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COUNTRY REPORT

GIS Activities, 1997 - 1999

(Paper Submitted by Singapore)

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GIS ACTIVITIES, 1997 – 1999

(PAPER SUBMITTED BY SINGAPORE)

1 INTRODUCTION

In Singapore, the responsibilities of cadastral surveying, topographic mapping and hydrographic charting rest with three government authorities. They are:

(a) Survey control and cadastral surveying - Survey Department, Ministry of Law.

(b) Topographic Mapping – Mapping Unit, Ministry of Defence.

(c) Hydrographic Surveys and Charting – Hydrographic Department, Maritime and Port Authority of Singapore (MPA), Ministry of Communications and Information Technology.

The Land Systems Support Unit, Ministry Law, administers the Land Data Hub which aims to provide an integrated infrastructure for sharing land data in digitised form.

2 SURVEY AND MAPPING CONTROL

At present, the horizontal control consists of about 70 first order points. Based on these control points, Survey Department undertook a project to establish an Integrated Survey Network (ISN) using Global Positioning System techniques to densify horizontal control. The project was completed in mid 1997. The ISN consists of about 3,500 survey control markers planted at approximately 300 m intervals along all the major roads. In 1998, Survey Department in collaboration with the Nanyang Technological University and the University of New South Wales embarked on a research project to set-up 4 multiple base stations. This project will assist in maintenance of the ISN and use of GPS in future land surveys.

The Precise Levelling network consists of approximately 623 benchmarks located at 1km intervals along major roads. A five years revision cycle is done to ensure that the datum for height measurements is maintained. In 1997, 17 km of precise level routes were observed to establish 17 precise levelling benchmarks (PLBMs). 119 PLBMs were verified and 7 of them were replaced. In 1998, 22 km of precise level routes were observed to establish 18 PLBMs. 98 PLBMs were verified and 12 of them were replaced. In 1999, 114 PLBMs were verified and 19 of them were replaced.

3 CADASTRAL SURVEYING

Cadastral surveys are carried out under the provisions of the Land Surveyors Act. The Land Surveyors Board with the approval of the Minister of Law, made the following Rules for carrying out the purposes of the Act:-

(a) The Land Surveyors Board Rules.

(b) The Land Surveyors Rules.

(c) The Land Surveyors (Survey Department Fees) Rules.

(d) The Land Surveyors (Conduct of Cadastral Surveys) Rules.

(e) The Land Surveyors (Code of Professional Conduct and Ethics) Rules.

(f) The Land Surveyors (Investigation Committees) Rules.

The Land Surveyors (Amendment) Act, enacted in August 1999, was brought into operation on 1 March 2000. The Act requires every land surveyor (and not only land surveyors who conduct cadastral surveys) to be registered. For practising surveyors who are currently not registered, a 4-year grace period is granted for them to be registered, with a further two years extension on a case by case basis. The Amendment Act also empowers the Land Surveyors Board to approve assistant surveyors employed by land surveyors. The Land Surveyors Board also made the Land Surveyors (Approved Assistant Surveyors) Rules which came into operation on 1 Mar 2000.

A registered surveyor who holds a practising certificate is entitled to provide survey services in Singapore. On completion of a cadastral survey of land lots and strata units, the surveyor is required to submit the survey documents viz the field notes, calculation sheets and survey plan, to the Survey Department for examination. When the survey plan is approved by the Chief Surveyor, all these documents are filed in the department as public records. Other survey plans need not be examined and approved by the Chief Surveyor.

At the end of 1999, there were 60 registered surveyors of whom 38 held practising certificates.

Over the past 3 years, the position of cadastral survey work was as follows:

Year	Subdivision of land (No. of lots)	Subdivision of buildings (No. of units)
1997	5,310	37,249
1998	4,319	44,787
1999	4,905	40,532

The Survey Department performs mainly the regulatory role in examination of surveys, providing survey controls and updating of cadastral maps. These 1600 cadastral maps, plotted at a scale of 1:1000, depict the lot boundaries, lot identifier, area, land tenure, etc. They are widely used by the public and private sector for land administration and physical development.

The cadastral maps have been converted into digital form for use by other public organisations through the Land Data Hub. The Survey Department has completed upgrading of the computer system (SURMAP) and made it Year 2000 compliant.

Currently, the cadastral maps and the street directory maps can be assessed through the Integrated Land Information Services (INLIS) which provides web-based access and e-commerce capability. Payment is by cashcard or Internet GIRO at users' terminal. More survey records will be made available in the enhancement to INLIS which is now in progress.

The availability of the digital Street Directory has also enabled entrepreneurs to release several version of the Street Directory in CD-ROMs and other services for the community.

The Survey Department conducted a pilot coordinates conversion project in 1997 and established the procedures for converting existing coordinates of land lots to the ISN coordinates system. This new coordinated cadastre system to be established under the Boundaries and Survey Maps Act, 1988 will supersede the existing bearing and distance survey system to define land lots. Survey Department commenced the programme of converting the existing land parcels to the SVY 95 datum. The conversion project is expected to take about 5 years. In October 1999, the department outsourced the conversion software and fieldwork of 13 survey districts to registered surveyors.

4 TOPOGRAPHIC MAPPING

Mapping Unit continued with the use of the 1:5,000 digital map base to maintain all the other national map series basing on aerial photography that was conducted annually. For the purpose of sharing with other ministries and government departments, the updated digital map base is sent to the Land Data Hub on a yearly basis.

