



Economic and Social Council

Distr.
LIMITED
E/CONF. 92/L.3
11 April 2000
ORIGINAL: ENGLISH

FIFTEENTH UNITED NATIONS REGIONAL
CARTOGRAPHIC CONFERENCE FOR
ASIA AND THE PACIFIC
Kuala Lumpur, 11- 14 April 2000
Item 6 of the provisional agenda*

Construction of National Spatial Data Infrastructure (NSDI) in China

(Technical Paper Submitted by China)

* E/CONF. 92/INF. 1

**Construction of
National Spatial Data Infrastructure
in China**

**Presented by
State Bureau of Surveying and Mapping
The People's Republic of China**

Construction of National Spatial Data Infrastructure in China

Presented by
State Bureau of Surveying and Mapping
The People's Republic of China

In accordance with the government administration functions endowed by the State Council, State Bureau of Surveying and Mapping of China (SBSM) has been engaged in the construction of the national spatial data infrastructure (NSDI) for about two decades. In the early 1980's, SBSM started its digital reformation of the traditional surveying and mapping technologies, carried out pilot projects on database construction, research and development of the national fundamental geographic information system (NFGIS) and related standards and specifications. In recent years, SBSM has been working on the strategic plan, overall design and implementations of NSDI. It participated in organizing the National Committee for Geographic Spatial Information Coordination, which coordinates the production and utilization of geographic spatial data on behalf of the government. SBSM has put forth more strength in the development of spatial data framework and standards, and has speeded up its steps to build the geographic information distribution system and spatial data networks.

I. Spatial Positioning Reference Framework

High Precision GPS Network: The national high precision order A and B GPS networks have been established, forming a national three-dimensional geocentric reference frame, with its accuracy in centimeters. Order A consists of 33 points, with an accuracy of 10^{-8} , and order B 818 points.

Re-measurement of Order I Leveling Network: In the mid-1980s, China established its nationwide unified 1985 height datum, which is reflected and maintained through thousands of points of the 100,000km long order I leveling network and 800,000km long order II network. SBSM initiated the re-measurement of the order I leveling network in 1991 and completed the work in 1999. Altogether 241 leveling lines were re-measured, totaling 93,000km and 77 closed level circuits. After adjustment, the mean square error is 0.25mm per unit weight, and 1.33mm per kilometer. The results will provide for a new leveling control datum.

GPS Tracking Network: Eight permanent GPS tracking stations have been

constructed since 1993 in Beijing, Wuhan, Harbin, Haikou, Xian, Xining, Urumuqi and Lhasa, which operate consecutively, transfer measurements automatically, and form a reliable GPS tracking network with the satellite orbit determination accuracy within centimeters. The network serves to maintain the national dynamic geocentric reference frame, to provide GPS data and related information services; and to support scientific research and applications of GPS in geodynamics, meteorology, Local area differential GPS (LADGPS) and wide area differential GPS (WADGPS). Those located in Wuhan, Lhasa, Urumuqi and Beijing, have become IGS stations. The daily GPS measurements from the stations are processed and distributed by the GPS Data Processing Center of the National Geomatics Center of China.

Geodetic Database: The geodetic database is an important component of the NFGIS. The construction of the database was started in 1995 and completed at the end of 1999. It includes gravity datasets, GPS datasets, leveling datasets and triangulation datasets.

Re-establishment of National Basic Gravity Network: The National 1985 Basic Gravity Network was set up in 1985. The National 2000 Basic Gravity Network was jointly initiated by SBSM, the Military and the National Bureau of Seismology in 1999. It consists of 137 points, including 18 fiducial points and 119 basic points. The fieldwork and data processing will be completed by the end of 2000 and by 2001 respectively.

II. Acquisition & Processing of Fundamental Geographic Data

Aerial Photography and Remote Sensing: Aerial photographic information is the fundamental data source for the production and revision of basic scale topographic maps, and it is widely used in the field of natural resource exploration, land use monitoring and environment monitoring. In recent 3 years' aerial photography, SBSM covered 412,000 km² in 1997, 488,000 km² in 1998, and 523,000 km² in 1999. In some areas, the GPS-based aerial triangulation technique was employed.

10 digital cartographic production bases of considerable scale have been established in the whole country, applying modern surveying and mapping technologies based on RS, GIS and GPS. Mass production of digital cartographic products, represented by digital elevation model (DEM), digital raster graphic (DRG), digital line graphic (DLG) and digital orthophoto map (DOM) has been realized. These production bases are equipped with many kinds of domestic-developed software and hardware for data collection, image processing, database management and data output, such as VirtuoZo, JX-4, Geostar and etc. A comprehensive and advanced system in technological process and equipment has been available from data collection, processing and management to data maintenance, revision, and distribution.

III. Construction of NFGIS Databases

1:1million-scale Database: The construction of the national fundamental geographic information system was initiated in 1985. Through nearly 10 years' efforts, the national 1:1million-scale topographic database, place name database, and DEM database were completed in 1994.

1:250,000-scale Database: After the establishment of 1:1million-scale database, the national 1:250,000-scale database, which is the largest NFGIS database of this country, took another three years to be completed. The 1:250,000-scale database is composed of topographic datasets, place name datasets, and DEM datasets, totaling 816 map sheets. There are 14 layers of features, such as hydrography, transportation, boundary, residential area, terrain, vegetation and etc. The DEM datasets is in two types: 100 meter by 100 meter grid and 3 second by 3 second. The place name datasets includes 805,431 items of place names.

