Panel on Planning, Lands and Works of the Legislative Council

Replacement of Computerised Land Information System for the Lands Department

INTRODUCTION

This paper informs Members of the plan for replacing the Computerised Land Information System (CLIS) of the Lands Department (LandsD).

BACKGROUND

2. The CLIS in the Survey and Mapping Office (SMO) of LandsD, which was set up since 1989, has become incapable of meeting the existing and new operational needs, as well as the contemporary user requirements of bureaux, departments, consultant firms, private companies and the general public.

3. Since the implementation of CLIS in 1989, digital mapping and land boundary information maintained by SMO has become the essential geographic information in support of the business functions and activities of more than 40 government departments and numerous consultants firms and private companies.

4. In recent years, a growing number of government departments have experienced the benefits of using geographical information as a valuable management and analytical tool by setting up their own Geographical Information Systems (GIS). As SMO is Government's sole supplier of digital maps which have constituted the basis of all GIS, the data maintained by CLIS has actually become the cornerstone of all these systems. Below are a few examples where the digital geographical information in CLIS is being intensively used:

(a) the Third Generation Mobilisation System (TGMS) of the Fire Services Department;

(b) the Command and Control System of the Hong Kong Police Force;

(c) the Slope Information System of Civil Engineering and Development Department;

(d) the Transportation Information System of the Transport Department;

(e) the Town Planning Information System of the Planning Department;

(f) the Road Data Management System of the Highways Department;

(g) the Building Records Management System of the Buildings Department; and

(h) The Property Master System and the Interim Valuation System of the Rating and Valuation Department.

5. In 2004, the Food and Environmental Hygiene Department requested SMO to develop a web-map system to record and monitor the Dengue Fever Ovitrap Index, spatial dispersion of chicken farms and pig husbandries. Also in 2004, the Treasury also requested SMO to report on the up-to-date information and status of the Government Land Allocation for preparing the stewardship statement, which is to be published together with the accrual-based consolidated financial statements by Government. Again, the digital mapping and land boundary information of LandsD has proven to be a common information reference framework across government departments. It is therefore vital for CLIS to maintain a comprehensive data model, an efficient system architecture and the ability to provide up-to-date information in appropriate formats.

JUSTIFICATION

Current Problems

6. The hardware vendor of CLIS has informed SMO that a significant part of the critical hardware of CLIS has passed the end-of-service life while many others are approaching the same. After the end-of-service life, the hardware supplier will not be able to provide full technical support for the products. In the event of hardware failure, SMO will fail to maintain and provide the required digital geographical information products and services to support the operations of LandsD, other government departments and the general public.

7. In the meantime, the software vendor has also advised SMO that the current software version of CLIS has retired. The new version of the software has been developed using the latest design method and modern computer programming paradigms, which are completely different from those adopted in the

retired version of the software in the old days. The software revolution renders the retired software impossible to be upgradeable onto new hardware environment. This means that the software vendor will no longer provide technical support of the retired software version through direct phone, fax, or email. No patches or hot fixes will be available for existing and new software bugs and security loopholes. Moreover, the retired software environment has rendered the whole system vulnerable to security threats and system failure.

8. As mentioned at paragraph 4 above, the digital mapping and land boundary data maintained by CLIS was essential to many other GIS. However the database model of CLIS, which was designed some 15 years ago, can no longer meet the modern requirements for an enterprise database. Below are some of its deficiencies -

(a) The current database cannot handle more complex data structures such as digital orthophoto[1] images, digital terrain model and seamless geographical database model.

(b) The current database cannot support present-day and advanced geographical applications such as 3D spatial data processing, real time location-based applications, as well as wireless applications.

(c) The legacy database management system hinders efficient data storage, data retrieval, data conversion, information analysis and prompt generation of system statistics. It also makes the database updating and data sales transaction processes very tedious, inflexible, labour intensive and time consuming.

[1] Orthophoto is an aerial photograph with a uniform scale and can be used as an ordinary map.

9. As a result, many departments have to deploy resources to convert, re-organise, or even modify the data received from SMO to suit their own needs. Such duplication of efforts has taken up a significant amount of recurrent resources.

10. The storage capacity of CLIS has become insufficient to store and maintain new data, such as digital Land Boundary Plan, digital terrain model, point of interest, road network and digital orthophoto. This adversely affects the efficiency and productivity of daily activities of SMO. The data processing capacity of CLIS has also proven to be insufficient in handling automatic data conversion and dissemination of large amount of geographical information between CLIS and other survey and mapping systems in SMO.

11. The existing CLIS lacks adequate uninterrupted power supply, a resilience system, fail-over or speedy system recovery solutions to sustain and restore itself within a reasonable period of time. In case the headquarters system fails, the data supply services will have to be halted. It will gravely affect other GIS which are relying on on-line data access through direct linkage, such as the Slope Maintenance Responsibility Information System of LandsD, the TGMS of the Fire Services Department, the Geographical Information Retrieval System of the Government Property Agency, and many other departments that rely on CLIS data to support their applications. In the absence of a reliable system, LandsD will also run the risk of not meeting the obligation to supply digital map data on a regular basis imposed by the contract with the web-map services contractors and the public-private partners.

