[ADB Workshop on Building NSDI]

Introduction to NSDI

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CONTENTS

I

Concept of NSDI

National Spatial Data Infrastructure

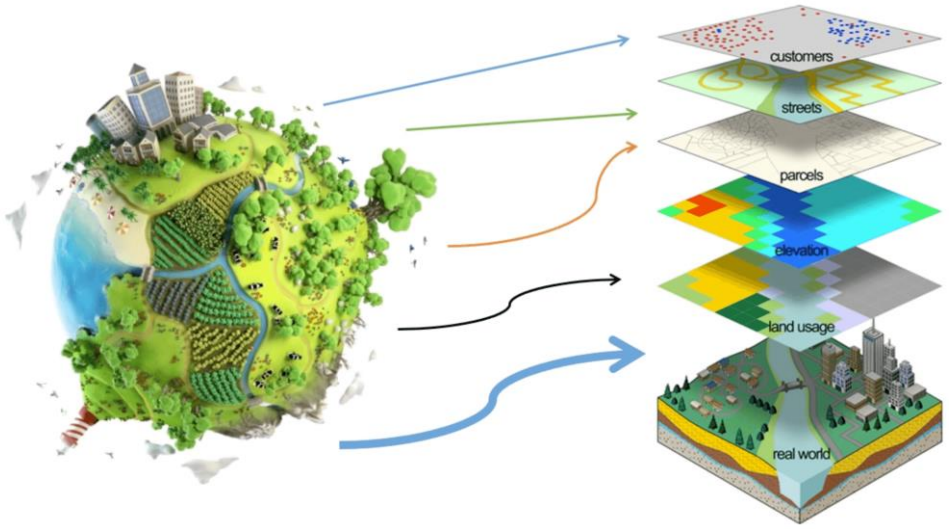
Representation of real world with map/geographical visualization

Getting synchronized

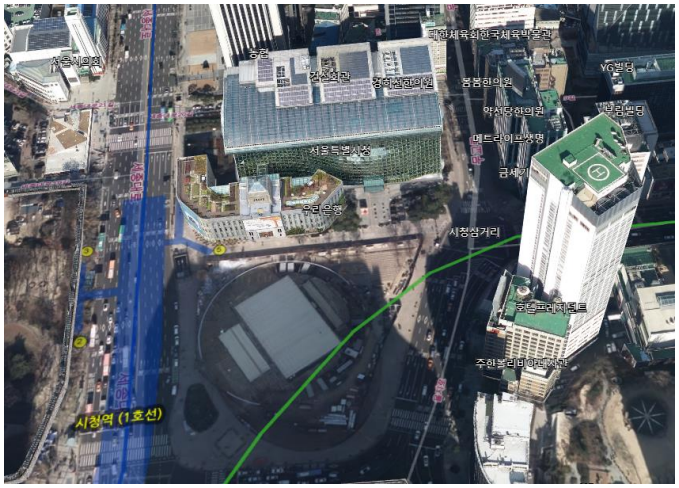
As it was (abstracted) :: past → As it is (fidelity):: real time

Digital Twin
Metaverse

IT being advanced,
Mapping, communication, edge & cloud computing, AI…



https://www.geo.university



https://smap.seoul.go.kr

Geospatial Data Act of 2018 - U.S.

"geospatial data"—
1.means information that is tied to a location on the Earth, including by identifying the geographic location and characteristics of natural or constructed features and boundaries on the Earth, and that is generally represented in vector datasets by points, lines, polygons, or other complex geographic features or phenomena;

2.may be derived from, among other things, remote sensing, mapping, and surveying technologies;

3.includes images and raster datasets, aerial photographs, and other forms of geospatial data or datasets in digitized or non-digitized form; and

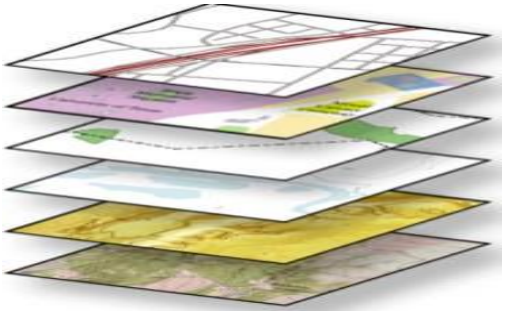
4.does not include—

1. geospatial data and activities of an Indian tribe not carried out, in whole or in part, using Federal funds, as determined by the tribal government;
2. classified national security-related geospatial data and activities of the Department of Defense, unless declassified;
3. classified national security-related geospatial data and activities of the Department of Energy, unless declassified;
4. geospatial data and activities under chapter 22 of title 10, United States Code, or section 110 of the National Security Act of 1947 (50 U.S.C. 3045);
5. intelligence geospatial data and activities, as determined by the Director of National Intelligence; or
6. certain declassified national security-related geospatial data and activities of the intelligence community, as determined by the Secretary of Defense, the Secretary of Energy, or the Director of National Intelligence;

Easy to understand and communicate

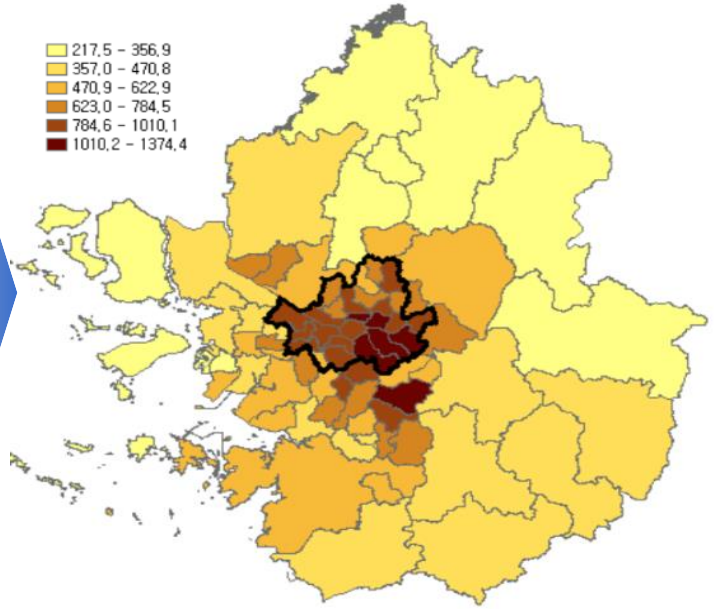
Statistical data

	2011.01	2011.02	2011.03	2011.04	2011.05	2011.06	2011.07	2011.08	2011.09	2011.10
강남구	371.4	393.9	356.4	352.9	365.4	363.4	377.0	401.1	386.8	391.6
서초구	341.6	349.6	325.4	329.6	329.3	332.9	341.1	361.6	347.8	355.1
송파구	311.2	306.0	283.5	282.4	282.5	283.5	292.9	303.4	296.3	307.6
성동구	273.8	287.9	257.5	261.3	270.9	280.0	279.1	284.5	282.8	279.0
중구	243.9	296.0	266.7	267.7	262.5	261.2	269.2	285.3	285.1	266.6
마포구	255.3	264.6	265.4	256.7	253.3	269.2	279.9	278.7	271.1	271.6
동작구	260.7	269.2	257.7	248.6	255.2	255.1	255.4	272.1	267.9	256.8
영등포구	252.4	265.1	256.6	258.3	258.9	262.1	258.5	262.9	270.8	271.6
양천구	296.9	314.3	267.9	251.8	247.6	259.0	254.1	263.0	242.5	248.5
광진구	259.0	266.8	236.3	231.2	228.7	237.2	248.5	263.2	260.9	245.4
용산구	231.5	257.7	250.0	247.8	228.8	227.2	237.4	256.9	236.7	243.0
종로구	226.5	234.3	219.7	231.6	227.3	216.0	235.0	229.0	238.8	224.2
관악구	238.1	252.5	235.7	225.5	220.0	230.8	240.2	246.1	240.0	233.3
강서구	224.1	234.3	211.9	219.3	217.8	220.7	219.3	231.5	227.3	225.0
강동구	224.0	212.0	201.6	210.9	212.3	212.4	218.8	229.2	232.2	235.3



Geospatial data

- Easy understanding
- Effective communication
- Precise analysis
- Customized policy

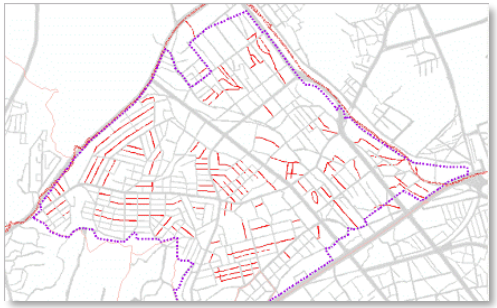


Rent price map

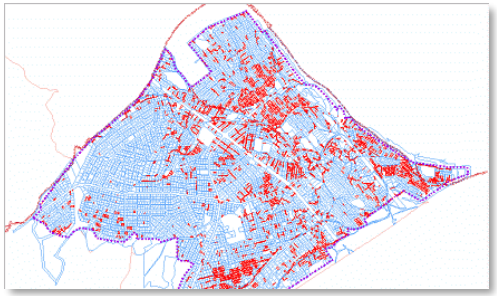
I Why is geospatial data important?

Geospatial data is a melting pot for creating new value

Overlay & Visualization

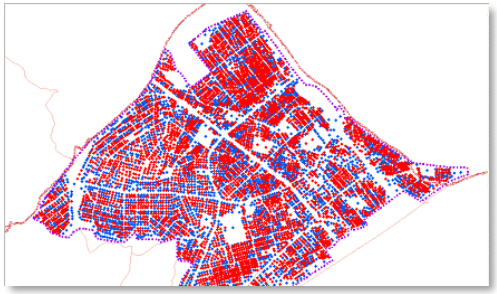


→ **Road → A thing**



→ **Road + Building**

→ **Something New!**



→ **Road + Building + Land Value**

→ **Something New!!!**

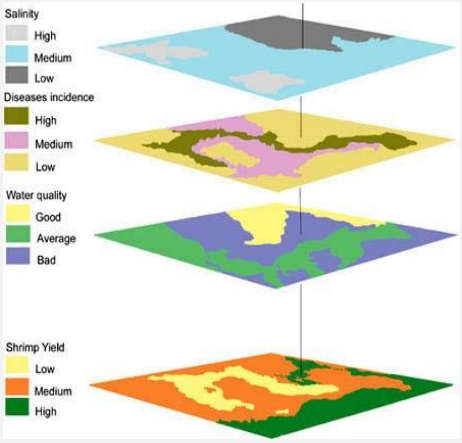
☆ About 60% of all information are geospatially referenced!

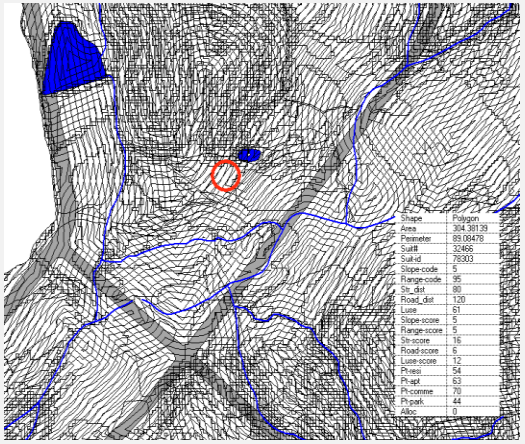
Hahmann, Burghardt. 2013. How much information is geospatially referenced? Networks and cognition. IJGIS. 27(6)

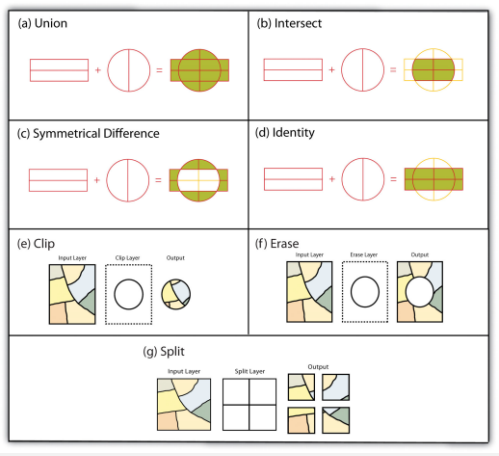
Geospatial data is a melting pot for creating new value

Overlay

- A method to analyze relationship among layers or to create another layer by combining layers
  (Ex: Union, intersect, Symmetrical Difference, Identity, Clip, Erase, Split etc.)







Geospatial data is a melting pot for creating new value

Geocoding

- Converting addresses or place name(POI, Point of Interest) into geospatial coordinates

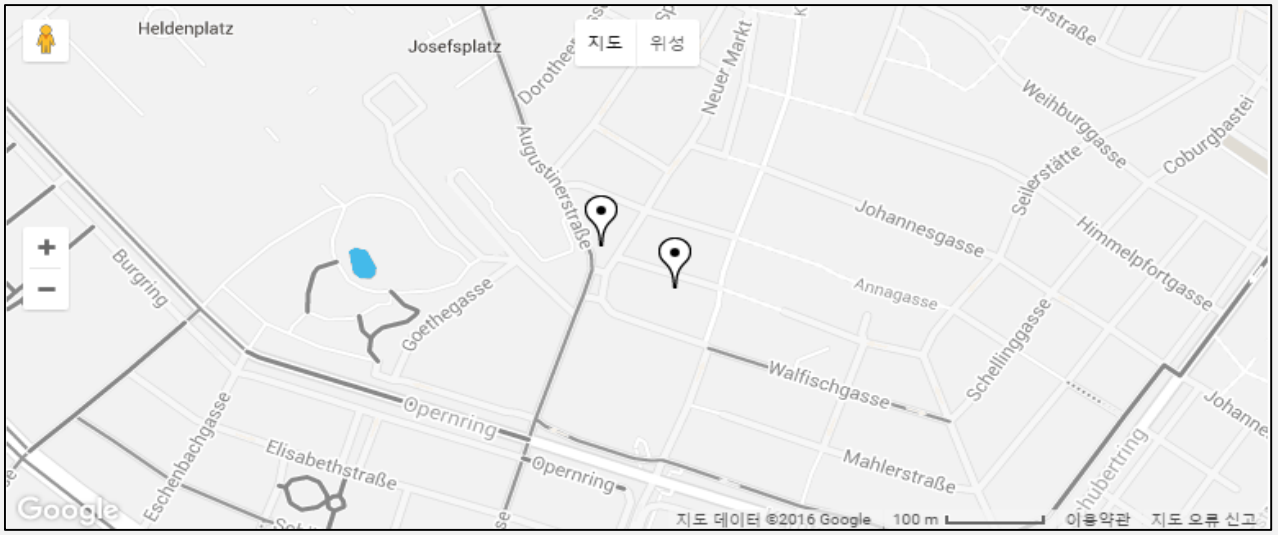
E
소재지
ADDR
서울특별시 종로구 창신동 687번지 20호
서울특별시 종로구 창신동 581번지 8호
서울특별시 종로구 숭인동 339번지
서울특별시 종로구 관수동 14번지 1호
서울특별시 종로구 창신동 555번지
서울특별시 종로구 명륜3가 149번지
서울특별시 종로구 숭인동 414번지
서울특별시 종로구 숭인동 178번지 73호
서울특별시 종로구 숭인동 227번지 5호
서울특별시 종로구 창신동 464번지 8호
서울특별시 종로구 숭인동 1127번지
서울특별시 종로구 무악동 46번지 131호
서울특별시 종로구 창신동 395번지 28호
서울특별시 종로구 숭인동 327번지
서울특별시 종로구 익선동 79번지
서울특별시 종로구 숭인동 1137번지
서울특별시 종로구 숭인동 1065번지
서울특별시 종로구 효제동 207번지 0호
서울특별시 종로구 창신동 459번지 26호

Geospatial data is a melting pot for creating new value

Geo-parsing

- Extracting geospatial elements from non-structured data(ex. SNS) and converting into geospatial coordinates

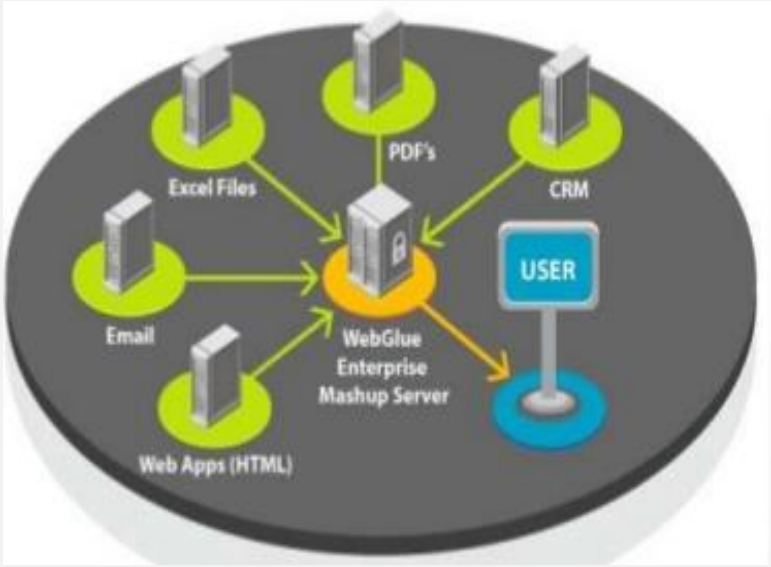
> The Vienna Tourist Board [3] operates information and booking booths at the airport Arrival Hall, 7AM-11PM and in the center at 1., Albertinaplatz/Maysedergasse. Information and free maps are also avialable from the ÖBB InfoPoints and offices at train stations.

