Africa GIS 2005 Pre-Conference Tutorial

From SDI to Service and Application

Oct.30, 2005, Tshwane, South Africa

JIANG Jie

Chair, ISPRS WG IV/1
National Geomatics Center of China

Contents

- Towards Service and Application of SDI
- Concepts and Evolution of SDIs
- Make SDI Serviceable
  - Data Updating
  - Data Harmonization
  - Framework
  - GIS Portal
  - Application

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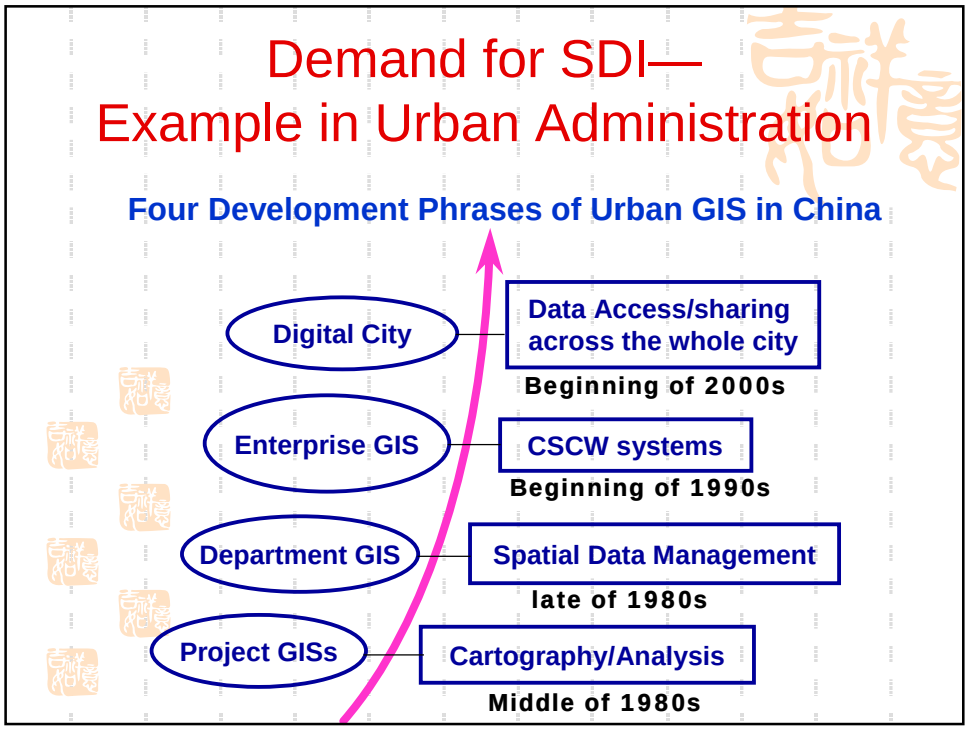
ISPRS Workshop on "Service and Application of SDI"

Oct.14-16, Hangzhou

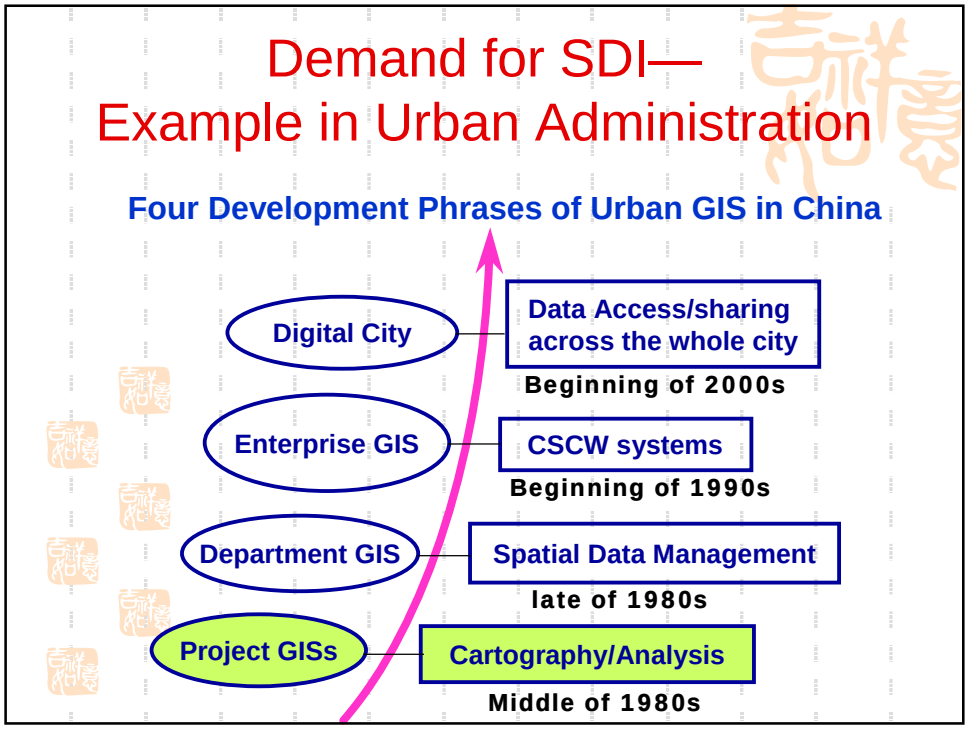
- Keynote Speeches
  - Is geo-services ready? ----On generalized and specialized spatial information grid, *Deren LI*,
  - The future of spatial data infrastructures, *Ian Masser*
  - Cross-agency alignment of geospatial investments for spatial data infrastructure development, *Kate Lance*
- Plenary Session: Advanced Development of SDI
- Technical Session
  - Information Sharing & Interoperability
  - Data Processing and Mining
  - SDI for Emergency Services
  - Global and Regional SDI
  - SDI in Urban Areas and Marine Areas
  - Update and Quality Control of the Spatial Data
  - Modelling Methods and Models for SDI
  - Implementation & Application of SDI


ISPRS Worksh
Service and Application of Spatia
isprs

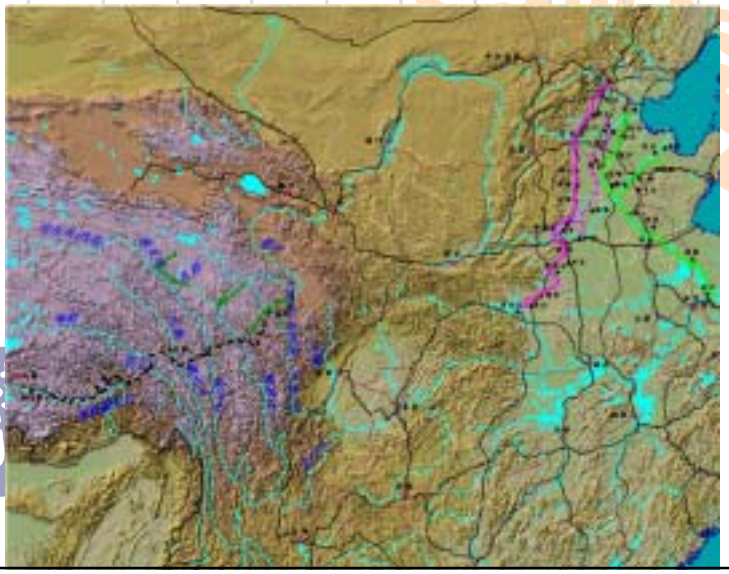
Demand for SDI— Example in Urban Administration

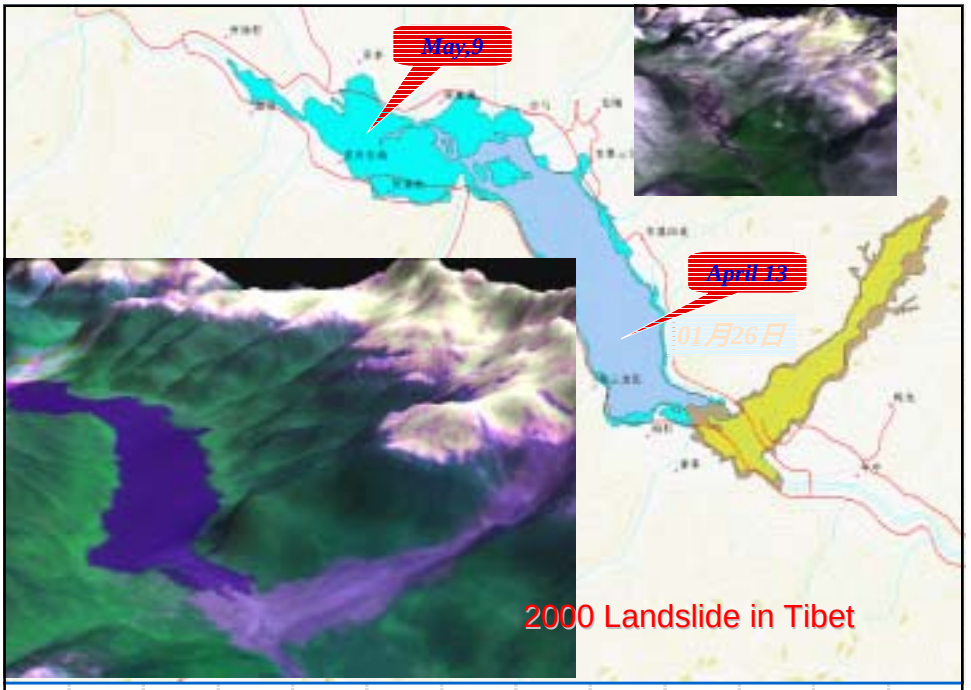


Demand for SDI— Example in Urban Administration



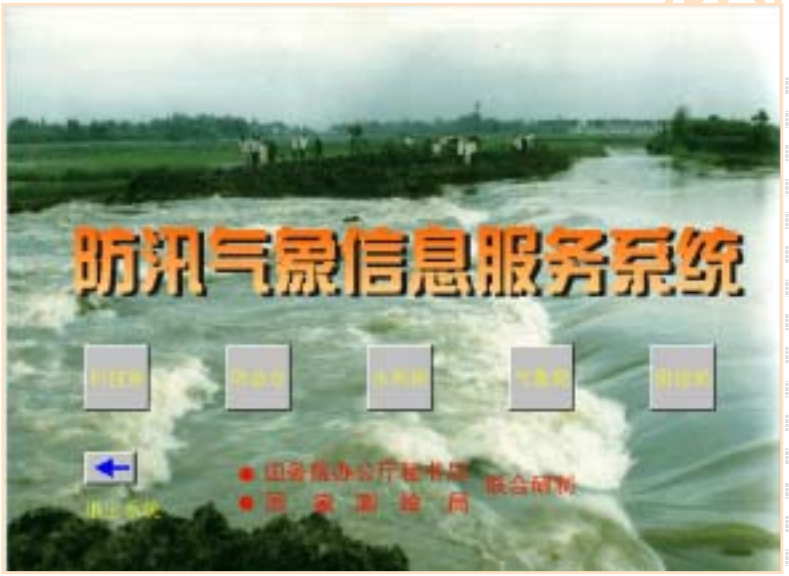
Transferring Water from South to North



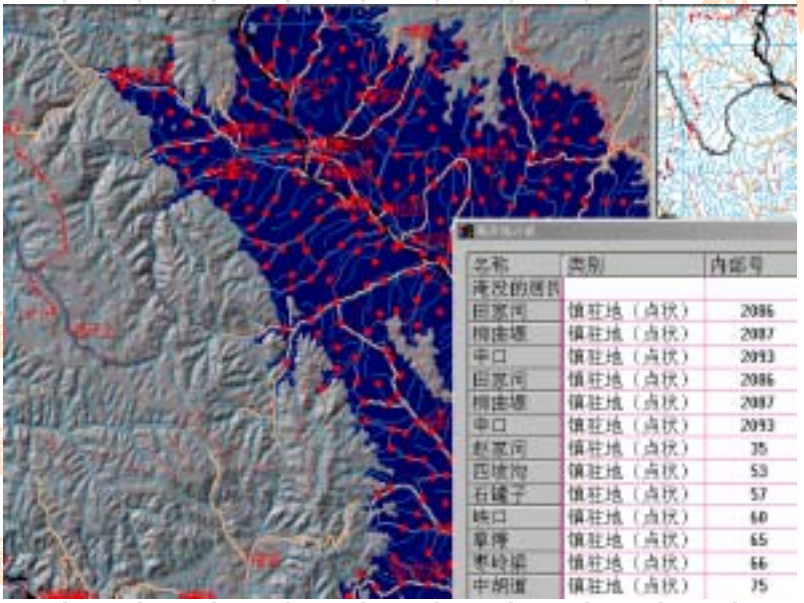


2000 Landslide in Tibet

Flood Prevention



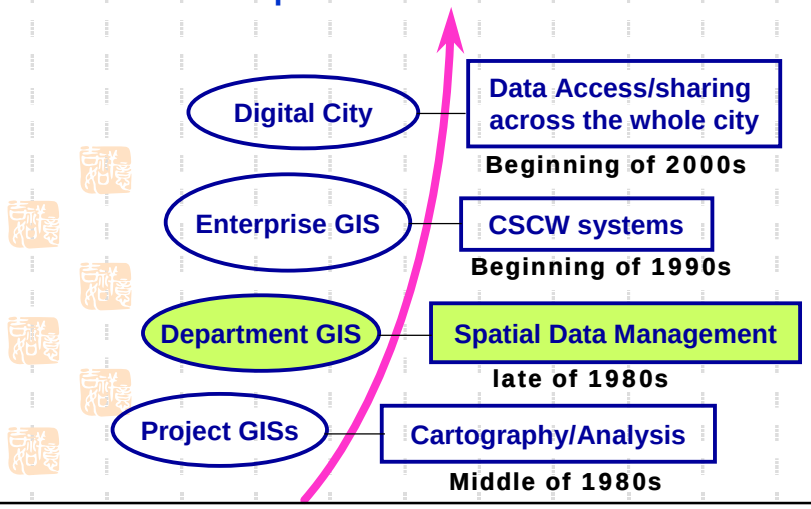
Analysis of flooding



名称	类别	内部号
库区的居民		
巨家河	镇驻地（点状）	2086
柳庙塬	镇驻地（点状）	2087
中口	镇驻地（点状）	2093
巨家河	镇驻地（点状）	2086
柳庙塬	镇驻地（点状）	2087
中口	镇驻地（点状）	2093
赵家河	镇驻地（点状）	35
四道沟	镇驻地（点状）	53
石罐子	镇驻地（点状）	57
峡口	镇驻地（点状）	60
草滩	镇驻地（点状）	65
枣岭梁	镇驻地（点状）	66
中胡渡	镇驻地（点状）	75

Demand for SDI— Example in Urban Administration

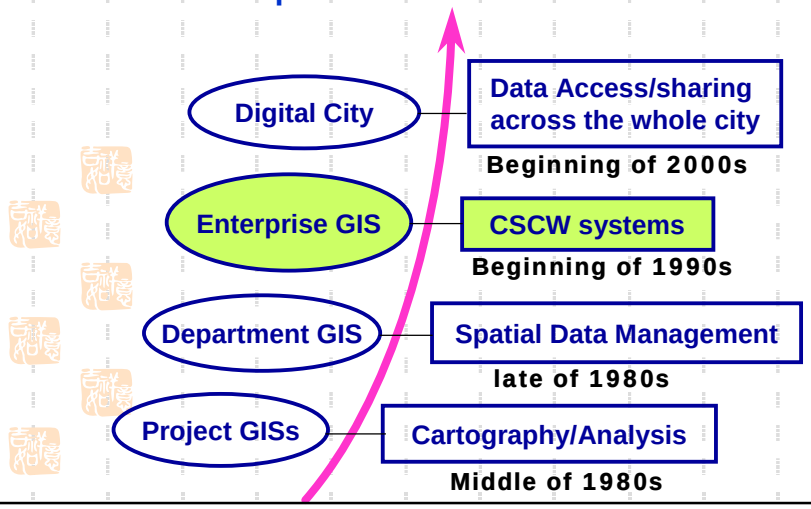
Four Development Phrases of Urban GIS in China



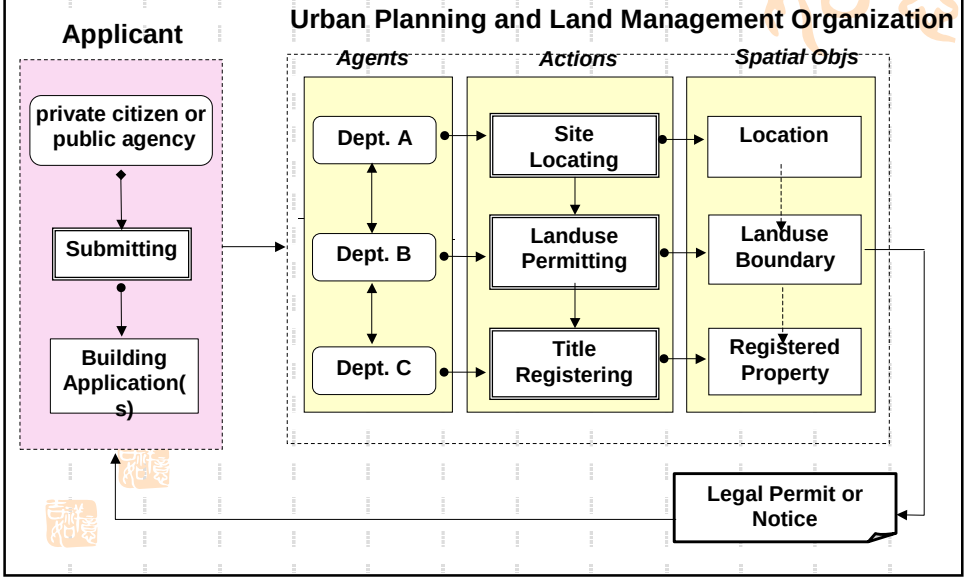
Landuse Database

Demand for SDI— Example in Urban Administration

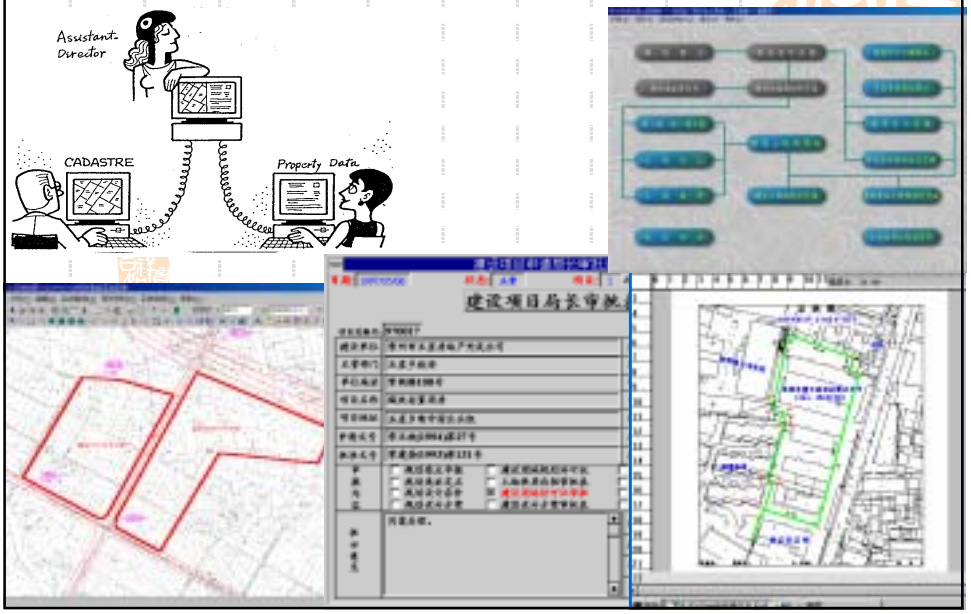
Four Development Phrases of Urban GIS in China



Collaborative Land Subdivision Process



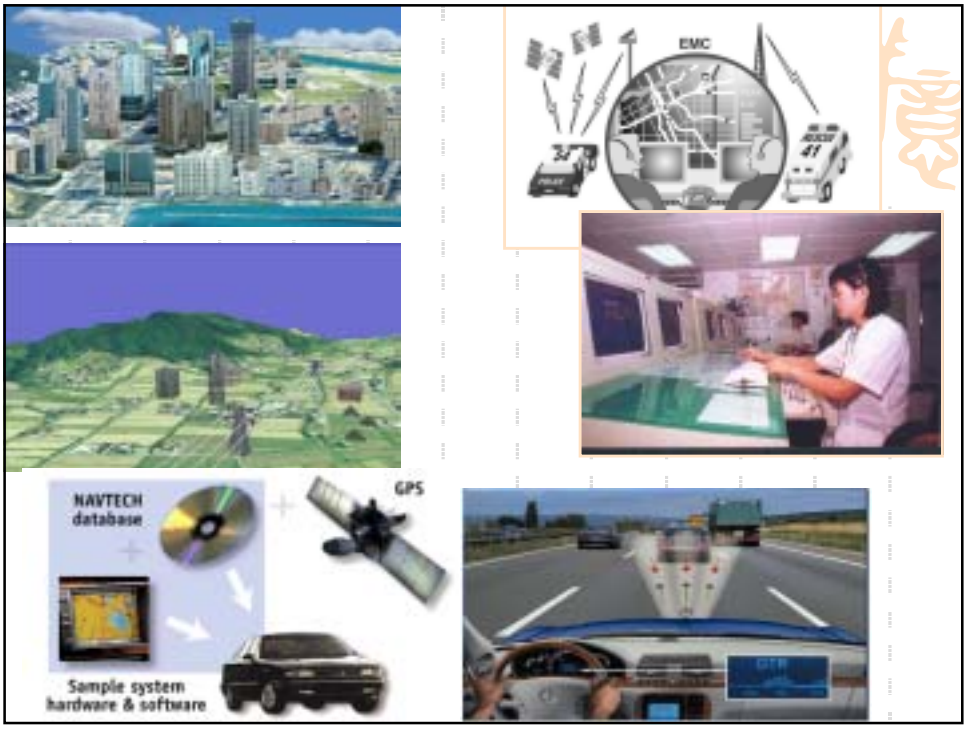
GIS based Computer Supported Collaborative Working (CSCW) Systems

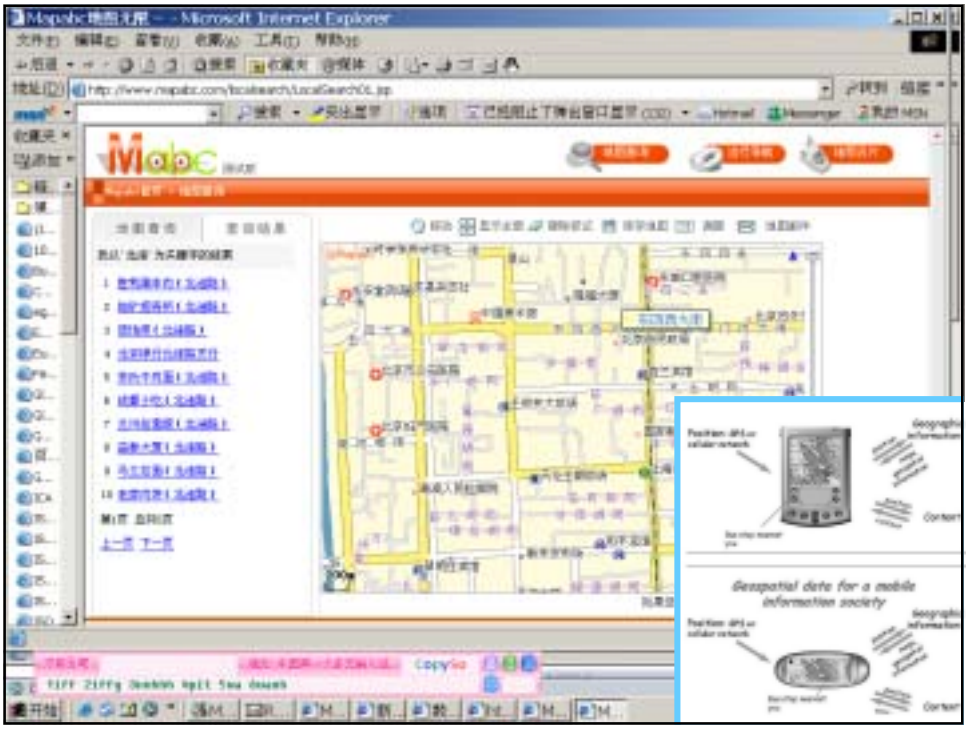


Demand for SDI— Example in Urban Administration

Four Development Phrases of Urban GIS in China

Digital City	Data Access/sharing across the whole city	Beginning of 2000s
Enterprise GIS	CSCW systems	Beginning of 1990s
Department GIS	Spatial Data Management	late of 1980s
Project GISs	Cartography/Analysis	Middle of 1980s


EMC
NAVTECH database
GPS
Sample system hardware & software


Mapabc地图先锋 - - Microsoft Internet Explorer
Mapabc
Geospatial data for a mobile information society

Demand for SDI—Example in United Nations

The Security Council…

Close attention to:

working methods

procedures

flow of info

Better informed via new approach to enhanced briefings

Vladimir Bessarabov,2002, 8th PCGIAP

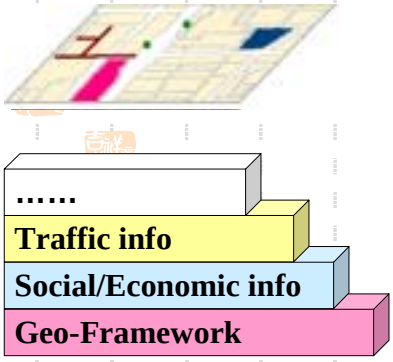
GIS Operational Concept for Peacekeeping

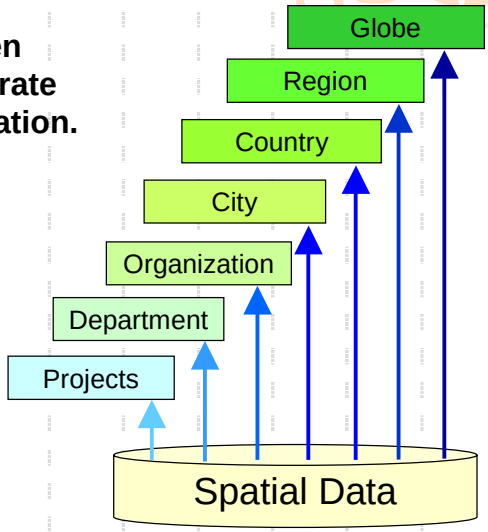
Life Saving Technology !!!

