

**Eighteenth United Nations Regional Cartographic
Conference for Asia and the Pacific
Bangkok, 26-29 October 2009
Item 7(b) of the provisional agenda
Invited Papers**

**Institutional Strengthening to Stimulate Geospatial Industry
Growth in China***

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Institutional Strengthening to Stimulate Geospatial Industry Growth in China

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Abstract

In the new round of the institutional reform initiated by Chinese government, the function of the State Bureau of Surveying and Mapping has been further specified to administrate the mapping and geospatial industry. In light of the fact that the public has increasing needs for geographic information products and services, the State Bureau of Surveying and Mapping explicitly points out its three flagship areas: Digital China Geospatial Framework, informationized surveying and mapping system, and geospatial industry. The Chinese geospatial industry benefits from the achievements of the basic mapping program, which grew rapidly during the past several years. Along with the increasing domestic needs and the measures promoted by Chinese government to ensure economic growth, living standard upgrading and social security, the future of the geospatial industry is even brighter. The State Bureau of Surveying and Mapping is now making the new map policy to make the geographic information resources currently controlled by the government be gradually available to the enterprises that are interested in the development of public geographic information products. The mergers and acquisitions of enterprises will be more active and the whole geospatial industry in China is thrilled to welcome a new period of rapid growth.

Introduction

The government of the People's Republic of China has been paid high attention on legal system, democracy and scientific decision. China is also pushing forward the development and compliment of market economy. It is reshaping the government body with limited responsibilities. The market is playing a key role for resources allocation to promote economy, politics, society and ecological construction balanced. The reform of government outlines four responsibilities, i.e. macro-economy adjustment,

market supervision, community administration and public service. The new round of the State Council reform is to decrease the body of central government and local governments. One outstanding point is to nominate only one organization to coordinate a specific affair across agencies.

The State Council has approved the term of references of SBSM including its responsibilities, organization structure and the number of personnel. SBSM is under the supervision of the Ministry of Land and Resources. SBSM has more responsibilities than before, such as mapping for emergency issues and coordination of geospatial industry. SBSM has been allowed to nominate a chief engineer. It has established a new department of Science, Technology and International Cooperation.

According to the speedy development of information technology, geospatial information products have been widely used in government, enterprises and community. There are more and more firms doing the acquisition, processing, transmission and service of geospatial information. Based on a social survey, there are more than 10000 enterprises holding certificate of surveying and mapping and doing business in geospatial industry. More than 400000 people are working for geospatial industry. The domestic gross production of geospatial industry reached to 60 billion RMB Yuan in 2008, increased 20% annually.

The steady development of geospatial industry relies on active political strategy, government support, professional coordination and social requirement. Geospatial industry needs strong capital input and scientific innovations. It also requires the new map policy to allow using geospatial data from government. The Chinese geospatial industry is going into a quick development era. The technology of information, space and communication is developing very fast. Requirement for geospatial information service is increasing dramatically. There are more and more new products appearing. Several enterprises are going to be listed in the stock market. Merging and acquisition will begin in the coming years.

Strengthening Unified Supervision of Surveying and Mapping

SBSM was found in 1956 and provincial agencies of surveying and mapping were established in early 1970. China has formed an administration system of surveying and

mapping at central, provincial, municipal and county levels. All provinces and cities have local institutes of surveying and mapping. There are also special surveying and mapping teams and brigade for different professions. A large number of enterprises were formed in recent years.

Surveying and mapping are obeyed to the Law of Surveying and Mapping which was released in 1992 and revised in 2002. Based on this law, China has four regulations referring to Management of Surveying and Mapping Records, Basic Surveying and Mapping, Map Publishing, as well as the Protection of Surveying Marks. Each province has made the local regulations for surveying and mapping as well. The State Council has released a circular on Some Opinions to Strengthen Surveying and Mapping in September 2007. It specially points out all governments paying more attentions on surveying and mapping for administration, public service and geospatial industry.

Each provincial mapping agency has the similar responsibility as SBSM, even though there are different structures in the local government. SBSM has four branches in Shaanxi, Heilongjiang, Sichuan and Hainan Provinces. In the new round of government reform, SBSM has the following responsibilities:

- i. To draft legal documents, national plan of surveying and mapping, administrative policy and standardization.
- ii. To be responsible for basic mapping, boundary survey, cadastral survey and national key projects of surveying and mapping, as well as maintenance of the national datum.
- iii. To draft plan, standard of cadastral survey and certificate cadastral survey records.
- iv. To be responsible for regulating surveying and mapping market, including administration of Certificate of Surveying and Mapping, supervision of the surveying activities and mapping quality, coordination of security of geospatial information.
- v. To organize public service and emergency despondence of surveying and mapping.
- vi. To manage national records of basic surveying and mapping, supervise and monitor all types of surveying and mapping records and survey marks.

