

**ECONOMIC AND SOCIAL COUNCIL**

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Item 6 (b) of the provisional agenda\***

**COUNTRY REPORTS**

**COUNTRY REPORT ON CARTOGRAPHIC ACTIVITIES IN SINGAPORE  
(2003- 2005)**

**Submitted by Singapore \*\***

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\*\* Prepared by Singapore.

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**COUNTRY REPORT ON  
CARTOGRAPHIC ACTIVITIES IN SINGAPORE**

**(2003 – 2005)**

**(SUBMITTED BY SINGAPORE)**

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**1.0 INTRODUCTION**

Three agencies are responsible for the cartographic activities in Singapore. The survey control infrastructure and cadastral surveying are undertaken by the Singapore Land Authority (SLA), topographical mapping by the Singapore Armed Forces Mapping Unit (SAFMU) and hydrographical surveys by the Maritime and Port Authority (MPA) of Singapore. The Singapore Land Authority also provides Land Information services and administers the Land Data Hub for sharing of data among agencies.

**2.0 SURVEY AND MAPPING CONTROL INFRASTRUCTURE**

The Integrated Survey Network (ISN) which is the national survey control infrastructure has been in place since 1999. At present, the ISN consists of about 65 first order markers, which were established since 1995. The second order network was established along major roads is

used by as their control for all types of survey including cadastral survey.

A new GPS reference station network will be launched in September 2006 to replace the existing network (SIMRSN) which was established in 1999. The new network which is known as the Singapore Satellite Reference Station Network (or SiReNT) is based on the Network-RTK technology. It supports both post-processing and real-time GPS applications through nation-wide GPRS network. In SiReNT, there are 5 permanent GPS reference stations strategically located to maximise the coverage area for whole island of Singapore. For more information of SiReNT, please visit <http://www.sirent.sla.gov.sg/>

Presently, the precise levelling network consists of approximately 500 precise levelling benchmarks located at approximately 1 km intervals along major roads. A project has started in 2005 to establish a Geoid Model to convert the ellipsoidal height measured by GPS to the reduced level height measured to mean sea level. The project is expected to complete in Q1 of 2007.

### **3.0 CADASTRAL SURVEY**

The Singapore Land Authority (SLA) has launched the SVY21 cadastral survey system in August 2004. The new system which replaced the former cadastral survey system is based on the coordinated cadastre concept. With the new system, which utilises the new technology such as the GPS and automation, land surveys can be carried out faster and more efficiently.

The SVY21 plane coordinate system is based on the Transverse Mercator projection with the origin located at an unmarked point situated approximately in the centre of Singapore. The SVY21 system is based on the WGS-84 ellipsoid geocentric datum. The ISN

infrastructure which was established under SVY21 system provides the surveyors with survey control points.

Under the new system, the submission of the cadastral survey job to the authority is carried out in digital format. The survey data, observations and results are set out in ASCII format in two files, the "Field Survey File" and the "Result Data File". The surveyors in the field use Total Station with data logger for their surveys. The survey data from the logger can be downloaded and converted into ASCII format for submission to the authority automatically.

With the switch to the SVY21 system, the electronic submission (E-Transmission) of a cadastral survey job to the authority for approval was subsequently implemented in 2005. It allows private registered surveyors to submit their survey jobs digitally via secure electronic channel to the authority for processing and approval.

A cadastral survey GIS database known as the Consolidated GIS System (CGS) was established in 2004 to replace the SURMAP system. The new CGS is based on the ArcGIS software and is designed specially for the SVY21 system.

In the year 2005, there were 68 practising surveyors in Singapore. Over the past 3 years, the output of cadastral survey work was as follows:

Year	Subdivision of land (No. of lots)	Subdivision of buildings (No. of units)
2003	3,125	58,870
2004	2,345	46,510
2005	2,156	40,357

## **4.0 TOPOGRAPHICAL MAPPING**

Topographical mapping updates are carried out with the aid of aerial photography and supplemented with field surveying using Differential GPS receivers and Total Stations. The following are the new editions since the last conference

- a. A new edition of the 1:50,000 topographic map of Singapore (ie Series SMU075, Edition 8) was produced in 2006.
- b. A new edition of the 1:25,000 road map of Singapore (ie Series SMU1169, Edition 7 SMU) was produced in 2004
- c. A new edition of the 1:25,000 road map of Singapore (ie Series SMU1169, Edition 8 SMU) was produced in 2006

To demonstrate our commitment to deliver consistent and high quality spatial products, we adhere to a well planned and documented Quality Management System (QMS). In 2006, SAFMU attained ISO 9001:2000 certification for the provision of mapping and geospatial support for the SAF and other government agencies.

## **5.0 HYDROGRAPHICAL SURVEY**

Hydrographical surveys are carried out aboard two 15-metre survey launches each launch is equipped with a Multibeam Survey System integrated with Differential GPS receivers and an Inertial Navigation System (INS). Each launch is also equipped with an Electronic Chart Display and Information System (ECDIS). The survey data is processed and used to update a series of nautical charts used for navigation.