1:50,000-scale Database Project: 1:50,000 scale topographic map is one of the national basic scale topographic maps and is made up of 24322 map sheets. The national 1:50,000-scale database, as one of the important component of NFGIS, consists of the national DRG datasets, DOM datasets, DLG datasets, place name datasets, land cover datasets and metadata at 1:50,000 scale. The DLG datasets includes topographic datasets (contours, elevation points, and etc.), boundary datasets, transportation datasets, residential area datasets, and hydrographic datasets. It is one of the central tasks of SBSM in the next few years to organize, design and implement the 1:50,000-scale NFGIS database project, mobilizing all resources and adopting advanced and practical techniques. From 1995, SBSM has started to update the 1:50,000-scale topographic maps and carry out pilot projects on database construction. So far, we have updated 766 sheets of topographic maps, acquired DEM data from 9000 map sheets, completed production of all the DRG, data acquisition and the pilot project for place name database, finished the trial production of DOM and the experiment of acquiring road information with car-borne GPS. Related mass production is also proceeding.

1:10,000-scale Fundamental Geographic Information Updating and Database Construction: The 1:10,000-scale database is an essential part of NFGIS. Since 1997, many provincial governments have listed the 1:10,000-scale fundamental geographic information updating and database construction in their economic and social development plan as a key project in provincial-level surveying and mapping work. So far, more than 30000 map sheets have been updated. In addition, SBSM worked out the Technical Guidebook for 1:10,000-scale Fundamental Geographic Information Updating and Database Construction.

IV. NFGIS Network System

SBSM is presently organizing and implementing the project of National Surveying and Mapping Infrastructure Construction. The general target of the project is to construct industrialized infrastructure for acquisition, processing, storage, management, distribution and application of national fundamental geographic information, which is composed of aerial-borne and space-borne remotely sensed data processing system, technological systems in production, management and services, and data transmission network of national fundamental geographic information. The main goals of the project are:

- to establish an aerial-borne and space-borne remotely sensed data processing base as a window providing technical services in remotely sensed data acquisition and processing, so as to meet the needs of updating fundamental geographic information;
- to establish geomatics centers at national and provincial levels, taking charge of quality control, spatial databases, product generation, development and applications, and information services for national fundamental geographic information;
- to establish production bases possessing technical capabilities for mass production of national and provincial fundamental geographic data;
- to connect local networks of the production bases, by stages and batches, through the national express network for public data communications, and to establish the data transmission network for national fundamental geographic information at both national and local levels, and for uses inside and outside SBSM.

V. Development of Geomatic Standards

As a member of ISO/TC211, China has been actively involved in the activities of its working groups and some Chinese experts have taken part in the formulation of international geomatic standards. The 7th meeting of ISO/TC211, successfully held in Beijing in 1998, further promoted the connection of China with the world on geomatic standards.

A national technical committee (CSBTS/TC230) was founded in December 1997 to take charge of geomatic standardization. Its main missions are to organize the formulation and revision of national geographic information standards, to coordinate, examine and approve geomatic standards, to promote the activities related with geomatic standards, and to give publicity to geomatic standards.

Based on practical needs and the research made, a series of technical standards for geomatic data sharing have been worked out and published, such as the Spatial Data Exchange Format, the Classification and Codes of National Fundamental Land Data, Digital Topographic Product models and etc.

VI. Coordination Agency for National Spatial Data

Approved by the State Council in 1997, a National Committee for Geographic Spatial Information Coordination was founded. As an coordinator between government agencies, the committee is composed of the directorate of both the comprehensive and professional agencies closely related to the production, application, transmission, security and data-sharing of geographic information. Among those agencies are Commission of Development Planning, Ministry of Science and Technology, Ministry of Finance, Commission of Science, Technology and Industry for National Defense, Ministry of Information Industry, Ministry of Land Resources, Ministry of Construction, Ministry of Agriculture, Chinese Academy of Sciences, State Bureau of Surveying and Mapping. The committee has the following main functions:

- to organize the research and formulation of the strategic plan and related standards, specifications, policies and regulations for NSDI and GIS development;
- to coordinate the interests between agencies and regions in the development of NSDI and GIS, and to put forward solutions for avoiding unrealistic and repeated efforts in this field;
- to organize the investigation and demonstration of priorities in the development of NSDI and GIS, so as to enable them to be listed in the National Information Development Plan and the National Economic and Social Development Plan;
- to coordinate international cooperation and security of NSDI and geographic information;
- to promote high-level and efficient construction of NSDI and GIS.

VII. Policies and Regulations for Geomatic Data Sharing

SBSM has formulated and promulgated the Administrative Regulations on Licenses for Using National Fundamental Geographic Data, in which the data users are divided into three categories:

- Central government agencies and provincial governments get the national fundamental geographic data free of charge for purposes of macro decision making and social welfare;

- Non-commercial organizations or individuals get the data with favorite prices for internal or individual uses in education, academic research, planning and management, or for them to provide academic results to central government agencies and provincial governments for macro decision making and social welfare;
- Commercial users or non-commercial organization using the data for commercial purposes, profits or construction engineering projects get the data at market prices.

SBSM has provided 12 ministries and 14 provincial governments with the 1:10,000 DEM and DOM data for the 340,000km² key flood control area covering seven major river valleys, which has promoted the social services and the data sharing process of national fundamental geographic information.