- vii. To be responsible for administration of various maps, including the supervision of map market, cartographic works, technical auditing of public map products, and also the cooperation with other agencies to compile national standard boundary map.
- viii. To be responsible for innovation of science and technology of surveying and mapping as well as international cooperation.

Geospatial Information Resources and Utilization in China

China has upgraded the technology of surveying and mapping to digital system in the last decade. Now SBSM is pushing forwards the construction of informatization of surveying and mapping to reflect the geospatial information service capability. There is more and more financial support from government.

The national planimetric datum has upgraded from Beijing 1954, Xi'an 1980 to CGCS2000. Many cities and a few provinces have established GPS Continuous Operating Reference Stations (CORS). The government has been paid high attention on geospatial information resource which is one type of important, fundamental, public and strategic information.

Based on 60 years of surveying and mapping activities, China has built a national standard system of surveying and mapping. Geospatial information resource has been accumulated with full coverage of the country at 1:100million, 1:50000 and 1:25000. There are a few provinces covered with geospatial information at 1:10000. All cities have been covered with large scale geographic information. The land territory has been covered by geographic information about 80% at 1:50000, and will be fully covered with updating next year. China has collected rich remote sensed image and photography. China has replaced the paper topographic map with DEM, DOM, DLG and DRG and established geospatial databases. The second round of land use survey will be finished and create a Land Map of China by end of this year, which will be renewed annually.

SBSM has determined the goal to build Digital China Geospatial Framework which includes digital regions, digital cities and digital villages. The objective is to enrich geospatial information resource and supply easy geospatial information service to

public. Geospatial information has been widely used in government for decision support. Surveying and mapping agencies always play active role in response to natural disasters with geospatial information and technology. SBSM has done its best to respond to the earthquake happened last year in Sichuan. Remote sensing satellites, airplanes and UAV were used in surveying and mapping for the relief of the earthquake at each phase. Specific GIS's have been established for the earthquake area.

In order to fulfill the goal of Digital China, SBSM is carrying out five key projects of surveying and mapping. The first project is the updating project of geospatial information at 1:50000. The second one is the Western China Mapping Project to produce geospatial information at 1:50000. The third one is the surveying and mapping of islands. The fourth project is to modernize the national geodetic reference. The fifth one is to launch Ziyuan-3 stereoscopic mapping satellite. The Surveying and Mapping Base of China has been established which supports scientific research and technology innovation, application of mapping satellites, archiving of surveying and mapping records as well as headquarter of SBSM. The new building has total area of 75000 m². This totally changes the poor infrastructure situation of surveying and mapping.

Human resource of geospatial industry is getting richer and richer. There are more than 100 universities offering undergraduate and post graduate courses in Geospatial sciences and surveying and mapping. There are more than 4000 young talents graduated each year. China has an academy of surveying and mapping to do research work. Several institutes in other ministries have done research in geosciences as well. A provincial geospatial industry garden has performed well in Heilongjiang Province, and a group of firms have formed a chain of industry.

Current Situation of the Geospatial Industry in China

China has formed a complete and systematic industry of geographic information in the last ten years. GIS software, represented by SuperMap, GeoStar and MapGIS, is developed and applied into Digital Region and Digital City programs. Digitized surveying instruments and advanced digital geospatial data processing software are produced by Chinese companies. There are many firms be able to carry out software customization and system integration. There are more and more common people being

familiar with personnel navigation products. Internet-based geographic information service and digital map market become mature with the booming of digital map providers, WebGIS service platforms and channels for value added service. To sum up, the geospatial industry in China can be divided into seven categories:

- i. **Remote Sensing and Aerial Photography.** As the state government purchases aerial photos and remote sensed data in the open market, many satellite remote sensing companies and aerial photography companies prosper. Equipped with film aerial camera, digital camera, LIDAR and InSAR, these companies supply aerial photos and remote sensed image data covering lands of 3 million square kilometers each year.
- ii. **Data Processing of Surveying and Mapping.** To meet the public demand for geographic information, the industry of data processing of surveying and mapping grows rapidly. Data processing services are provided not only by mapping institutes but also by companies.
- iii. **System Integration of Geographic Information.** Today, the self-developed Chinese GIS systems have been put into use in many government information projects, and the redevelopment of popular international GIS software is also capable in China. Enterprises for GIS system integration are shaping up.
- iv. **Development of Maps and Navigation Systems.** China is pushing ahead the reform of enterprises in the culture sector. There are a dozen of enterprises of map publishing to be consolidated into the China Map Publishing Group. A number of private-owned publishing firms developed quite well and published a great number of maps. There are 11 enterprises and public institutions are qualified to produce navigation systems. A number of popular brands of navigation systems are selling well. Navigation products, such as pre-installed automobile navigation products, post-installed automobile navigation products and personnel navigation devices (PND), are all developed fast and achieve profits. A number of such enterprises are even considering to be listed in stock market.
- v. **Geographic Information Service.** Although there is no a unified standard for geographic information service yet in China, while web map service enterprise are at their early stage, the 3rd value-added service channels are setting up, such as real estate enterprises, logistic companies, restaurant seeking services, so as to provide convenience service to customers. Normally based on

navigation e-map data, web map service providers integrate POI information to provide remote sensing image, vector map, panorama image and 3D model maps to end users or value-added enterprises.