Vladimir Bessarabov,2002, 8th PCGIAP

The function of Spatial Data as Infrastructure

- **geo-spatial data has been used to support or integrate various thematic information.**





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What's SDI?

- GIS-NSDI-GSDI-SDI
- Definition of GIS
  - A system for capturing, storing, checking, integrating, manipulating, analysing, and dispalying data which is spatially referenced to the Earth (Department of Environment 1987, p.132). It's "The biggest step forward in the handling of geographic inforamtion since the invention of the map" (Para 1.7)

Department of the Environment,1987. Handling geographic information: Report to the Secretary of State for the Environment of the Committee of Enquiry into the Handling of Geographic Information, UK

What's SDI?

- GIS-NSDI-GSDI-SDI
- Definition of NSDI
  - Geographic information is critical to promote economic development, improve our stewardship of natural resources, and to protect the environment. Modern technology now permits improved acquisition, distribution, and utilization of geographic data and mapping. The National Performance Review has recommended that the Executive Branch develop, in cooperation with state, local, and tribal governments and the private sector, a coordinated National Spatial Data Infrastructure to support public and provide sector applications of geospatial data in such areas as transportation, community development management, and information technology.

Executive Order signed by U.S. President Clinton: Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure (Executive Office of the President 1994, USA)

What's SDI?

- GIS-NSDI-GSDI-SDI
- Definition of GSDI
  - "The Global Spatial Data Infrastructure supports ready global access to geographic information. This is achieved through the coordinated actions of nations and organisations that promote awareness and implementation of complimentary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes."

GSDI Association, www.gsdi.org

What's SDI?

- GIS-NSDI-GSDI-SDI
- Definition of SDI
  - A Spatial Data Infrastructure is the means to assemble geographic information that describes the arrangement and attributes of features and phenomena on the Earth. The infrastructure includes the materials, technology, and people necessary to acquire, process, store, and distribute such information to meet a wide variety of needs.

[Toward a Coordinated Spatial Data Infrastructure for the Nation (1993) Commission on Geosciences, Enviroment and Resources (CGER) National Academies Press]

What's SDI?

- GIS-NSDI-GSDI-SDI
- Definition of SDI (Continue)
  - A spatial data infrastructure supports ready access to geographic information. This is achieved through the co-ordinated actions of nations and organizations that promote awareness and implementation of complimentary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes. These actions encompass the policies, organizational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the (national) and regional scale are not impeded in meeting their objectives.

[Ian Masser, GIS Worlds: Creating spatial data infrastructures, 2005]

What's SDI?

- GIS-NSDI-GSDI-SDI
- Definition of SDI (Continue)
  - **SDI** is an initiative necessary for the effective collection, management, access, delivery and utilisation of spatial data
  - **SDI** is about facilitation and coordination of the exchange and **sharing** of spatial data
  - **SDIs** constitute a set of **relationships** and **partnerships** that enable data sharing, update and integration

Ian Williamson, Meeting of PCGIAP, 2004

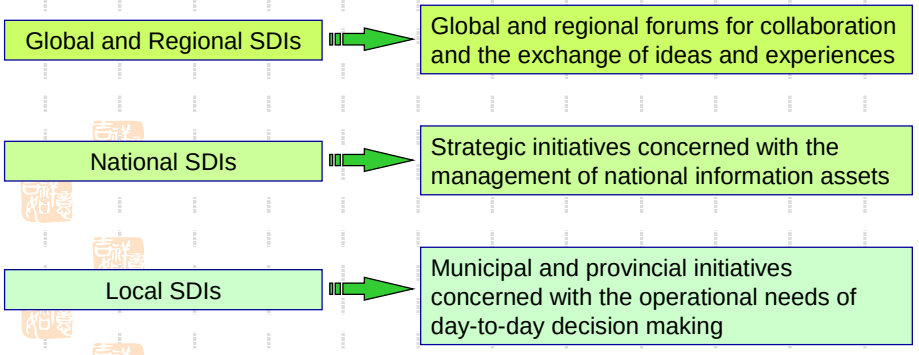
What's SDI?

- GIS-NSDI-GSDI-SDI
- Definition of SDI (Continue)
  - SDI is a special kind of infrastructure for acquisition, measurement, processing, management, maintenance, representation, distribution and utilization of geo-spatial data based on computer networks with distributed databases and unique standards.

Deren LI, 2002, ISPRS Com.II Symposium

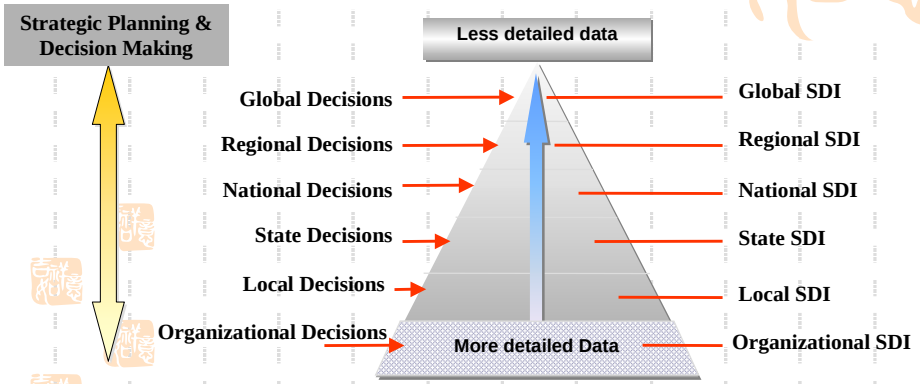
What's SDI?

- GIS-NSDI-GSDI-SDI



Ian Masser, GIS Worlds: Creating spatial data infrastructures, 2005,

Hierarchy of SDI

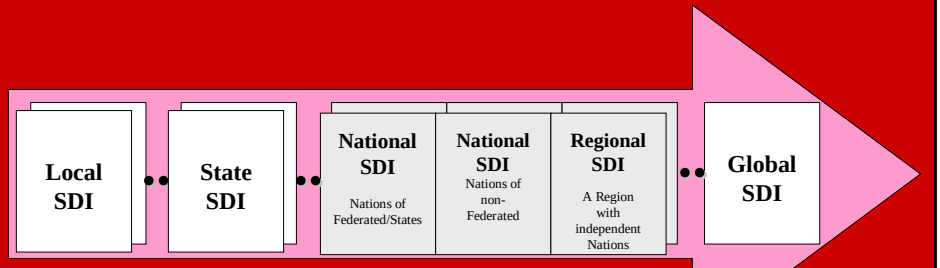


Success depends on cooperation between individuals and agencies

Ian Williamson, Meeting of PCGIAP, 2004

Continuum of SDI Development

Increasing autonomy among member nations/states



Ian Williamson, Meeting of PCGIAP, 2004

Milestones of SDI Development

- 1986 Australian ALIC set up
  - To coordinate the collection and transfer of land related information between the different levels of government
- 1987 Chorley report to UK government
  - Handling geographic information
- 1990 US FGDC set up
  - To coordinate the development, use, sharing and dissemination of surveying mapping and related spatial data
- 1993 Creation of EUROGI
  - First regional SDI body
- 1993 US MSC report
  - 'Toward a coordinated spatial data infrastructure for the nation'
- 1994 Clinton Executive Order 12906
  - Coordinating geographic data acquisition and access: the National Spatial Data Infrastructure
- 1996 First Global Spatial Data Infrastructure (GSDI) Conference in Bonn, Germany

Ian Masser, The Future of SDIs, 2005 (Proceedings of ISPRS Hangzhou Workshop)

The Diffusion of SDIs

- 1999 First generation of NSDIs study identified 11 nations as implementing NSDIs in 1996
- 1998-2000 53 countries/projects responded to GSDI survey
- 2003 120 countries considering SDI projects (more than half the countries in the world)

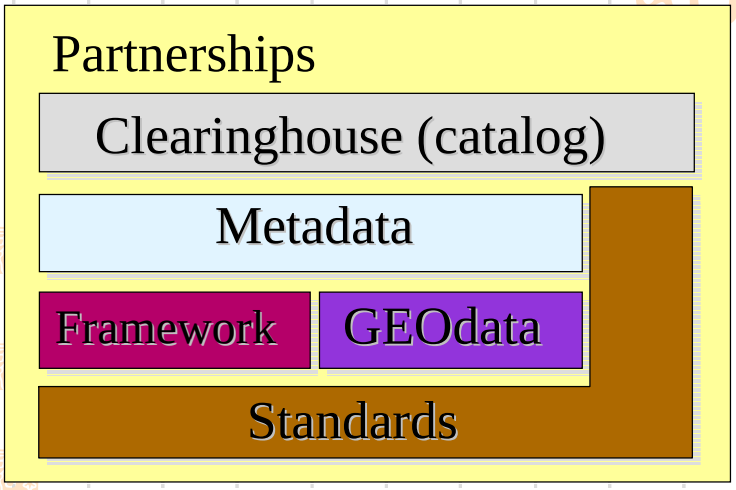
Ian Masser, The Future of SDIs, 2005 (Proceedings of ISPRS Hangzhou Workshop)

The Diffusion of SDIs

- The 11 innovators and early adopters
  - Australia: Australian Spatial Data Infrastructure
  - Canada: Canadian Geospatial Data Infrastructure
  - Indonesia: National Geographic Information Systems
  - Japan: National Spatial Data Infrastructure
  - Korea: National Geographic Information System
  - Malaysia: National Infrastructure for Land Information Systems
  - Netherlands: National Geographical Information Infrastructure
  - Portugal: National System for Geographic Information
  - Qatar: National Geographic Information system
  - United Kingdom: National Geospatial Data Framework
  - United States: National Spatial Data Infrastructure

Ian Masser, GIS Worlds: Creating spatial data infrastructures, 2005,

Components of (N)SDI

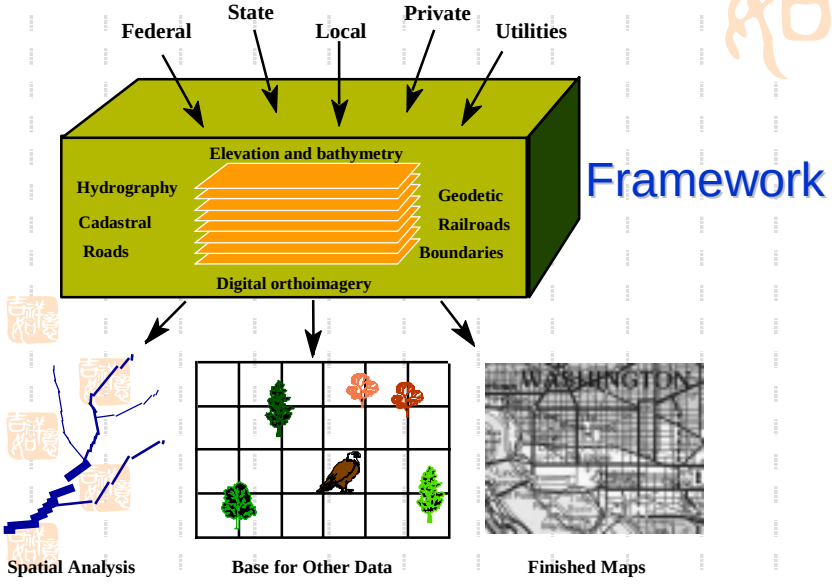


http://www.fgdc.gov

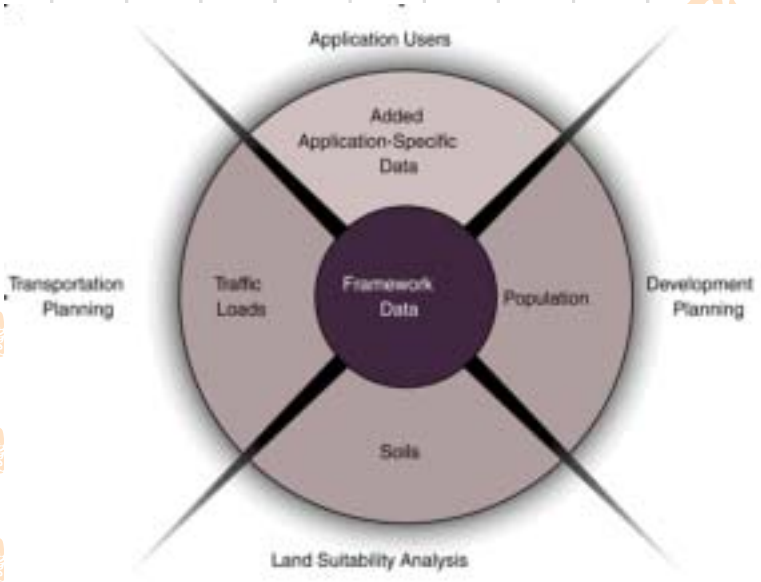
Framework—provides a core…

- Data sets developed to a common content specification for high re-use potential. These are known as “Framework” data.
  - a foundation to which spatial information and attributes can be added
  - a base on which other themes of data can be compiled
  - context to orient and link the results of analyses to the landscape
- Framework supports...
  - Community development of sets of spatial primitives, feature representation, and attribution to a lowest common denominator
  - Participants collecting or converting information to common Framework specifications
  - Multiple representations of real-world features at different scales and times by feature identifier and generalization
- Framework implementation
  - Performed within thematic communities, composed of federal, local government, academic, and vendor contributions
  - Drafted and tested first on a local scale and propagated upwards to assure compatibility
  - Ownership does not fall to one organization but to a cooperative group

Framework—provides a core…



Framework—provides a core...



MetaData--Describing your data...

- The uses of metadata
  - Provides documentation of existing internal geospatial data resources within an organization *(inventory)*
  - Permits structured search and comparison of held spatial data by others *(advertising)*
  - Provides end-users with adequate information to take the data and use it in an appropriate context *(liability)*
- Metadata developments
  - Metadata Standard
  - Collection tools available
  - Training

Clearinghouse --Making data discoverable...

- Clearinghouse is used to…
  - Discovery of spatial data
  - Distributed search worldwide
  - Uniform interface for spatial data searches
  - Advertising for your data holdings
- Clearinghouse operates as...
  - Entry point to constellation of servers
  - Collection of distributed servers
  - A virtual “google” for geospatial data

Standards -- Consistent approaches...

- Tables of standards
  - Data content
    - —Common classifications
    - —Common collection criteria
  - Data management
    - Metadata
    - Spatial Data Transfer
- Clearinghouse operates as...
  - Entry point to constellation of servers
  - Collection of distributed servers
  - A virtual “google” for geospatial data

Partnerships hold it all together

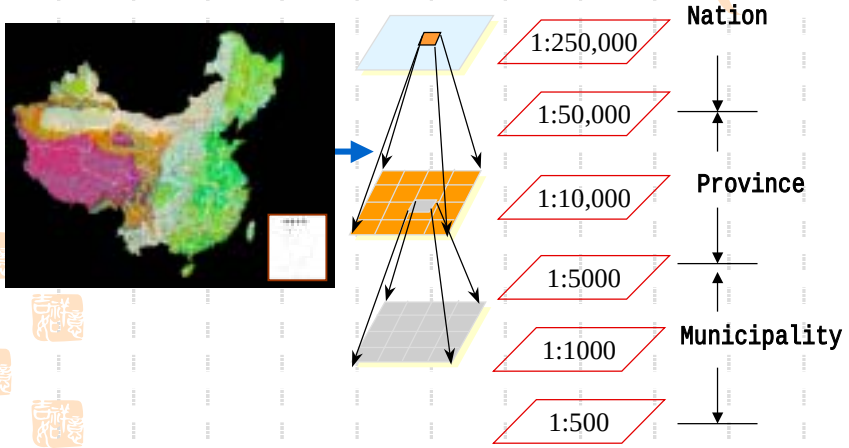
- The (N)SDI is built through the actions of thousands of participants
- Policy and legal issues about SDI
  - Spatial data access rights
  - Enabling of SDI
    - Concepts of “free” or “un-inhibited”
    - Impact on copyright and IPR
    - Issue of right to privacy”
  - Liability exposure of decisions from spatial data
  - Right to value-add
    - Owner, customer or service provider
  - Spatial data as a privilege knowledge

Development of SDI in China

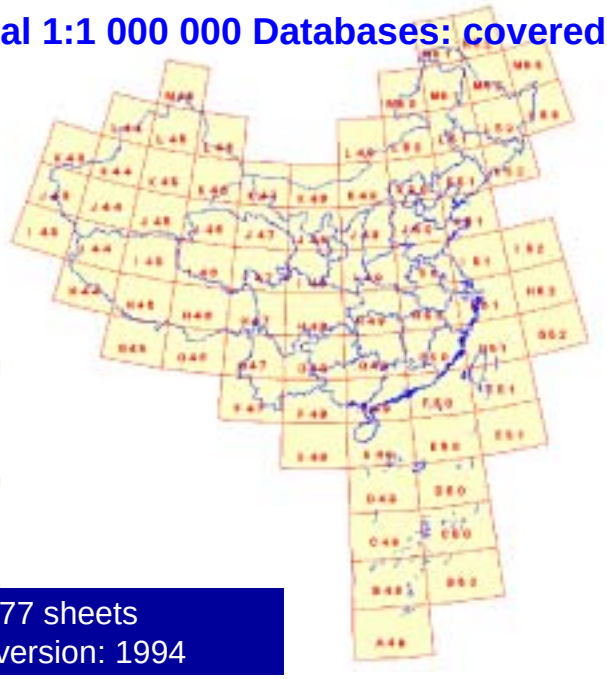
Development of SDI in China

- Developing multi-scale data sets
- Home-grown Technical Systems
- Intensive scientific research activities
- Degree education program & training
- National coordination

Multi-Scale Datasets

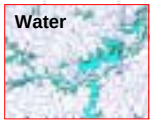


National 1:1 000 000 Databases: covered area



77 sheets
1st version: 1994

National 1:1 000 000 Databases:main contents



Topographic database

.All features

.ARC/INFO format

.Arc/China products

Place name database

.Covering whole country

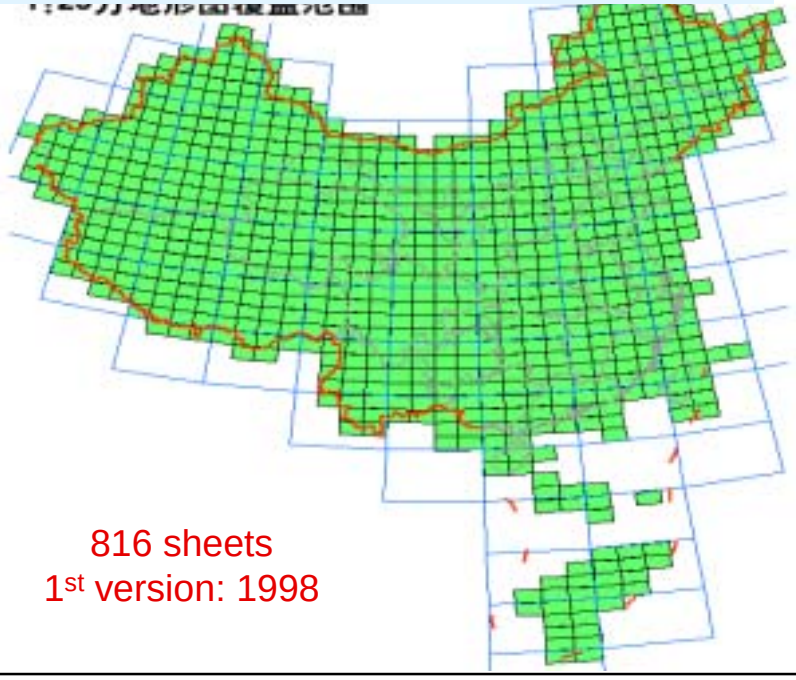
.Dbase and Oracle format

DEM database

.28.125' X 18.750'

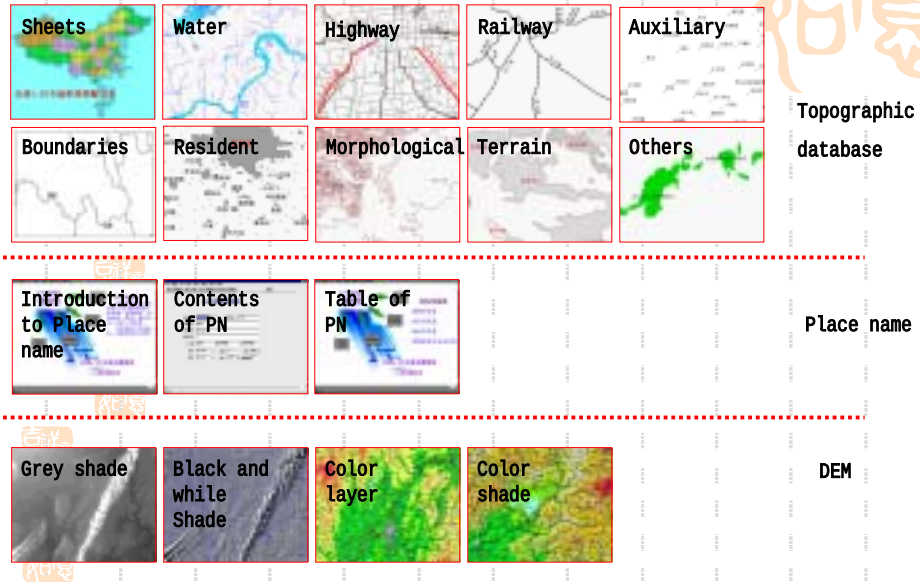
.600m X 600m

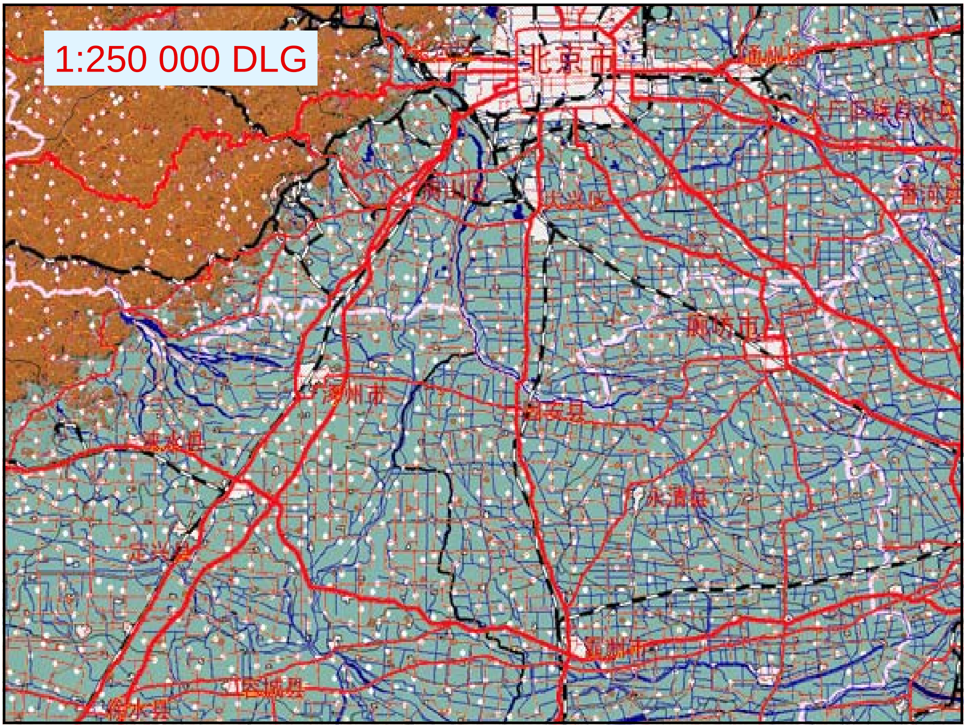
National 1:250 000 Databases: covered area

