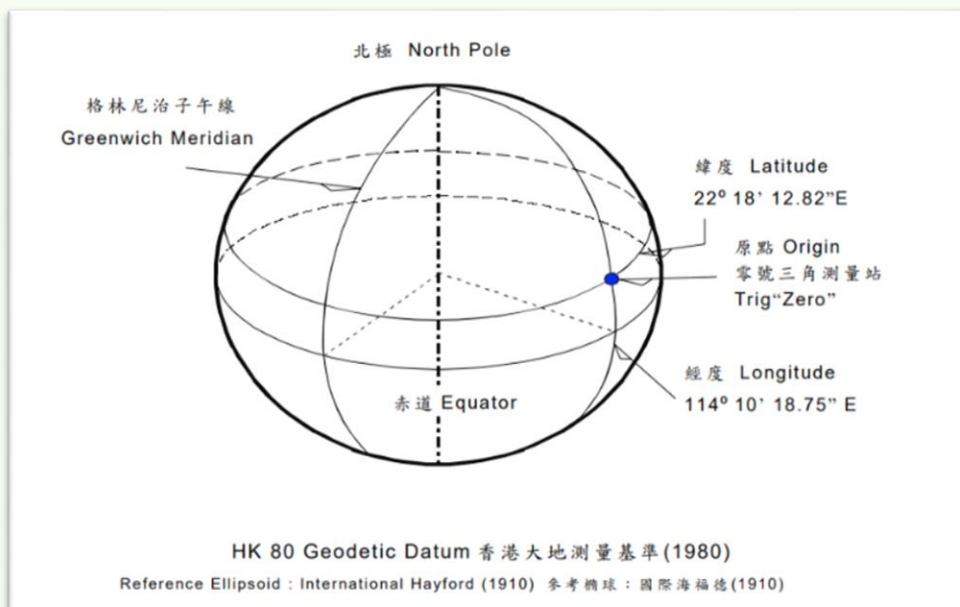
A Coordinate Reference System (CRS) FSDT provides a specification for uniquely referencing spatial information in space as a set of (X, Y, Z) coordinates and/or latitude and longitude and height, based on a geodetic horizontal and vertical datum.

#### 1. Geodetic Datum

An ellipsoid defined with orientation and position as well as size and shape are known as geodetic datum. There are two geodetic datum currently in use for horizontal control in Hong Kong. They are the local datum – Hong Kong 1980 Geodetic Datum (HK80) and the global datum – the World Geodetic System 1984 (WGS84).

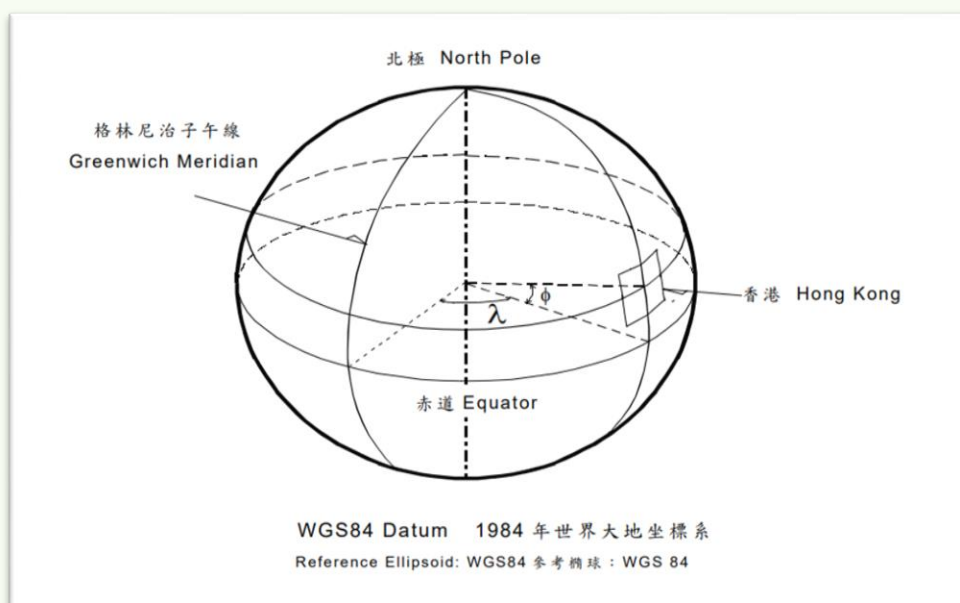
##### a. Hong Kong 1980 Geodetic Datum (HK80)