Improvement Areas

12. A feasibility study which was completed in March 2001 recommended that LandsD should enhance or replace the existing CLIS in order to meet the contemporary user requirements and provide higher service level with better data quality. Some identified areas to be improved are as follows –

(a) Replacement of the existing hardware is required. In view of the lack of serviceable parts and the high cost incurred in maintenance contract renewal, the most cost-effective solution is to replace the end-of-service-life hardware before the system deteriorates. It is also necessary to expand the current storage capacity to cater for new data types required by both public and private users, and improve the capacity of the current uninterrupted power supply system to ensure system availability.

(b) Upgrading of the existing software is required to improve the existing data processing workflow. Moreover, the existing CLIS does not cover the land boundary survey activities in the District Survey Offices (DSOs) of SMO. Additional software licenses are therefore required to enhance the land boundary survey operation of SMO, such that all data capture, processing and plan production activities are under a unified platform thus resolving the internal data inconsistency problems. Additional software licenses are also required to produce new orthophoto maps in the DSOs to facilitate land resumption, land clearance and land control activities of LandsD.

(c) An object-oriented data model [2] for the development of a geographical database in CLIS is required to capture, store, maintain, manipulate and visualise the historical and existing data, as well as new data types to satisfy the new user requirements. In particular, it will facilitate the speedy updating and delivery of data in support of real time and mission critical applications of other government departments, such as emergency rescue of Fire Services Department, epidemic control of Hospital Authority, and traffic management applications of Hong Kong Police Force and Transport Department.

(d) An optimised system architecture is required to enhance the system capacity and performance to manage the object-relational enterprise geographical database and to implement new functionalities of CLIS. In addition, resilience measures, disaster recovery requirements, and adequate uninterrupted power supply system are required to ensure system availability. Moreover, the security measures of the system will have to be strengthened.

13. The new CLIS will have no adverse effects on the existing users. The user departments can continue to use their present computer systems to retrieve the digital map data from the new CLIS through the on-line linkage connection.

14. The open architecture design adopted in the new CLIS will allow the system to be upgraded in future when new hardware and software technology emerges.

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[2] Object-oriented is a state-of-the-art data modeling technique, in which data records in a database are treated as real-world items that can have their individual status, behaviors, and can interact with other items.

15. Since the obsolete system components have started to undermine the ability of SMO in providing necessary digital map and land boundary data to support GIS and location-based applications in both the public and private sectors, it is imperative to replace the system so as to continue smooth delivery of services.

Cost Savings

16. The replacement of CLIS will bring about an annual saving of $2,621,000 from 2008-09 onwards. This represents the savings in hardware maintenance of the existing CLIS hardwares. This saving will be used by SMO in the recurrent expenditure for hardware and software maintenance of the new system.

Intangible Benefits

17. The proposed replacement of CLIS will bring about the following benefits:-

(a) ***Improved Business Process***

The replacement of CLIS provides an opportunity to revisit the entire system design and to re-engineer the existing workflow with a view to improving the productivity and reducing the operation cost of the system using the latest information and telecommunication technologies. It is expected that after the implementation of the new system, geographical information can be supplied to other government departments and the general public in a more efficient

manner.

(b) ***Improved Data Model and Database Structure***

The replacement of CLIS requires a redesign of the data model and the database structure using object-oriented database analysis and design methodology. This allows more efficient concurrent data updating, version control and data integrity checking so that the quality, accessibility, usability and serviceability of the geographical information can be improved.

(c) ***New Data Types to meet Contemporary User Requirements***

The new database can facilitate the production and storage of new data types required by many government departments and the general public. This will also create new business opportunities with existing business partners, generate new sources of revenue for the government and improve the quality of life of the community.

(d) ***Better Data Sharing Potential***

The de facto data format adopted by the new system will minimise the data conversion effort and further enhance the usability and interoperability of the data. This will eliminate the duplicated data conversion and restructure efforts currently engaged by different data receivers.

FINANCIAL IMPLICATIONS

Non-Recurrent Cost

18. We estimate that the development and implementation of the project will require $42.841 million. A breakdown of the estimate is as follow:

		Total $ '000
(a)	Hardware	11,116
(b)	Software	17,805
(c)	Implementation services	3,570
(d)	Contract staff	2,998
(e)	Site preparation	824
(f)	Training	2,202
(g)	Consumable	431
(h)	Contingency (10%)	3,895
	Total	**42,841**

Recurrent Cost

19. It is estimated that the recurrent expenditure is $14.401 million per annum to cover the expenditures of on-going maintenance and support for hardware and software, consumable and staff for system support. LandsD will absorb all the recurrent cost of the CLIS by redeploying in-house resources.

IMPLEMENTATION PLAN

20. We estimate that the proposed CLIS can commence operation in March 2008 with full implementation in August 2008. The proposed implementation plan is as follow:

Activity	Target Completion Date
Site Preparation	March 2006
Tendering	June 2006
System Analysis & Design	February 2007
Data Conversion	January 2008
Roll out of Headquarters System	March 2008
Full Implementation of the new CLIS	August 2008

WAY FORWARD

21. Subject to Members' views, a submission will be made to the Finance Committee for the approval of a new commitment of $42.841 million for the replacement of system.

Housing, Planning and Lands Bureau
Lands Department
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