

China's National Spatial Data Infrastructure (CNSDI): Current Status and Prospect

Minhe Ji, Ph.D.

Key Lab of GeoInfo Science, Ministry of Education
East China Normal University

International Symposium on NSDI, Tokyo, Japan

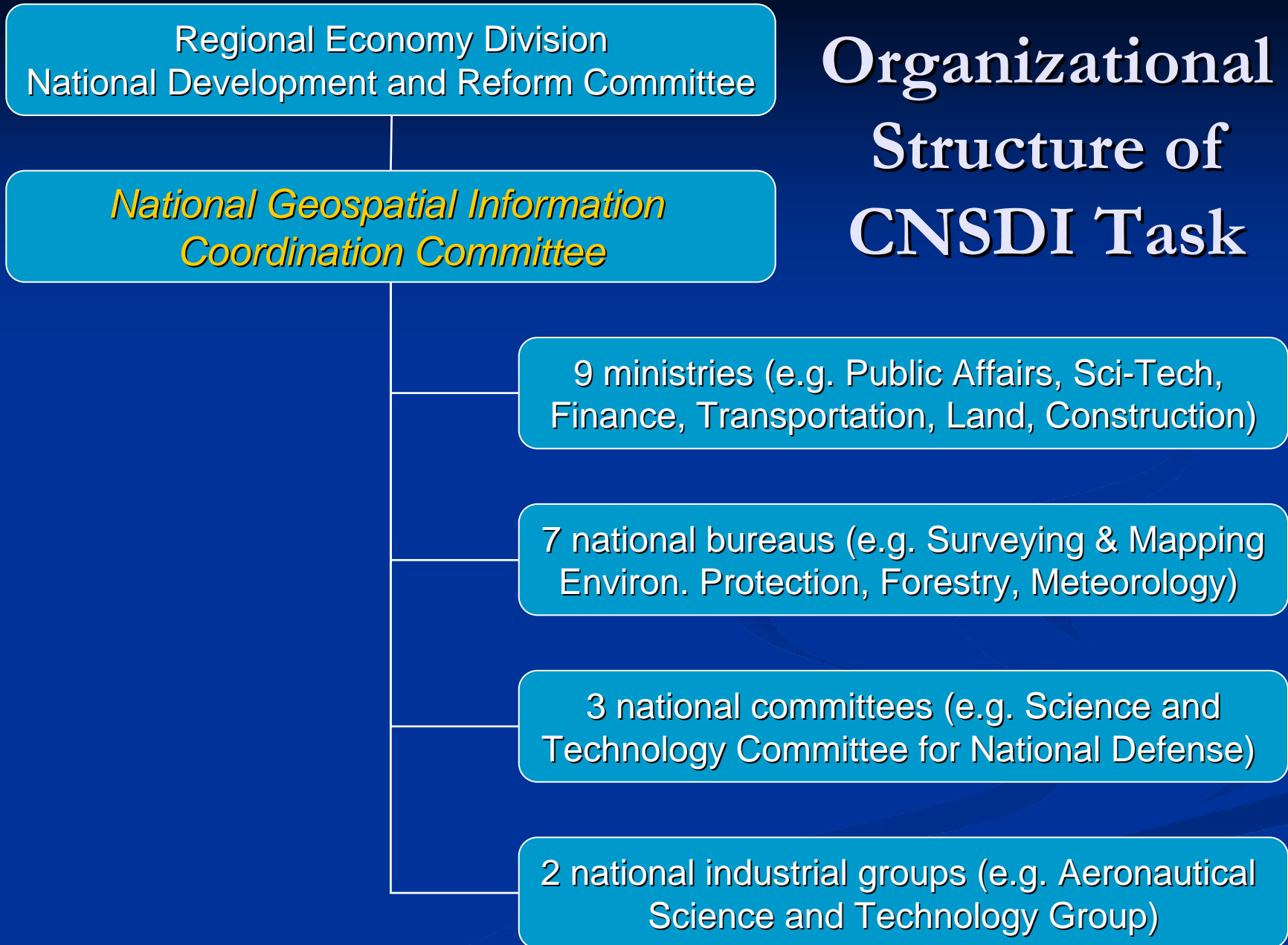
Presentation Outline

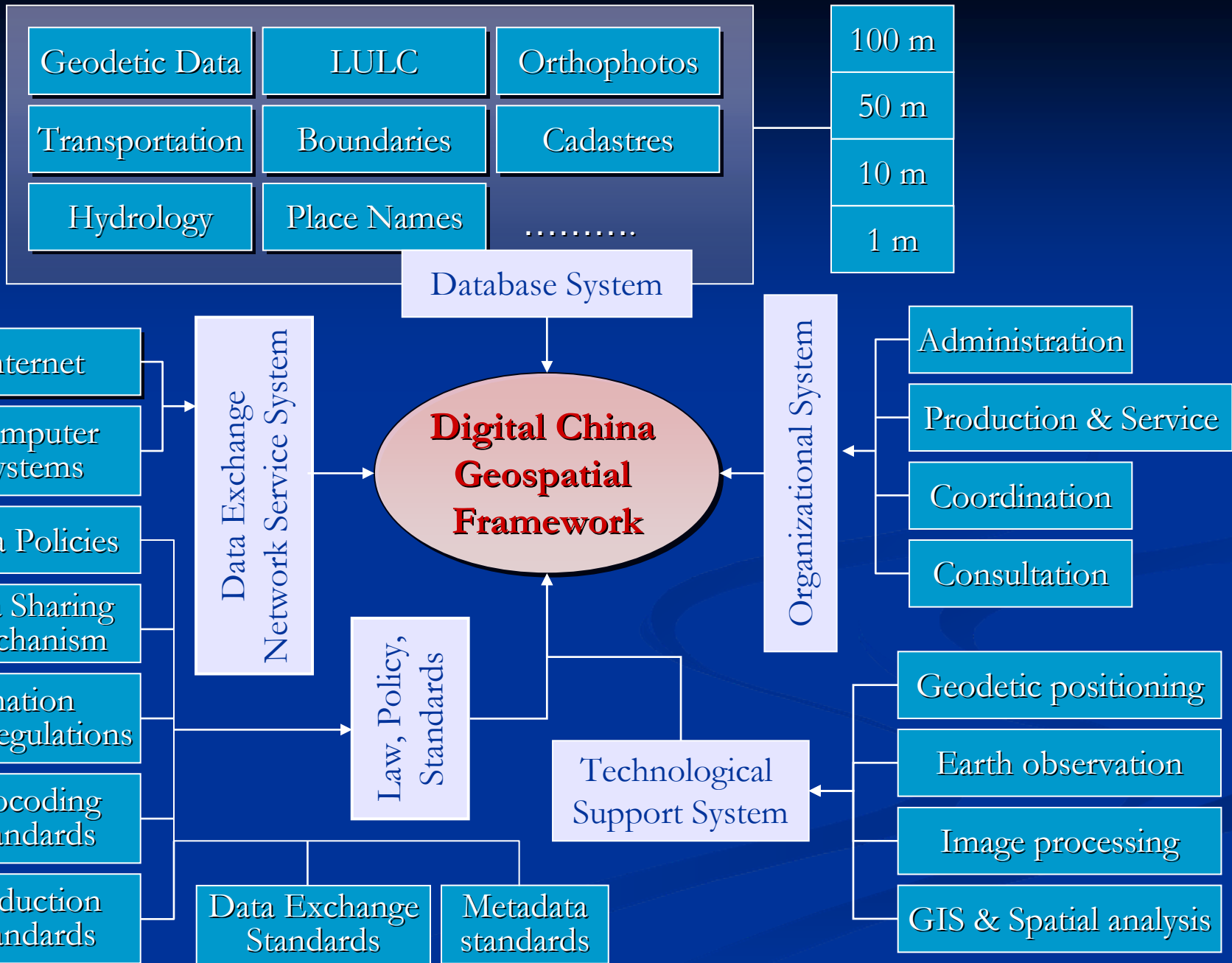
- Historical Milestones of CNSDI
- Framework and goals
- The 10th and 11th 5-year plans
- Major tasks and progresses
- Earth observation and digital China

Historical Milestones of CNSDI

- The 1990s: Fusion of space, internet, geospatial technologies and accelerated diffusion of geospatial data applications
- June 1998: Issue raised and recognized in a joint meeting of CAS and CAE, and then further discussed in a seminar held by Earth Science Department of CAS. Suggestions of building CNSDI submitted to the State Department
- April 2000: the National Geospatial Information Coordination Committee formed under the National Development and Planning Committee
- March 2001: the 4th Plenary of the 9th People's Congress passed the Outline of 10th 5-year Plan for National Socioeconomic Development, which included an official plan for CNSDI development.
- July 2001: the Office of State Department of China issued the executive order of "Facilitating Construction and Application of NSDI"
- Aug. 2002: Officially announced goals for e-government, which included natural resource and basic geographic databases as one of the four priorities
- Dec. 2007: the National Development and Reform Committee officially distributed "Construction and Application of the National Spatial Information Infrastructure: the 11th 5-year Plan", compiled jointly by 21 member agencies of National Geospatial Information Coordination Committee.