HK80 is a local datum. It is the reference datum for the Hong Kong 1980 Grid, but rarely used as the Geodetic Coordinate System to store and present spatial data. Details of the HK80 geodetic datum are illustrated in below diagram.



## b. World Geodetic System 1984 (WGS84)

The World Geodetic System defines a reference frame for the Earth. WGS84 is global datum, and commonly used as the CRS to store geodetic latitude and geodetic longitude. WGS84 is an earth-centred, earth-fixed Cartesian coordinate system. The origin of the system is at the geometric centre of the WGS84 Ellipsoid which also coincides with the Earth's centre of mass. The X-axis of this datum passes through the Greenwich meridian and the equator. The Y-axis forms a right-handed orthogonal plane on the equatorial plane. The Z- axis goes through the North Pole.





## 2. Cartesian Coordinate System

A map projection is a representation of the latitude and longitude of the ellipsoidal Earth surface by a planar surface according to certain mathematical functions.

### a. Hong Kong 1980 Grid (HK 1980 Grid)

The HK1980 Grid is a local rectangular grid system based on the HK80 Datum and Transverse Mercator projection. The projection parameters of the HK 1980 Grid are detailed in the table below:

|                       |                                                      |                   |
|-----------------------|------------------------------------------------------|-------------------|
| Grid System           | Hong Kong 1980 Grid System (HK 1980 Grid)            |                   |
| Projection            | Transverse Mercator                                  |                   |
| Geodetic Datum        | HK80                                                 |                   |
| Reference Ellipsoid   | International Hayford (1910)                         |                   |
| Origin of Projection  | Old Trig 2 "Patridge Hill"                           |                   |
|                       | Latitude                                             | 22° 18' 43.68" N  |
|                       | Longitude                                            | 114° 10' 42.80" E |
| Grid Coord. of Origin | 819069.80 mN                                         |                   |
|                       | 836694.05 mE                                         |                   |
| Scale Factor          | Unity (1.0) along the central meridian at old Trig 2 |                   |

The HK1980 Grid is extensively used in cadastral, engineering surveying and large scale mapping in Hong Kong. It is also the native storage format of most spatial data maintained by the Government bureaux and departments.

## 3. Vertical Datum

There are two vertical datums used for vertical control in Hong Kong. They are the Hong Kong Principal Datum (HKPD) and Chart Datum (CD).



## a. Hong Kong Principal Datum (HKPD)

Hong Kong Principal Datum (HKPD) serves as a reference for all heights and levels measured on land in Hong Kong. Back in 1866, the surveyors of the H.M. Surveying Vessel Rifleman mapped the northern shore of Hong Kong Island and fixed a bolt (then known as the 'Rifleman's Bolt') on a block of granite cornerstone at the Royal Naval Dockyard (now near the MTR Admiralty Station, Wanchai) as a benchmark. The level of the bolt was found to be 17 feet 10 inches (5.435 m) above a datum measured at the time. This datum was subsequently adopted as the Principal Datum (PD).



The 'Rifleman's Bolt' (left) and details of the soundings taken by H.M. Surveying Vessel Rifleman in 1866 (right) as displayed at the Hong Kong Maritime Museum, on loan from the Lands Department (courtesy of the Lands Department and the Hong Kong Maritime Museum).

