

## Development of the National Spatial Information Infrastructure (NSII) in China

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**ABSTRACT** National Spatial Information Infrastructure is the important component of the National Information Infrastructure. In China, with the more extensive applications of Geographic Information System in varied social field and the speed development of network technology, the construction of Geospatial Information System has come into the stage of available, integration and network distributed from the initial study. Thus National Spatial Information Infrastructure (NSII) has been proposed to the schedule. In the mid of the 90's, layout of NSII, study of the relevant standards, spatial integration and the network application of the resource, environmental and region economic database, key technology of NSII and some prototype has been developed. Some opinion on the constitution, development and key technology of NSII that need to be discussed has been presented in this paper.

**KEY WORDS** NSII, key technology, development

### 1. Constitution and Techniques of NSII

#### 1.1. The constitution of NSII

The concept of NSII has not been acquired a common understanding. Yet, the category of NSII is bigger than the category of National Spatial Data Infrastructure (NSDI) of the United States. At least, NSII must include: National Public Spatial Information Communication Network, National Public Spatial Information Resource Network, Public Spatial Data Warehouse, spatial information management regulations and standards, framework and user system of national spatial information. The core is National Public Spatial Information Resource Network, the leading factor is multiple network management hierarchy and the user system, and the technique environment that support the implementation of NSII is the National Public Spatial Information Communication Network and the spatial information regulations, standards.

- **National Public Spatial Information Communication Network:** is mainly composed of the communication network systems that support the transmission and transformation of the public spatial information. National Spatial Information Transmission Network (similar with the Clearinghouse of the United States), National Spatial Information Transfer Center (NSITC), spatial information transmission network and clearinghouse of the relevant regions or branch and network sites in different levels are all constituted by it. The system that integrated in the National Information Infrastructure (NII) is the backbone network that support the spatial information management.

- **National Public Spatial Information Resource Network and Public Spatial Data Warehouse:** include commonweal or base information databases (databases, literature databases, function and model databases) and application systems (include stand-alone, LAN, WAN, special network) except public transmission and transfer network system. Its information category should contain all spatial information that involved in each shell of the earth such as NSDI, basic astronomical, aerographic, geographic, geologic, physical geographic, geochemistry survey data, medium and low resolution remote sensing data and its application results, basic resource and environment survey data, spatialized and standardized public economic and social data (include economic and social statistic data), spatial graphics, image and structured text that collected in public library. The resource network is a component having spatial features in national information infrastructure (NII) public data resource network. Their information resources have the unified public spatial location framework. The resource network should support the structured process and network integration management to the extensive, multiple sources, multiple hierarchy, varied fields, complex, isomerous, great capacity and dynamic spatial information. The network also should have the functions that provide the information serve and products of varied resolution spatial analysis and three-dimensional description to the network users. Based on the resource network, some spatial information resources managed

commercially should be derived. Thus geographic information industry can be promoted effectively. The construction of the spatial data resource network is a cross-branch, cross-field, cross-region and multiple hierarchy social work. It needs government, corporations and scientific research institutions to co-participate in its construction.

- **Spatial Information Regulations and Standards:** is the foundation and safeguard to spatial structure and standard integrating the separate and out-of-order data and databases and implement the NSII consequently. It mainly includes regulations on information property right, information sharing, management, security, secrecy and network transfers, spatial data standards, metadata standard and technique standards on software, hardware and network system.
- **Framework and user system of national spatial information:** the management and application principal part is the leading factor of the development and implement of NSII. It can be divided into three levels of government, enterprise and public according to the different needs and application objects.