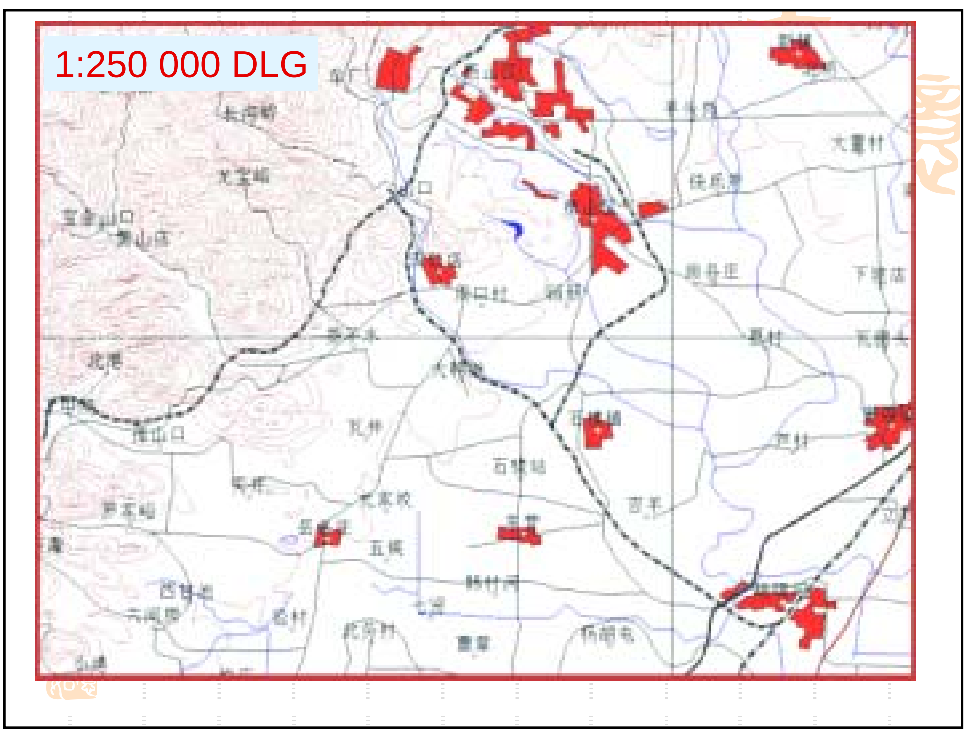


816 sheets
1st version: 1998

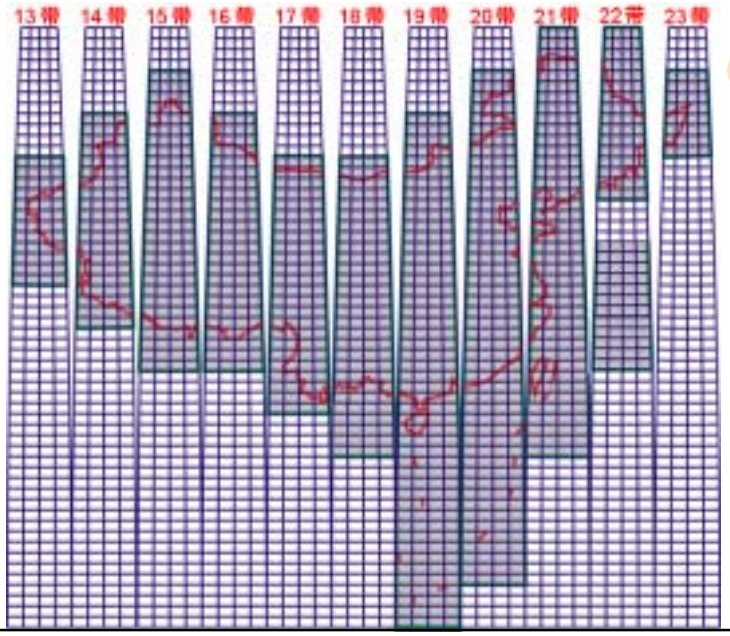
National 1:250 000 Databases :main contents




1:250 000 DLG
北京市
廊坊市
涿州市
固安县
永清县
霸州市

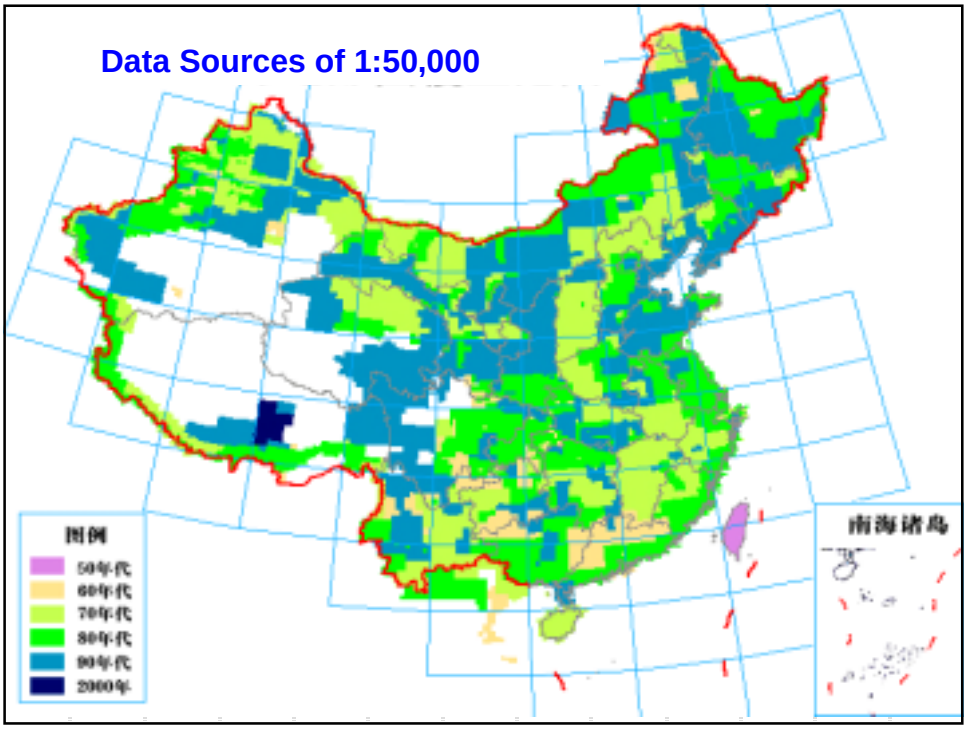

1:250 000 DLG

National 1:50 000 Databases: covered area

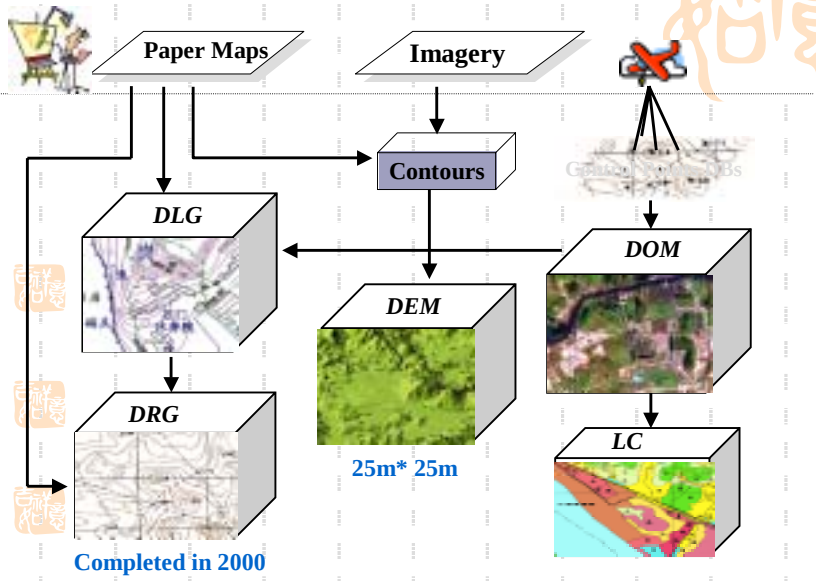


24,322 sheets

Data Sources of 1:50,000



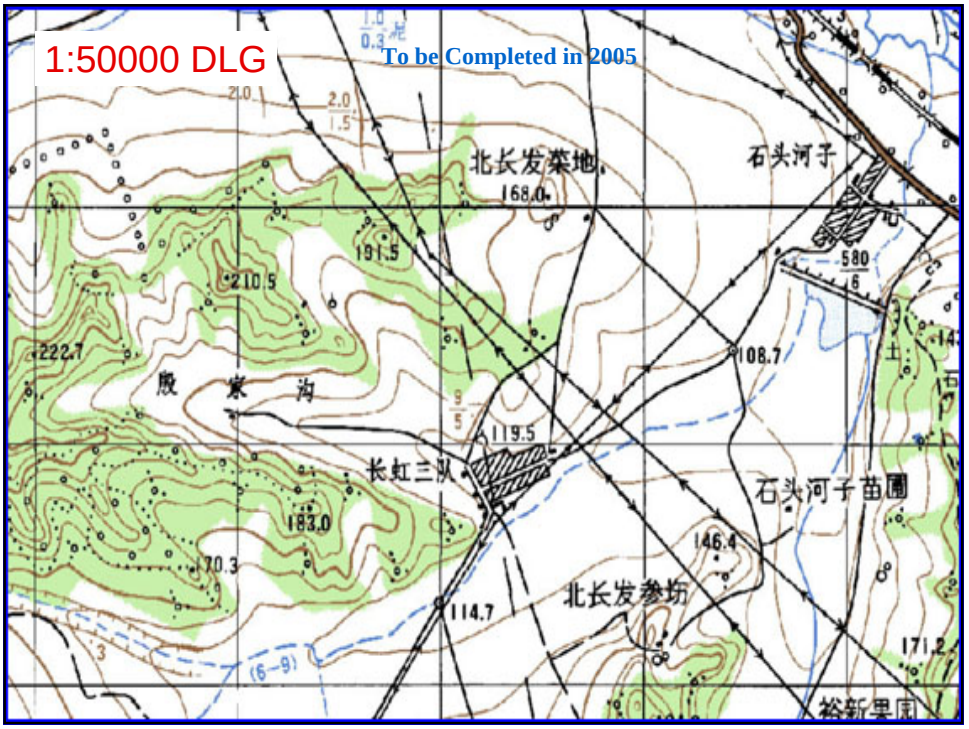
Workflow of 1:50,000 datasets production

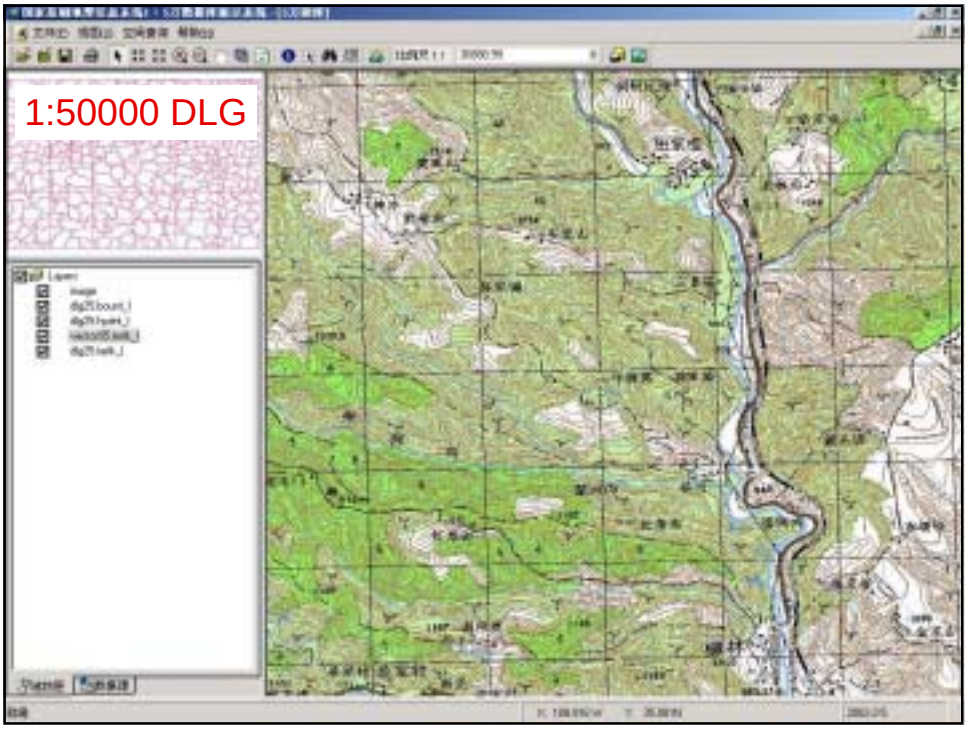


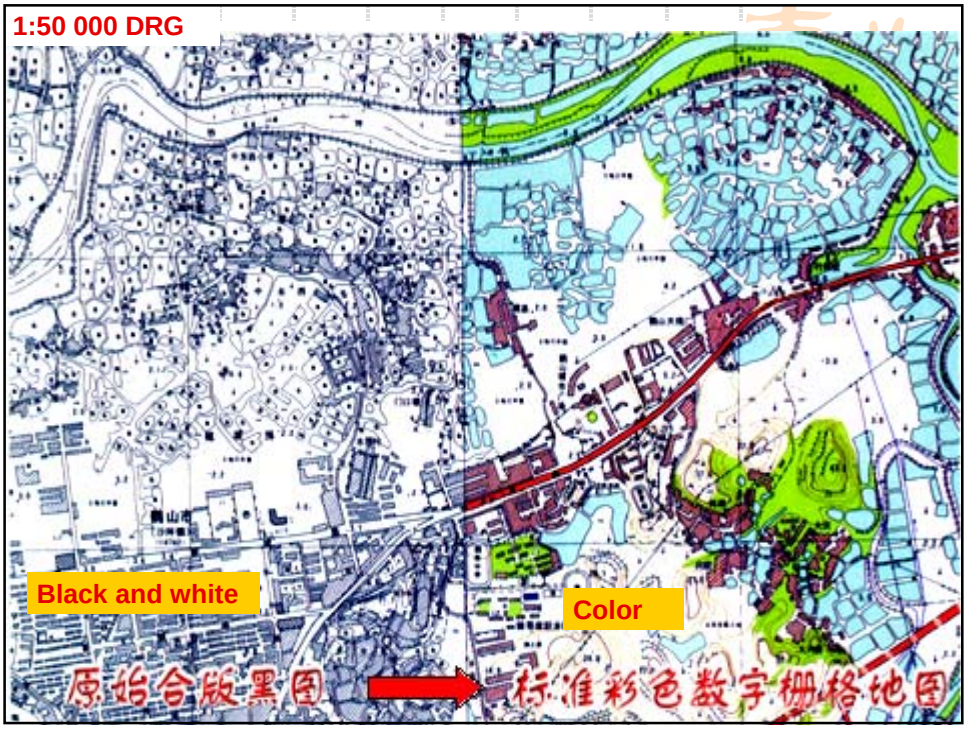
Data Volume of 1:50,000

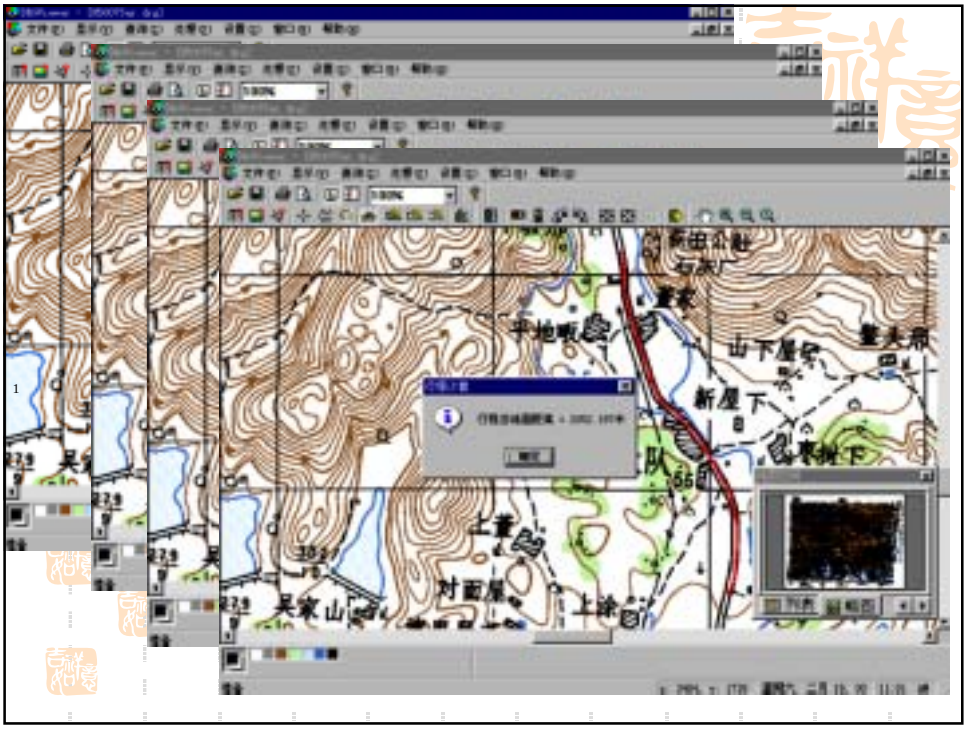
products	Data format	Storage volume	Online volume	notes
DRG	raster	186 GB	162 GB	4m resolution
DEM	Vector,raster	1700 GB	78 GB	25m grid (ArcInfo format)
DOM-AP	raster	6250 GB	218 GB	1m resolution, airphoto
DOM-TM	raster	600 GB	42 GB	30m resolution, TM image
DOM-SPOT	raster			10m resolution SPOT pan image
DLG	vector			Geo-element, with no contour
PN	text	4 GB	4 GB	More than 3 million items
LC	Vector, raster	30GB	10 GB	30m resolution
CP	Text, raster	127 GB	50 GB	0.15 million points
MD	text	10 GB	10 GB	
others		524 GB	16 GB	
total		10009 GB	671 GB	11TB

11TB

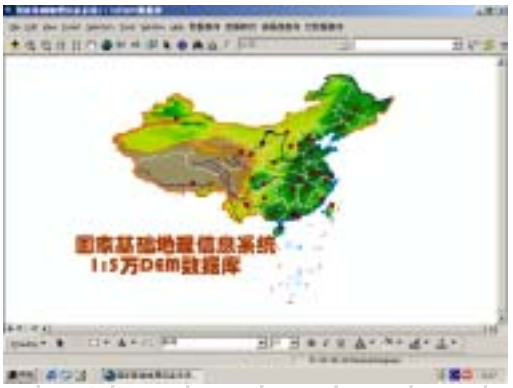

1:50000 DLG
To be Completed in 2005
北长发菜地
168.0
石头河子
191.5
210.5
580
222.7
108.7
119.5
长虹三队
183.0
石头河子苗圃
170.3
146.4
北长发参场
114.7
171.2


