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Conference for Asia and the Pacific**

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**Conference papers: Invited papers on achievements and developments in
Geographical information management in addressing national,
regional and global issues.**

**Country Report On
Sdi Activities In Singapore**

(2010 – 2012)

(Submitted By Singapore)

* Submitted by Singapore

**COUNTRY REPORT ON
SDI ACTIVITIES IN SINGAPORE**

(2010 – 2012)

(SUBMITTED BY SINGAPORE)

SUMMARY

Proliferation of geospatial technology in recent years has revolutionised the tradition of geospatial data infrastructure and management in the way of data sharing, data authentication, data control etc. At national level, a holistic and comprehensive approach is required to upgrade National Spatial Data Infrastructure (NSDI) from time to time in order to stay relevant without being obsolete.

The Survey and Mapping Control Infrastructure has been further intensified with better coverage to cater for more user's needs and requirements. Regular control and maintenance are performed to assure the quality of data at any time. The current cadastral survey system is currently on a transition to "Smart Cadastre" where 3D component will be highly at stake. With the introduction of 3D component, another initiative of 3D Topographical Mapping will be seen as a tool to support and complement the development of 3D Cadastre in years to come. Ultimately it will facilitate better policy, decision-making and governance of geospatial data.

This report describes the progress update since the Eighteenth United Nations Regional Cartographic Conference for Asia and the Pacific.

- 1.0 Introduction**
- 2.0 Survey and Mapping Control Infrastructure**
- 3.0 Cadastral Survey**
- 4.0 3D Topographical Mapping**
- 5.0 Development of National Spatial Data Infrastructure (NSDI)**

1.0 INTRODUCTION

Generally, there are three main agencies responsible for the land surveying, mapping, cartographic and geospatial information activities in Singapore. The geodetic control infrastructure and cadastral surveying tasks are undertaken by the Singapore Land Authority (SLA). The topographical mapping is the responsibility of the Singapore Armed Forces Mapping Unit (SAFMU) and hydrographical surveys is conducted by the Maritime and Port Authority (MPA) of Singapore. Since early this year, SLA has started a team to establish high resolution Digital Terrain Model (DTM) at national level. The Singapore Land Authority is also responsible for the development of National Spatial Data Infrastructure (NSDI) that supports the sharing of geospatial data across government agencies. Other thematic mapping such as road network, buildings etc. are being carried out by the relevant authorities. (i.e. transport and building authority).

2.0 SURVEY AND MAPPING CONTROL INFRASTRUCTURE (GEODETIC)

The Singapore's national survey control network infrastructure known as the Integrated Survey Network (ISN) was established since 1999. At present, the ISN consists of about 65 first order markers and about 6000 second order markers. The second order network markers are densely situated along major roads with good accessibility. These second order control points are used as survey control for all cadastral and engineering survey.

The Singapore Satellite Positioning Reference Network, SiReNT system was implemented by Singapore Land Authority (SLA) in September, 2006. This CORS system has been in operation for almost 6 years and has gained superior recognition as the authoritative Differential GPS (DGPS) infrastructure in Singapore. SiReNT is a nation-wide system that serves as the national geographic reference frame and provides homogeneous coordinates system for various positioning and geospatial needs. The user base has grown to more than one hundred for applications such as land surveying, mapping, GIS data acquisition and engineering positioning. Presently, we have a total of 7 permanent GPS reference stations strategically located across whole island of Singapore, operating 24/7 throughout the year.

There is an increased reliance of satellite positioning technology in everyday applications and businesses such as navigation, vehicle and assets tracking, monitoring of structural deformation and weather prediction. The SiReNT has become the key component in providing accurate and reliable services in these areas. In order to meet the user's needs, SiReNT must be flexible in delivery of its services and dynamic in the management of the infrastructure. It must be able to keep up to the pace of GNSS and ICT developments.

At present, the national height datum of Singapore consists of about 450 precise levelling benchmarks located at an interval of about 1 km. Constant revision and rationalisation of the network are performed from time to time to make sure height values of each benchmarks are always relevant and compatible.

SLA started on a project in March 2005 to create a Geoid Model for Singapore. This project involved precise levelling exercise of about 50 benchmarks and DGPS survey on the same benchmarks. The First Geoid Model in Singapore has been in place since end of 2009 and named SGeoid09.

3.0 CADASTRAL SURVEY

The cadastral survey in Singapore is conducted based on the SVY21 cadastral survey system. The new system is based on coordinated cadastre concept and was in place since August 2004.

Presently, there are 72 practising registered surveyors (registered with the Land Surveyors Board) in Singapore as at 3rd Sept 2012. 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)
2009	2,296	13,679
2010	2,283	14,576
2011	2,279	13,257

* Includes Private and Public (Housing Development Board) Strata Lots

With increasingly complex developments above ground and usage of underground space where the structure cannot be seen, a 2D cadastral survey system cannot adequately satisfy the need for measurements, spatial query, spatial analysis and 3D visualisation for government and private users. Going forward, a holistic approach is needed for the continuous development of cadastral survey processes, models and systems. As the process of cadastre development cannot be carried out in short time frame, we have to devise a vision that will systematically improve our current approach. Hence, a high level strategic plan of moving towards a “Smart Cadastre” was initiated early this year, to set the vision and goals for the improvement and development for cadastral survey system in the next 4 years. The 3D component will be a major feature in the strategic plan.

4.0 3D TOPOGRAPHICAL MAPPING

Since early of 2012, SLA has spearheaded and leading a whole-of-government initiative to develop and maintain a large-scale national level 3D Topographic Map.

The primary aim of producing 3D Topographic Map is to support and complement the development of 3D Cadastral that will replace the traditional 2D Cadastral in years to come. Government Agencies ranging from building to aviation authority have indicated their needs and requirements through expression of high interest and support to the initiative.

The increasing demand for cross-sharing of information for better planning and design of public infrastructure such as roads, drainage, parks etc. has triggered a strong need to coordinate and integrate existing and future topographic data into 3D GIS Datasets. The additional height component will enhance 3D map for various analysis and to be more realistic in term of representation of real world features in three dimensions.

5.0 DEVELOPMENT OF NATIONAL SPATIAL DATA INFRASTRUCTURE

The Singapore's NSDI initiative is known as the SG-SPACE (Singapore Geospatial Collaboration Environment). This initiative was launched in April 2008. The SG-SPACE is a cross-agencies program spearheaded by the Singapore Land Authority (SLA) under the Ministry of Law, together with the Infocomm Development Authority (IDA) under the Ministry of Information, Communications and Arts.

The SG-SPACE aims to provide a platform and mechanism for government agencies to share and use geospatial data. It facilitates

better policy, decision-making and governance. Beyond data-sharing, SG-SPACE aims to create a sustainable and collective environment where geospatial data is interoperable, accessible and usable by agencies in day-to-day operation.

Developing a spatially-enabled nation is ongoing and multi-disciplinary. Achieving the vision will draw on a wide range of experiences and disciplines from surveying and mapping, land administration, GIS, information and communications technology, computer science, legal and public administration and many more. In this regard, SG-SPACE will continue to explore and learn from the international experiences, towards achieving a spatially enabled nation.