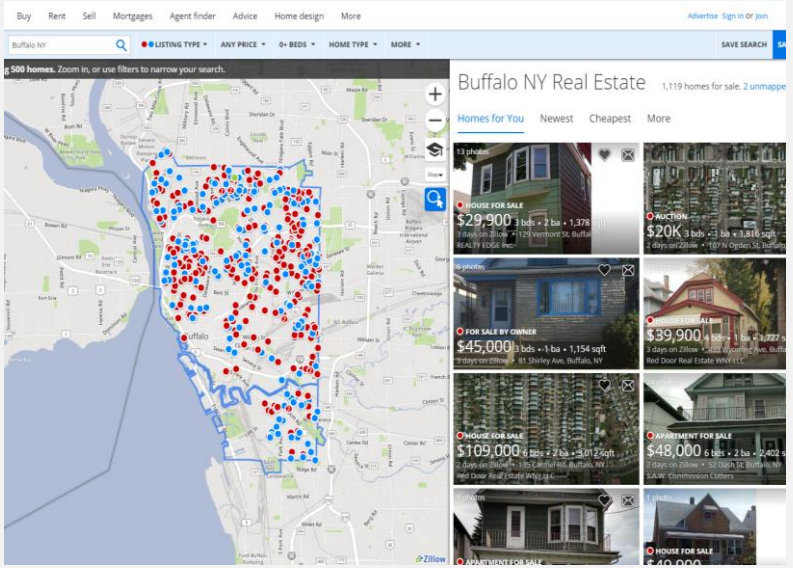


Geospatial data is a melting pot for creating new value

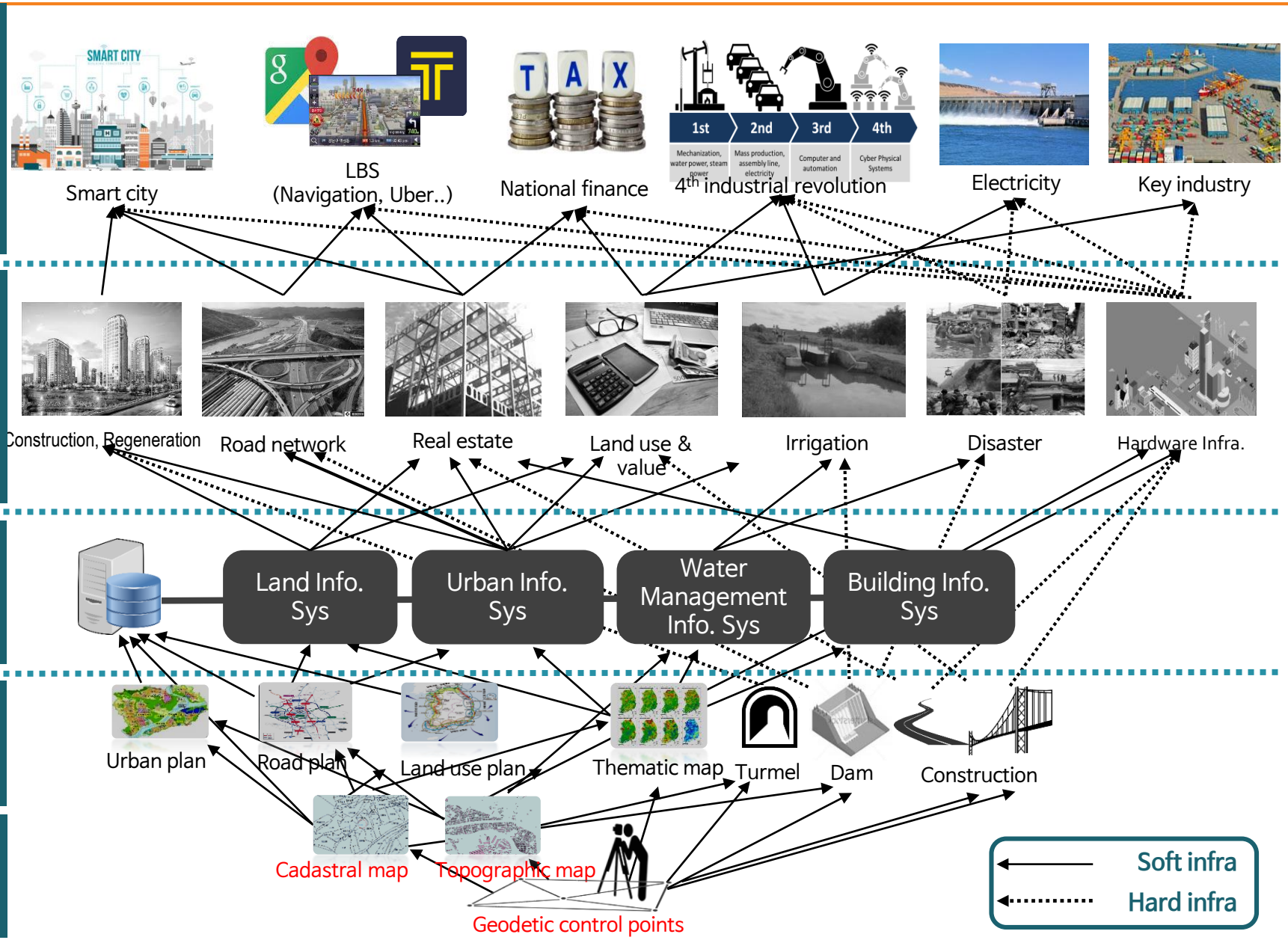
Mashup

- Creating a software, a service or a database using exiting information resources on web such as data and Open API (Ex: Zillow.com)





I Software infra for developing hardware infra and more



Source: KOICA (2018), Integrated evaluation on GIS projects

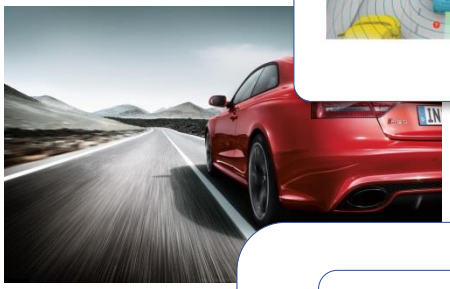
National Spatial Data Infrastructure

"… the technology, policies, criteria, standards, and employees necessary to promote geospatial data sharing throughout the Federal, State, Tribal, and local governments, and the private sector (including nonprofit organizations and institutions of higher education)" Section 755, Geospatial Data Act of 2018, USA

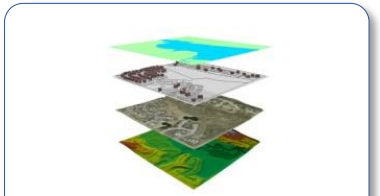
"shall ensure that geospatial data from multiple sources (including the covered agencies, State, local and tribal governments, the private sector, and institutions of higher education) is available and easily integrated to enhance the understanding of the physical and cultural world

Road is a hardware infrastructure to transport people and goods. Spatial data is a software infra to develop and manage hardware infra. This means that software infra should go first to develop hardware infra. SDI should be national because most data are owned by government. Government needs geospatial data to protect and manage people, land and infrastructure. The data should be accessible by all people.

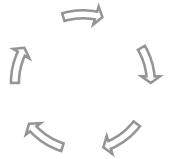
- Not just geospatial data but many to make the data available



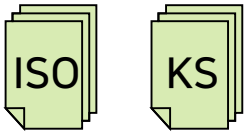
Applications



Framework Data



Clearinghouse

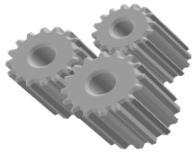


Standards

Human Resources

Institutions

Organization



Technology

National **S**patial **D**ata **I**nfrastructure

Partnership

II

History of NSDI policy in Korea

Since 1995

Background of Nation GIS

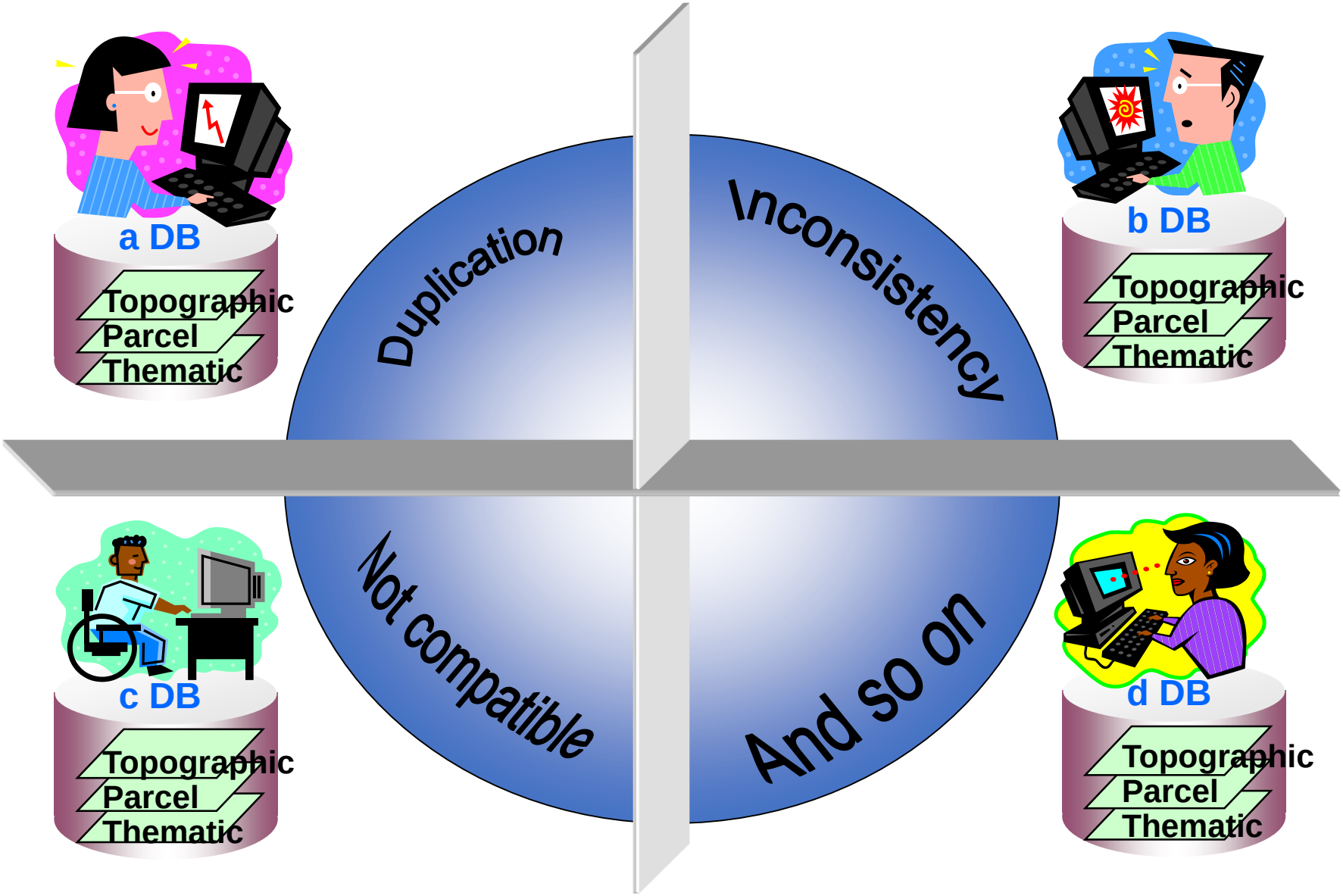
Dec. 7, 1994(Seoul)

hankookilbo.com

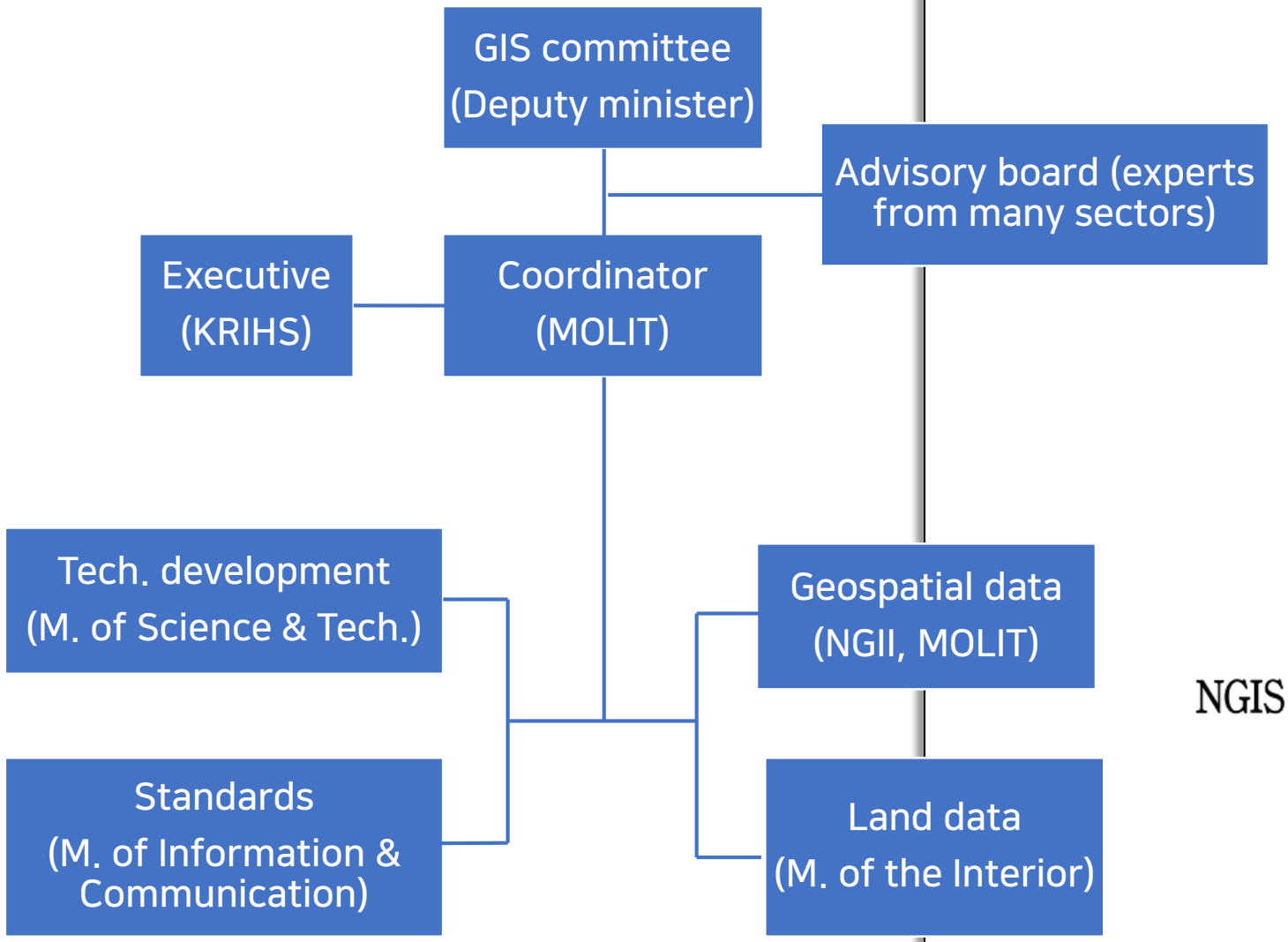
April 29, 1995(Daegu)

www.ehistory.go.kr
db.history.go.kr

Background of Nation GIS



The first master plan for National GIS (1995-1999)