## b. Chart Datum (CD)

The Chart Datum, formerly known as Admiralty Datum, is approximately the level of Lowest Astronomical Tide and is adopted as the zero point for Tide Tables since 1917. All depths and submarine contours on Navigation Charts refer to the Chart Datum. The Chart Datum is 0.15m below the Hong Kong Principal Datum.





CRS is a crucial basis for the sciences and technologies of Geoinformatics, including cartography, geographic information systems, surveying, and remote sensing. CRS is also an important basis in design and construction of engineering works, such as measurement of the existing site conditions for design and analysis and setting out accurate positions and levels of different features such as road, bridges, drainage and buildings etc. on site according to the design. Moreover, with the establishment of CRS FSDT, other data sets could be geocoded or referenced by coordinates which facilitates further analysis and information exchange.

#### *Reference materials:*

*Explanatory Notes on Geodetic Datums in Hong Kong of LandsD*

<https://www.geodetic.gov.hk/common/data/pdf/explanatorynotes.pdf>

*Story of a Bolt of the Hong Kong Observatory*

<https://www.hko.gov.hk/en/blog/00000204.htm>

## Latest activities of GeoLab

### Talks and Workshops



Starting the new school semester, in October, GeoLab re-ran the STEM Parent-child Workshop "Create an Interactive Web Mapping Application" targeted at Primary 5 to Secondary 2 students and/or their parents on 30 October 2022. Besides deepening students' knowledge of spatial data and web mapping application, it also built up their learning ability and creativity.





For further promoting the basic concept and applications of spatial data to the public, professional geospatial workshop "Exploring Spatial Data for GIS Application" was conducted on 22 October 2022, with hands-on practice for display, edit, query and analysis of spatial data being demonstrated. Same as before, the workshop was held with hybrid format, participants could join the virtual session as observers.



On 31 December 2022, workshop on "Introduction to Free and Open-source Geographic Information System (GIS)" was held for participants with basic experience and understanding of GIS. Free and open-source software (FOSS) are applications that users can freely access and modify their source code. FOSS GIS provides alternatives to some commercial off-the-shelf software. This workshop introduced the basics open-source software and programming language for handling geospatial tasks.





## Theme talks x Workshops

Three professional geospatial theme talks x workshops under the theme “Urban Planning and Development” were held in October and November 2022:

- ✧ Concept of Urban Planning and Development
- ✧ GIS Application in Urban Planning and Development
- ✧ Workshop on Application of GIS in Urban Planning and Development



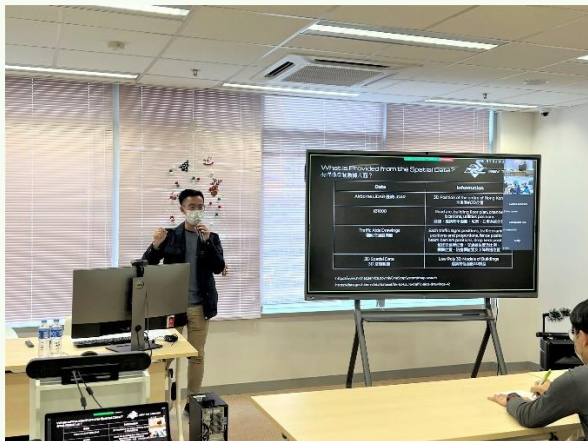




There were demonstrations with hands-on practice in each module. Objectives of the three 'talks x workshops' were to provide an overview of urban planning and development in Hong Kong and to demonstrate how technologies in particular GIS could be adopted for various planning and development tasks. The participants would be given the opportunity to operate GIS tools.