Organizational Structure of CNSDI Task





Major CNSDI Construction Tasks

- Design and construction of seven major components
 - A modernized national surveying datum system
 - A comprehensive national database of fundamental (basic) geographic information
 - A geospatial data acquisition system
 - A system of policies, regulations and standards
 - A technological support system
 - A computer network system for communication and services
 - A organizational system for CNSDI operations

Achievements in the 10th 5-year Plan

- Platform development of inter-agency geospatial data exchange and sharing, application, and service
- Geospatial data acquisition capacity and digital format
- Key technologies and relevant standards for NSDI construction
- Basic geospatial applications for public benefits
- Industrialization of geospatial information and enterprise development
- Geospatial data management and coordination mechanism and information service support system construction

Goals of National Bureau of S & M

- A framework of geospatial base data at the national, provincial, and municipal levels
 - positional, natural, human, socioeconomic, environmental, with multi-scale, multi-resolution, diverse and current basic geospatial information
- Provision of substantial data service to government agencies, enterprises, and general public
 - relying on national high-speed broadband public communication network and special computer network for web-based services
- Establish application demonstration projects, promote geospatial information industrialization

National Surveying Datum System

- Unification of National Control Networks
 - Astro-geodetic network over the entire country (1951-1978)
 - First, second, and third grade leveling network (1951-1998)
 - Gravity observation network (1957/1985)
 - High-precision GPS A-grade network (1992/1996, 27 points) and B-grade network (1991-1997, ~800 points)
 - Geodetic control network containing 2500 GCPs and 30 gravity network points (2000)
 - Construction of a centimeter-level geoid for cities and provinces (present)

NBGID (国家基础地理信息数据库) Milestones

- 1994 – 1999:
 - 1:1M topographic map and place name databases and DEM
 - 1:4M topographic map database
 - 1:250K topographic map, DEM, and place name databases
 - 1:10K DEM for seven key flood protection districts in China
- 2000 – 2002:
 - 1:50K DRG and DEM databases
 - updated 1:1M and 1:250,000 topographic database
- 2003 – 2006:
 - 1:50K DLG, place name, land cover, metadata, DOM (AP-1, TM-30 and SPOT-10) and ground control point databases
- Starting from 1997:
 - 1:10K DLG, DRG, and DEM under construction at provincial level

1:50,000-scale Basic Geographic Data

Data Content	Data Type	Total Vol. (GB)	Online Vol.	Remarks
DRG	imagery	186	162	4 m
DEM	raster, vector	1,700	78	25 m
DLG	vector	122	56	core features
DOM-AP1	imagery	6,250	218	1 m
DOM-TM30	imagery	600	42	30 m/6 bands
DOM-S10	raster	456	25	10 m pen
CP	text, raster	127	50	422,000 points
PN	text	4	4	~ 4 million
LC	raster, vector	30	10	30 m
MD	text	10	10	
Other		524	16	
Total		10,009 GB	671 GB	23,920 maps

Provincial and City Geospatial Databases

- Majority of 663 cities started to build basic geographic databases
- 1:10K-scale databases completed: more than a dozen provinces
- 1:2K to 1:500-scale basic geographic databases completed: Beijing, Shanghai, Shenzhen, and other major cities
- Data sharing and service platforms (digital city projects) under rapid construction (e.g., Beijing and Shanghai)
- Basic geospatial data being integrated into urban planning, urban housing development, urban utilities management systems
- Digital Housing Project covers 2700 counties and all 663 cities, Urban Dynamic Monitoring Project covers all 663 cities, 101 historical cultural sites, and 170 state-level scenic spots.

Homeland Resource Data

- Standardization and up-scaling of land resource data and metadata for online and offline data sharing
 - Integrated 30 important data sources, forming a group of databases with standardized metadata, classifications, and naming rules
 - 1:500K, 1:200K, 1:2.5M, and 1:5M nationwide geological databases; 1:200K hydro-geological database; 1:500K nationwide land use database
 - Databases of national land inventory, deep geophysics, groundwater dynamic monitoring, rocks, aeromagnetic, active faults along Qinghai-Tibet Railway, specific geo-landscape
 - All 30 databases (> 1.2 TB) are currently available for sharing, 24 of which are online for public access.

Other National Databases Completed

- **Transportation:** highway, waterway, and marine charts databases
- **Forestry:** six major databases: forest inventory time series, forestation comprehensive verification, logging quota verification, forest planning-design-investigation, and annual forest dynamic survey
- **CAS:** resource-environment remote sensing dynamic monitoring
- **Oceanic Bureau:** 1:1M and 1:500K oceanic basic geography, oceanic resources, oceanic environment, oceanic hazards
- **Water Resources:** a group of 1:250K water resource thematic databases, a 30-year time series basin water quality database.