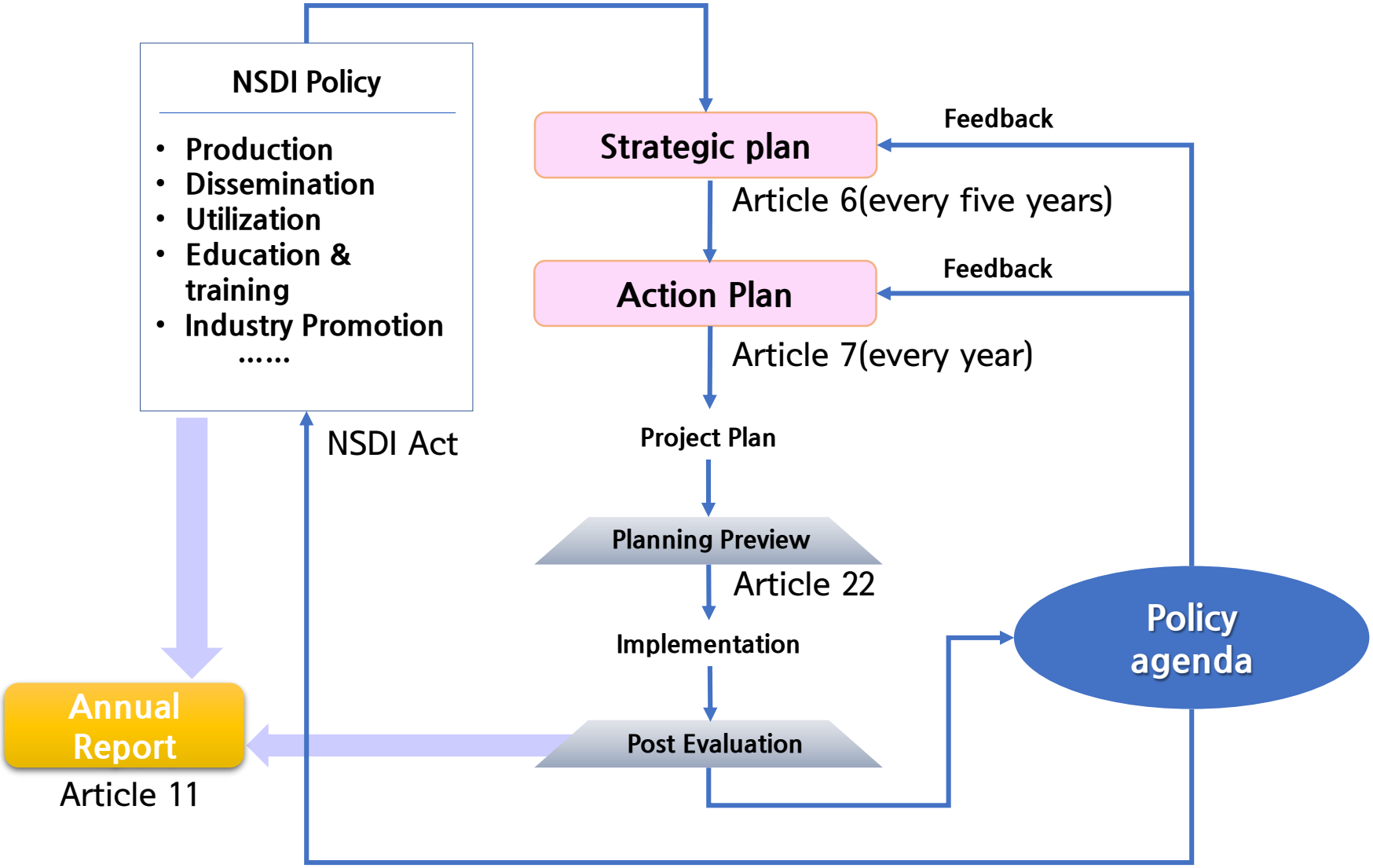


國家地理情報體系(NGIS) 構築 基本計劃

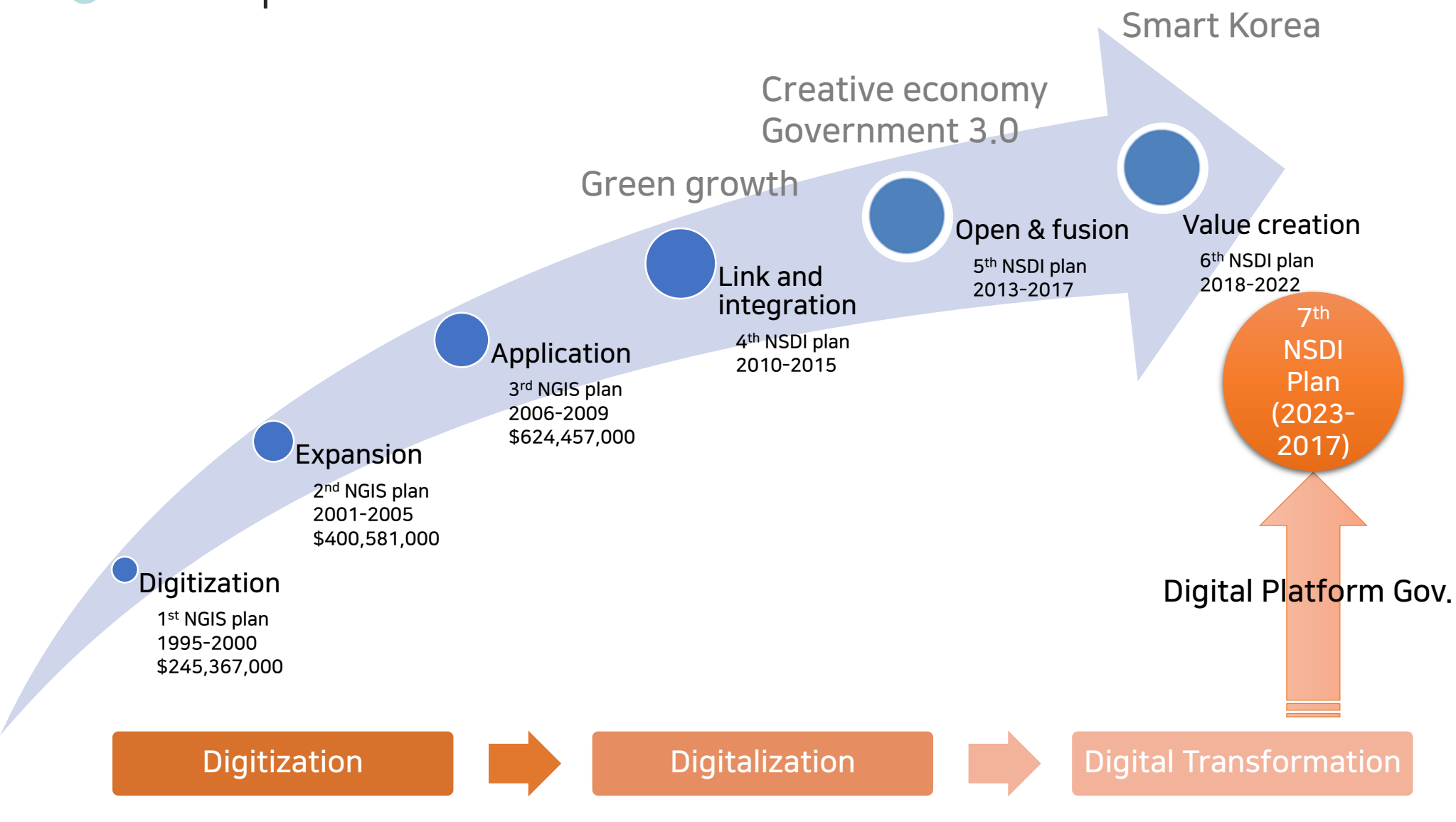
1997. 10

NGIS 總括分科委員會

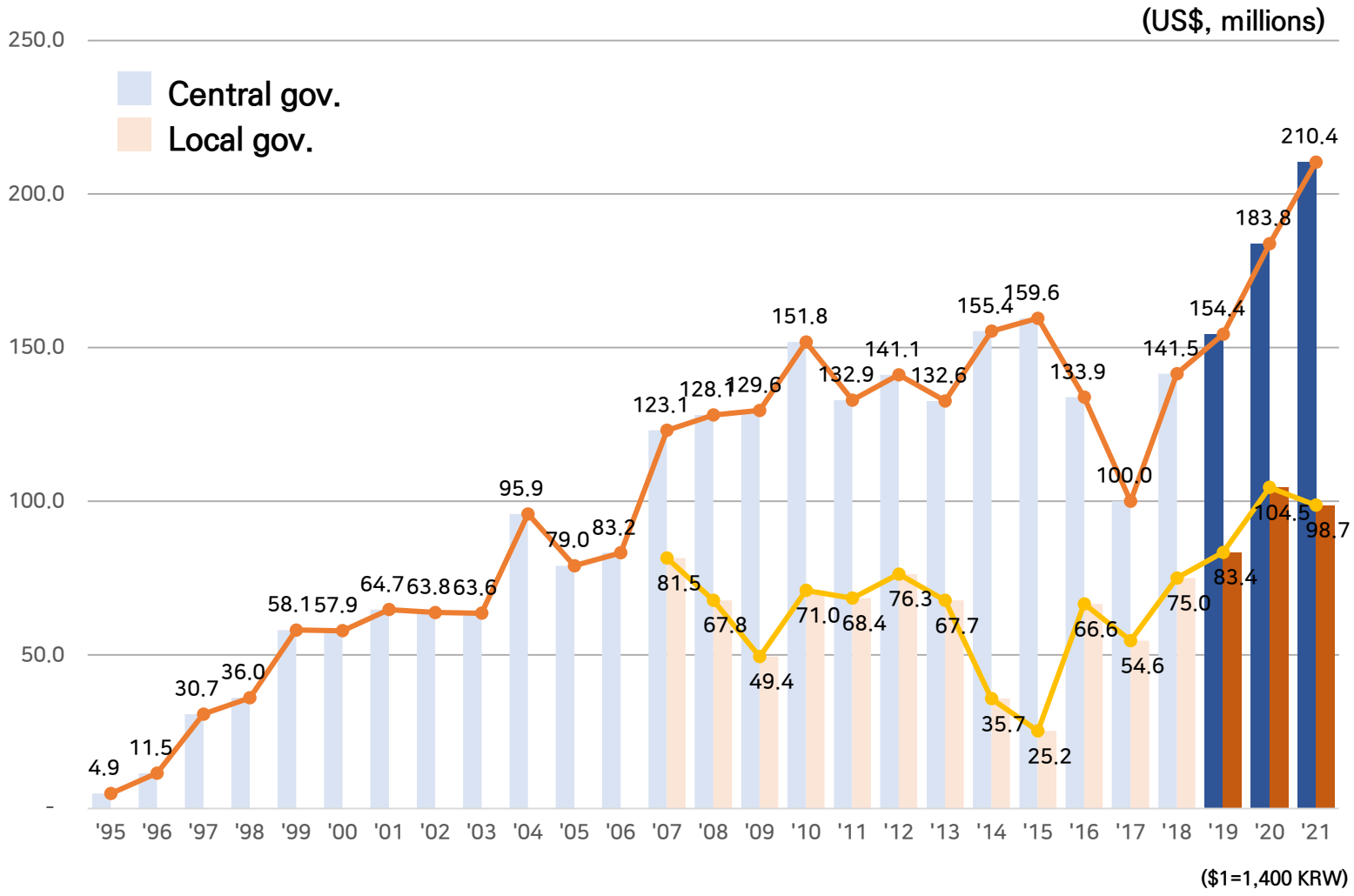
NSDI policy framework



Master plan for NSDI



Investment by central and local governments

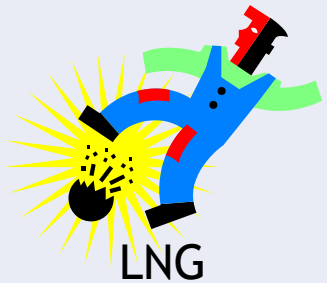


III

Main projects, applications & services

Ⅲ Main projects

Too many regulations for land use



LNG explosions

1st NGIS Master Plan | 2nd | 3rd | 4→5th

National land planning and utilization act

Act on the est. and use of NGIS → NSDI Act → F. Act

Framework act on land use regulation

F. act on the N. Land

(1996) Underground facility information management system

(1998) LMIS → (2003) KLIS

(1996) PBLIS

(1999) NSIC

(2009) Vworld

Digitalization of topographic maps → Framework data

3D image

National Spatial Data Integrated Sys.