1:50000 DLG


1:50 000 DRG
Black and white
Color
原始合版黑图
标准彩色数字栅格地图

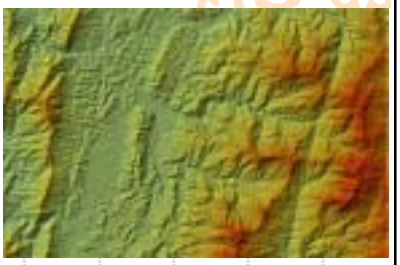


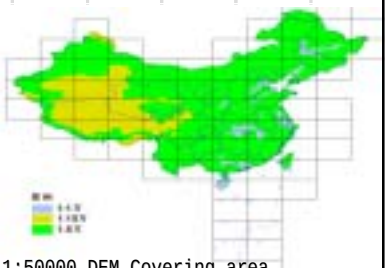
1:50 000 DEM



DEM information system

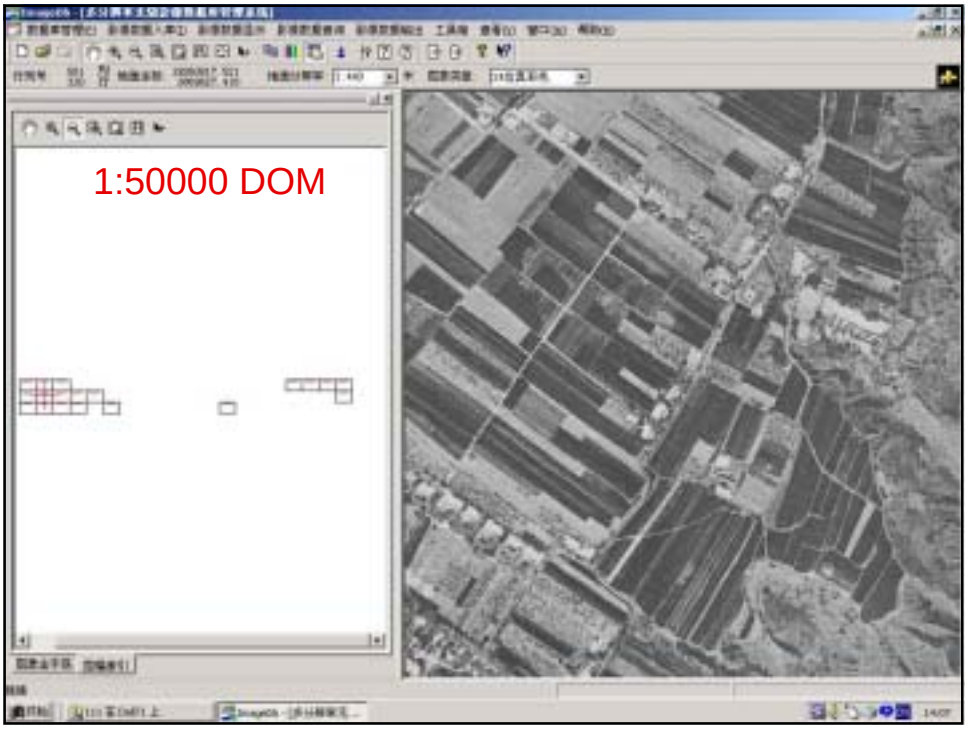
1:50000 DEM shade

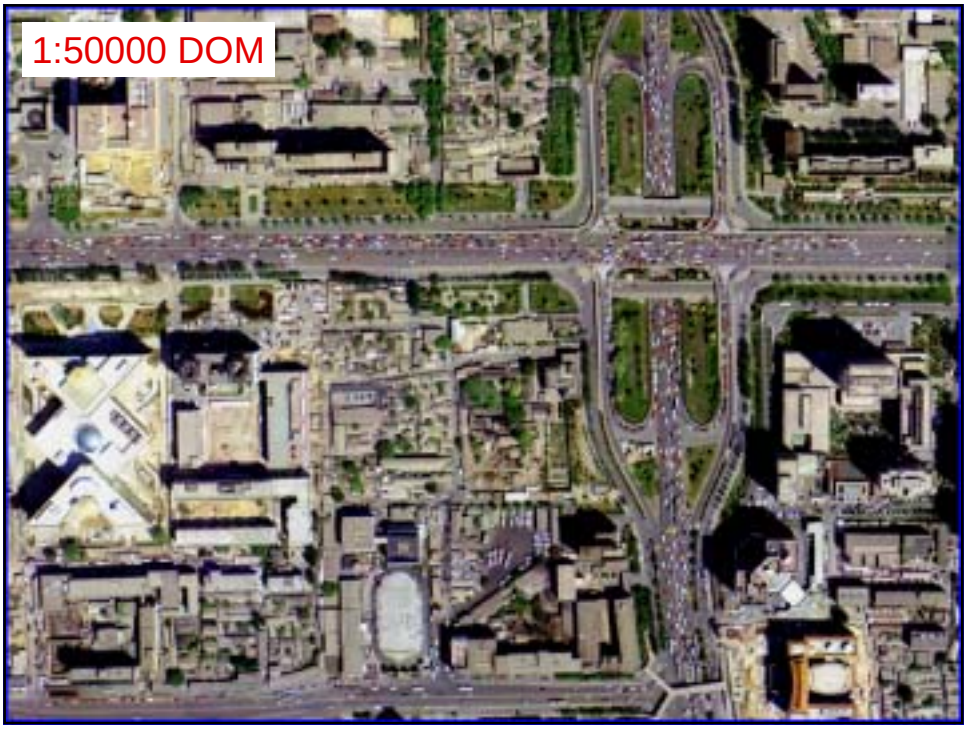


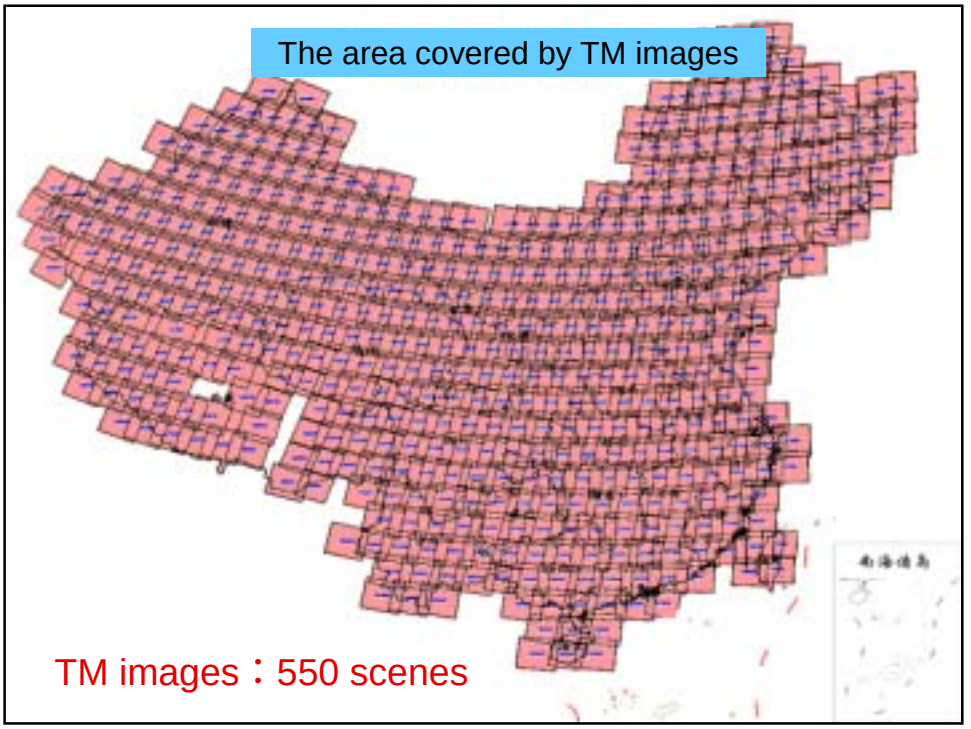


1:50000 DEM Covering area

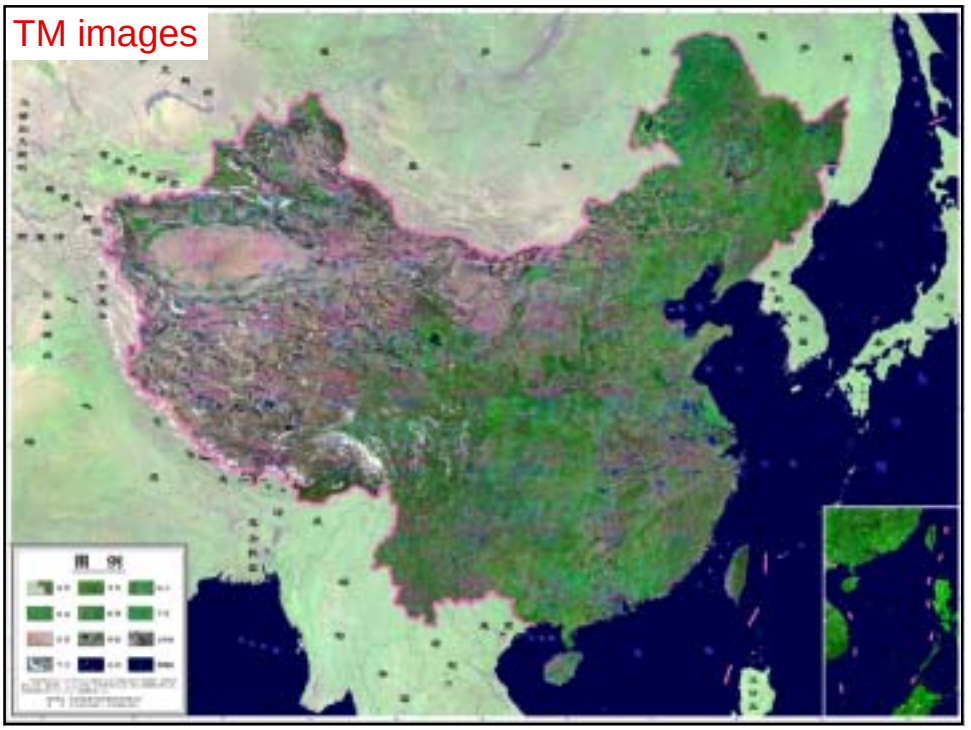
Grid format，ASCII files，106 items

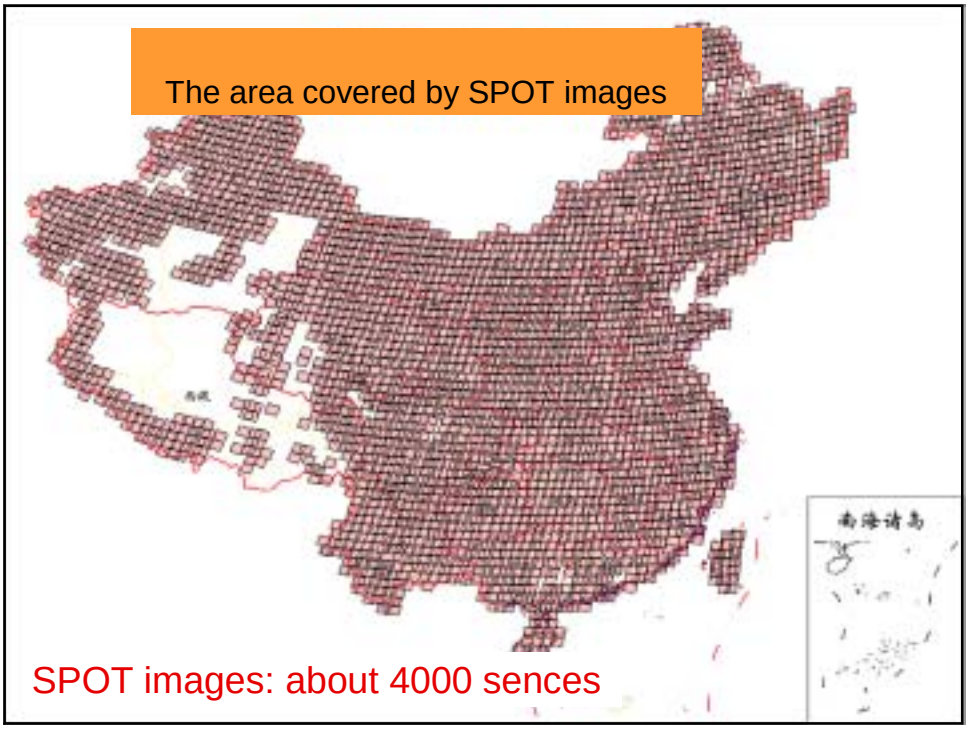



1:50000 DOM

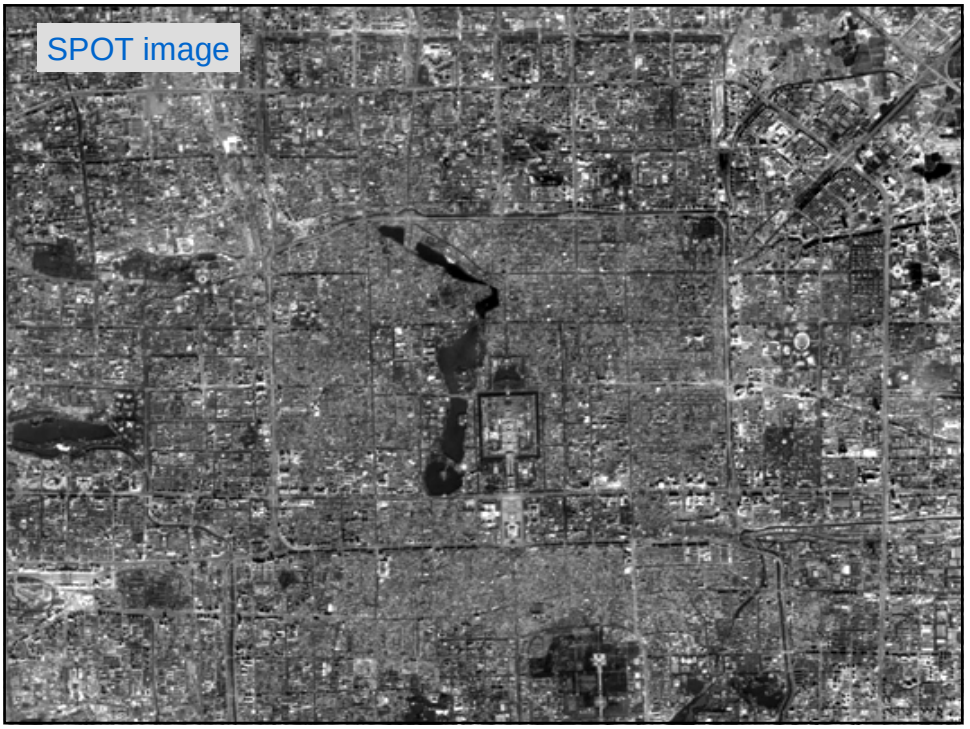

The area covered by TM images
TM images：550 scenes

TM images



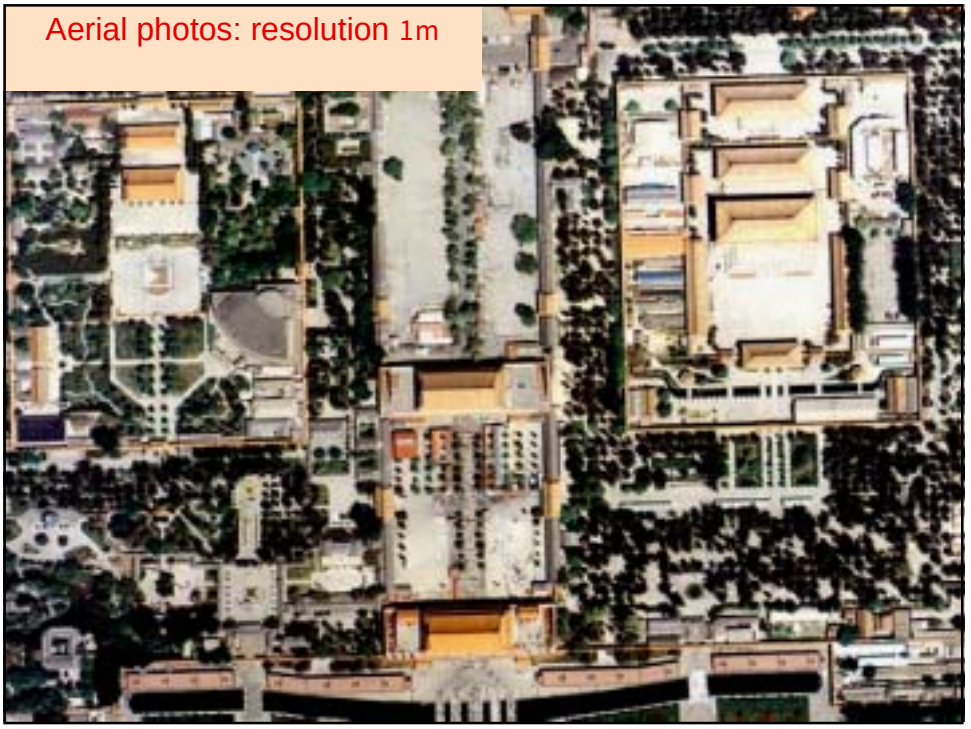


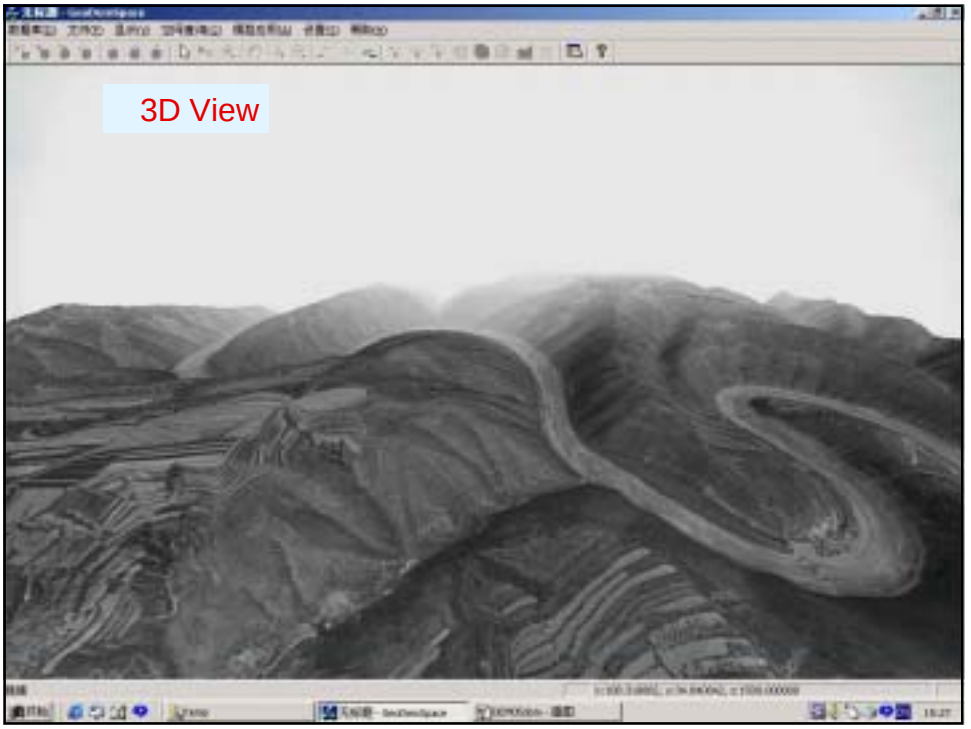
SPOT images: about 4000 sences

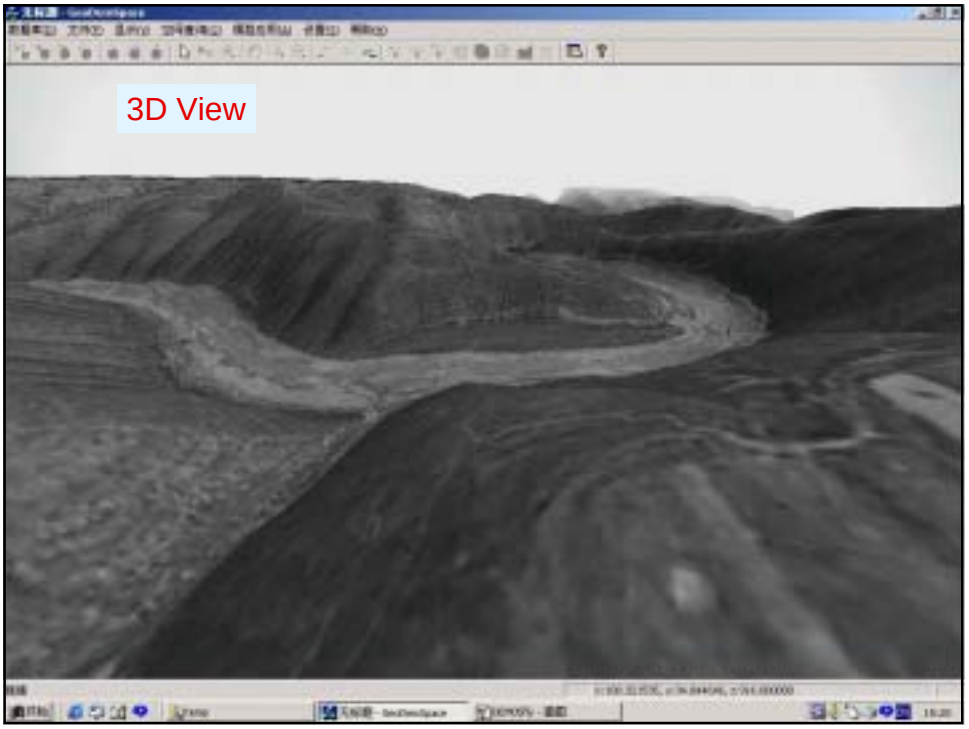

SPOT image


The area covered by aerial photos
图例
60年代
70年代
80年代
90年代以后
南海诸岛

Aerial photos: resolution 1m

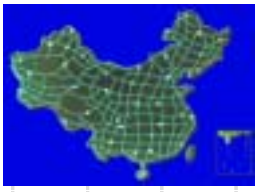






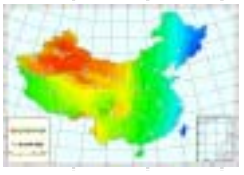
National Geodetic Databases

Astro-Geodetic Network



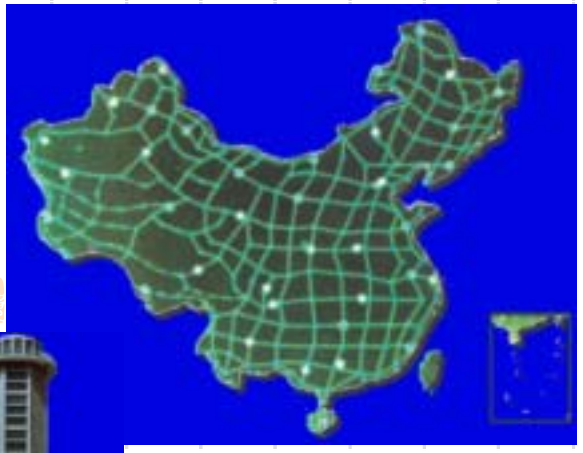
1st Order Leveling Network

GPS Network (A and B levels)



Basic Gravity Network

National Astro-Geodetic Network



Triangulation points

& Traverse points

48433

Laplace points

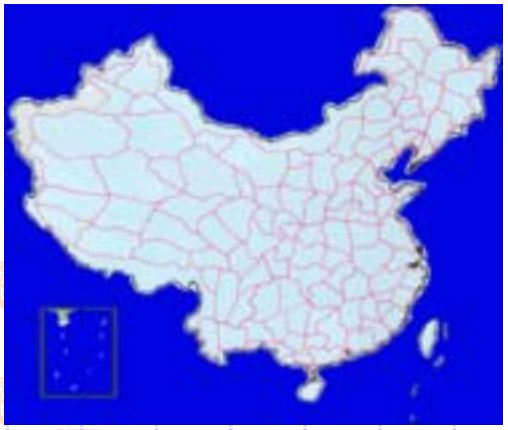
458

origin edges

467

Geodetic Origin

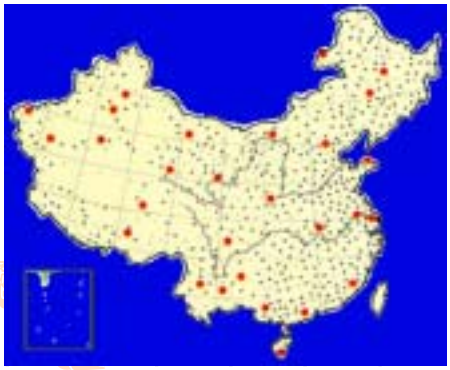
National First Order Levelling Network



Leveling Origin

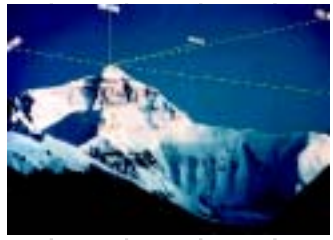
292 chains、19931 benchmarks, total length 93341km

National High-Precision GPS Network



利用高精度GPS网

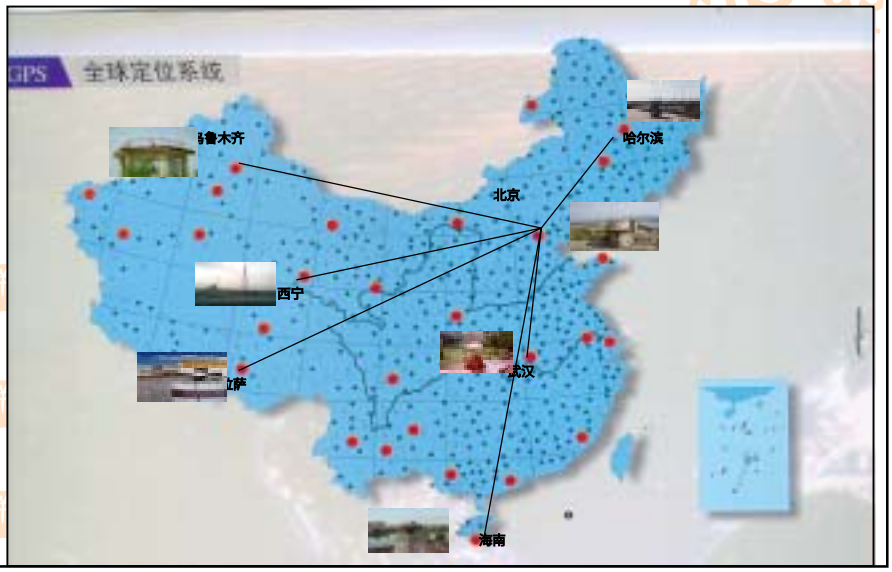
对珠峰进行精确测量



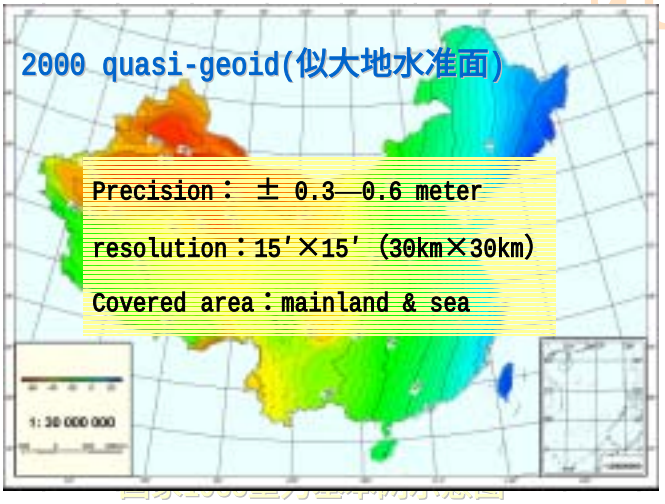
Level A points:33

Level A points 818

GPS TRACKING STATION



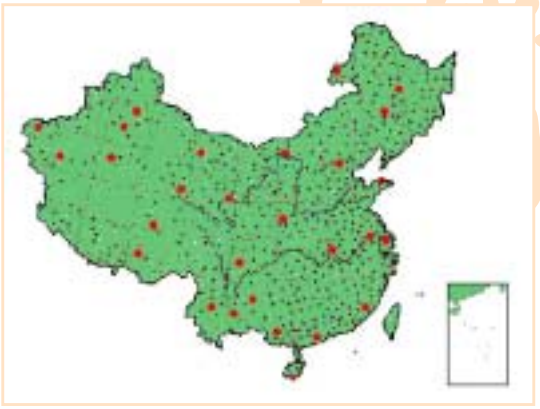
National Basic Gravity Network



National 2000 Basic Gravity Network

- Jointly initiated by SBSM, Military and Bureau of Seismology in 1999
- Consisting of 137 points, including 18 fiducial points and 119 basic points
- Field work completed and data processing being under way.

