The Standardization of NGII in Korea
Past, Present and Future

Eunmi CHANG (emchang21@gmail.com),
Hye Seung LEE(lhs0623@korea.kr)
Contents

1. Introduction of NGII
2. Institutional Standards: needs and directions
3. The Roles of NGII and Ministry of Infra. and Transp. in Geospatial Standard
4. The effort to apply standards to mapping processes.
5. Metadata service with data: the limits and directions
6. The prospect of NGII in the future and the roles of Standards
7. Conclusions.
1. Introduction of NGII

<table>
<thead>
<tr>
<th>Vision</th>
<th>Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realization of smart geospatial convenience for the people anytime, anywhere</td>
<td>Establishment of national geodetic datum and geospatial information</td>
</tr>
</tbody>
</table>

- Transitioned within the Ministry of Construction
- Nominated as Executive agency
- Opening of Map Museum
- Establishment of National land satellite center
- Declaration of New Visions and Missions Of NGII
- Founded under the Ministry of Defense
- Founded under the Ministry of Construction
- Nominated as National Geographic Information Institute (NGII)
- Established the Geodetic VLBI Observation Center
- Name changes Survey → Geodesy Space image → Smart Spatial Information
1. Introduction of NGII

<table>
<thead>
<tr>
<th>Director General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director General</td>
</tr>
</tbody>
</table>

### Staffs

- **Director General**: 1
- **Department manager**: 7
- **General staffs**: 107
- **Researcher**: 15

**Sum**: 129
1. Introduction of NGII

- **Update Cycle**
  - 1975: 20 years
  - 1995: 5 years
  - 2011: 1 year updating, periodically updating

- **Technologies**
  - 1975: Analog B/W camera
  - 1995: Digital color camera
  - 2009: Digital color camera

- **Datum**
  - 2005: Tokyo
  - 2005: World Geodetic datum

- **Layer Codes**
  - 2005: Layer codes
  - 2005: Integrated code for different scales
2. Institutional Standards: the needs and directions

- **3D map**
  - Nationwide 3D map
  - Rules of 3D geoSpatial data

- **High definition road map**
  - Nationwide high definition road map
  - Rules of 3D National High-Definition maps

- **Imagery map**
  - High resolution Imagery map
  - Rules of DEM and image maps

Process-oriented rules
- Rules of 3D geoSpatial data

Product-oriented Standards
- KS (Korea Standard) for digital twin Land are being developed and will be verified
- Data Model for HD maps
- Metadata for HD maps
- Data specification for HD maps
- Quality Standard for HD maps
- Metadata for Ortho images
- Data specification for Ortho images
2. Institutional Standards: the needs and directions

- Too many standards
- Too abstract standards
- Profiling
- Small # Executable Standards

- Standards based on International regulations consisted of national bodies, technical members, related International Organization ISO, OGC, JTC-1
- Standards based on Framework act on National Spatial data infrastructure government and authorized institute for safety, environment, industries in nations Ex) KS, JIS, GB,
- Standards of associations consisted of agency, institute or company for common benefit Ex) Telecommunication Technology Association
- NGII, USGS, LG, Forest Service
## 2. Institutional Standards: the needs and directions (2022-26)

**Vision**  
Operation of spatial information standards which are the bases for realizing the national digital twin

### Goals

- **Strengthening the status of the NGII nationwide**
- **Expansion and enhancement of Institutional Standards**
- **Expansion of standard applicability and build governance in standards**

### Strategy

**Strengthening the status of the NGII nationwide**

1-1. **Development of 3D Geospatial (DEM) National Standard (90%)**
1-2. Development of national standards for 3D traffic information (roads, bridges, tunnels...)(They will be verified)
1-3. National Standardization of Institutional Standards for Survey Reference Point Data Model (100%)
1-4. National standardization of national framework data (Plan)
1-5. National standardization of institutional standards for grid system product specifications (Plan)
1-6. National standardization of institutional standards for high-definition road map data model (Plan)

**Expansions and enhancement of Institutional Standards**

- **Basic (Core) data**
  - 2-1. Establishment of institutional standard for national basic map (They will be verified)
  - 2-2. Establishment of institutional standards for 3D building (They will be verified)
  - 2-3. Establishment of institutional standards for indoor spatial information (They will be verified)
  - 2-4. Establishment of institutional standards for Satellite Image (50%)

- **Usage (Derived) data**
  - 2-5. Establishment of institutional standard for GNSS State Space Representation Information (100%)
  - 2-6. Establishment of institutional standard for name DB (Plan)
  - 2-7. Revision of institutional standards for grid-based land index product specifications (Plan)
  - 2-8. Establishment of Braille Guidance Institutional Standards (Plan)
  - 2-9. Establishment of institutional standards for documents and other map production