(2001) UPIS

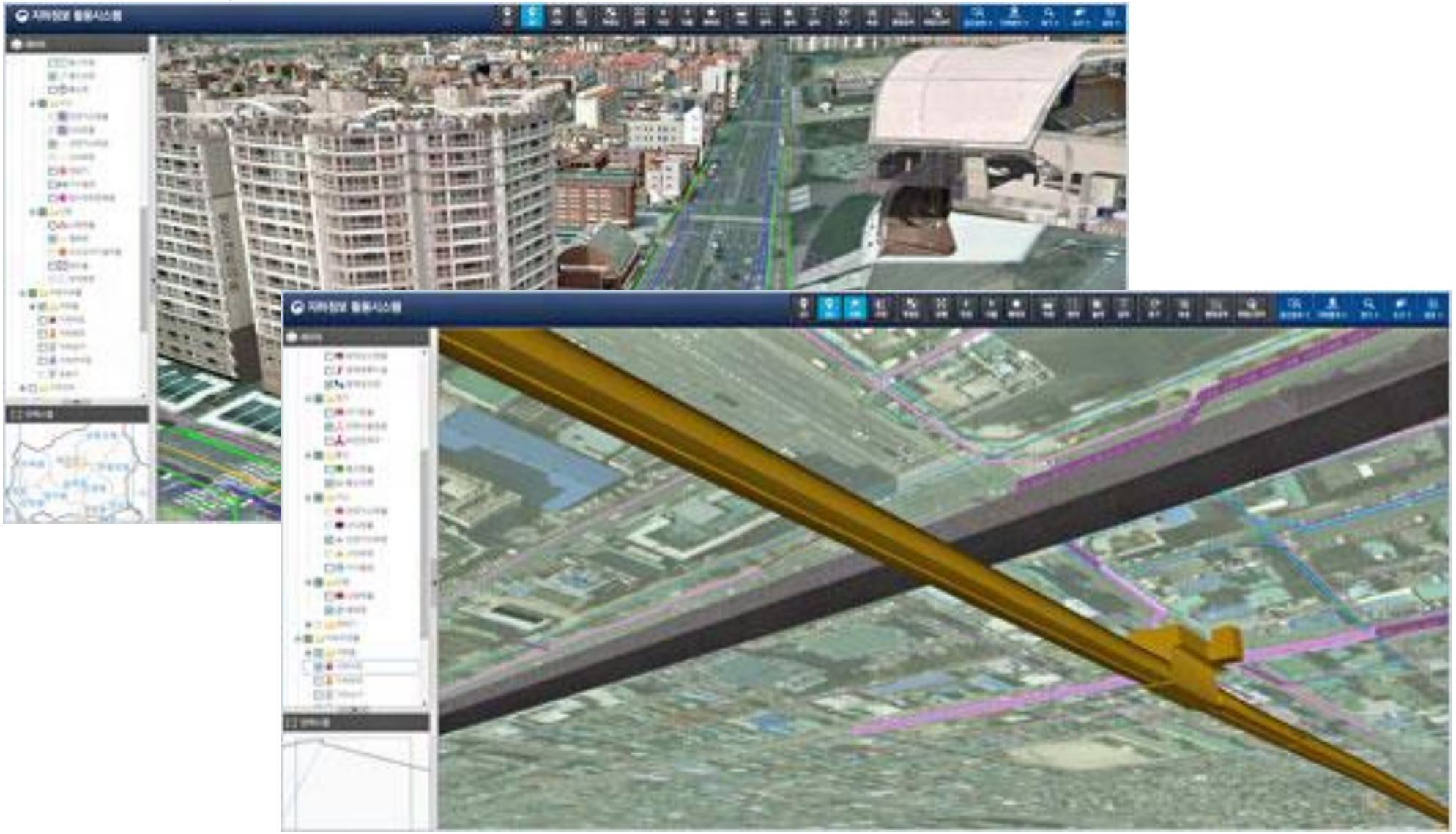
(2006) KOPSS

(2007) LURIS

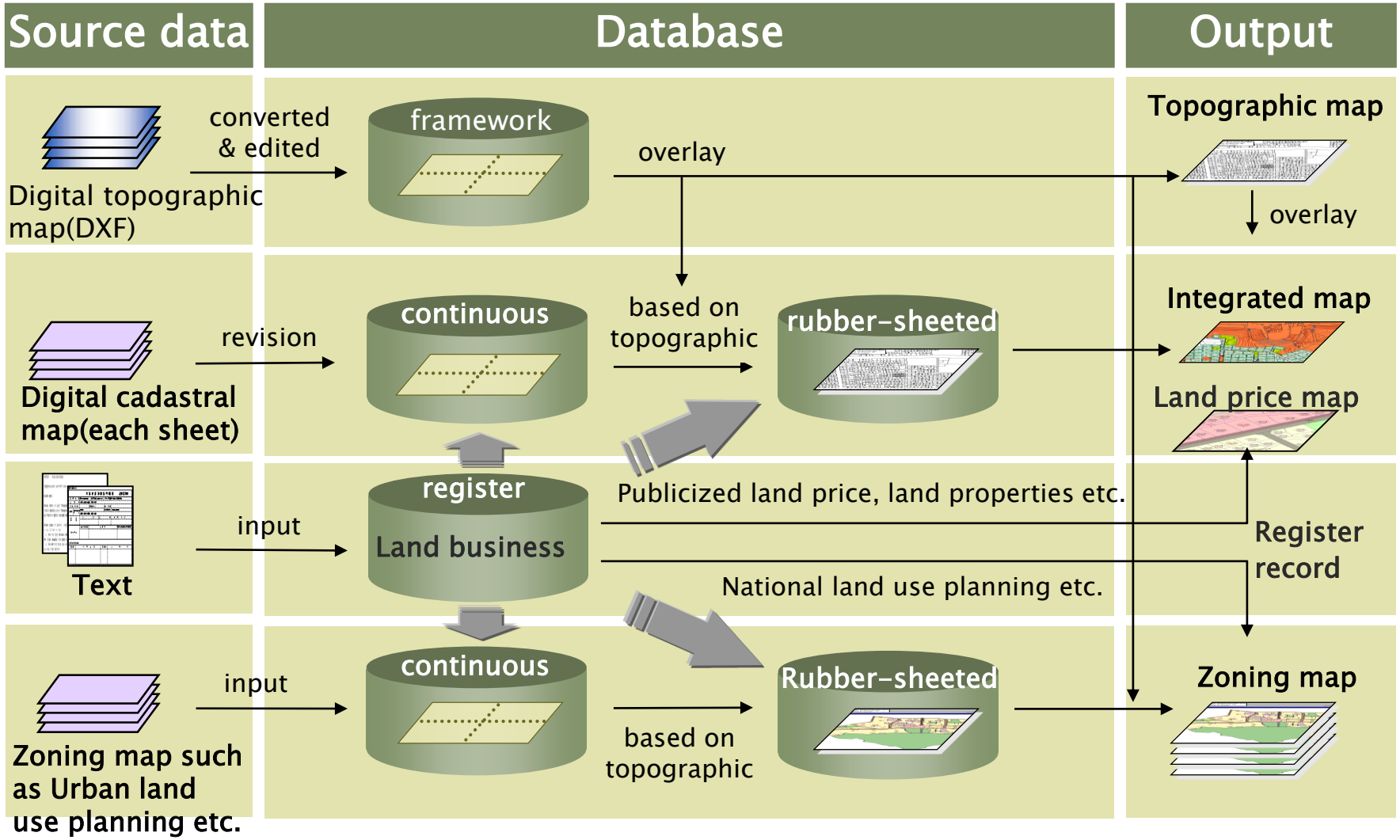
LMIS: Land Management Information System
PBLIS: Parcel-Based Land Information System
KLIS: Korea Land Information System
NSIC: National Spatial Information Clearinghouse
NSDI: National Spatial Information System
UPIS: Urban Planning Information System
KOPSS: KOrea Planning Support System
LURIS: Land Use Regulation Information System

1995 2001 2005 2010

Underground facilities



Conceptual DB model of KLIS

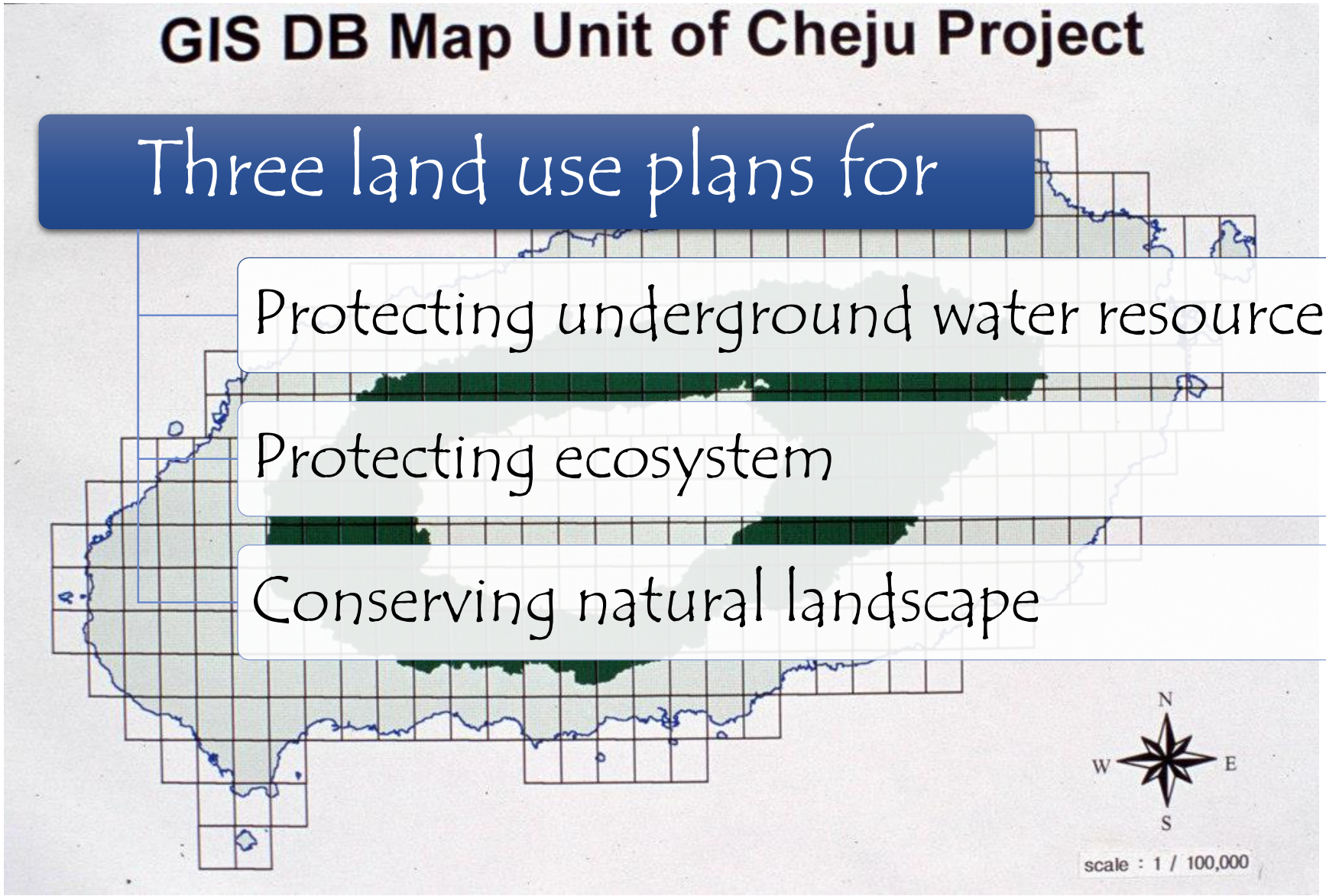


Source: Ministry of Construction and Transport, 2000, Guideline for Land Management Database

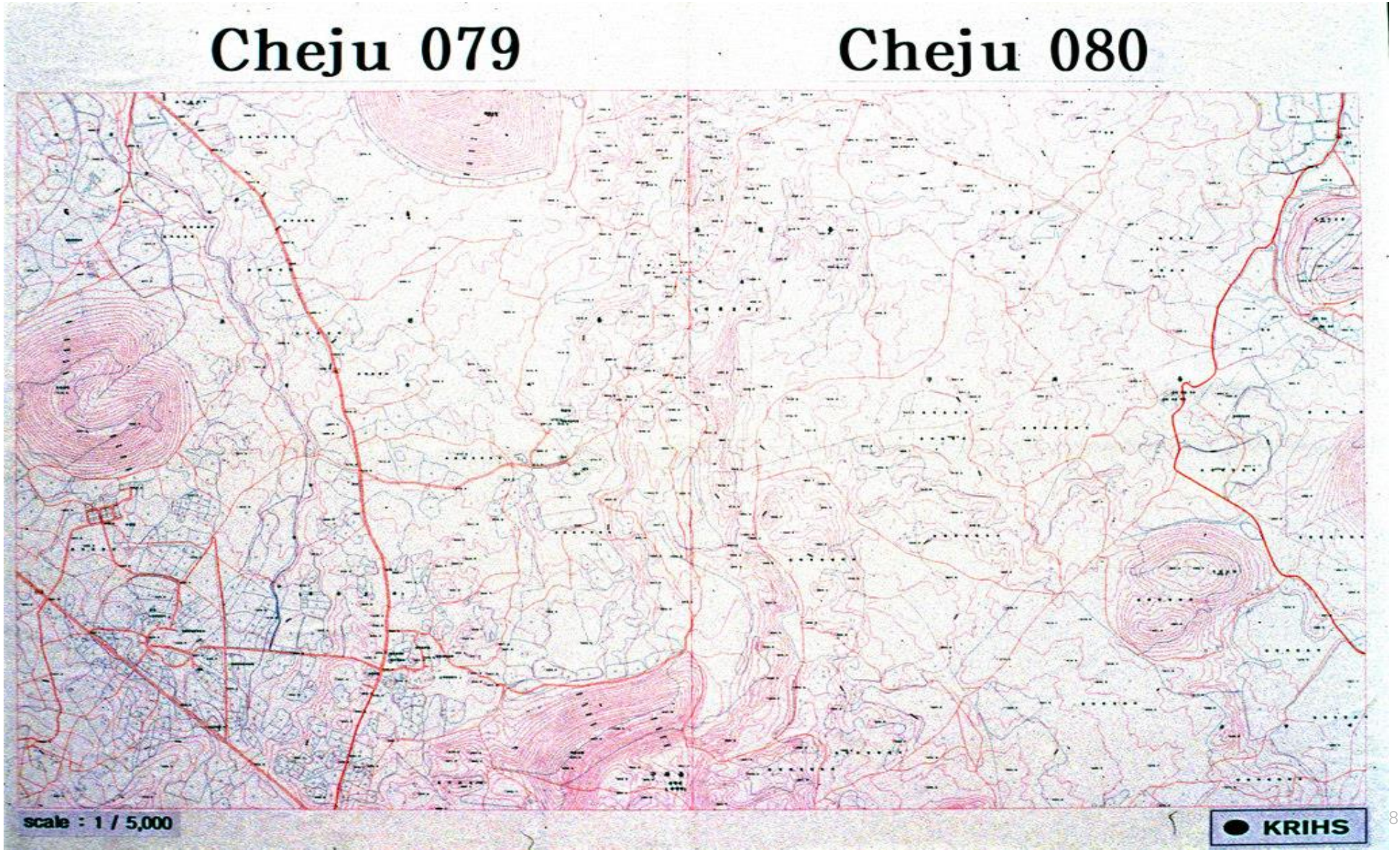
Land use planning with geospatial data

- Period: 1995 – 1997 (2.5 years)
- Budget: $1.7 Million (2,000,000,000 KRW)
- Goal: Environmentally sound land use plan
- Method:
  - Survey of natural resources of
    - Geological structure, soil and special area
    - Vegetation characteristics and habitat
    - Landscape assets
  - GIS database building
  - Spatial analysis using GIS

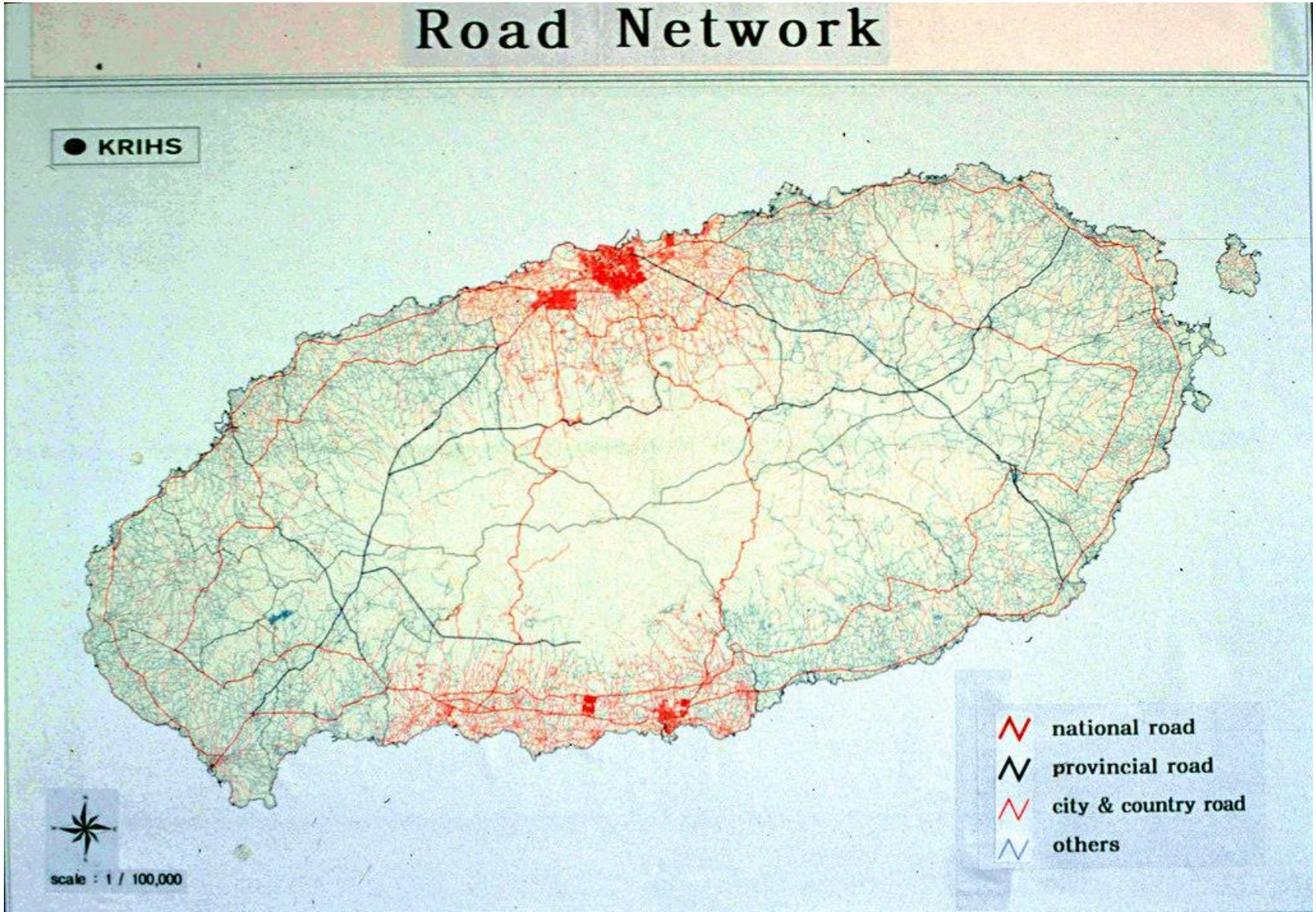
- Land use planning with geospatial data