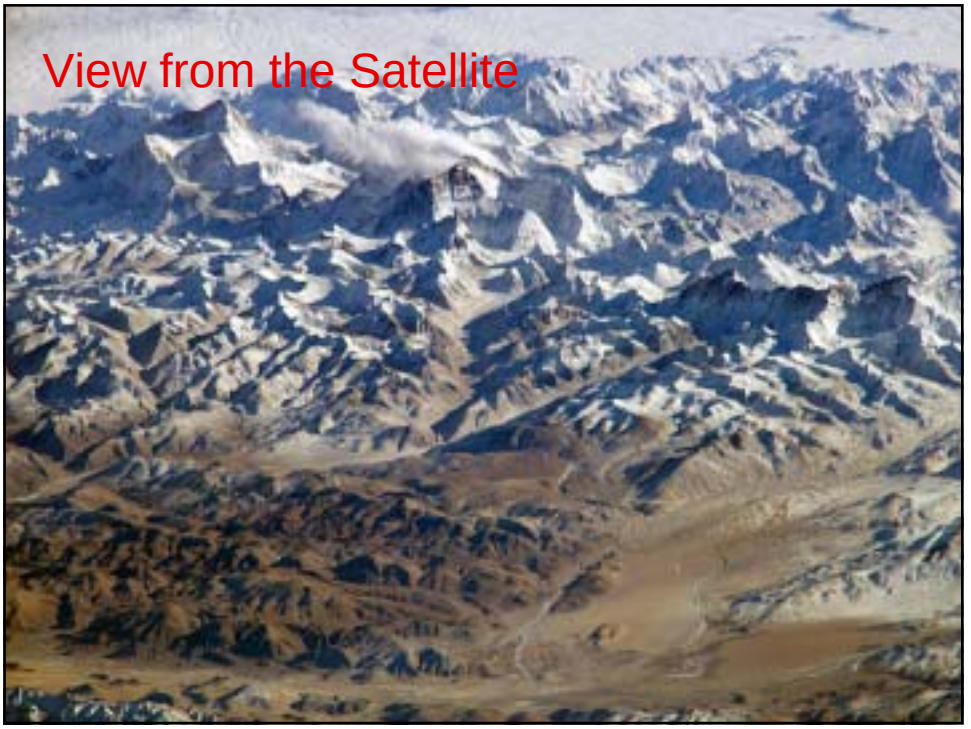
Crustal Movement Monitoring Network



- 1,200 GPS points mainly along the tectonic belts
- 25 permanent GPS stations established by the end of 2000 for maintaining national geocentric reference frame, supporting the study in geo-dynamics, promoting the application of local area differential GPS as well as wide area differential GPS.

Elevation of Mt.Zhumulangma (Everest)

- 1975—8848.13
- 1992—8846.27
- 1999—8849.5
- 2005—8844.43

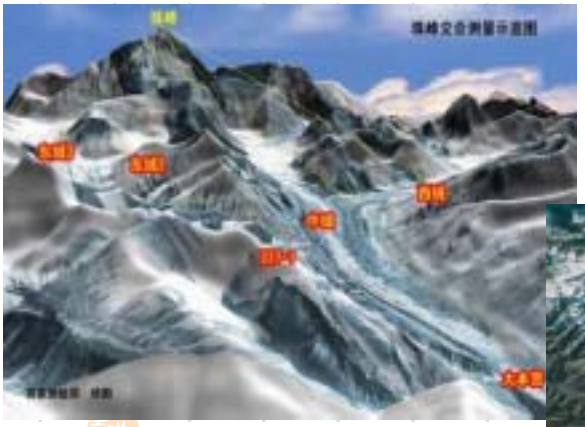

View from the Satellite


Morning

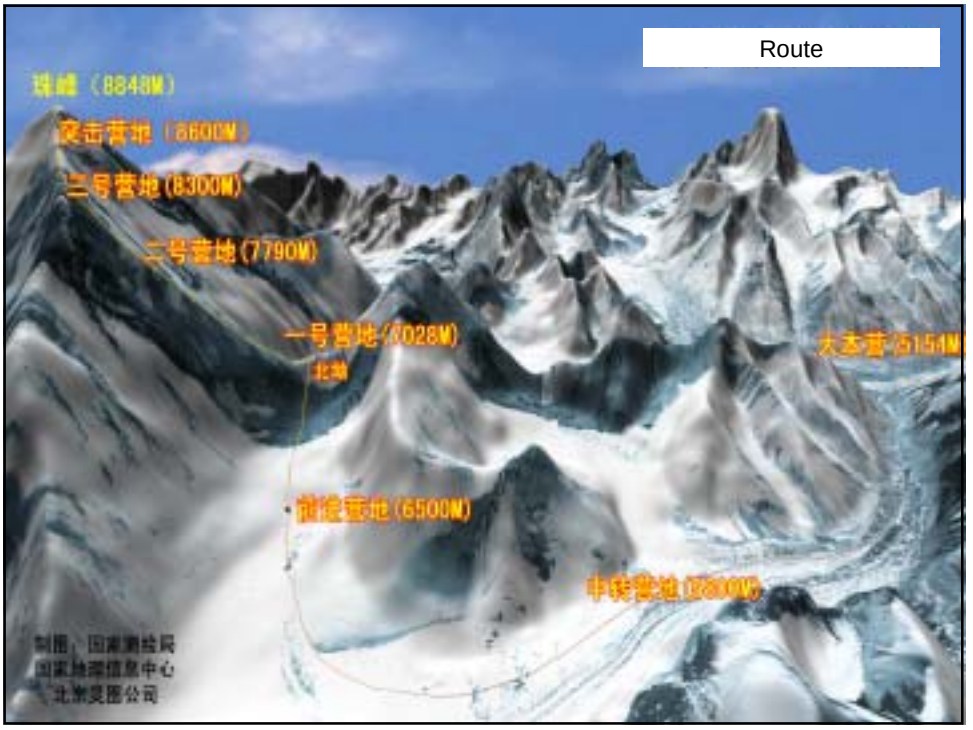

Noon


Sunset

Methods used in 2005



定日基准站



Base Camp

Climbing

2005-5-22
CCTV Living Broadcast

Archiving documents of
National Surveying and Mapping

Contents

- Towards Service and Application of SDI
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- **Make SDI Serviceable**
  - Data Updating
  - Data Harmonization
  - Framework
  - GIS Portal
  - Application

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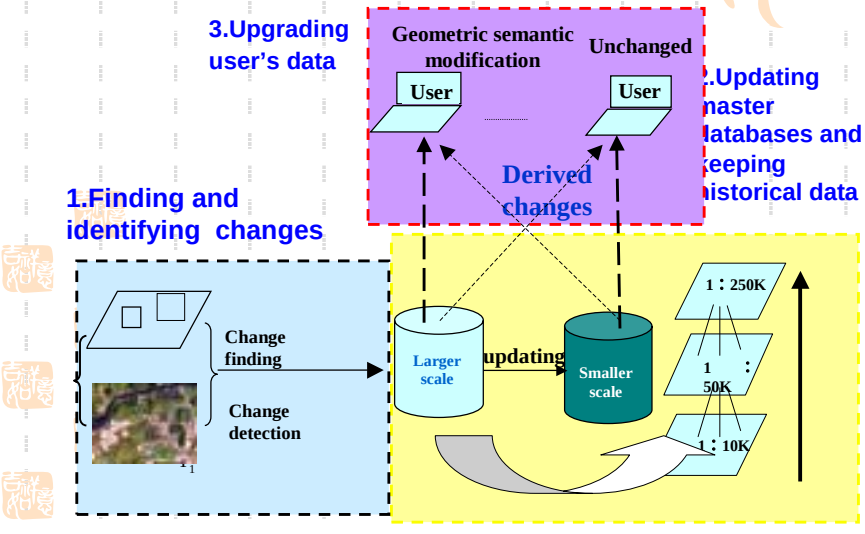
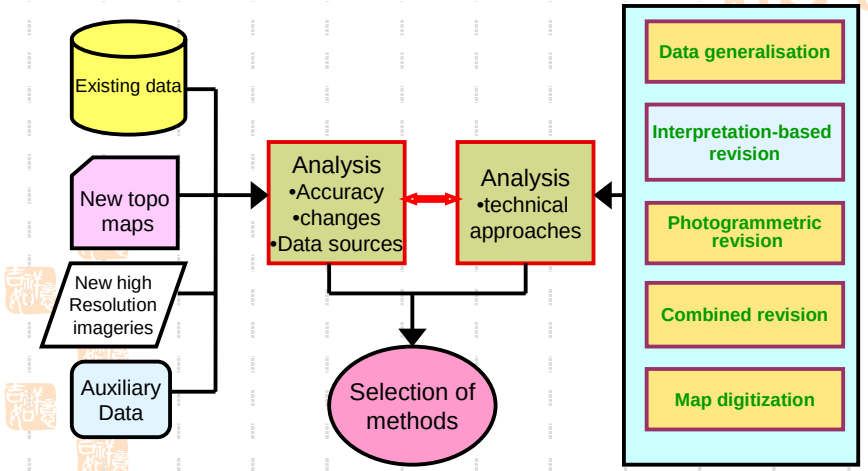
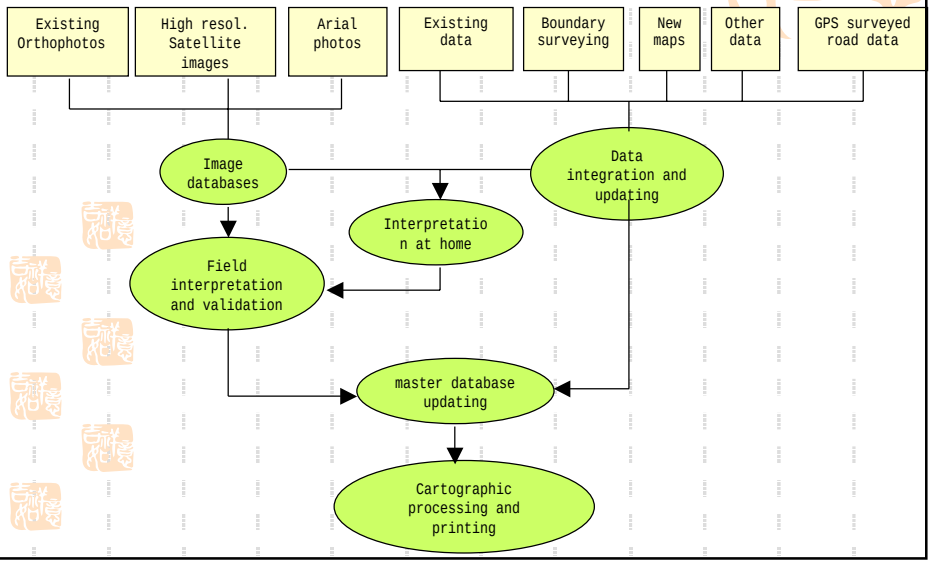
Three major steps of updating



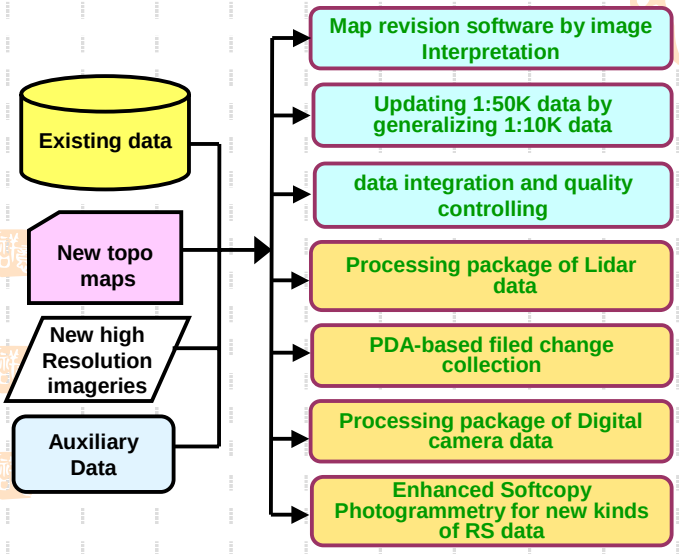
General methodology for updating



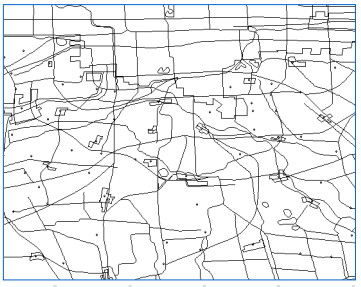
Updating work flow with image database and field interpretation



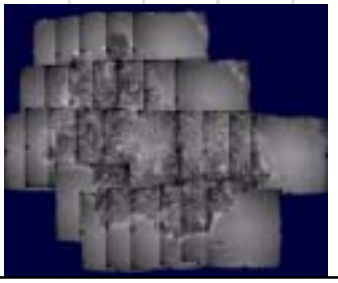
Updating Tools

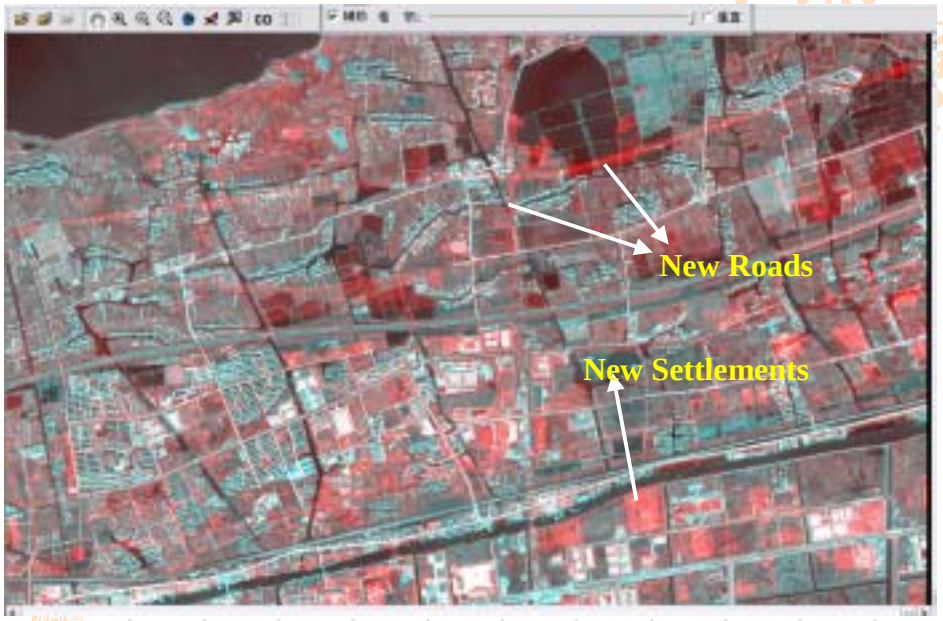


Updating existing datasets with Images

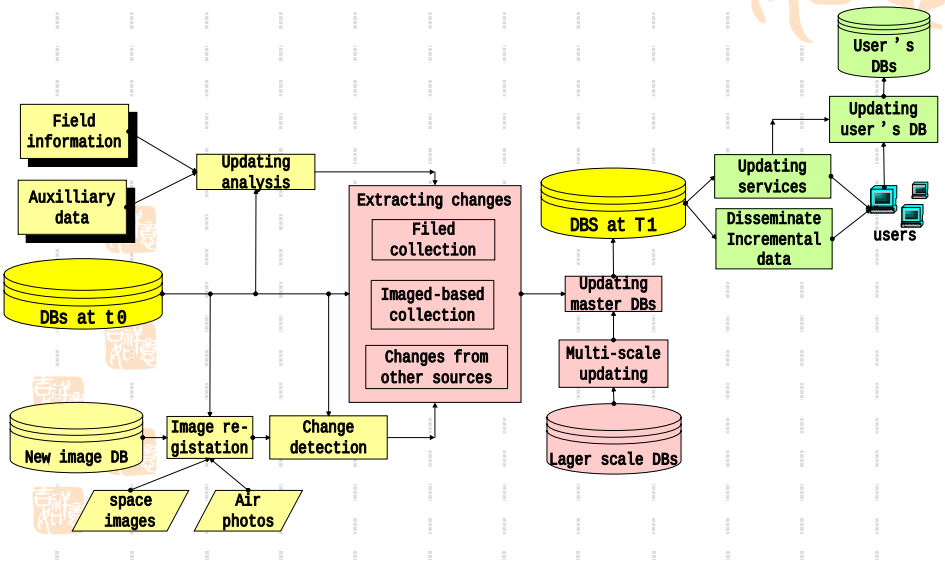


Existing dataset





A new system for dynamic updating



Data Updating in NGCC

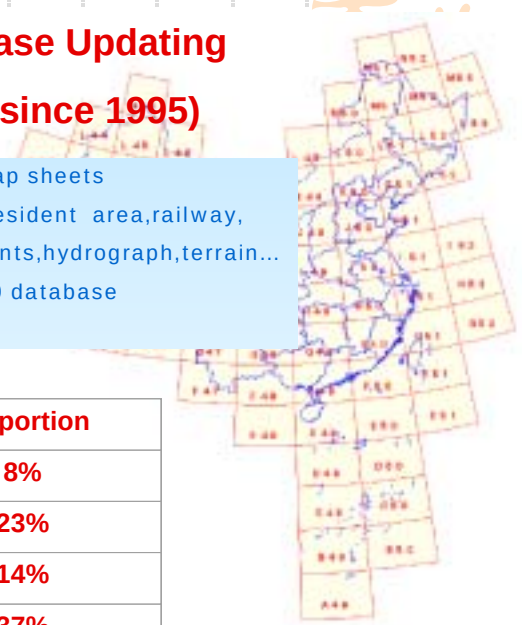
1:250,000

Rapid Changes Caused by Development

National 1:1M Database Updating

Completed in 2003 (since 1995)

- Range: the whole country, 77 map sheets
- Features: administration area,resident area,railway, highway,cultural elements,hydrograph,terrain...
- Method: updating with 1:250 000 database
- Format: ARC/Info Library, BIL



Updating features	proportion
Administration area	8%
Resident area	23%
Railway	14%
Roads	37%

National 1:250 000 Database Updating

Completed in 2002 (since 1998)

- Range: the whole country, 816 map sheets
- Updating sources:
  - TM images
  - National main road netwowk
  - place name database
  - national boundaries and marine maps
  - other up-to-date materials
- Methods: automatic or semi-automatic updating technique

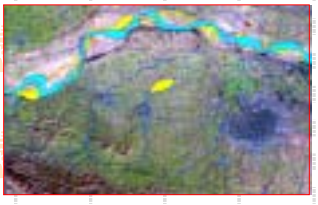
National 1:250 000 Database Updating

Updating features with Landsat images

Updating boundaries with TM

Updating resident with TM

Updating hydrology with TM



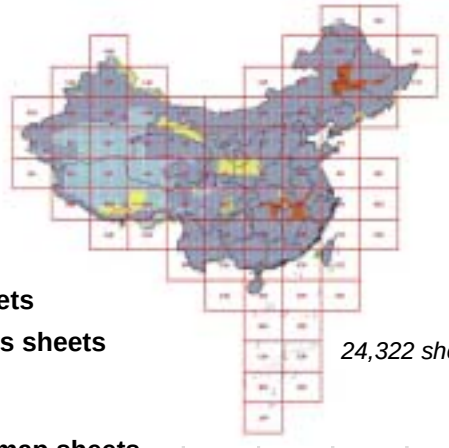
Updating highways with TM

Updated 1:250,000 Database

2002 version
Before updating: 4G
After updating: 5.3G

One version every 2 or 3 year is required!

The National updating campaign



24,322 sheets

- **2006-2008**
  - **Updating 10000 map sheets**
  - **Printing of the 10000maps sheets**
- **2009-2010**
  - **Updating the other 9000 map sheets**
  - **Another special project for the other 5000 map sheets of the western area**

Urban Large Scale Data Sets (Shanghai Case)

	Coverage	Map Sheets	Updating Cycle (year)
▪ 1:10,000 DLG	Whole city	322	5
▪ 1: 2,000 DLG	Whole city	7511	4
▪ 1: 1,000 DLG	Fringe area	5069	3
▪ 1: 500 DLG	Down town	7758	2
▪ 1: 2,000 DOM	Whole city	2463	

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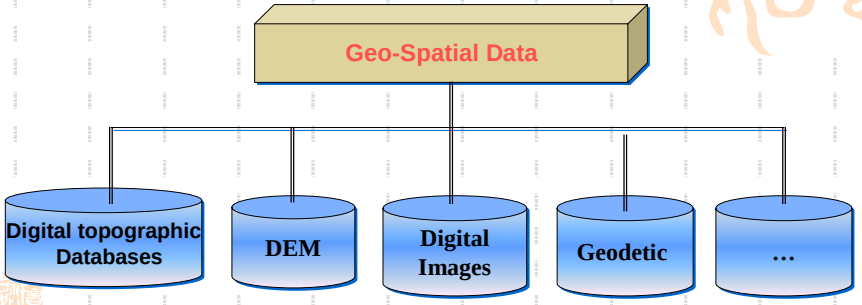
Data Harmonization



- Different scale (Spatial, temporal)
- Different data definition and data model
- Different coordinate system
- Different format
- Different quality
- …

Harmonization

basic spatial data
- Consistent
- Current
- Accurate

The National Map

-- Topographic Mapping for the 21st Century

- A database of continuously maintained base geographic information for the United States and its territories that will serve as the Nation's topographic map for the 21st century.
- Thorough data integration to improve the internal consistency of the data, and dramatically increased reliance on partnerships and commercially available data To keep the information current, seamless national digital data coverage to avoid problems caused by map boundaries, higher resolution and positional accuracy.
- Serve as a foundation for integrating, sharing, and using spatial data easily and consistently and will provide a new approach to provide more current information while retaining and improving other valued characteristics, such as positional accuracy and content completeness.
- The resolution of the data will vary depending on geographic area and availability

USGS, 2001

Information Content of The National Map

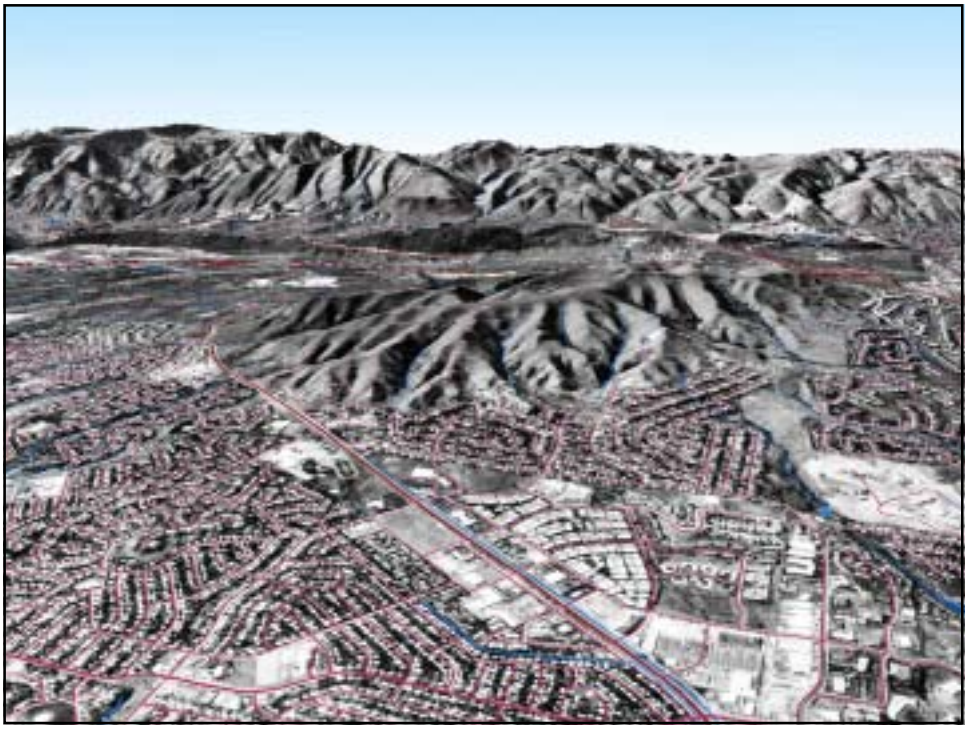
- High-resolution digital orthorectified imagery.
- High-resolution elevation data, including offshore bathymetric data maintained by the National Oceanic and Atmospheric Administration.
- Vector feature data for the themes of hydrography, transportation (especially roads, but also including railroads and waterways), structures, boundaries of governmental units, and administrative boundaries of publicly owned lands. These data will have unique feature identifiers and minimal associated descriptive information.
- Geographic names, include those for physical and cultural geographic features needed to support the U.S. Board on Geographic Names, and other names, such as for highways and streets. Names will be associated with their corresponding features, and the locational accuracy of names not associated with a feature specifically represented in *The National Map*, such as a locale or a ridgeline, will be improved.
- Land cover information.