Aerospace Development

- 12 different models of “Long March” launch vehicles
- 10/80 are earth-observation satellites on orbit
- 2 positioning satellites of 1st Compass series in 2000 and 2 of 2nd Compass series in 2003 and 2009
- Recent missions of manned spacecrafts (神舟) in 2003, 2005, and 2008

Satellite Type	Counts
Meteorological	8
Ocean	2
Earth Resources	10
Communication	10
Positioning	4
Returnable	18
Scientific Experi.	18
Manned Spacecraft	7
Small Satellite	2

Space-borne Earth Observation

- FY-1A thru 1D polar orbit meteorological satellites (10-channel scanning radiometer with 1.1 km resolution)
- FY-2A thru 2D geostationary meteorological satellites (5-channel visible infrared spin scanning radiometer with 1.25 km and 5 km resolutions)
- HY-1A and 1B ocean satellites (10-channel China ocean color temperature scanner with 1.1 km res.)
- CBERS-01, 02, and 02B resource satellites (CCD camera, IRMSS, WFI, HR, with 20m, 78m, 156m, 258m, and 2.36m, respectively)
- Beijing -1 micro-satellite (3-band CCD and linear CCD push-broom imaging spectrometers, with 32m and 4m, respectively)
- SZ-3 and SZ-4 manned spacecrafts (microwave radiometer)

Major Issues in the 10th 5-year Plan

- Weak strategic planning and coordinated management
- Lack of self-dependent, advanced technologies for geospatial data acquisition and data resource development and utilization
- Standardization a bottleneck, leading to incapacity to participate in international competition and global change observation
- Lack of secured supply channels for basic geographic data
- Limited in many aspects, many current geospatial databases are still far from meeting the practical requirements.
- Low operational level for geospatial data applications

Objectives in the 11th 5-year Plan

- Data, network, and support systems for NBGID collection, updating, sharing, and service
- National geospatial data public sharing platform to provide multi-function, multi-level, and one-stop data service
- A standard system suitable for China and compatible with international standards
- Independent ability for securing own data resources through earth observation satellite series
- Industrialization of aerial remote sensing for meeting needs of disaster management
- Establish network-based, space-ground integrated multi-layer data collection and processing systems
- Further promote social services and industrial development of geospatial information
- Strengthen the geospatial data application development for the benefits of general public

Policies in the 11th 5-year Plan

- State-led joint construction
- Unified standards for resource sharing
- Demand-oriented and prioritization
- Self-dependent and innovative, open and inclusive
- Secure and regulated data management