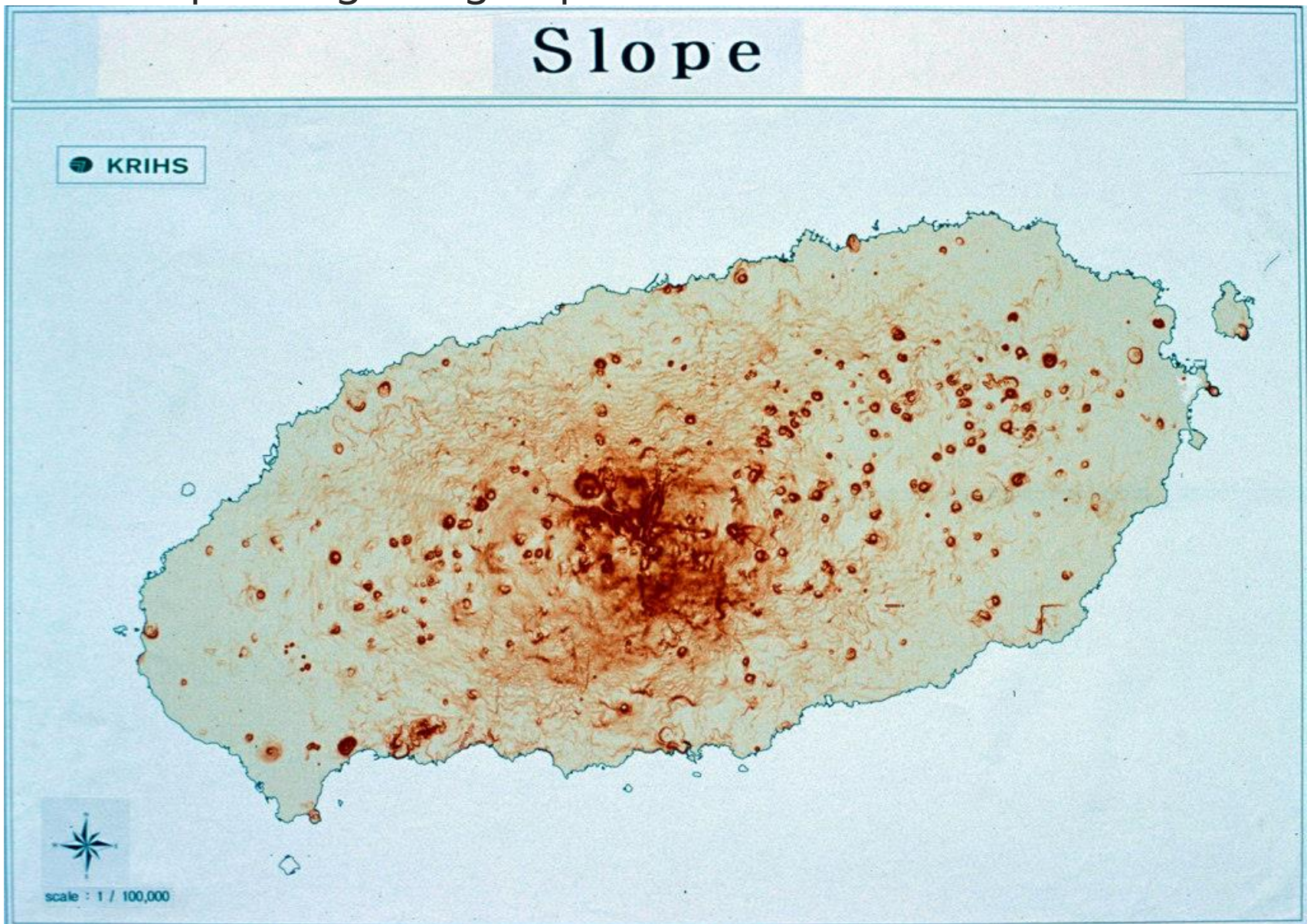
Land use planning with geospatial data



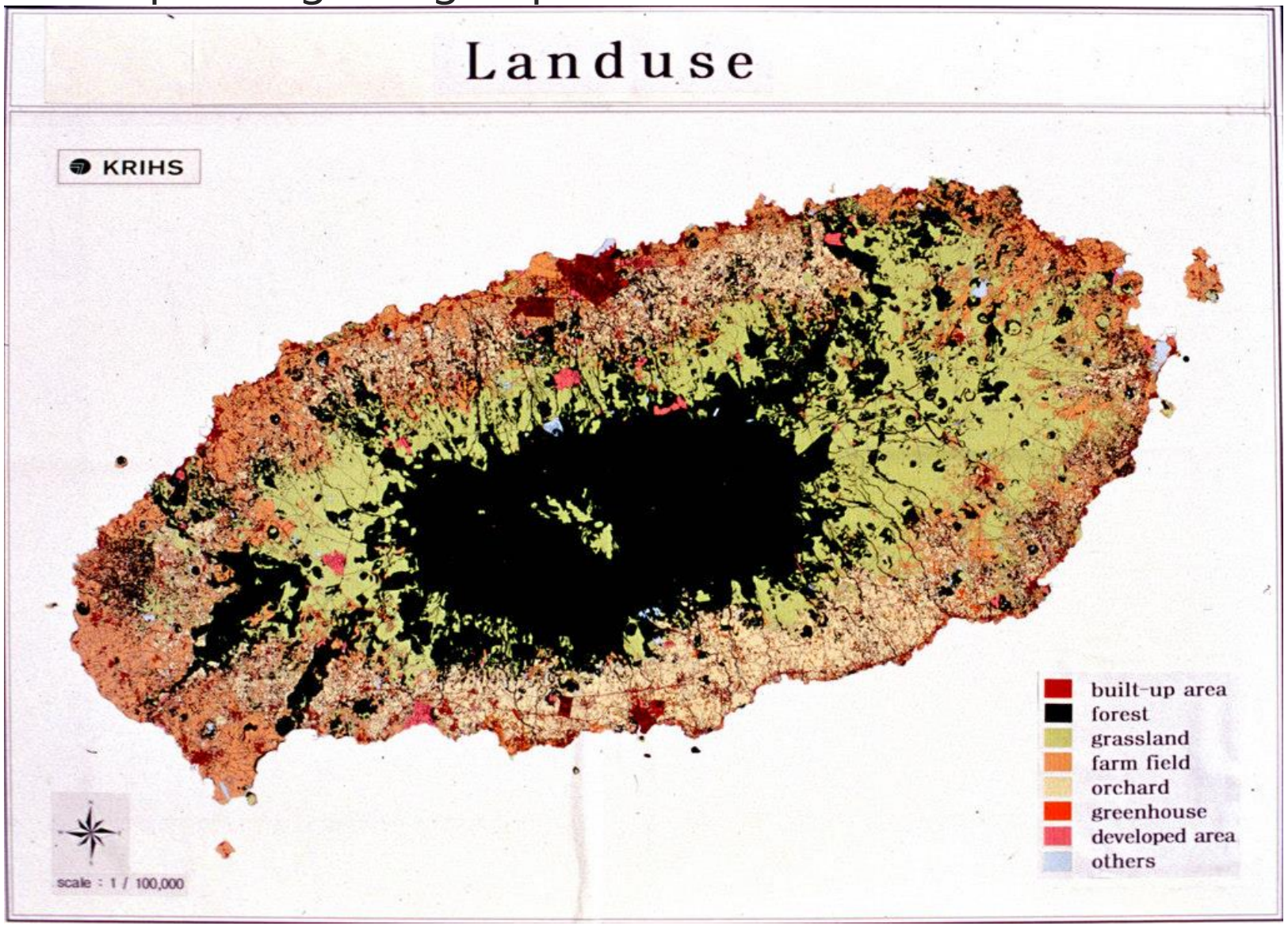
Land use planning with geospatial data



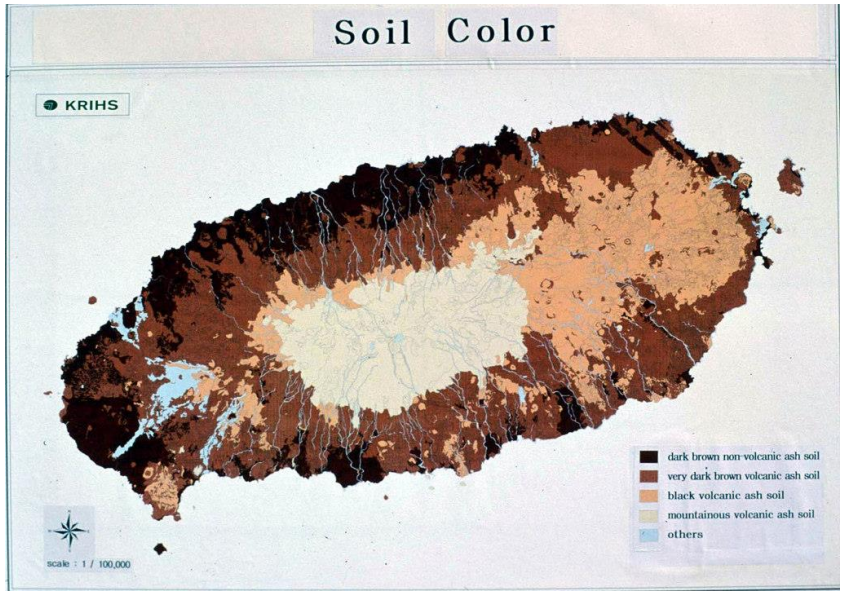
Land use planning with geospatial data

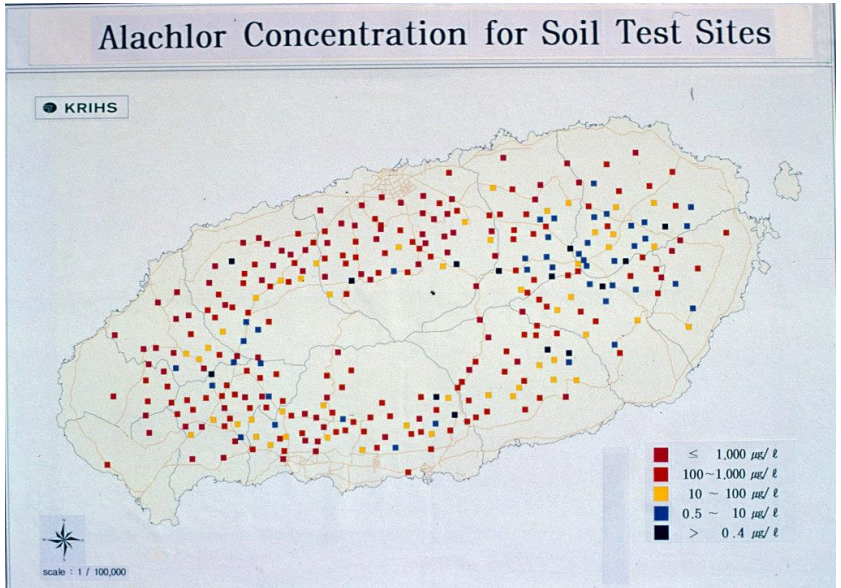


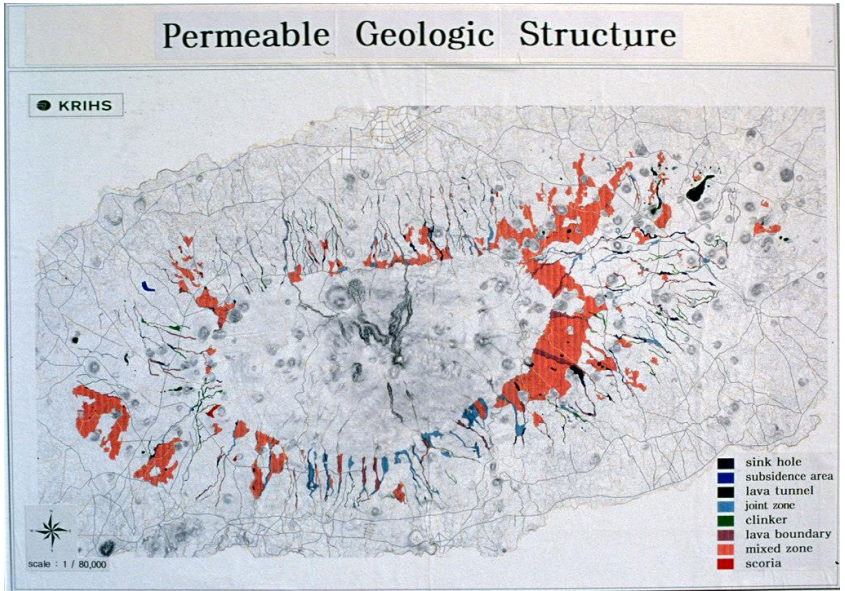
Land use planning with geospatial data



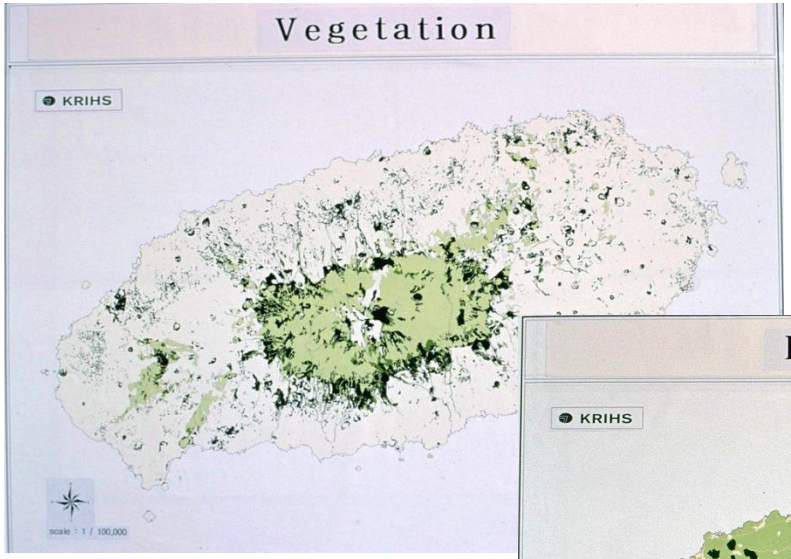
Land use planning with geospatial data

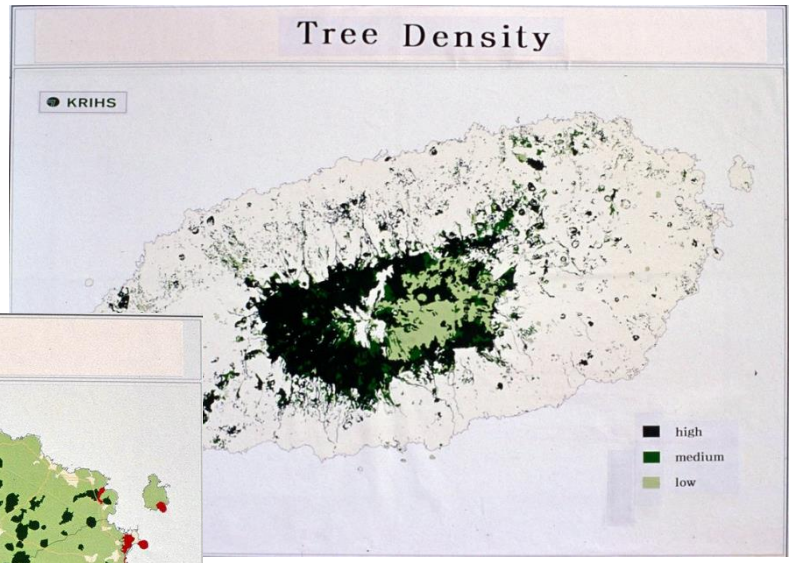


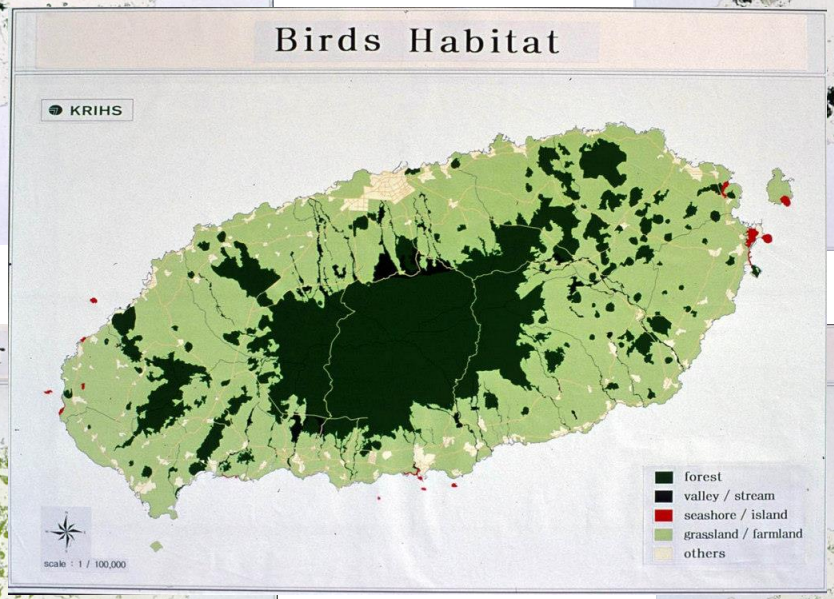


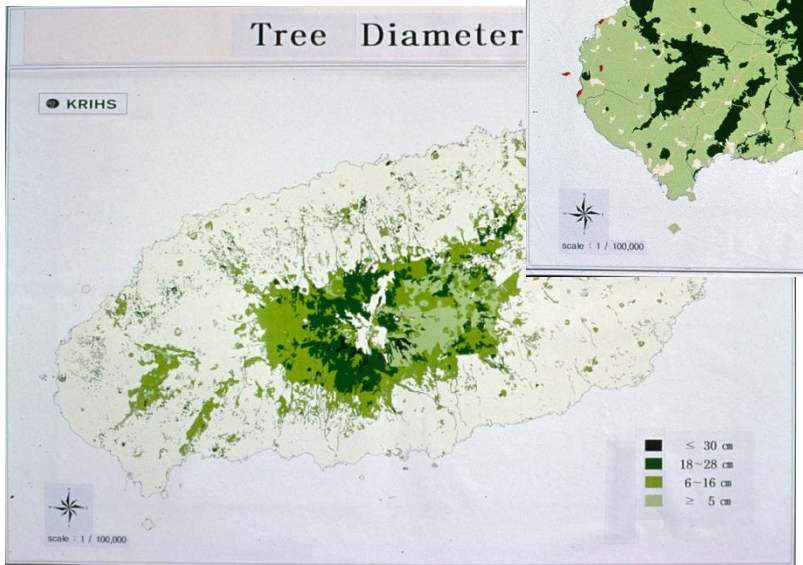