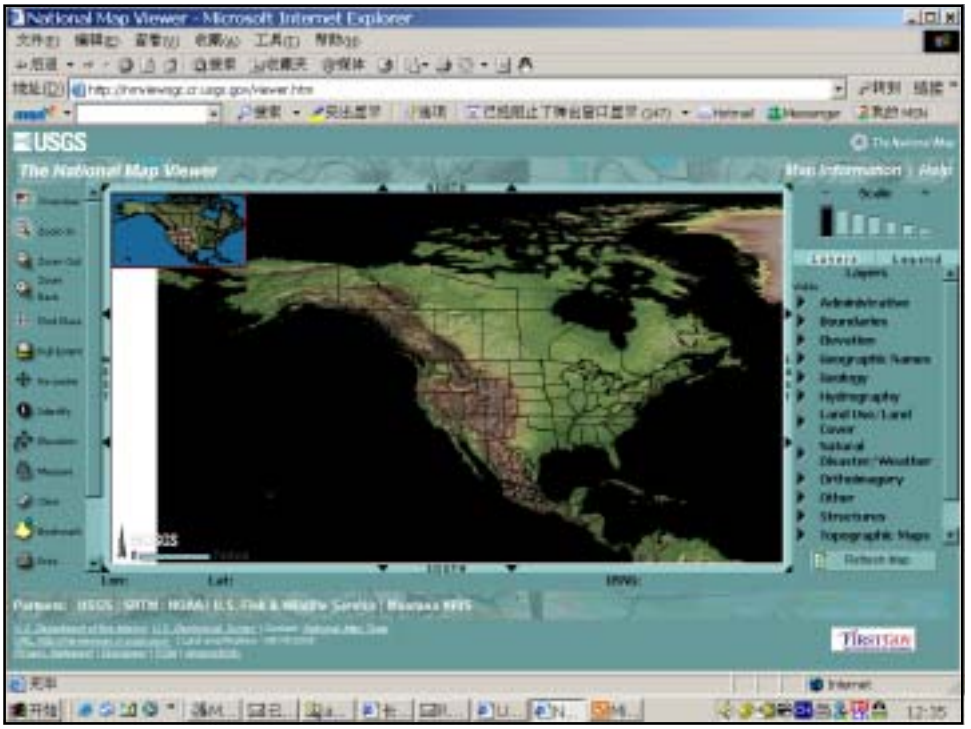
USGS, 2001

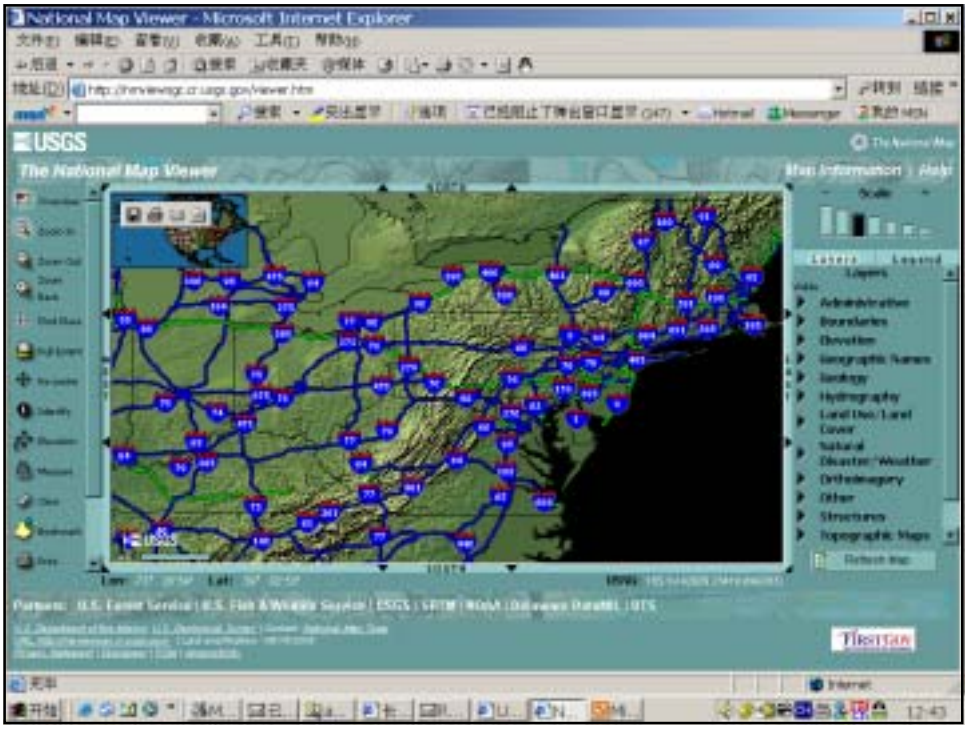
Data Characteristics of The National Map

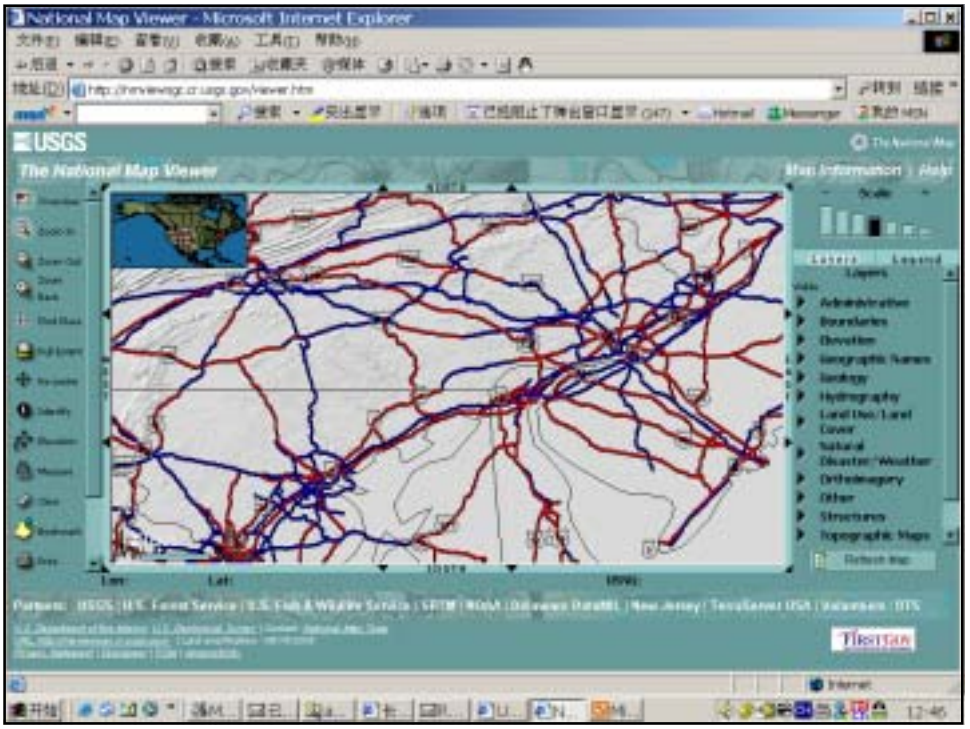
- Currentness
- Seamlessness
- Consistent classification
- Variable resolution.
- Completeness
- Consistency and integration.
- Variable positional accuracy
- Spatial reference systems
- Standardized content.
- Metadata
- Temporal dimension

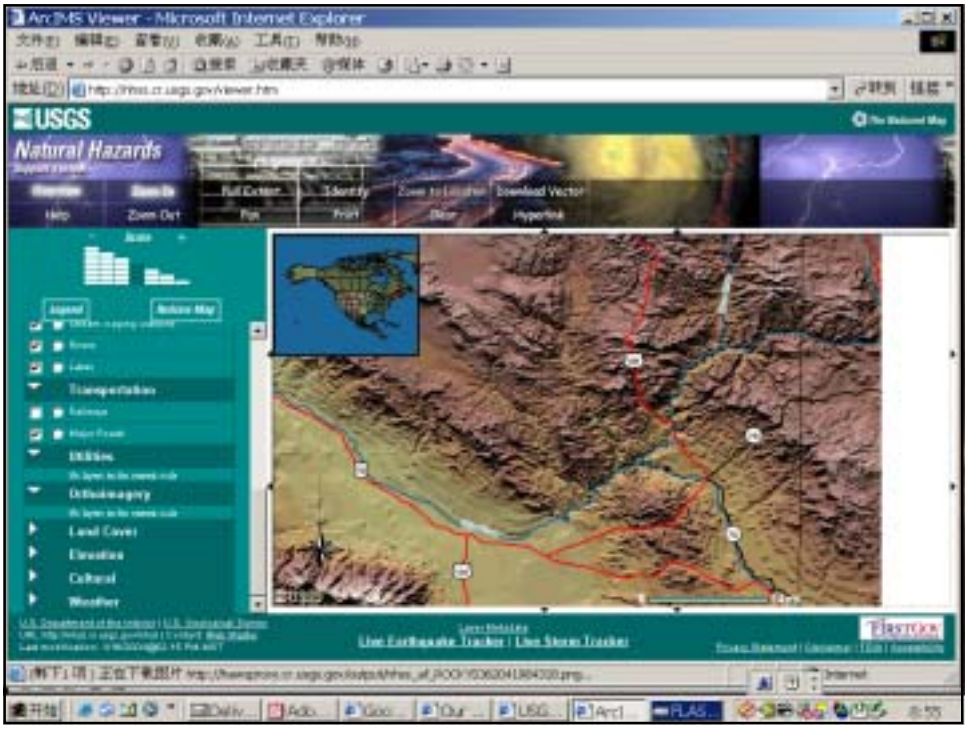
USGS, 2001

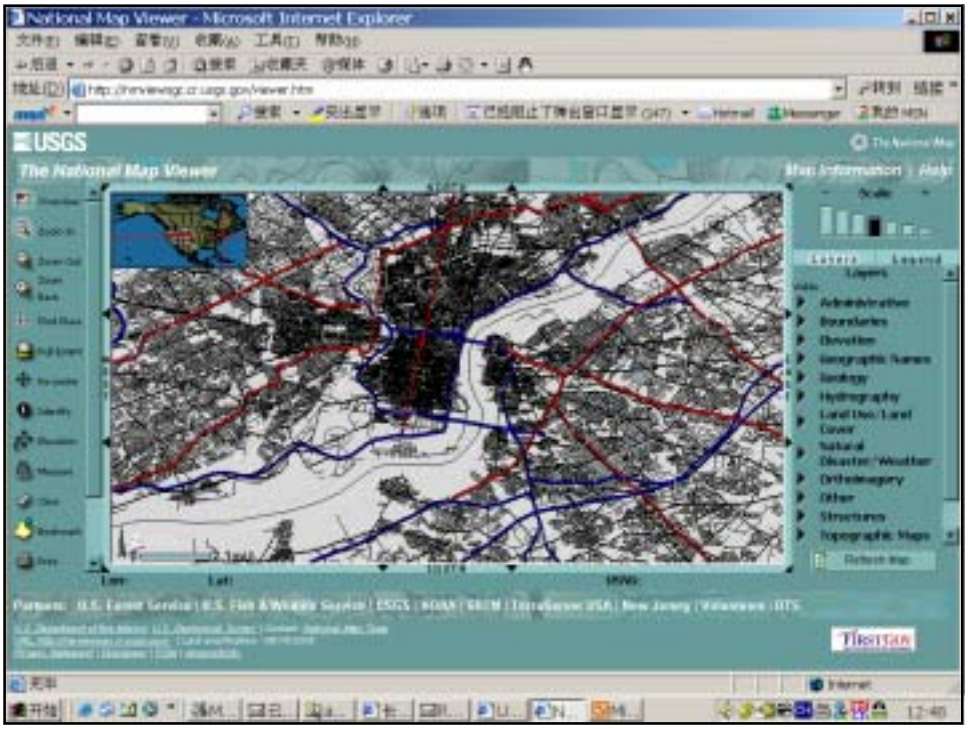


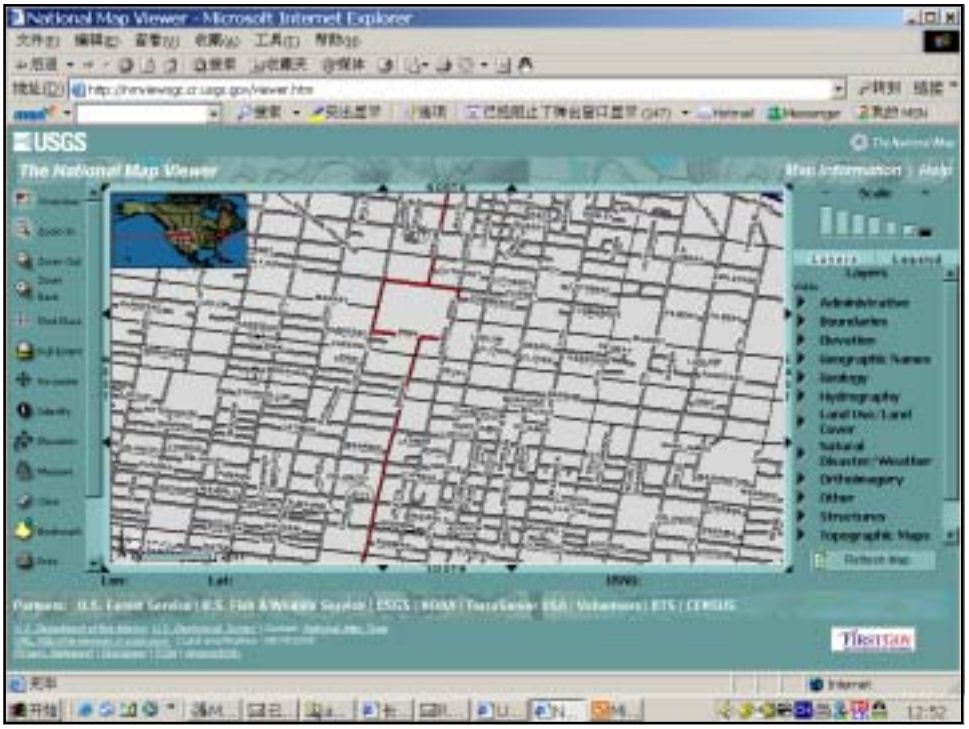

National Map Viewer - Microsoft Internet Explorer
USGS
The National Map Viewer


National Map Viewer - Microsoft Internet Explorer
USGS
The National Map Viewer


National Map Viewer - Microsoft Internet Explorer
USGS
The National Map Viewer


ArcIMS Viewer - Microsoft Internet Explorer
USGS
Natural Hazards
Transportation
Utilities
Orthoimagery
Land Cover
Elevation
Cultural
Weather


National Map Viewer - Microsoft Internet Explorer
USGS
The National Map Viewer



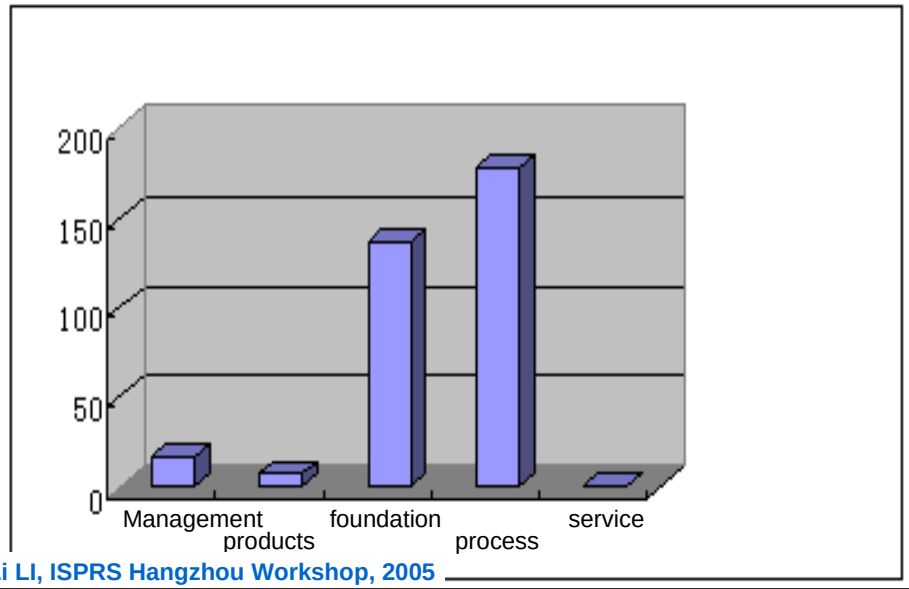
Case in China

-- Improve data consistency by standards.

- **Major GI Standard Organizations in China**
  - **Geo-Spatial Information Coordination Commission of China**
  - **Geographic Information Standardization Technical Commission of China (SAC/TC 230)**
  - **Standardization Institution of Surveying and Mapping of the State Bureau of Surveying and Mapping of China**

Standards' Name	No.
1. Codes for the administrative divisions of the People's Republic of China	2260-1999
2. Classification and codes of water path information	17735-1999
3. Classification and codes for soils in China	GB/T 17734-1999
4. Classification and codes for economical types	GB/T 12404-2000
5. Name codes of countries and districts in the World	GB/T 2659-2000
6. Classification and codes for thematic map information	GB/T 18317-2001
7. River name codes in China	Ministry of Water Resources of P. R. China
8. Classification and codes for national land information	State Bureau of Surveying and Mapping of P. R. China
9. Quality requirement for digital products of surveying and mapping—Part 1: Quality requirement for digital line topographic map, digital elevation model	GB/T 17941.1-2001
10. Testing of quality and assessment method for digital products of surveying and mapping	GB/T 18316-2001
11. Digital topographic map series and basic requirement	GB/T 18315-2001
12. Format for geo-spatial data exchange	17798-1999
13. Interface specification between topographic maps database and place names database	17797-1999
14. Graphical symbols of common information used on the maps—common used symbols	17695-1999

Statistics of GI Standards



Contents

- Towards Service and Application of SDI
- Concepts and Evolution of SDIs
- **Make SDI Serviceable**
  - Data Updating
  - Data Harmonization
  - **Framework**
  - GIS Portal
  - Application

Building Framework

Why do we need a framework?

- Thousands of organizations spend billions of dollars each year producing and using geographic data. Yet, they still do not have the information they need.
- Most organizations need more data than they can afford. Frequently, large amounts of money are spent on basic geographic data, leaving little for applications data and development.
- Organizations often need data outside their jurisdictions or operational areas.
- Data collected by different organizations are often incompatible.
- Many of the resources organizations spend on geographic information systems (GIS) go toward duplicating other organizations' data collection efforts.

http://www.fgdc.gov

What can a framework do?

- The framework provides basic geographic data in a common format and an accessible environment that anyone can use and to which anyone can contribute.
- The framework is a growing data resource to which geographic data producers can contribute. It will continually evolve and improve.
- The framework represents "data you can trust" -- the best available data for an area, certified, standardized, and described according to a common standard. It provides a foundation on which organizations can build by adding their own detail and compiling other data sets.
- The framework integrates data from all types of organizations in all sectors, promotes partnerships for data creation and maintenance, and provides unrestricted access to data. The framework environment is designed to be responsive to the needs of the geographic data community.
- With the framework, users can perform cross-jurisdictional and cross-organizational analyses and operations, and organizations can funnel their resources into applications, rather than duplicating data production efforts.

http://www.fgdc.gov

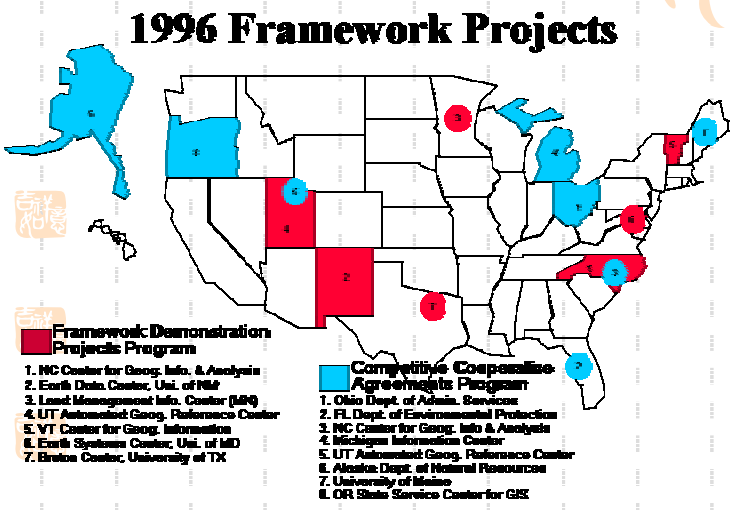
Framework—a new production

FGDC, U.S.A.
National Digital Geospatial Data Framework

- Geodetic Control
- Orthoimagery
- Elevation
- Transportation
  - Roads, trails, railroads, waterways, airports and ports, bridges and tunnels
- Hydrography
- Governmental Units
  - the nation, states and statistically equivalent areas, counties and statistically equivalent areas, incorporated places and consolidated cities, functioning and legal minor civil divisions, federal- or state-recognized American Indian reservations and trustlands, and Alaska Native regional corporations
- Cadastral Information

http://www.fgdc.gov

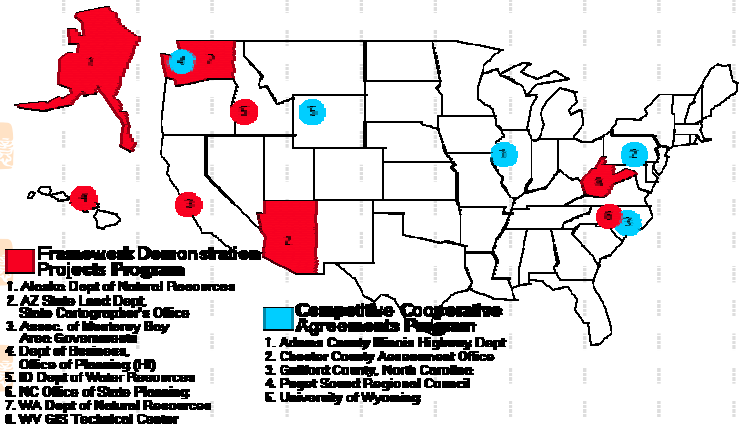
U.S.A.
National Digital Geospatial Data Framework



http://www.fgdc.gov

U.S.A.
National Digital Geospatial Data Framework

1997 Framework Projects



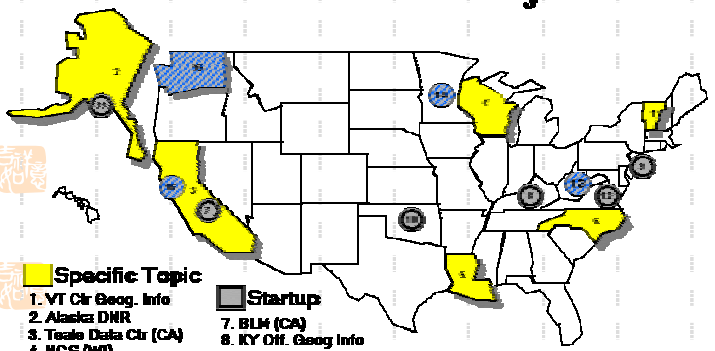
Framework Demonstration Projects Program
1. Alaska Dept of Natural Resources
2. AZ State Land Dept. State Cartographer's Office
3. Assoc. of Monterey Bay Area GOVERNMENTS
4. Dept of Business, Office of Planning (HI)
5. ID Dept of Water Resources
6. NC Office of State Planning
7. WA Dept of Natural Resources
8. WV GIS Technical Center

Competitive Cooperative Agreements Program
1. Adams County Illinois Highway Dept
2. Chester County Assessment Office
3. Guilford County, North Carolina
4. Puget Sound Regional Council
5. University of Wyoming

http://www.fgdc.gov

U.S.A.
National Digital Geospatial Data Framework

1998 Framework Projects



Specific Topic
1. VT Ctr Geog. Info
2. Alaska DNR
3. Texas Data Ctr (CA)
4. NGS (WI)
5. LA State Univ
6. NC Dept Comm Colleges

Startup
7. BLM (CA)
8. KY Off. Geog Info
9. Burlington Co., NJ
10. Logan Co., OK
11. Muni. of Anchorage
12. Rappahannock (VA). Devel. Comm.