## Feature Talk

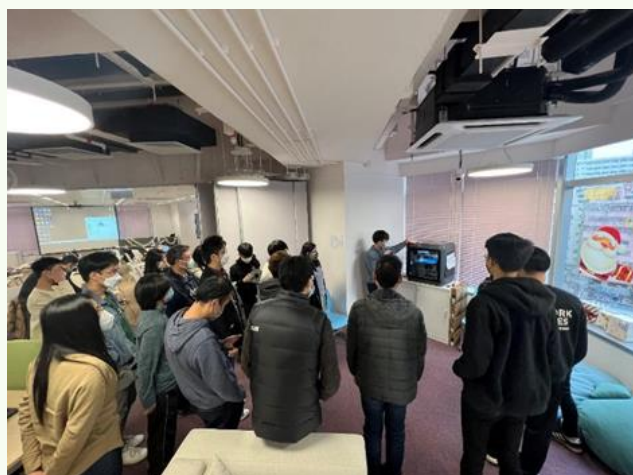
An appealing and practicable application of spatial data was demonstrated in "Using spatial data for car-racing games" on 3 December at GeoLab. Spatial data and 3D data provide accurate depictions of real-world environments that can be easily imported into development tools for 3D model generation, thus greatly reducing the game developers' efforts to create large-scale environments. This sharing session explored the application of spatial data for creating a 3D environment in the game industry, different game tools and GIS software were applied for game demonstration.



## Highlights of the activities and events

### 3D Printing - Using LiDAR Data to Create 3D City Models

Activity "3D Printing - Using LiDAR Data to Create 3D City Models" was held on 17 December 2022 exclusively for GeoLab members. Participants were taught to generate a 3D city model of areas in Hong Kong from LiDAR data and turned digital spatial data into reality, thus making the 3D model as a souvenir for free and brought it back home.







## Launch Ceremony of Walking Assistant

"Walking Assistant" is a Proof-of-Concept developed for the visually impaired, focusing in Kowloon East, providing the visually impaired with indoor and outdoor positioning and seamless navigation. Guest speakers from different sectors introduced the concept of "Walking Assistant" at the launch ceremony and shared how spatial data can embrace social inclusion on 11 January 2023. Details of the event can be found at <https://csdigeolab.gov.hk/en/upcoming-events/launch-ceremony-of-walking-assistant-230111>.



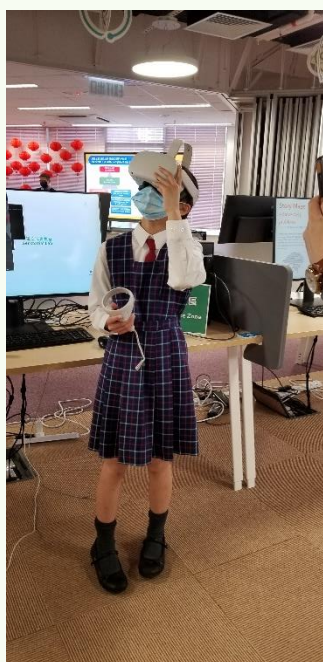
## GeoLab's Experience Day

To make the knowledge and applications more realistic to the public, on 14 January 2023, GeoLab organised different interactive games and showcases which were available throughout the Experience Day. Some activities were running all day long for interested parties to experience and learn more about what is spatial data and its practical usage:

- ✧ Driving experience simulator  
《Rev to Vertex》 - An RPG story-driven car simulator set in the unexplored hills and streets of Hong Kong
- ✧ Virtual reality experience zone
- ✧ 3D Visualisation Map
- ✧ Other games related to spatial data



Other sharing sessions and workshops which required reservations with different target audiences also took place on that day. STEM Parent-child Workshop “Create an Interactive Web Mapping Application” was held for primary 5 to secondary 2 students and their parents. Participants were also given the chance to gain first-hand experience in operating portable and backpack mobile mapping systems for collecting 3D spatial data in another talk and demonstration by the Lands Department. In the aspect of career planning, career talk shared by professionals of different disciplines on how spatial data being used in their works was organised in the afternoon session.







空間數據共享平台  
Common Spatial  
Data Infrastructure

# NEWSLETTER

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For details of upcoming and past activities, please visit <https://csdigeolab.gov.hk/en/> to register for GeoLab's activities and have a recap!