- vi. **Comprehensive Engineering Surveying.** As the pillar of geospatial industry, the majority of engineering surveying institutions pay much attention on technology development. There are a great number of comprehensive institutes focusing on geodetic survey, precision engineering surveying, underground pipelines surveying, boundary surveying and cadastral surveying. With the implementation of interior demands incentive and active financial policy, these kinds of institutes are enjoying high speed of development in the recent years.
- vii. **Manufacture of Surveying Instrument Equipments.** Chinese surveying and mapping enterprises not only purchase the most advanced surveying instruments in the world, but also develop its own total stations, LIDAR, GPS receivers, digital aerial camera, UAV, digital photogrammetry system, GIS, and remote sensing image processing software. These enterprises have developed a set of digitized surveying instruments and software with own intellectual property rights, which are attracted more and more attentions in the international market.

Opportunities and Challenges of Geospatial Industry in China

Lots of opportunities and challenge have emerged as the geospatial industry in China went out of its childhood and begins to gather pace. New laws, policies and rules are enacted in order to extend the use of geographical information and open the state-owned geographical information to private enterprises. Meanwhile, the innovation of surveying and mapping technology and the construction of information-based mapping system are also attached great importance. The central government starts to build a public geographical information service platform and more digital cities. The geospatial industry of China will have the following characteristics:

- i. **Wide application of geographical information promoted by the information revolution.** The revolution of information technology has brought great changes to the society. Today, more than 338 million people in China enjoy internet service and 600 million people have mobile phones. Location service becomes an important part of internet and mobile

communication. As the public are accustomed to the geographical information, more and more people like to use digital map, WebGIS and navigation system.

- ii. **Opportunities brought by 3G mobile communication technology.** The development of third generation mobile communication technology is accelerating in China. China Mobile, China Telecom and China Unicom have set up TD-SCDMA, WCDMA and CDMA2000 system respectively in hundreds of cities. The bandwidth of mobile internet reaches 3MB above for download, which gives a good support for the use of video calls, IPTV and navigation. WiFi network can be found in airports, hotels and conference centers, providing internet service anywhere and anytime. The application of GIS on wireless internet becomes practical.
- iii. **Interactive environment provided for every family by digital television network.** Nowadays, Cable TV is very popular in China. The government is pushing the integration of three networks to provide telecommunication, internet service and digital cable TV. The launch of wireless digital broadcasting in Beijing, Shenzhen and other cities provide new modes of one-way information service for ITS. Interactive geographic information service will be accessible at home.
- iv. **E-government with service of professional geographic information.** With the implementation of *the Regulation on the Disclosure of Government Information* and the establishment of the database of natural resources and geographical information, the first stage of Chinese E-government project has achieved outstanding progress. All industries and sectors, like those of urban planning and management, land and resources, public security, forestry, agriculture, transportation, environmental protection, emergency commanding and statistics are developing professional GISs.
- v. **Globalization promoting the international cooperation of geospatial enterprises.** The globalization has resulted in the industrial specialization and the vigorous development of financial and information services. With the healthy growth of the geographic information outsourcing, not only China is providing lots of outsourcing service, such as surveying and mapping engineering, data processing and software engineering services, but also Chinese geospatial enterprises are going to the international market. On the other hand, more and more international geographic information enterprises

are developing technical service in China.

- vi. **Industrial division and enterprise acquisition accelerating.** There are two types of organization engaging in geospatial industry, enterprises and public institution. With the progress of reclassified reform in the public institution, some institutes of surveying and mapping will transform into surveying and mapping enterprises. Enterprises are developing diversified and there will be heavy investment flowing into the industry. With the speed-up of merger and acquisition among enterprises, a group of leading companies will appear, each of which will prompt the development of supporting enterprises and appearance of channel enterprises like acquisition, process, service and consultation of geographical information.

Conclusion

The geospatial industry in China is entering into a new era of standardized regulation. The geographic information enterprises will move towards rapid development in a transparent environment from the "gray zone". This industry involves so many sectors, such as surveying and mapping, communications, information, cultural publication and other sectors which are closely related to the industry, that it is difficult to find an authoritative body responsible for regulations, and the market is relatively chaotic.

It is clearly stated in the responsibility definition of the State Bureau of Surveying and Mapping that it is the leading organ responsible for regulations. At present, the Bureau is working with the Ministry of Industry and Information, Press and Publication Administration and other government departments to carry out the special rectification on the geographic information market and educational activities of the national territory awareness. The strengthened State Bureau of Surveying and Mapping with new functions and institutions will certainly prompt the rapid development of the geographic information industry in China.