Full Demonstration
13. WV State GIS
14. Metropolitan Council
15. WA DNR
16. Marin Co., CA

http://www.fgdc.gov

Ordnance Survey,UK
Digital National Framework (DNF)

- DNF data provides a seamless representation of the whole of Great Britain. Comprising the National Grid and the National Topographic Database that defines each geographical feature as it exists in the real world with a maintained unique reference allocated to each feature. The DNF is not a product; it is the framework on which our future products will be based.
- DNF data is designed for use as an intelligent digital map within GIS and database systems. All DNF products and services are based on this seamless data concept. Because there is no 'map tile' or similar data unit, the basic unit of data in the DNF is the feature.
- The life cycle of each feature is matched, as far as is possible, to that of the real-world object(s) that it represents.
- Every DNF feature has a topographic identifier (TOID). This is a 16-digit integer that uniquely identifies that feature. Each feature also has a version number which is incremented each time there is change of any kind to the feature in the Ordnance Survey database.
- Each DNF feature has several descriptive attributes.
- Features are grouped into themes

www.ordnancesurvey.co.uk

Themes of DNF

- **Buildings:** Roofed, and usually walled, constructions. Such as Barns, private houses, factories, schools.
- **Land:** Features defining and/or describing natural and manmade parcels of land not specifically within other themes. E.g., Fields, forested areas, playing fields, cliffs, quarries, sand dunes.
- **Roads, tracks and paths:** Features related to transport by vehicles, cycles or on foot. Metalled roads (public and non-public), cycleways, footpaths.
- **Heritage:** All heritage-related features. Burial mounds, earthworks, ruins and battlefields.
- **Height:** Non-real-world features that describe the elevation of particular locations. Spot heights and bench marks, areas of cliff and slope.
- **Rail:** Features related to transport by railway or tramway. Track alignments, switch points, permanent way.
- **Structures:** Man-made constructions, usually unroofed. Chimneys, storage tanks, telephone boxes, electricity transmission lines, masts.
- **Water:** Features that contain, delimit or are related to real-world objects containing water. Rivers, ponds, reservoirs, canals, wells.
- **Administrative Boundaries:** The limits of responsibility and representation for electoral and administrative purposes. Parish boundaries, European parliament constituency boundaries.

www.ordnancesurvey.co.uk

OS MasterMap

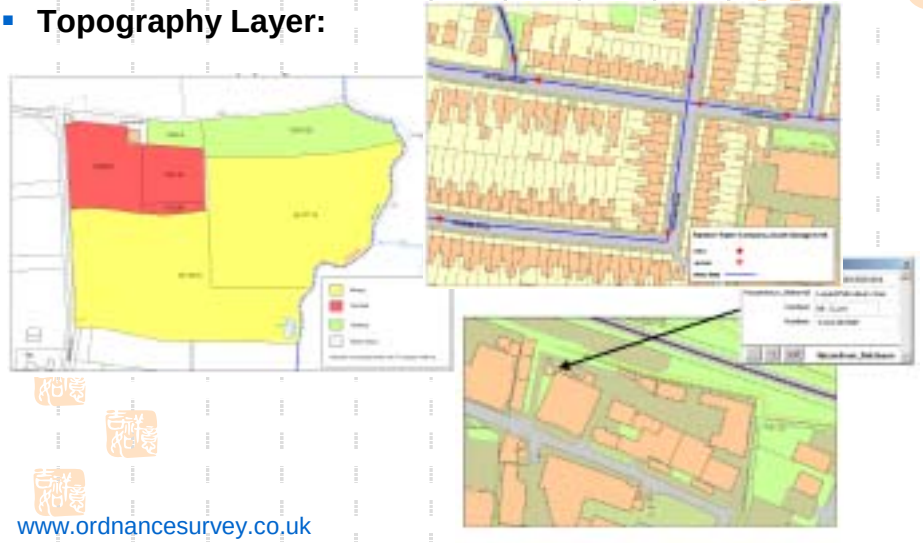
- **Topography Layer:** represents real-world objects such as buildings, kerb lines, fences and letter boxes, as well as intangible objects such as county boundaries or the line of mean high water.
- **Themes of the Layer**
  - administrative boundaries
  - buildings;
  - heritage and antiquities;
  - land;
  - rail;
  - roads,
  - tracks and paths;
  - structures;
  - terrain and height
  - water.

Example of Topography Layer data

www.ordnancesurvey.co.uk

OS MasterMap

- **Topography Layer:**



www.ordnancesurvey.co.uk

OS MasterMap

- **Address Layer:** provides the location of approximately 26 million residential and commercial postal addresses in Great Britain.
- **Address Components**
  - postcode
  - post town
  - organisation name
  - PO box number
  - building name or number
  - sub-building name or number

www.ordnancesurvey.co.uk

OS MasterMap

- **Imagery Layer**: adds a visualisation and contextual capability to the other vector data layers in OS MasterMap.

www.ordnancesurvey.co.uk

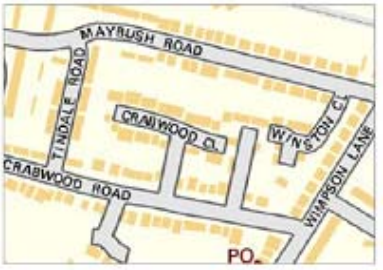
OS MasterMap

- **ITN (Roads) Layer**: consists of a fully topologically structured link and node network representing the driveable roads of Great Britain
- Includes:
  - road classifications;
  - road names;
  - types of road;
  - motorway junctions;
  - information potentially relevant to routing;
  - references to the intersecting topographic polygons.

www.ordnancesurvey.co.uk

OS MasterMap

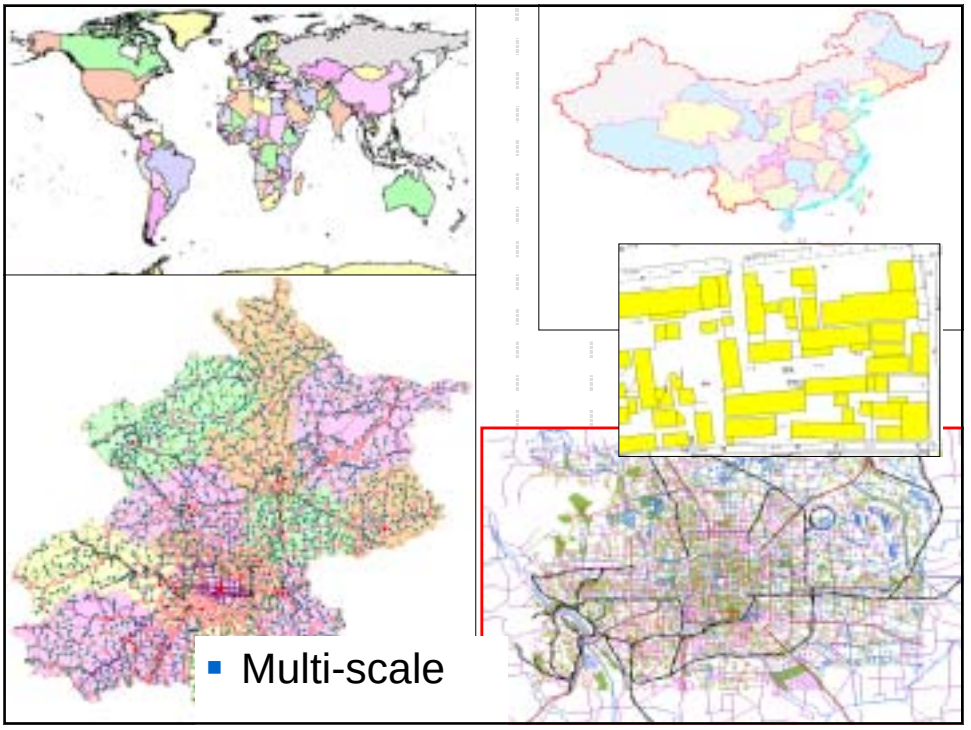
- **ITN (Roads) Layer**:



www.ordnancesurvey.co.uk

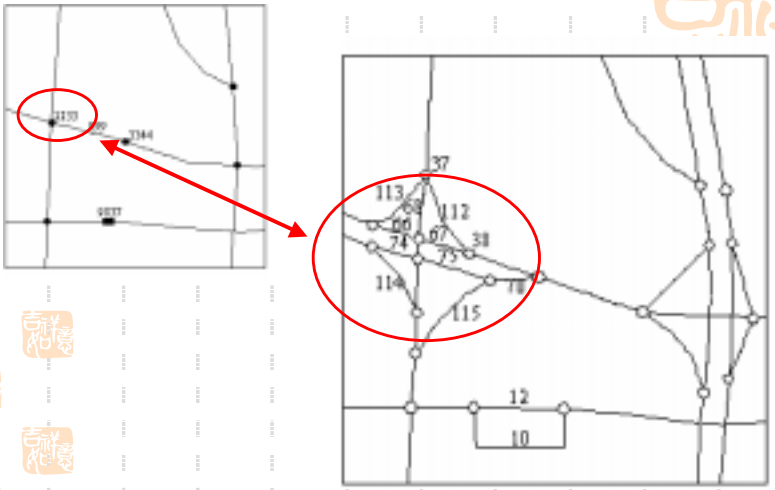
Example in China

- E-government and public services brought new requirement to geo-spatial information.
- Some applications involve different level of study,
  - an official in local government might want to know where is the road cross that are having serious traffic jam,
  - an official in central government wants to know the location of a county that are suffering flooding
  - So the geo-framework should be multi-scale, multi-abstracted and multi-represented, which means one geographic feature in the real world will be modeled several times in SDI.
- so the geo-framework should be
  - multi-scale;
  - multi-abstracted;
  - multi-represented
- As a whole, the linkages between these differences should be modeled and represented.

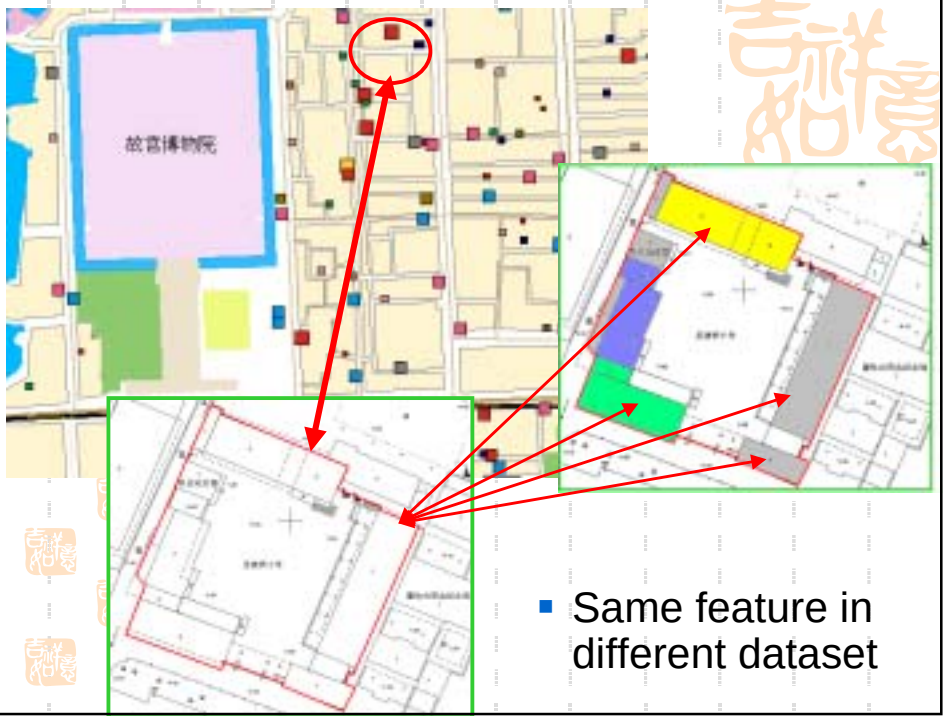


- Multi-scale

- Multi-represented



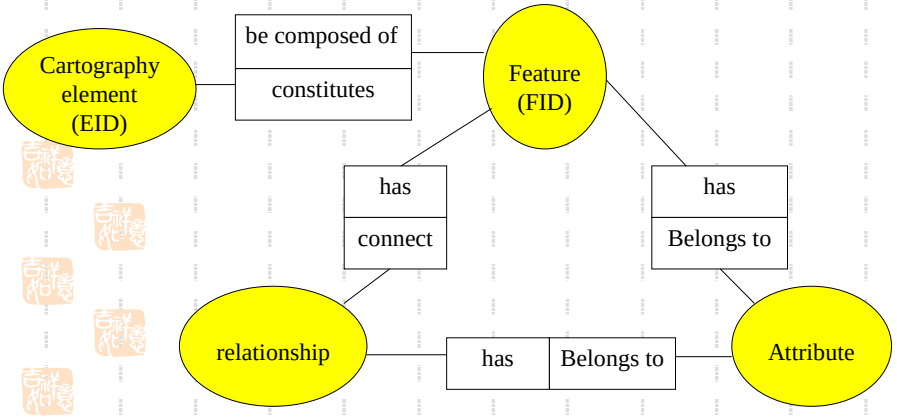
- Multi-abstracted



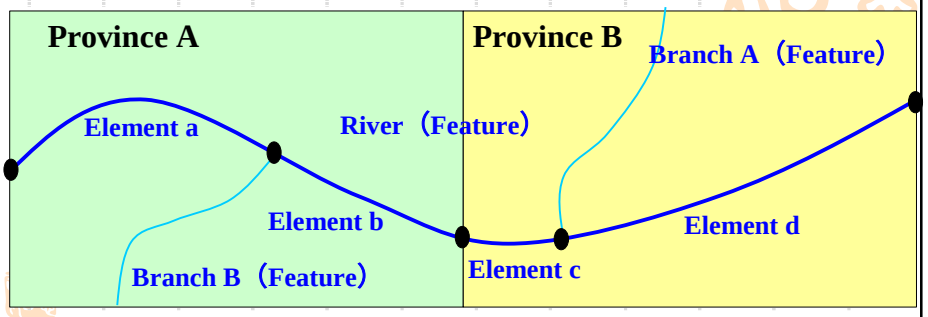
- Same feature in different dataset

Our Solution

- Feature-based data model to describe the real world

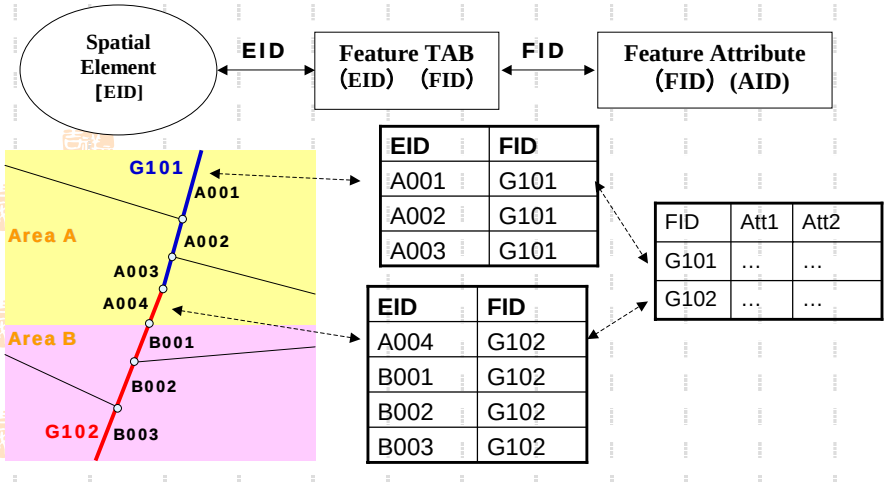


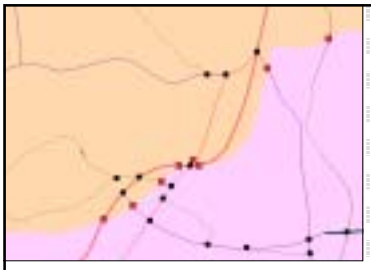
Example



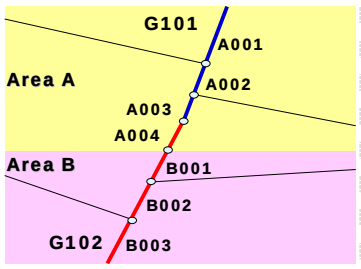
Establish links among elements

- Links among spatial elements

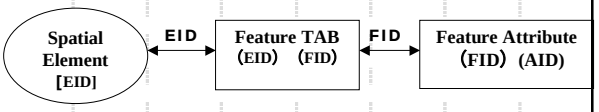




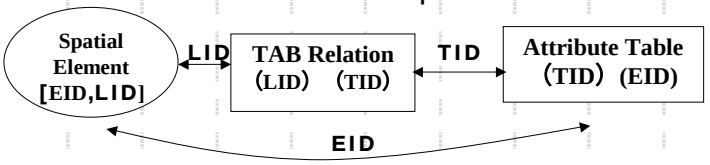
- Mark the most detail detailed object
  - Split the features when
    - Road-road cross
    - Road-boundary cross
  - Identify all elements
    - Unique ID for each spatial element (EID)



- Link spatial elements



- Link spatial feature and attributes from user or 3rd partners



Upgrade current datasets to form a new geo-framework data

Contents

- Towards Service and Application of SDI
- Concepts and Evolution of SDIs
- **Make SDI Serviceable**
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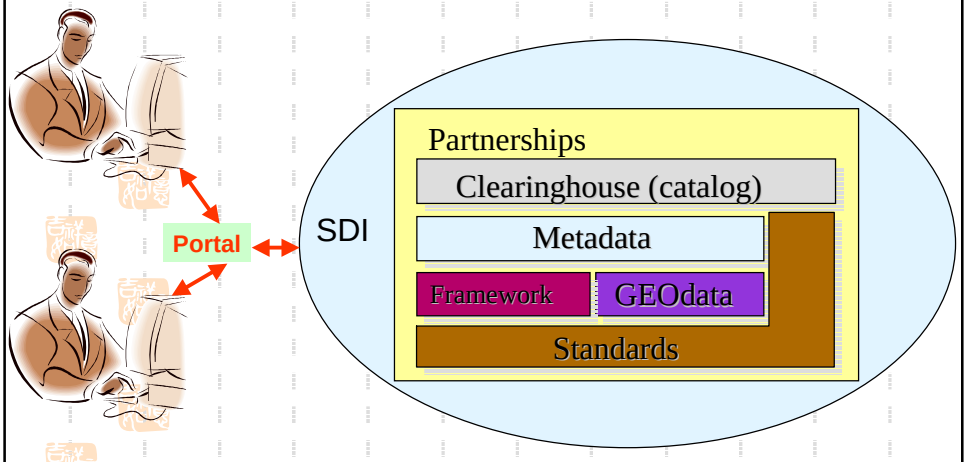
  - Data Harmonization
  - Framework
  - **GIS Portal**
  - Application

GIS Portal

"GIS Portals are the 'Face' of SDI"

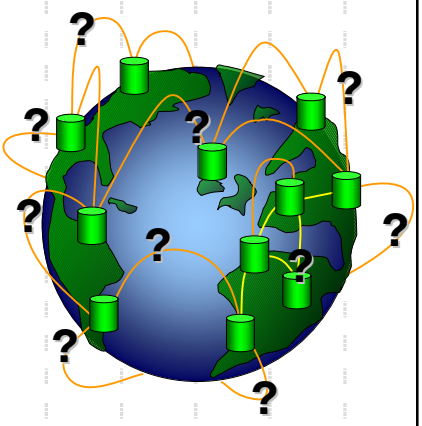
-- provide the critical linkage between the data of SDI and its use



Clive Reece, ESRI

Without an Organizing Portal

- Can't find data
- Unable to collaborate
- Use old or wrong data
- Produce redundant information
- Duplicate spending



GIS Portal Concept

Distributed data and services …
one place to find and access

Benefits of a GIS Portal

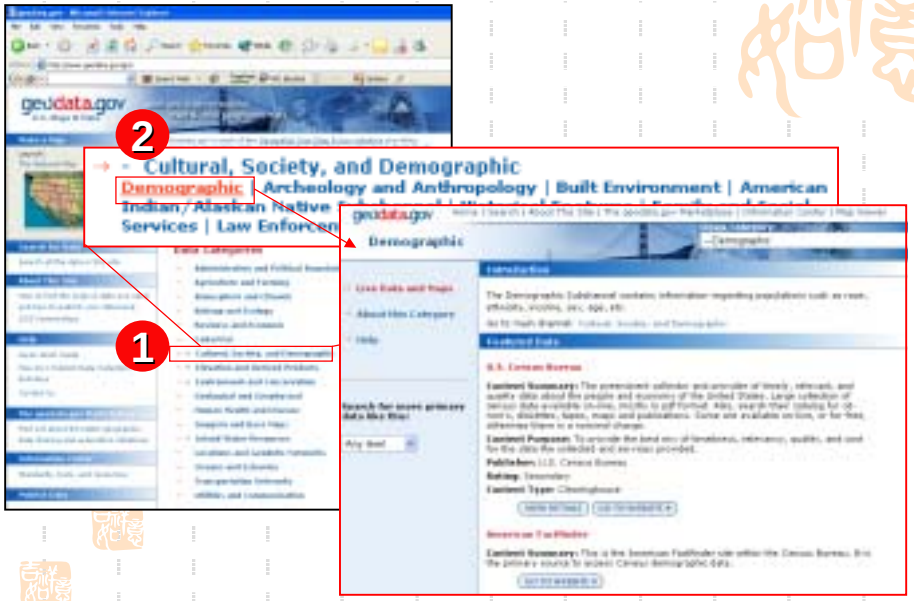
- Provides Organized Access to Geospatial Resources
  - Gateway to a spatial data infrastructure
- Value to Organization
  - **Collaboration** - Publish, share, and disseminate data and GIS Web services across the enterprise SDI
  - **Searching** – Discover, connect to, and utilize GIS data and Web services
  - **Awareness** – Organize geospatial resources in one place for the enterprise
  - **Categorization** – Catalog GIS data and web services within the context needed
- Supports / Facilitates:
  - Faster discovery
  - Direct access and use
  - Improvement of data quality and coverage
  - Collaboration for new data collection

Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Examples

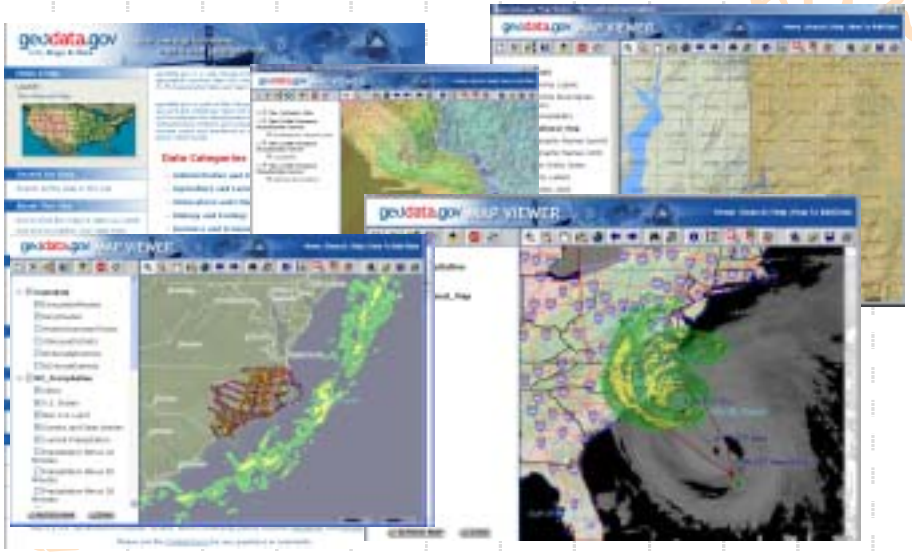
Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Types of Portals--Catalog Portals