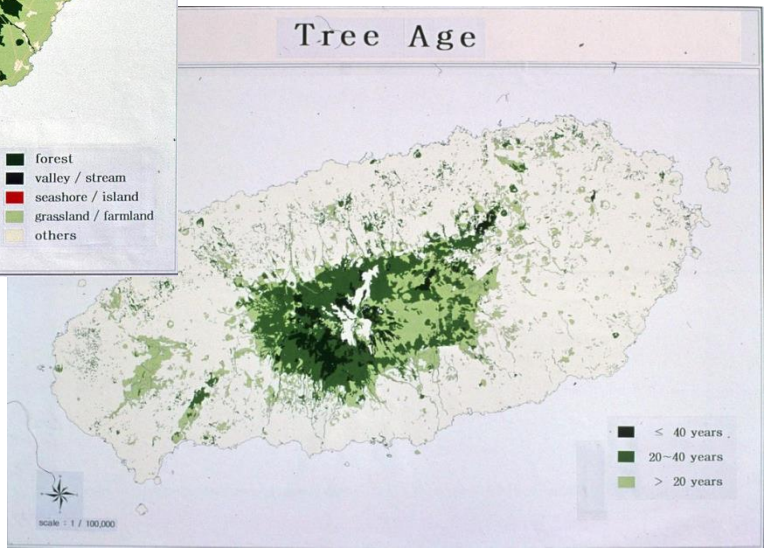
Land use planning with geospatial data



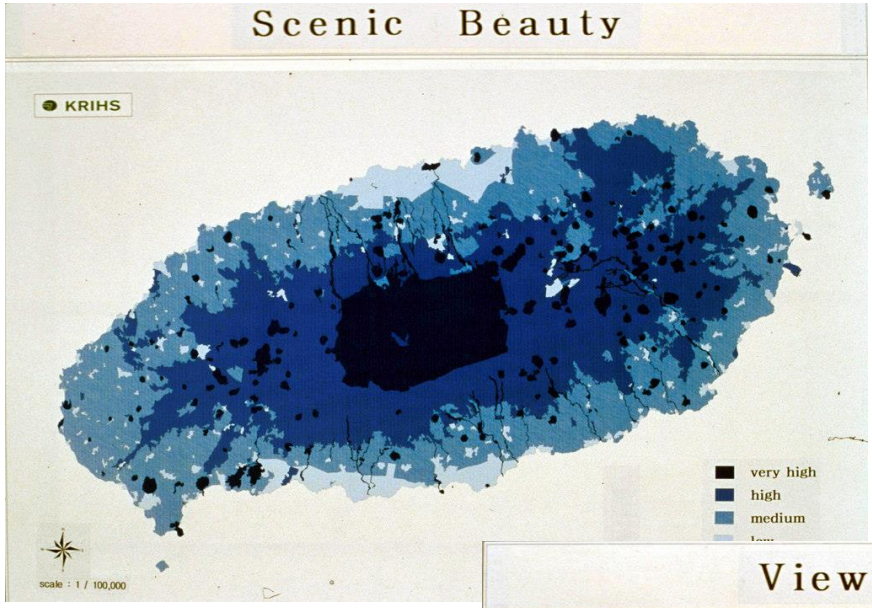


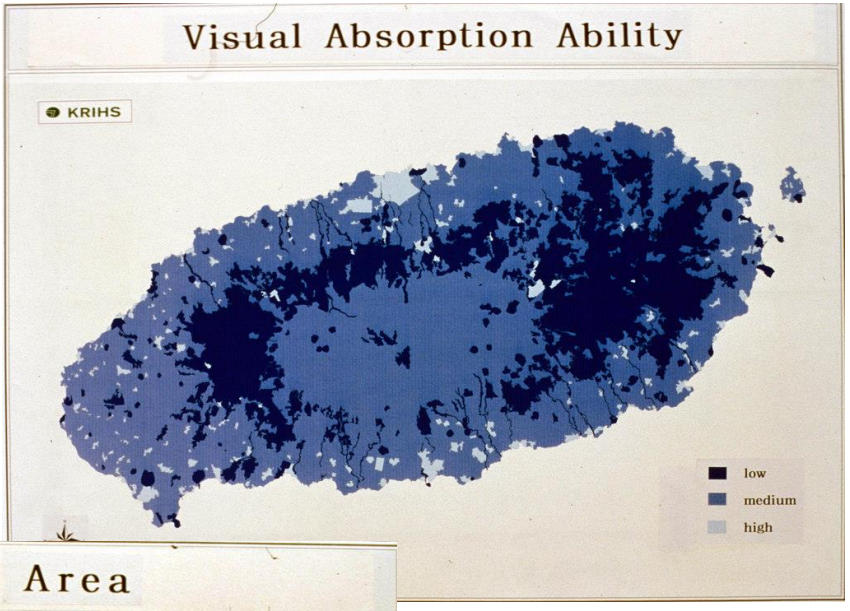


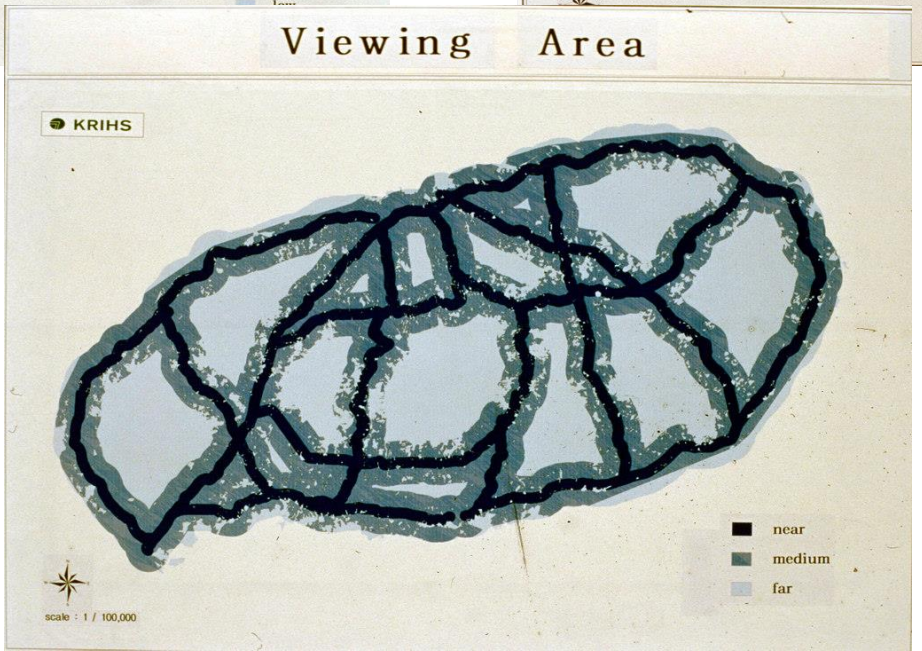




Land use planning with geospatial data







- Land use planning with geospatial data

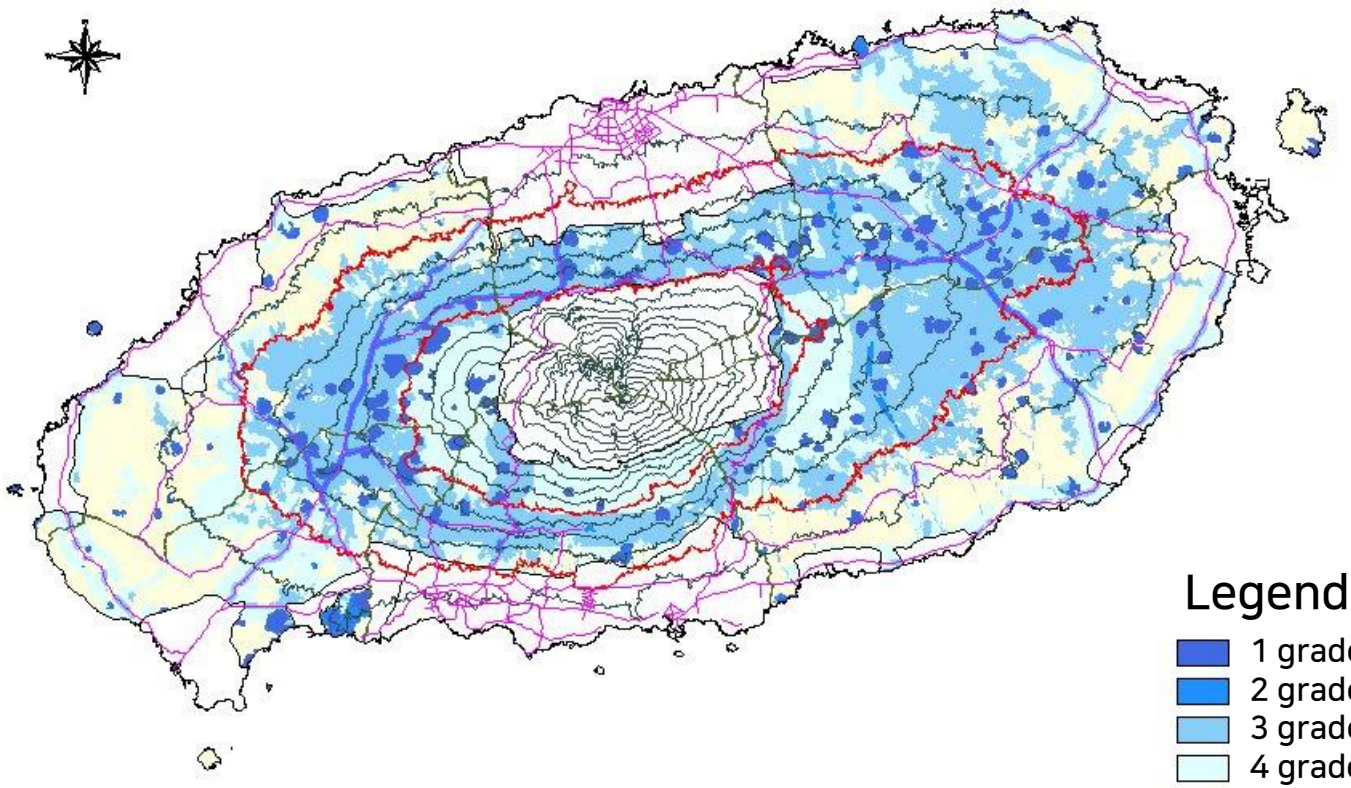
Five grades system for each land use plan

1. 1: No development
2. 2. No dev't, but small sized, limited
3. 3. Limited development
4. 4: Conditional development
5. 5. Any development

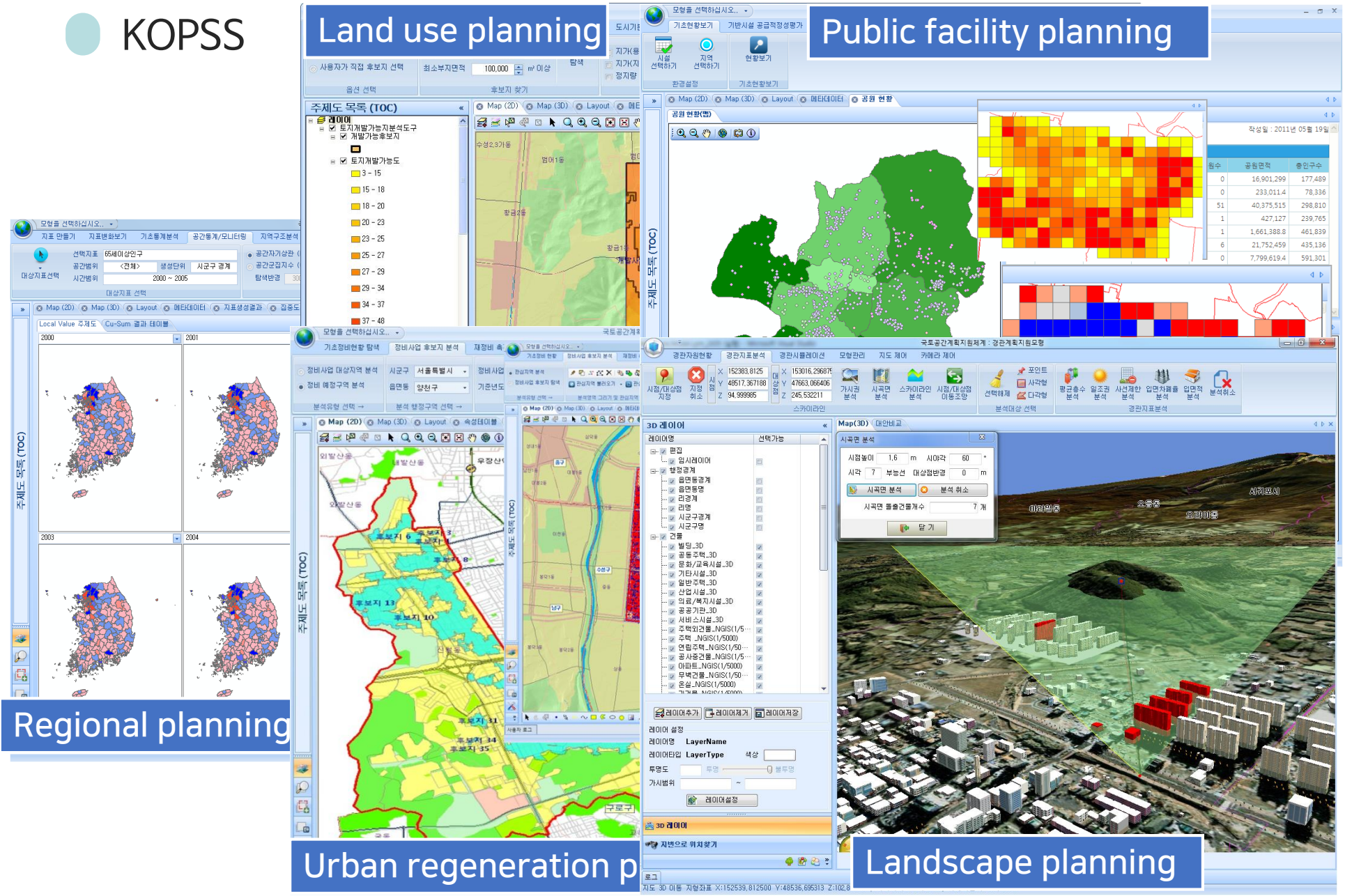
Land use plan for underground conservation