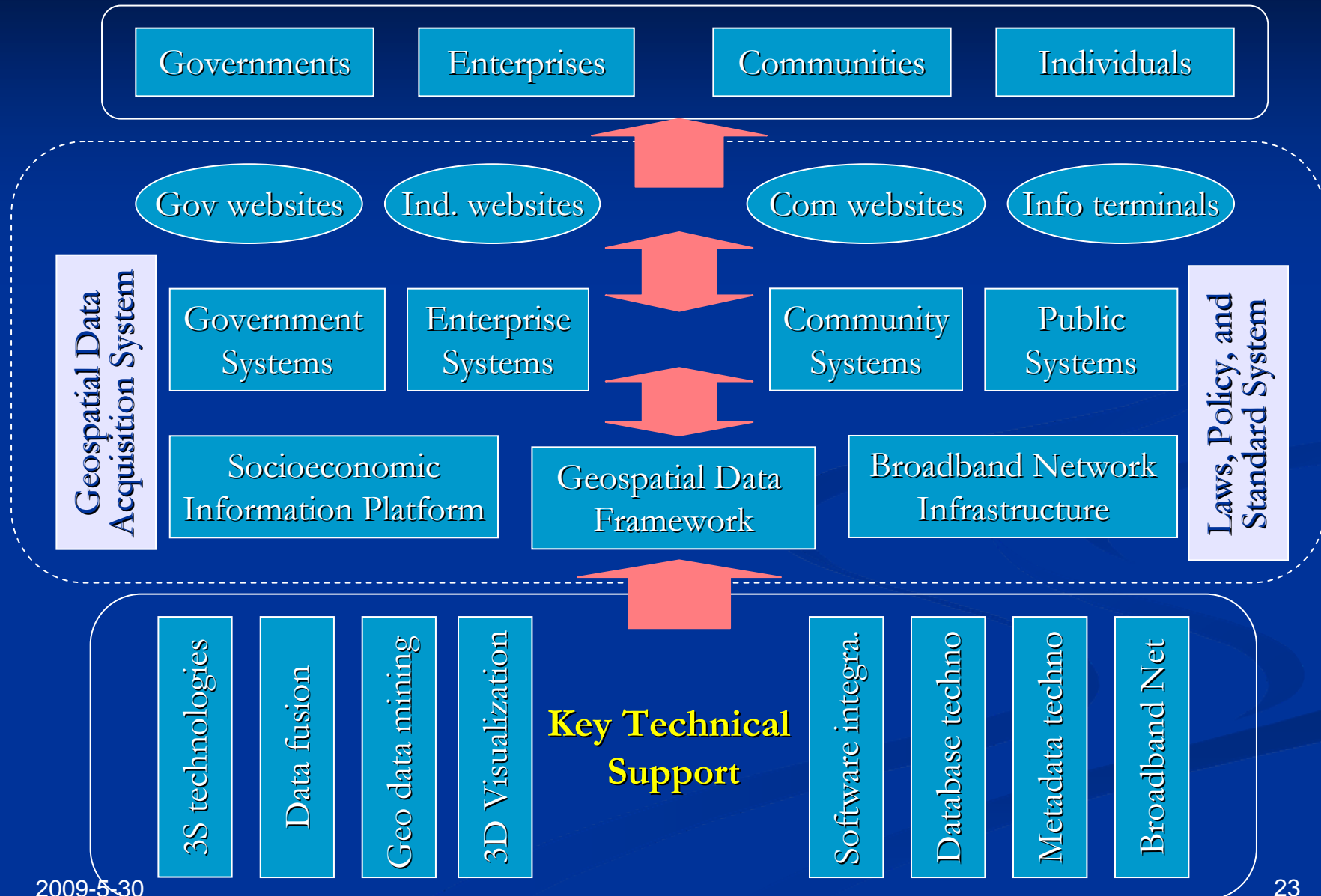
Major Tasks in the New Plan

- Inter-agency geospatial data sharing platform
- Improve aerospace, aerial and ground coupled infrastructure for geospatial data collection
- Strengthen geospatial data resource development and infrastructure construction
- Double the efforts on standardization of geospatial information
- Further push application and industrialization of geospatial data for the common good of general public

Main Areas and Projects in New Plan

- Construct geospatial basic databases for the National E-government Project
- Construct geospatial data supporting systems for national resource and environment monitoring, forecasting, and comprehensive evaluation
- Construct GIS for comprehensive monitoring, predicting, evaluation of and emergency responses to natural disasters
- Accelerate China's positioning benchmarking system for geospatial data
- Assess and construct national comprehensive aerial remote sensing data acquisition platforms
- Establish projects for industrialization of 3S network integration applications

Basic Framework of Digital China



Agencies and Institutions

- National Geospatial Information Coordination Committee
(<http://www.ngicc.gov.cn/main.htm>)
- Center for Earth Observation and Digital Earth, CAS
(<http://www.ceode.ac.cn/cn/index.jsp>)
- Institute of Remote Sensing Applications, CAS
(<http://www.irsa.ac.cn/cn/index.jsp>)
- Research Institute of Digital China, Beijing University
(<http://digitalchina.pku.edu.cn/index.php>)
- Chinese Academy of Surveying and Mapping
(<http://www.casm.ac.cn/>)
- National Remote Sensing of China
(<http://www.nrsc.gov.cn/index.asp>)

References

- Chen, J., 1999. Facilitating the Building of Digital Earth via Strengthening of CNSDI Construction, *Bulletin of Surveying and Mapping*. 11: 10-14.
- Du, Y., et al., 2007. *China's National Spatial Information Infrastructure: A Plan for Development*, Science Publishing House, Beijing, p263.
- Huang, X., 2004. GIS Development in China: A Progress Report, *Modern Surveying and Mapping*, 27(3): 3-7.
- ISPRS 2008 Committee, 2008. *Photogrammetry and Remote Sensing in China*, Surveying and Mapping Publishing House, Beijing, p236.
- Jing, G., 2004. GIS Technological Development and Industrialization in China, *Geomatics World*, 2(4): 13-17.
- Li, D., et al., 2002. Construction of China's Spatial Data Infrastructure, *Bulletin of Surveying and Mapping*, 11:4-7 and 12: 1-7.
- Shang, Y., et al., 2006. Data Design and Construction of National 1:50,000 Topographic Database, *Geomatics World*, 8(4): 6-9.
- Zeng, L., 2003. Overall Strategy of CNSDI Development in the early 21st Century, *Satellite Applications*, 11(1): 1-5.

Thanks, and your questions and
comments are welcome!