For the period under review, Mapping Unit has published the following paper maps:

(a) 1:25,000 Topographic Map, Series L802 Edition 8SMU in 1998

(b) 1:25,000 Road Map, Series SMU1169 Edition 6SMU in 1998

(c) 1:50,000 Topographic Map, Series SMU075 Edition 6SMU in 1999

(d) 1:10,000 Road Map, Series SMU1168 Edition 5SMU in 1999

5 HYDROGRAPHIC SURVEYS

Hydrographic surveys are carried out by two 15-metre survey launches. Each launch is equipped with an automatic data acquisition system integrated to the Differential Global Positioning System (DGPS)/Differential GLONASS and

echo sounder. In late 1999 the positioning system was upgraded to a Real Time Kinematic DGPS.

5.1 CHARTING

Nautical Charts

In 1998, all the 23 nautical charts covering the Straits of Malacca and Singapore including the port waters of Singapore were converted to the WGS 84 Datum. In addition, the new editions of the nautical charts incorporating the revised Traffic Separation Scheme (TSS) and Mandatory Ship Reporting Systems (STRAITREP) were released for sales to the public on 1 October 1998. The revised TSS and STRAITREP were approved by the International Maritime Organisation (IMO) and came into force effectively from 1 December 1998.

Charts for Small Craft

A series of user-friendly recreational charts titled "Charts for Small Craft" covering Singapore Strait and approaches was compiled and produced. The water-resistant series consists of 22 charts and accompanying information for use by pleasure craft. These charts highlight information shallower than 5-metre depth contour critical to the safety of small craft. The locations of marinas and pleasure craft recreational grounds are also shown on these charts. Other information on the sea conditions, climate, tidal characteristics, emergencies and distress, communication procedures are also included.

Electronic Navigational Charts (ENCs)

The production of the Singapore Electronic Navigational Charts (ENCs) covering Singapore waters and its approaches was completed in 1996. The Singapore ENCs, which comply with the International Hydrographic Organsization (IHO) specifications, were available in CD-ROM and released for sales commercially in March 1998. The ENCs are for use with the Electronic Chart Display and Information System (ECDIS), an advanced navigational tool to enhance safety of navigation approved by IMO as a paper chart equivalent.

Electronic Tide Table

The MPA launched the first edition of the Singapore Electronic Tide Tables (SETT) for year 2000 in CD-ROM on 13 Dec 1999 for commercial use. The SETT contains predictions of tidal heights and tidal streams around Singapore. Such information is also captured in the annual publication "Singapore Tide Tables and Port Information". The SETT is a timely complement given the increasing use of digital navigational aids such as the Singaproe ENCs for use with ECDIS.

5.2 INTERNATIONAL ACTIVITIES

In the international front, the Hydrographic Department participated in "The Four Nations Joint Re-survey of Critical Areas and Investigation of Dangerous/Unconfirmed Shoals and Wrecks in the Straits of Malacca and Singapore", jointly undertaken by the 3 coastal states and Japan. From October 1996 to February 1998, a total area of 780km^2 was surveyed. The survey confirmed the existence of 22 wrecks and 21 shoals. Fourteen (14) control survey points were also established in WGS-84 datum along the coasts of Sumatra, Peninsular Malaysia and Singapore. The results of the joint survey facilitated:

(a) the revision of the Traffic Separation Scheme (TSS) in the Straits of Malacca and Singapore; and

(b) the joint production of the ENCs covering the Straits of Malacca and Singapore by Indonesia, Malaysia, and Singapore, with the assistance of Japan.

To promote the use of ECDIS for safe navigation:

(a) Singapore and the United Kingdom Hydrographic Offices (UKHO) initiated the Singapore Hong Kong Admiralty Raster ENC Demonstration (SHARED) Programme. Due to limited availability of ENC data, the programme is aimed to promote and demonstrate the combined use of official vector ENC and raster data for safe navigation. Under this programme, the Singapore and Hong Kong ENCs with Admiralty raster charts covering the South China Sea were used with ECDIS on board ships plying between Southampton,

Singapore and Hong Kong. The programme is extended to include other countries; and,

(b) an international ECDIS Conference and Exhibition jointly organized by the MPA and the UKHO, with the support of the International Hydrographic Bureau was held in Singapore in October 1998. The Conference and Exhibition attracted 350 speakers and delegates from 37 countries;

The Hydrographic Department also conducted training courses on Hydrographic Surveying for Port Waters, Digital Cartography, ENC Production and ECDIS.

6 LAND DATA HUB

The Land Data Hub (LDH) provides an integrated infrastructure for sharing land data in digitised form. This activity facilitates the public administration on land matters as well as provides an efficient and cost effective way for the Government to provide public administration services on land.

The vision of the Land Data Hub involves three strategic thrusts - INLIS (Integrated Land Information Services), Land Base Information and LandNet (Land Information Network Infrastructure).

INLIS was made available to the private sector since 1998. It integrates land information from various government agencies for the public, giving them easier access to land information via the Internet.

Land Base Information was introduced since 1999. This information layer integrates various data in Land Data Hub to produce a basic land information layer that is fundamental to the development of most Geographic Information System (GIS).

The Land Data Hub commissioned the Land Information Network Infrastructure (LandNet) pilot project in February 2000. LandNet provides an effective and efficient conduit for the sharing and distributing of land data across government and private agencies. When fully implemented, it will integrate various data supplying agencies' land databases, maintain the data in an open

format and also automate the process of land data distribution. It will provide the foundation for online delivery and exchange of up-to-date land data.

The Land Data Hub is continually exploring new technologies and standards in the areas of National Infrastructure, Internet and Open GIS to establish a national land information infrastructure for the new millennium.