Land use plan for ecosystem conservation

Land use plan for landscape conservation



KOPSS


Land use planning
Public facility planning
Regional planning
Urban regeneration p
Landscape planning

www.NSDI.go.kr

"National Spatial Information Portal"
The Hub of spatial information

www.NSDI.go.kr

Map Service

OpenAPI Service

OpenMarket

Policy · Contents

Announcement· PR

Education · Start-up assistance

PR Support Hall

Introducing to Spatial information

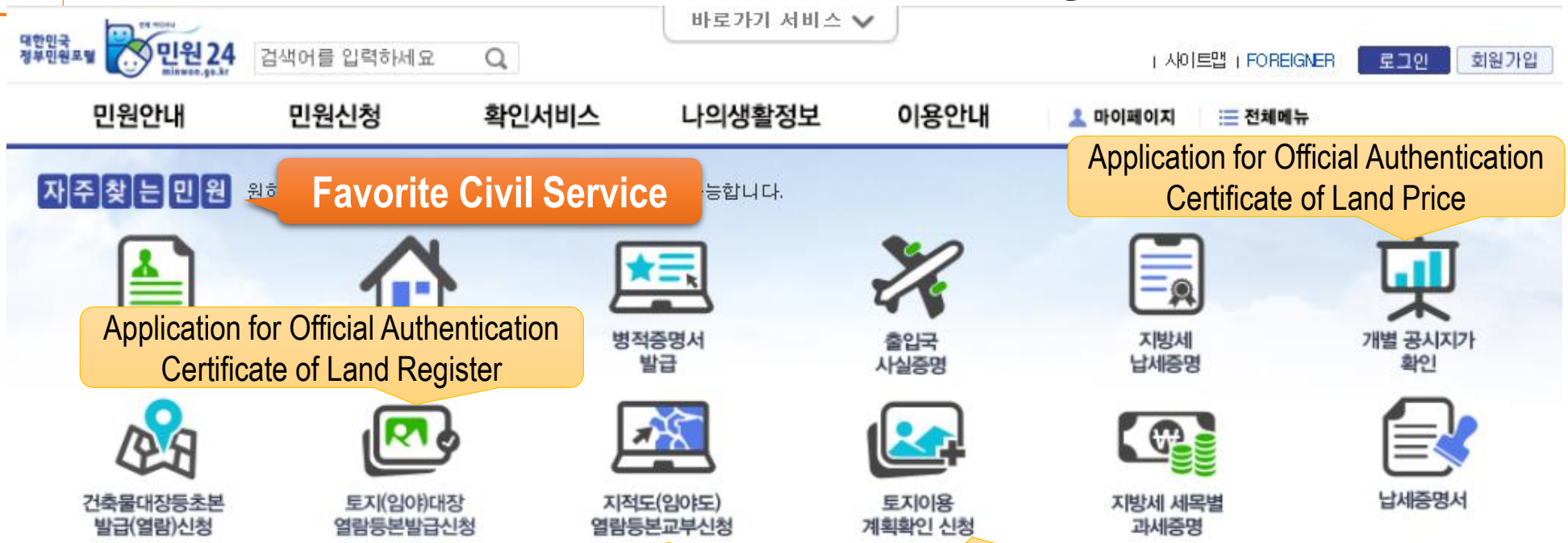
Introducing to Portal System

Spatial information is a good product!

www.VWORLD.kr

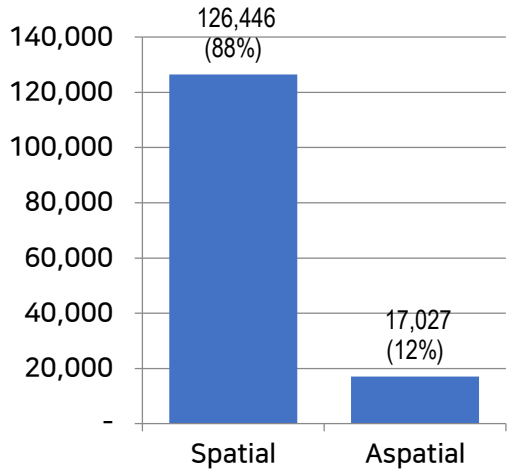
3D data-based open platform service with many other spatial data,
past areal photos, indoor data, visual analytics tools and OpenAPIs

Public services through e-Gov.



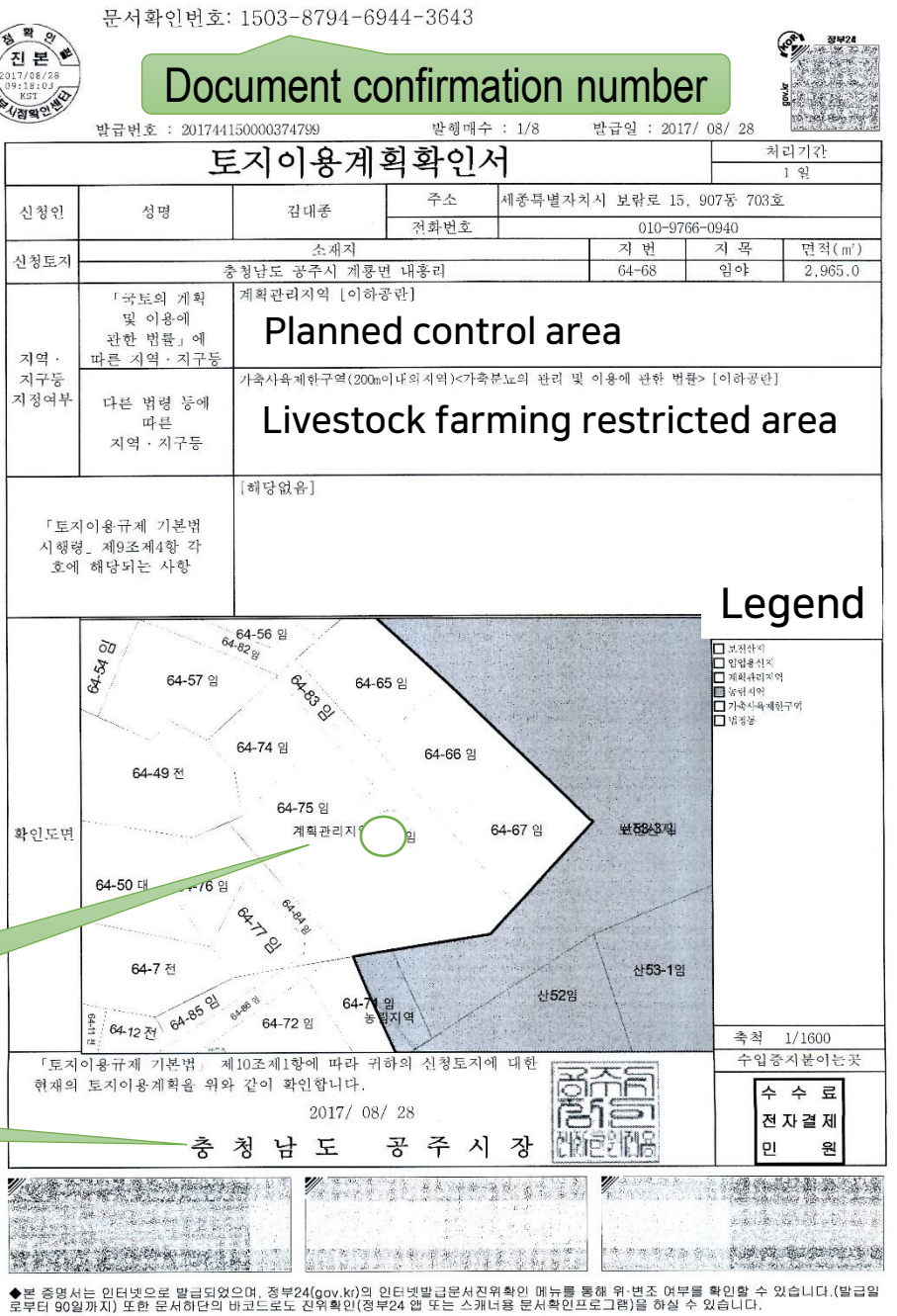
토지이용계획확인신청

신청내용	대상토지 소재지 *	기본주소	주소검색 / 일반 / 번지 / 호 ※1-30 1번지30호
	사용용도		
	토지이용규제포함		◉ 미포함 ○ 포함
수령방법 선택	수령방법 *		검색 / 온라인발급(본인출력)
	수령기관선택		검색
신청부수 *			1 부
신청일			2017 년 08 월 25 일



Example of certificate of land use regulation using KLIS

Valid! when printed w/ forgery protection technology



문서확인번호: 1503-8794-6944-3643

발급번호 : 201744150000374799 발행매수 : 1/8 발급일 : 2017/ 08/ 28

토지이용계획확인서

신청인	성명	김대종	주소	세종특별자치시 보람로 15, 907동 703호	
			전화번호	010-9766-0940	
신청토지	소재지		지번	지목	면적(㎡)
	충청남도 공주시 계룡면 내흥리		64-68	임야	2,965.0
지역·지구등 지정여부	「국토의 계획 및 이용에 관한 법률」에 따른 지역·지구등	계획관리지역 [이하공란]			
	다른 법령 등에 따른 지역·지구등	가축사육제한구역(200m이내의지역)<가축분뇨의 관리 및 이용에 관한 법률> [이하공란]			
「토지이용규제 기본법 시행령」 제9조제4항 각 호에 해당되는 사항		[해당없음]			

확인도면

「토지이용규제 기본법」 제10조제1항에 따라 귀하의 신청토지에 대한 현재의 토지이용계획을 위와 같이 확인합니다.

2017/ 08/ 28

충 청 남 도 공 주 시 장

수입증지붙이는곳

수수료 전자결제 민원

◆본 증명서는 인터넷으로 발급되었으며, 정부24(gov.kr)의 인터넷발급문서진위확인 메뉴를 통해 위·변조 여부를 확인할 수 있습니다.(발급일로부터 90일까지) 또한 문서하단의 바코드로도 진위확인(정부24 앱 또는 스캐너용 문서확인프로그램)을 하실 수 있습니다.

IV

Lessons learned from the past

Definition and scope of geospatial data is really important

The term "spatial data" means the locational data of natural or artificial objects existing in space, including the space above ground, space under ground, space above water and space underwater, and the data necessary for spatial identification and decision-making related thereto (Article 2, Framework Act on National Spatial Data Infrastructure)

The Minister of Land, Infrastructure and Transport shall designate the configuration of the ground, coastline, administrative boundaries, road or railroad boundaries, river boundaries, land registration, spatial data of artificial structures, including buildings, and other major spatial data prescribed by Presidential Decree as fundamental spatial data, and publicly announce such data in the Official Gazette after consultation with the heads of relevant central administrative agencies(Article 19)

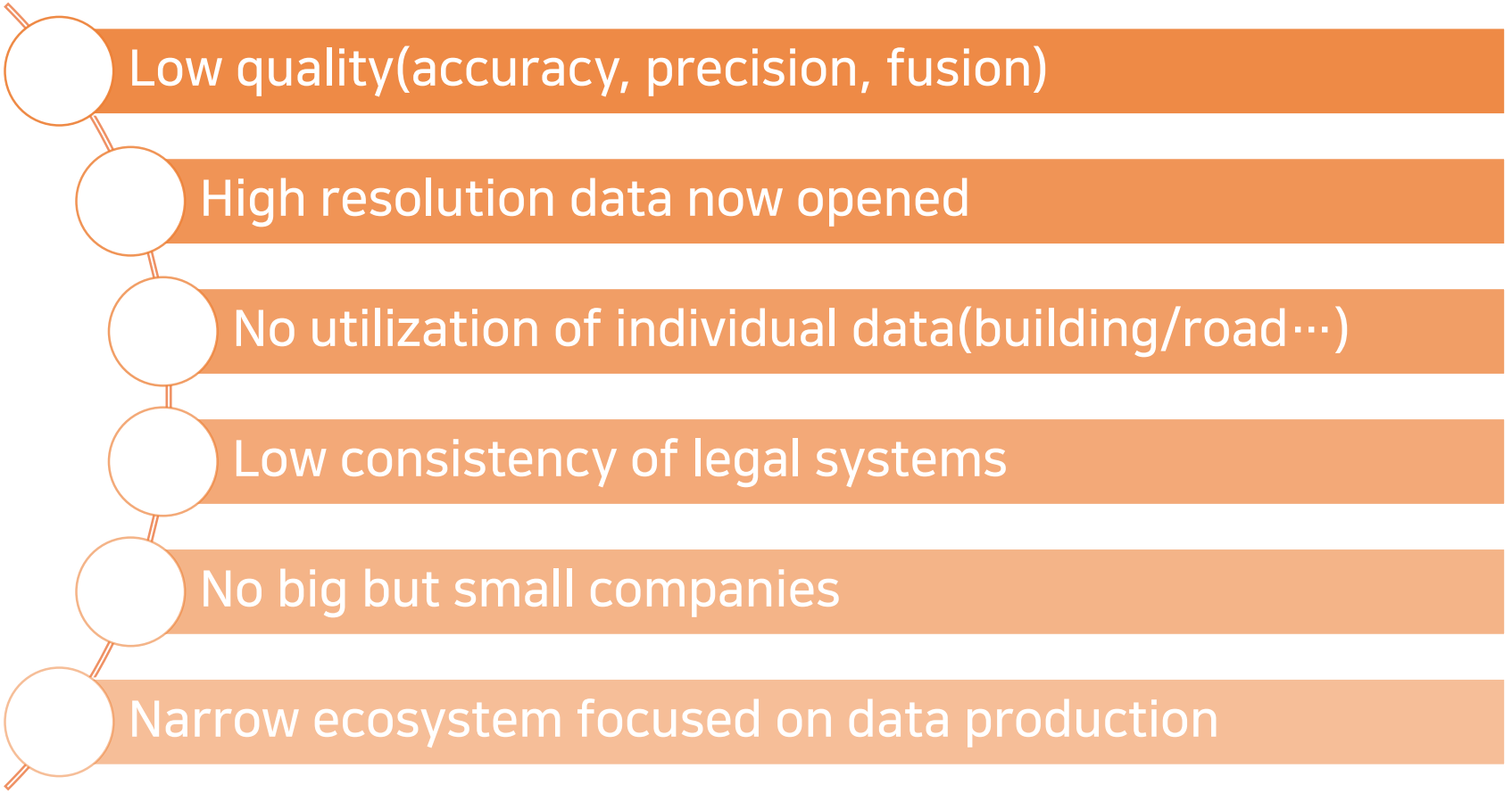
VS.

- Geo-coded spatial data?
- Attribute data with location info?
- Fused data?