### 1.2. The key techniques of NSII

The program of "Digital Earth" was proposed in the United States in Jan. 1998. This program is a important component of Global Information Infrastructure (GII). The six key technologies presented in the program such as computational science, mass storage, satellite imagery, broadband networks, interoperability, metadata generalize the key technologies needed in development and implementation of NSII generally. The most remarkable thing in it is the commercialization of satellite image in 1 meter resolution is permitted by American government and regarding the development of digital word map in 1 meter resolution as a step to startup the program of Digital Earth. It means that satellite image in high resolution will be widely used in spatial information analysis in the world extension including on-line analysis and process in network environment. This doesn't only have the important science significance meaning the numerous opportunities and economic benefits but also present a series important program related to national security. In the construction of NSII, we need to adopt an approach of integrating the introducing and innovation in China. Introducing opportune technologies can accelerate our construction of NSII. At the same time, we should arrange our own

development and innovation of the key technologies to reduce the disparity to the developed country according to our situation of the country, application need and the security.

## 2. Development of NSII in China

The technologies of RS, GIS, GPS and Internet have been developed rapidly in China in 90s, and seep to relevant information application fields. After a lot of base geographic databases on national level have been developed, the unified programming and regulations, standards of NSII is strengthened to coordinate and study by government. The key technologies and application systems of NSII have been presented as one of those key projects for the 9th Five-year plans of China. A prototype of NSII should be implemented at the end of this century. The clew of study and development is:

First, concentrate on the key technologies of interconnection and sharing of the base spatial resource, environmental and regional economic information using the existing base geographic databases on small scale, remote sensing resource environmental databases, the key resource integrate databases, regional economic databases and public economic network, public network system. Including: lay down the regulations, standards of NSII; Spatially integrates the existing base databases; Study and develop the interconnect of the heterogeneous spatial databases, information transfers and sharing and region economic spatial macro decision-making supporting system.

The specific object is: Implement the prototype of resource, environmental and regional economic information system and national spatial information clearinghouse on the national economic information network; Implement the integration of the key resource, environmental and regional economic databases and their application system on national level, run and share information on the network; Effectively strengthen the ability of access, process and analysis the national macro resource, environmental and regional economic information; Technical preparation for the complete development of later national information highway. A national key resource, environmental and regional economic databases network system which center around the National Planning Commission and sited at the relevant administrative ministry of land, water resource, minerals, forestry, sea resource, mapping and Chinese Academy of Sciences will be established at the end of this century. Based on it, a set of national macro decision-making supporting system will be developed.

According to the development situation of the global spatial information infrastructure and the actuality of NSII in China, five tasks will be mainly developed:

- a) Study and present the regulations and standards framework of the national spatial information transfer and sharing. The framework should support the spatial integration and information sharing of resource, environmental databases on national level. The primary standards are: The Standard of Spatial Metadata, Spatial Data Transfer Standard and Encoding Standard of National Key Databases.
- b) Plan and construct some key spatial databases as a whole. The emphasis of the development is integrating the existing databases of multiple sources, implementing the digitalization, spatial structure, network and standardization of these existing databases. This task can promote the effective use and modernize management of the spatial information collection, process and store.
- c) Initially construct the National Spatial Information Clearinghouse and the framework of information transfer and service. The standard and compatible sharing of the main special branches will be implemented. The National Resource, Environmental and Regional Economic Information Network that orient the decision making of the government will be implemented initially as a prototype of the NSII. It will be come under the Center Government Network and the China Economic Information Network. At the same time, a set of

spatial decision-making supporting system that suit to the situation of China will be developed.

- d) Strengthen the base study of NSII. Some test of multiple hierarchy and multiple fields will be studied, especially the study of digital city. These tests can provide lots of experiments for the development and application of NSII.
- e) Promote the application and development of GIS and pioneer a wider market for GIS through the study of NSII. This task can promote the development of the software property of GIS and bring up a new economic growth pole.

From the main matters of previous development of NSII, the effective macro regulation and control and the correct development polices are needed very much. The macro regulation and harmonization of the government should be strengthened. For example, a cross-branch, cross-region, high level and authoritative coordinating organization which can plan and coordinate the development of NSII should be set up; A special program of NSII which can organize and integrate the study and development in varied fields into the NSII framework; The relevant regulations and polices should be prepared in order to promote the effective use and network sharing of the spatial information.

#### References

- [1] FGDC,(1998),<http://www.fgdc.gov>
- [2] Al Gore, 1998, The Digital Earth: Understanding our planet in the 21st Century