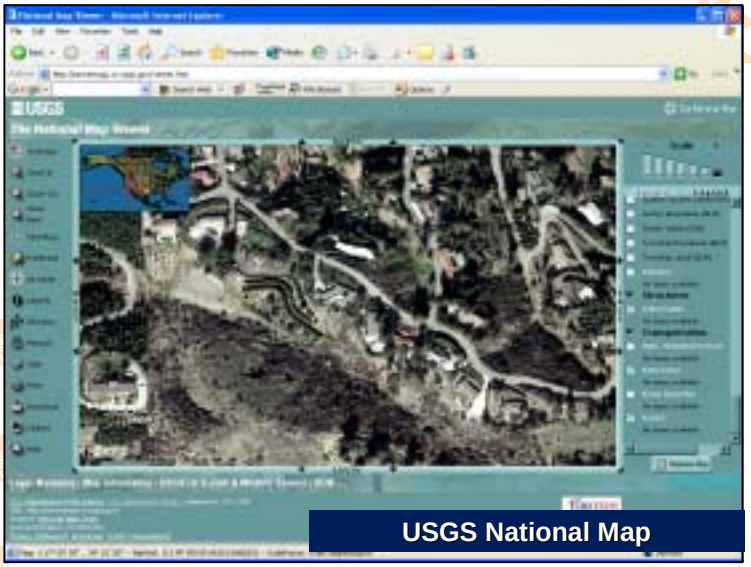
Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Example: GeoSpatial Onestop



Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Types of Portals-- Application Portals



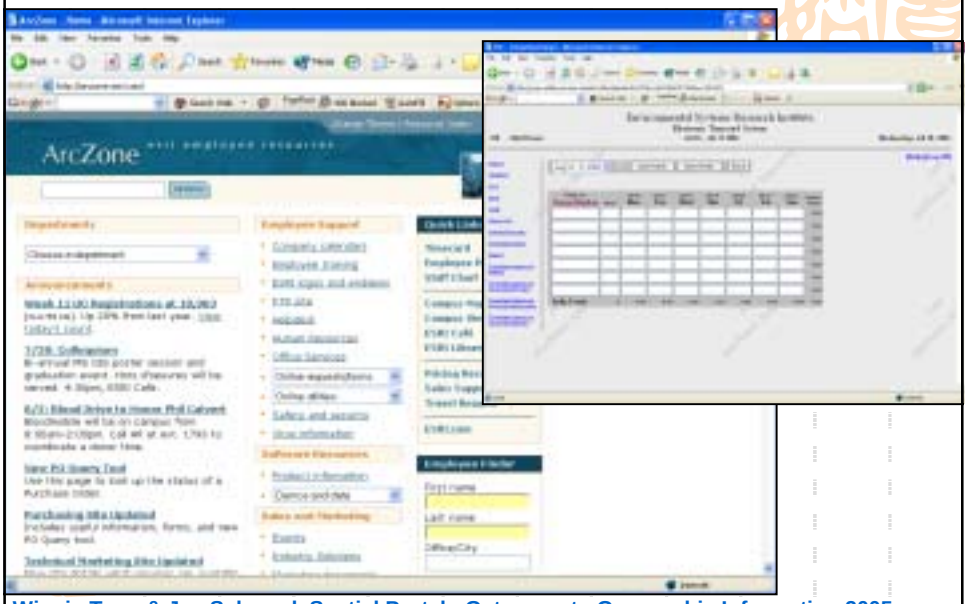
USGS National Map

Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Example:Transport Direct in UK

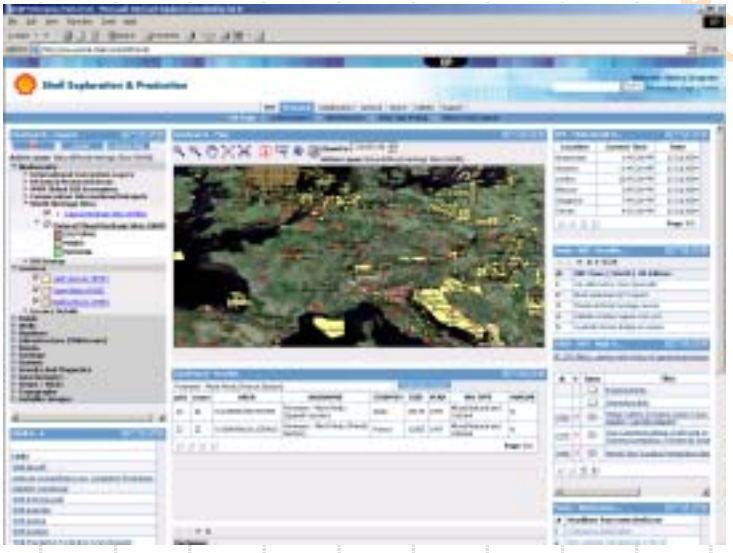
Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Types of Portals-- Enterprise Portals



Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Example:Shell Exploration & Production



Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Portals in the world

Winnie Tang & Jan Selwood, Spatial Portals:Gateways to Geographic Information,2005

Some of the Portals in China

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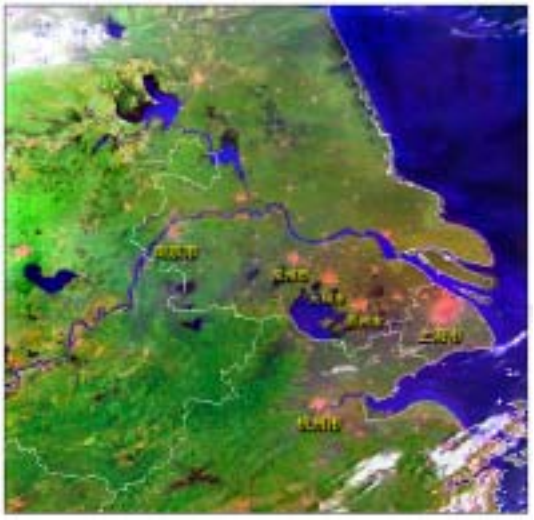
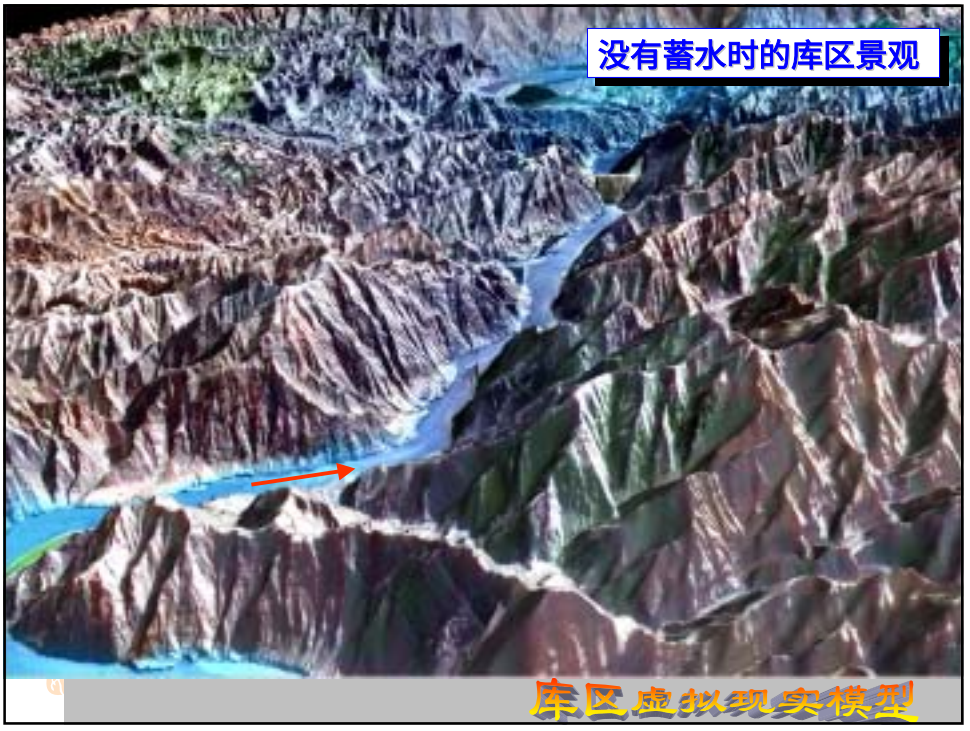
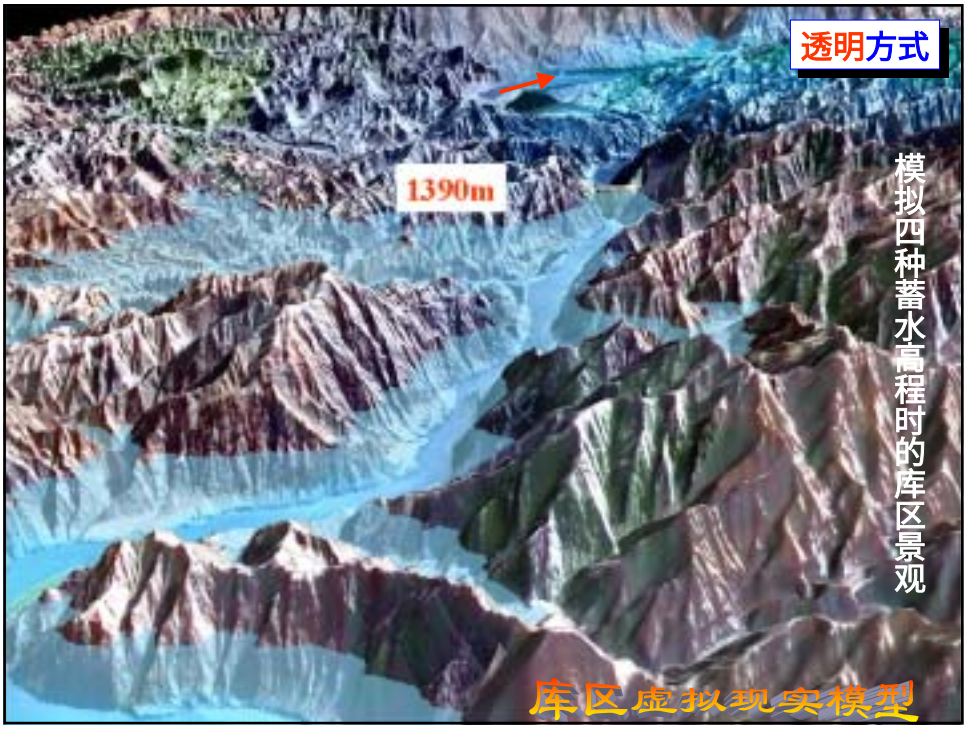
  - GIS Portal
  - **Application**

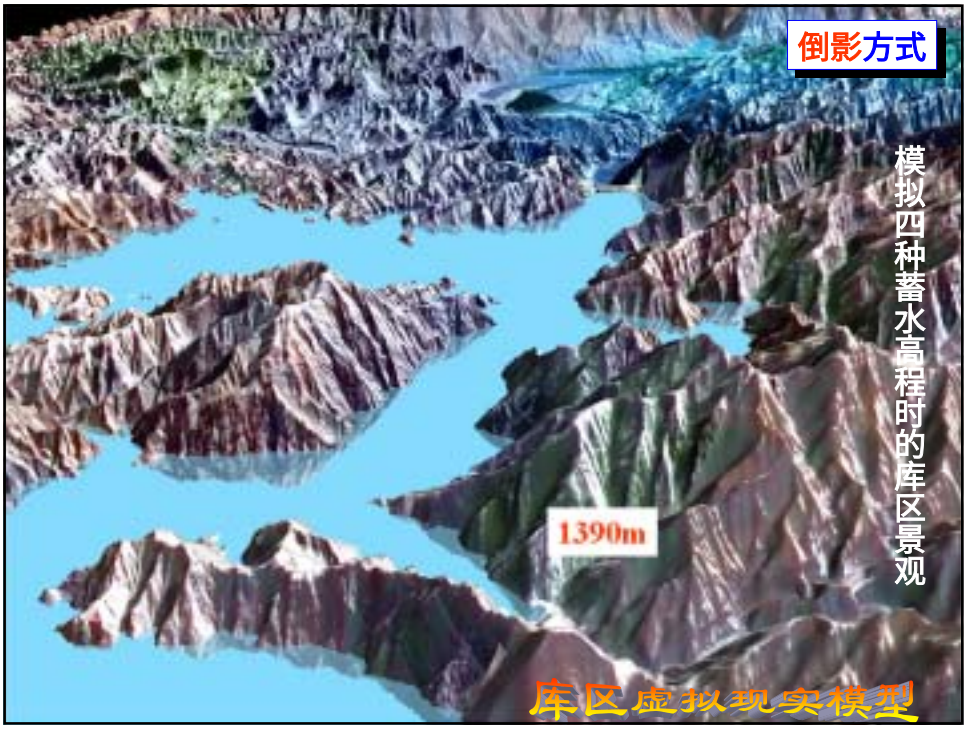
Application is the life of SDI

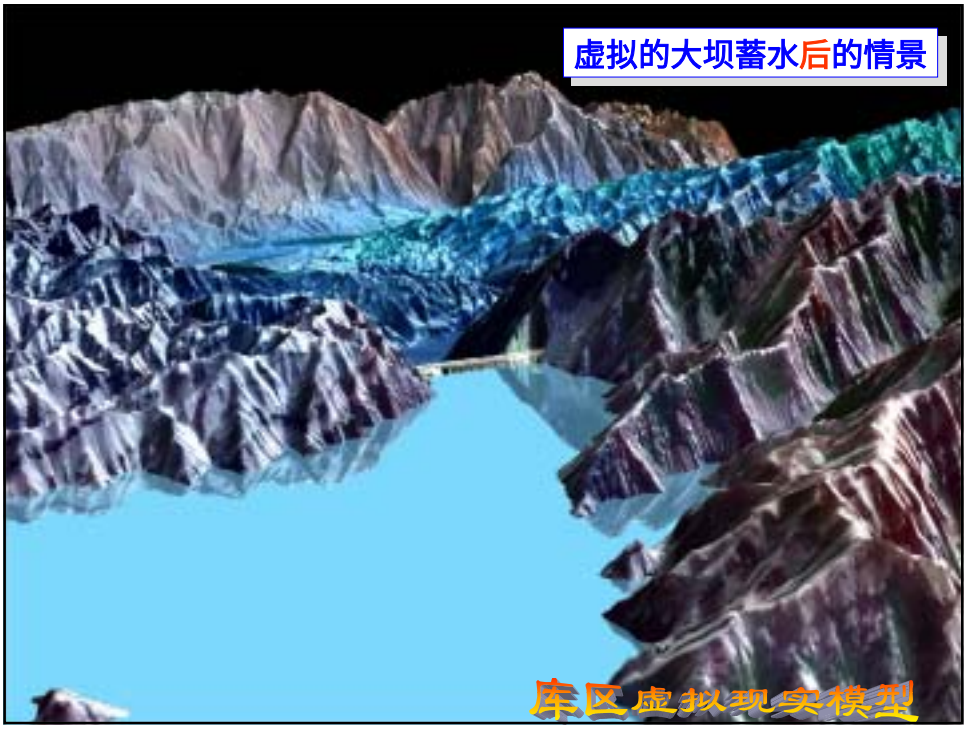
Yangzhi River Delta Megalopolis

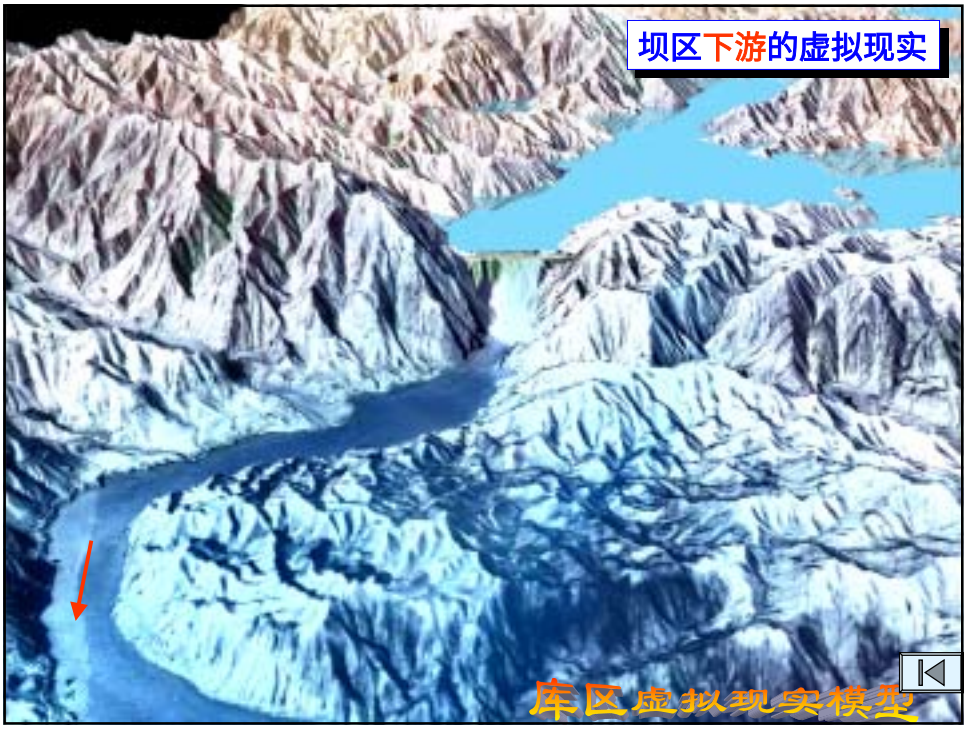





透明方式
1390m
模拟四种蓄水高程时的库区景观
库区虚拟现实模型


倒影方式
1390m
模拟四种蓄水高程时的库区景观
库区虚拟现实模型


虚拟的大坝蓄水后的情景
库区虚拟现实模型


坝区下游的虚拟现实
库区虚拟现实模型

ISPRS WG IV/1:(2004-2008)

Spatial Data Infrastructure

Terms of Reference

- Development and management of multi-scale national, regional and global databases;
- Data harmonisation and synergy approaches of multi-scale vector data and imagery;
- Integration of spatial information with environmental and socio-economic data for various geographic information services;
- Standards for content, access, interoperability, evolve and update of data framework;
- Development of comprehensive metadata, quality evaluation procedures and their standardization;
- Cooperation and Liaison with GSDI, WGISS, ICA, OGC and ISO.

Officers

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  - Jie JIANG
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  - Fax: +86-10-68424101
  - E-mail: jjie@nsdi.gov.cn, jiangjie_263@263.net

- **Co-Chair**
  - Gabor Remetey-Fülöpp
  - Department: Dept of Land Administration and Geoinformation
  - Ministry of Agriculture and Rural Development
  - Postal Address: P.O. Box 1, 1860 Budapest 55, Hungary
  - Phone: +36 1 301 4052
  - Fax: +36 1 301 4719
  - E-mail: gabor.remetey@fvm.hu, hunagi@hunagi.hu
  - http://www.hunagi.hu

WG Workshop

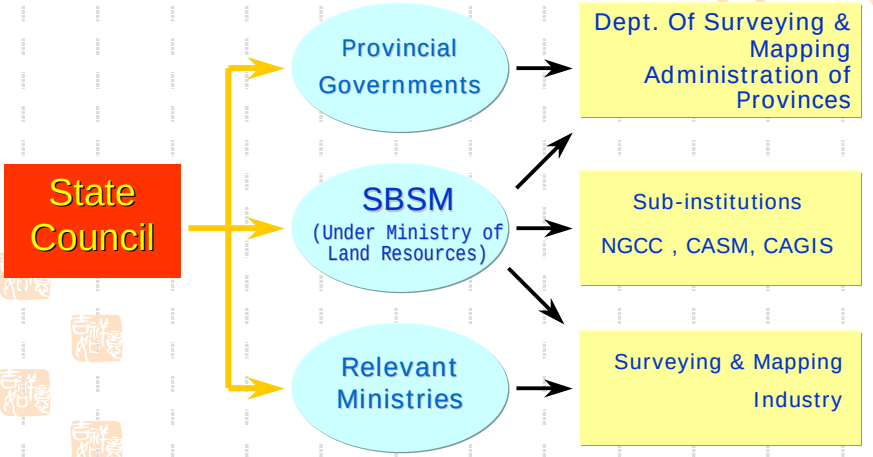
- Oct.14-16, Hangzhou, China
  "Service and Application of SDI"




- Oct. 15-17, Budapest, Hungary

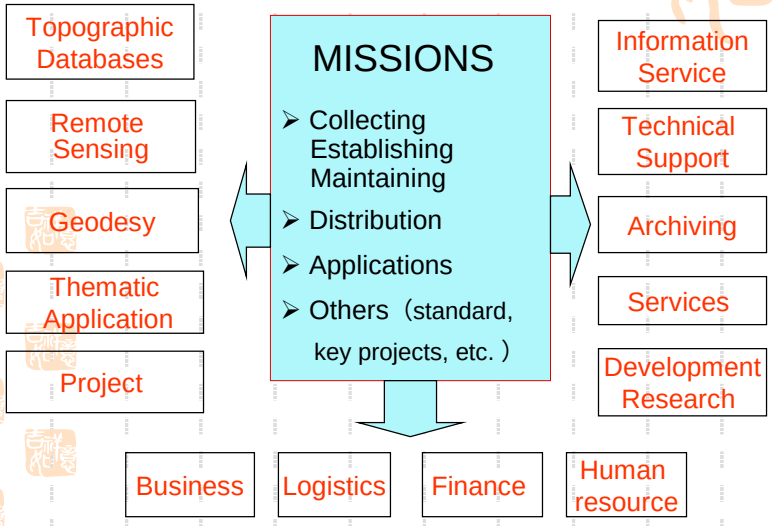
National Geomatics Center of China

Under the Umbrella of State Bureau of Surveying & Mapping

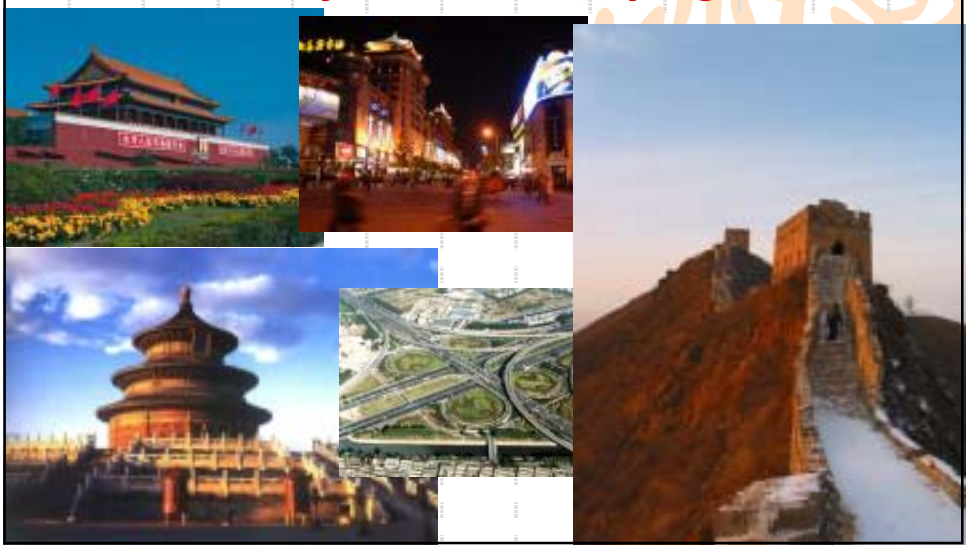


Organization's Structure

(14 departments, 150 staffs)



ISPRS 21st Congress
July, 2008, Beijing



Thanks for Your Attentions !