## **5.1 CHARTING**

### **5.1.1 Dual-Badged Charts**

The Bilateral Arrangement established between the United Kingdom Hydrographic Office (UKHO) and MPA in Year 2001, has proven to be very successful.

There were 15 nautical charts covering Singapore waters and its approaches with new chart editions published once every 2 years. These jointly produced charts, called “dual badged” charts, are based on the World Geodetic System 84 Datum (WGS 84) and conform to the specifications of the International Hydrographic Organisation for International Charts.

### **5.1.2 Singapore Charts**

There are 9 Singapore chart produced and printed by the department. In 2005, 7 of these charts were selected to be part of a “Print On Demand” (POD) series where we would print the charts only when customers request them. These charts would be digitally corrected with the latest monthly updates and printed with Ultra-Violet ink using our in-house A0 plotters. This has resulted in significant cost and space savings to both our chart agent and our department as compared to lithographic printing by commercial companies. In addition, mariners can confidently use these POD charts as they are ensured they are accurately updated.

### **5.1.3 Charts for Small Craft**

A new edition of user-friendly recreational charts titled “Charts for Small Craft” covering Malacca Strait (Port Dickson), Singapore Strait up to Pu Tioman was published in Feb 2005. These charts are bound into a book containing a series of 19 water-resistant charts and

accompanying information for use by pleasure crafts. These charts are customised to highlight water depth information shallower than 5-metre depth contour which are critical to the safety of small crafts. The locations of marinas and pleasure craft recreational grounds are also shown on these charts. Other information on sea conditions, climate, tidal characteristics, vertical clearances, emergencies and distress, communication procedures are also included.

## **5.2 QUALITY MANAGEMENT SYSTEM**

The Department successfully upgraded the certification from ISO 9002:1994 to ISO 9001:2000 standard on 2 Jun 2004. In addition, an independent 6 monthly audit on the Department's ISO Quality Management System was successfully carried on 25 May 2005. The certification covers hydrographical survey, cartography, Electronic Navigational Charts (ENCs) and Aids to Navigation. With the new ISO management in place, the Department would better meet the changing demands of customers.

## **5.3 INTERNATIONAL ACTIVITIES**

On the international front, the Hydrographic Department was involved in:

- (a) the joint production of the Electronic Navigational Charts (ENCs) covering the Malacca and Singapore Straits. The ENCs were jointly produced by the Hydrographic Offices of Indonesia, Malaysia, and Singapore, with the assistance of Japan. The ENCs were commercially released on 26 Dec 2005.
- (b) To increase the coverage of ENCs, Singapore together with members of the East Asia Hydrographic Commission (EAHC) jointly carried out production, Quality Assurance and ECDIS sea trials using the South China Sea (SCS) ENC. This was a

landmark event in hydrographic history where all 8 members of the EAHC jointly produced the SCS ENC's and was officially launched on 31 Mar 2005.

To promote the use of Electronic Chart Display and Information System (ECDIS) for safe navigation:

- (c) The MPA and the UKHO jointly organise the 2<sup>nd</sup> International ECDIS Conference and Exhibition in Singapore from 7 – 9 October 2003. This conference was opportune as mariners were displayed an increasing interest in the use of ECDIS but concerned by the lack commercially available official Electronic Charts covering the main the shipping routes. The conference addressed this issue and followed up actions were drawn up. Some examples of our joint efforts in increasing the coverage of official ENC's covering main shipping routes were the successful release of the Malacca and Singapore Straits and the South China Sea ENC's.

## **6.0 LAND INFORMATION SYSTEM**

### **6.1 INTEGRATED LAND INFORMATION SERVICE (INLIS)**

INLIS is a one-stop e-commerce portal that sells property and survey information. The public may search for information on a property by address, land or strata lot no and purchase it using online payment modes such as credit card, direct debit, stored-value card etc.

The information that may be searched includes details on landownership, land tenure, last transacted prices, lot particulars, title plans, survey plans, control point information etc.



INLIS was first introduced in 1998. It was re-developed to make it more user friendly and to incorporate a map-based search capability in Nov 2005. There are currently 14 information products in INLIS and by the end of 2006 the product range will increase to 25.

## **6.2 LAND INFORMATION NETWORK INFRASTRUCTURE (LandNet)**

SLA manages the Land Data Hub, a national repository of land information. The Hub collects information such as road, building, services, topographical data etc from government agencies and facilitates the sharing of the information across the public sector via the LandNet. This eliminates the need for agencies to approach one another individually when searching for information.

LandNet is a web-based spatial data sharing portal developed using GIS technologies such as Spatial Data Warehousing, Spatial ETL (Extraction, Transformation and Loading) tools and GIS Web Services. for secured spatial data sharing effectively over the web. It can also be used as a shared platform upon which common GIS applications and services can be developed and used by multiple agencies.