



### Land Surveying Division

Sr Koo Tak Ming LSD Council Chairman

## LSD Council Activities

The LSD Council meeting via Zoom was successfully held on 3 June in the HKIS Board Room. Members could still not meet in person because of the Covid-19 outbreak and social distancing measures in place. Those measures were recently relaxed, so the Council should resume its normal face-to-face meetings soon.

However, it will continue its current social distancing measures to minimise the risk of infection and uphold strict personal and environmental hygiene standards.

## Task Force on Standard Survey Contracts for Underground Pipelines

The Task Force is being formed to explore if a standard contract for leak detections and repairs could be finalised for public members' use.

The LSD notes that the Government is promoting leakage detection and the repair of private water mains in building developments. This is amongst its key initiatives for controlling water loss in Hong Kong and meeting the 2030 water savings target that it pledged in its policy address.

The LSD wants the HKIS to include its input on proper quality control in the terms of the contract and technical specifications of standard surveys of underground pipelines for detecting leaks.

## Roles of Land Surveyors in Firefighting and Road Asset Management

Many people have asked me what land surveyors really do in their careers. The question (Q) merits different answers at different points in time.

Sr Eddie WONG is a land surveyor in the Fire Services Department's Information Technology Management Unit who shared his answer to the Q in a CPD on his role in helping firefighters perform their jobs effectively.

Sr Alvin TSANG is an assistant land surveyor in the Lands Department's Railway Development Survey Unit and his APC Practical Task was awarded with the Best LSD APC Award 2019. Alvin's answer to the Q is to support his highway engineers on different road-related and asset management projects.

By applying their expertise in GIS, spatial data, and IT project management, along with adopting the latest MLSI and GNSS technologies, Eddie and Alvin's answers to the Q were inspiring. Thanks go to them for giving members diverse insights into the role of land surveyors. Well done!



Sr Eddie WONG (middle)



Sr Alvin TSANG (middle)

## The BeiDou Navigation Satellite System (BDS)

The last satellite that the BDS successfully sent into space on 23 June marked the completion of China's domestically developed BeiDou constellation – one of four global navigation networks alongside the United States' GPS, Russia's GLONASS, and the European Union's Galileo.



Launch of the BeiDou Constellation's Last Satellite

This last satellite, the 55th in the BeiDou Family, was sent into a preset orbit by a Long March-3B carrier rocket from the Xichang Satellite Launch Center in Sichuan Province. It is a geostationary earth orbit satellite of the BDS-3 system and came 26 years after the BeiDou-1 project officially started in 1994.

### Three Phases of BDS Development

China began building its own navigation system, named after the Chinese term for the Big Dipper constellation, during the 1990s. The satellites started serving the Asia-Pacific region in 2012. In over 30 years, the BDS has achieved a range of goals such as shifting from active to passive positioning and expanding its service coverage from China to the Asia-Pacific region and eventually the world.

**The first phase**, mentioned above, involved building the BeiDou-1 system in 1994. This task was completed in 2000 when two geosynchronous equatorial orbit (GEO) satellites were launched. A third GEO satellite was launched in 2003 to further enhance the system's performance.



First Phase of BeiDou (Figure from CGTN)

The completion of BeiDou-1 made China the third country after the US and Russia to have a satellite navigation system. In 2013, BeiDou-1 was decommissioned.

**The second phase** involved building the BeiDou-2 system, which shifted from active to passive positioning and launched regional navigation technology services for the Asia-Pacific region. Construction of BeiDou-2 started in 2004. A network of 14 satellites, which comprised five GEO satellites, five inclined geosynchronous orbit (IGSO) satellites,



and four medium-earth orbit (MEO) satellites. was completed in 2012. BeiDou-2 added a passive positioning system, which meant that user devices didn't have to send signals and location could be determined just by receiving the signals. Its completion has provided the Asia-Pacific region with positioning, speed measurement, timing, and short message communication services.



Second and Third Phases of BeiDou (Figure from CGTN)

**The third phase** involved the development of the BeiDou-3 system, which meant setting up “crosslink” and realising global networking. Construction began in 2009 and finished in 2020. The network comprises 30 satellites: three GEO satellites, three IGSO satellites, and 24 MEO satellites. BeiDou-3 features active and passive positioning and solves the problem of global stationing for global networking by utilising “crosslink” or satellite-to-satellite connection “dialogue”. It serves global users with positioning, navigation, timing, short message communication, and international rescue services, as well as provides augmentation system, precise point positioning (PPP), and regional short message communication services in and outside China.

### The Way Forward for BeiDou

BeiDou has established a bilateral cooperation mechanism with three other navigation systems to promote interconnection and services. Space experts say that BeiDou has strengthened the world's satellite navigation capabilities and will help provide better services for global users.

The BeiDou system is China's first major space infrastructure to provide public services to the world. Its completion has undoubtedly played an important role in various countries' social development, disaster relief, and economic transformation efforts.

As an important spatio-temporal infrastructure, BeiDou has three functions: 1) navigation and positioning, 2) precise timing, and 3) short message communication. It can more intelligently coordinate resources in the fields of transportation, agriculture, forestry, fishing, meteorology, and communications than what came before it. It also provides accurate services in such areas as piling, warehousing and logistics, and electrical power inspections.

Last, BeiDou provides accurate space-time system services that allow land surveyors to perform their jobs better than under the conventional GNSS.



Application of BeiDou (Figure from CGTN)