Geographic data and information is defined in the ISO/TC 211 series of standards as data and information having an implicit or explicit association with a location relative to Earth

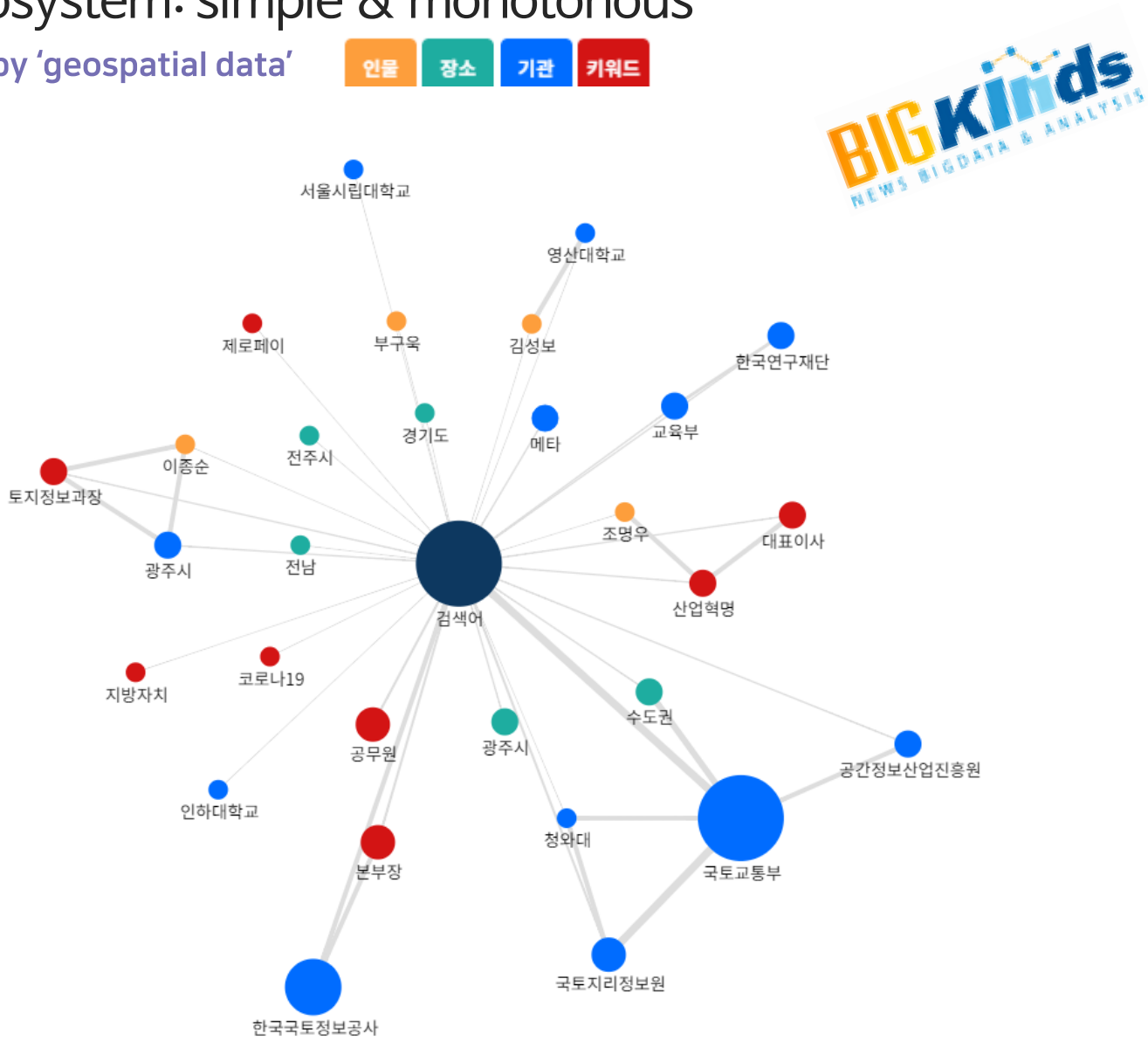
Digital Twin/Metaverse?

Limitations of NSDI



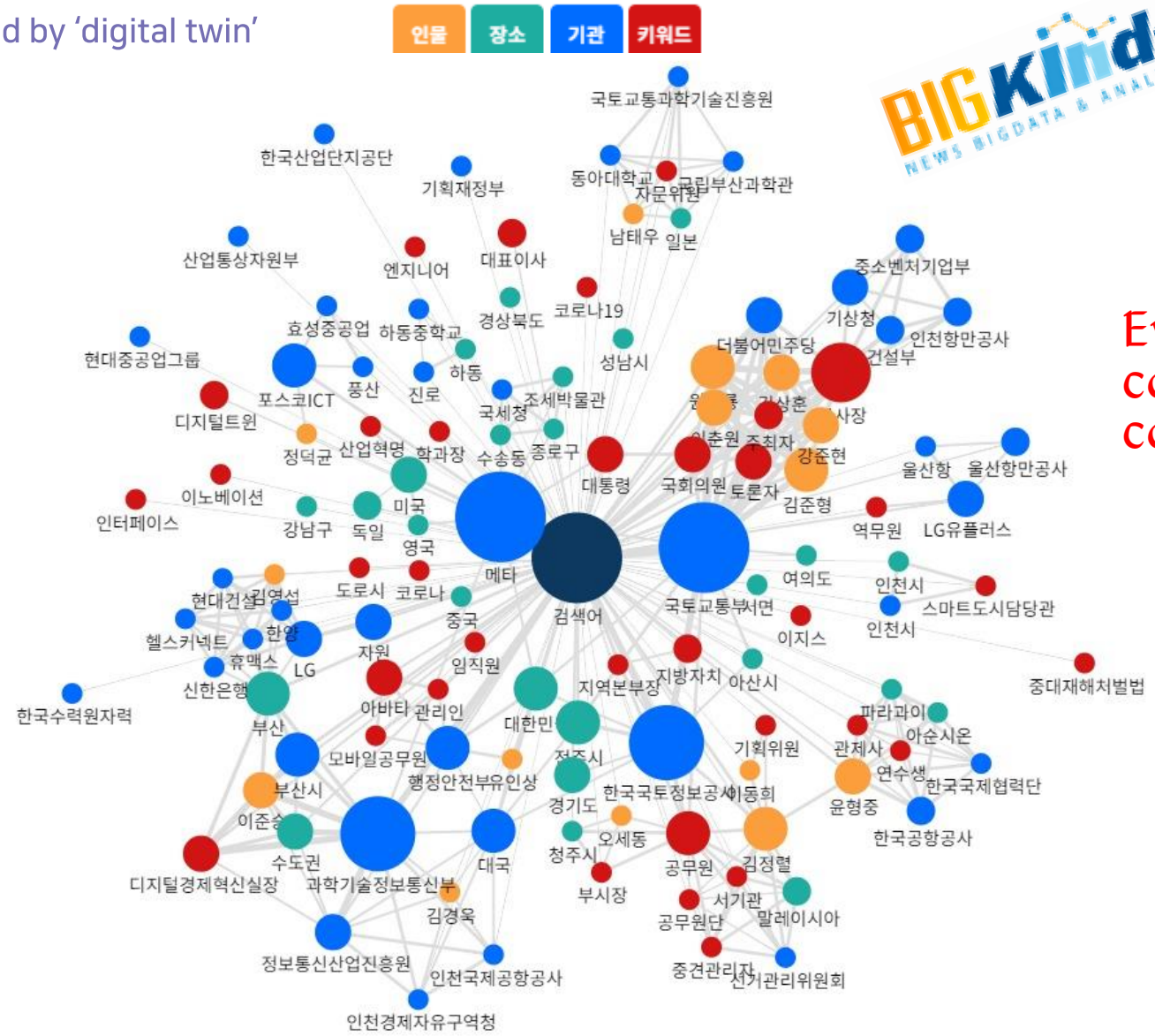
NSDI ecosystem: simple & monotonous

- Searched by 'geospatial data'



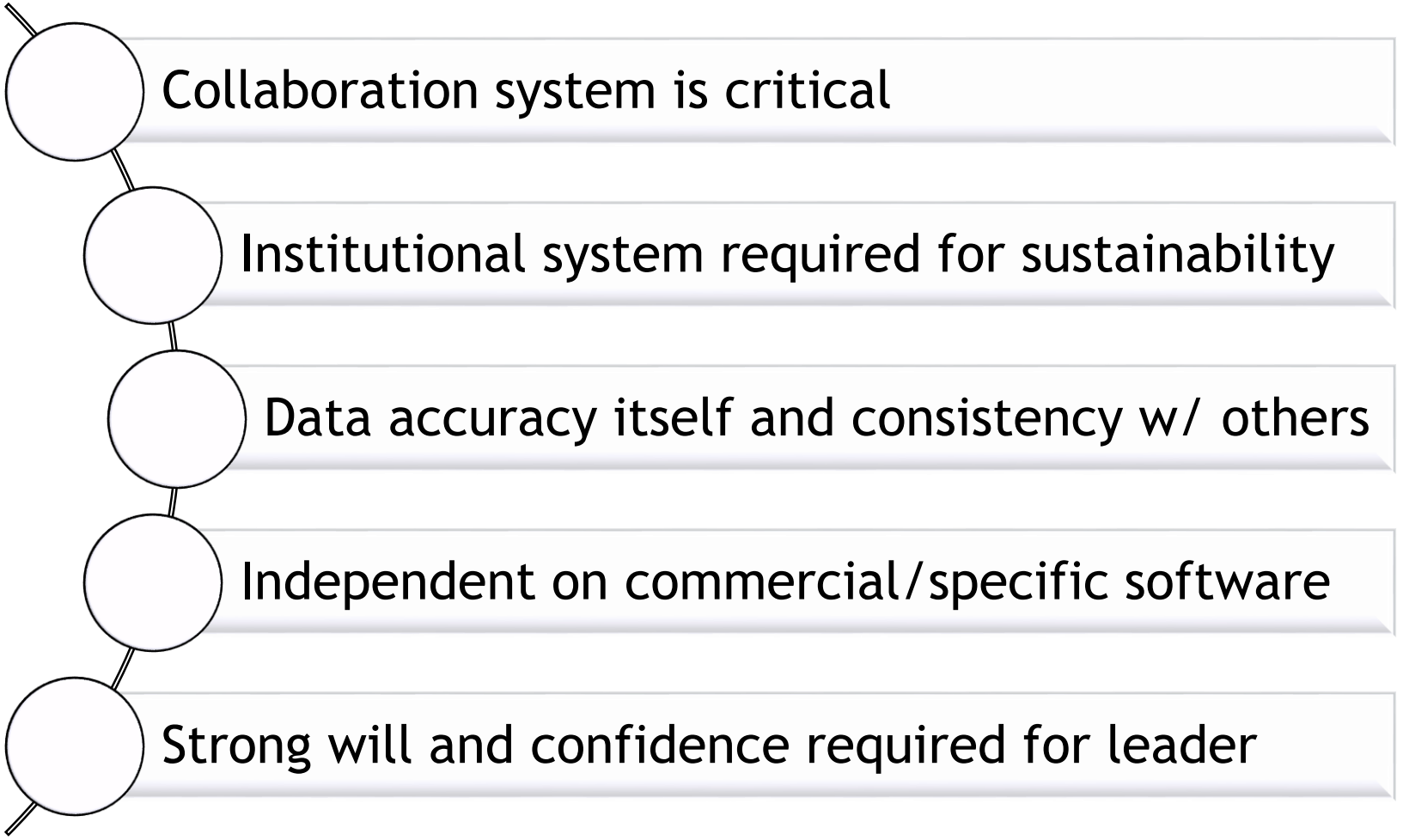
Digital twin ecosystem: complex & diverse

- Searched by 'digital twin'



Evolution by competition & collaboration

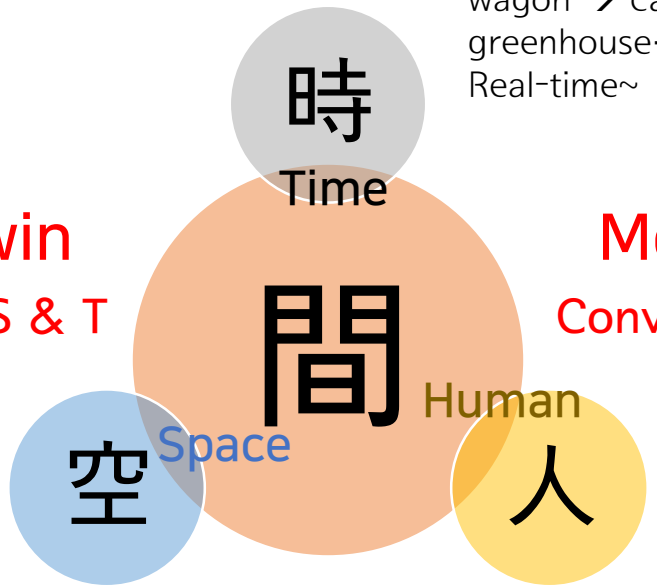
Lessons learned from NSDI policy implementation



V

Now & future

Importance of geospatial data



wagon → car → airplane…
greenhouse…
Real-time~

Digital Twin
Convergence of S & T

Metaverse
Convergence of S, T & H

Telephone, email …
Mapping(geospatial data) technology
VR/AR/MR…DT/Metaverse
Space exploration

Wine, food…
SNS, broker…
Cosmetics, plastic surgery…
Blockchain(NFT…)
Avatar(digital human)

V Digital Twin of Seoul

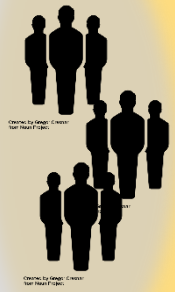
Seoul Institute of Technology & STLogic(2021)


www.BANDICAM.com
PC
X Box
Show Controls Tutorial
T
Start
Show Simple Controls Guide
Tab
Back
디지털미디어시티
Digital Media City
편의시설
이용안내
지하철입구

Convergence of real world and digital world

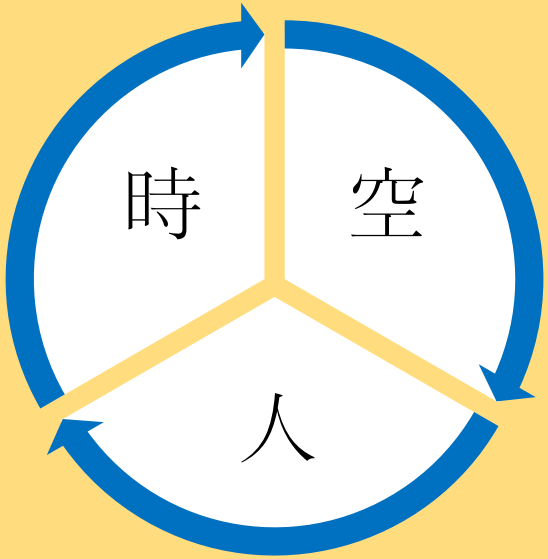
Offline

空
間
時　人



Limited by space and time

Online → Digital/virtual World → Parallel digital universe



Eased limitations

Sharing info.
Resources
Hyper-connected
Interaction
⋮

Source: uploadvr.com/10-most-important-vr-developments-of-2015/

The future of NSDI is probably NDTI

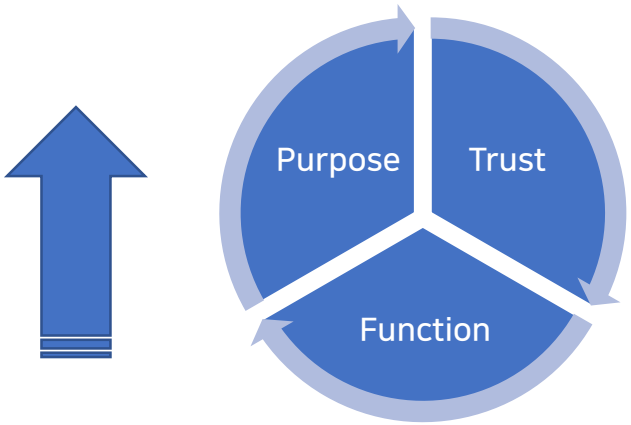
GEMINI Principle

Public good Must be used to deliver genuine public benefit in perpetuity	**Value creation** Must enable value creation and performance improvement	**Insight** Must provide determinable insight into the built environment
Security Must enable security and be secure itself	**Openness** Must be as open as possible	**Quality** Must be built on data of an appropriate quality
Federation Must be based on a standard connected environment	**Curation** Must have clear ownership, governance and regulation	**Evolution** Must be able to adapt as technology and society evolve

https://www.cdbb.cam.ac.uk/

NDTI

National Digital Twin Infrastructure



국가공간정보기반(NSDI)

National Spatial Data Infrastructure

Thank you!

Any questions are welcomed!!

KRIHS 국토연구원