### Core Tasks

- **Expansion of standard applicability and build governance in standards**
  - 3-1. Establishing a framework linking technical regulations and standards (80%)
  - 3-2. Create a standard application checklist (100%)
  - 3-3. Expansion of training for standard-capacity building (On-going)
  - 3-4. Participation in working groups and expert committees for the establishment of national standards (O-g)
  - 3-5. the operation of the Institutional Standards Deliberation (On-going)
3. The Roles of NGII and Ministry of Land, Infra. and Transp. in Geospatial Standard

<table>
<thead>
<tr>
<th>Ministry of Land, Infrastructure and Transportation</th>
<th>National Geospatial Information Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Act</td>
<td>Framework act on National Spatial data infrastructure 21 (1)</td>
</tr>
<tr>
<td>Targets</td>
<td>Framework act on National Spatial data infrastructure 21 (3, 4)</td>
</tr>
<tr>
<td>All the ministries and organizations dealing with National/Public Geodata</td>
<td>Surveyors and local governments with NGII projects Aerial photography, National Framework data, HD maps, National Survey Control Points, National Survey for activities on land(GRID statistics), Satellite for Land Information</td>
</tr>
<tr>
<td>(Cadastral data, Forestry, Environments, Land Information Center, water and swage etc. National Park etc.</td>
<td></td>
</tr>
<tr>
<td>Roles</td>
<td>Localization of International Standards Development of original Standards (bottom up)</td>
</tr>
<tr>
<td>International Partnership</td>
<td>Management of Institutional Standards aligned with KS, ISO. Archive and Service of all the Geospatial Information in Korea</td>
</tr>
<tr>
<td>ISO/TC 211, through KATS</td>
<td>UNGGIM UNGGIM-Asia Pacific ODA projects</td>
</tr>
</tbody>
</table>
4. The efforts to apply standards to mapping processes

**Preparedness of basis for Institute Standards**
- Methods
- Standard Infrastructure Planning
- Institutional Standard Guideline

**Apply GI standards**
- Publish 13 NGII standards
- Organized Institute Standard Committee
- Produce supporting Materials (Manuals, Registry, Education)
- Excel sheet form for applying GI standards for the data
- Education and training
- Consulting

**Apply and Service of GI standards**
- Positioning NGII Standard among IS, KS
- Monitoring and Evaluate the KASE of GI standards
- Education and training
- Development of 5 KS standards
- Survey Point management Data model
- Checklists for compliance of Standards
- Education and Consulting
- Plans for Standard service
- Update of Roadmap for NGII standards
- Support KS development
- Update of regulations for harmonization
- Standard Issue Report
- Development of Education Materials on Standards
- KS standardization
- Support and verification of Metadata Reports

** Timeline 2014-2023**
- 2014
  - Development of 5 KS standards
  - Survey Point management Data model
  - Checklists for compliance of Standards
- 2015
  - Education and training
- 2016
  - Education and training
- 2017
  - Education and training
- 2018
  - Education and training
- 2019
  - Education and training
- 2020
  - Education and training
- 2021
  - Education and training
- 2022
  - Education and training
- 2023
  - Education and training
4. The efforts to apply standards to mapping processes

AS-IS

The ways to overcome

1. Too many GI standard to apply
   - Selected the most important standards
   - KS 73
   - ISO 88
   - OGC 150
   - LX-OGC 78
   - NGII 22

2. Too difficult standards to apply
   - Provide the template for applying standards

Complex UML Converted into Excel format.

〈How to fill out metadata, quality reports〉
4. The efforts to apply standards to mapping processes

AS-IS

Too complex systems to apply standards

The ways to overcome

Provide the checklists for System Integrators and project manager

Checklists for the database design
And critical issues in standard reports
4. The efforts to apply standards to mapping processes

AS-IS

Scattered materials on standards

gsqm.lx.or.kr  nsdi.go.kr
tta.or.kr  ngii.go.kr

The ways to overcome

Provide Standard Information Submenus

NGII staffs
intranet

Citizens and Experts
qsm.lx.or.kr
NGII homepage

Different viewpoints of Standards in each department

Geodetic Reference
National Map
Smart geoSpatial Information
Satellite Imagery

National Geographic Data Monitoring

Education Sessions for each department and programs for all the departments
4. The efforts to apply standards to mapping processes

AS-IS

Conflicts of rules with Standards
The lack of compliance

The ways to overcome

Revise of NGII rules to reflect NGII Standards

Seven rules updated in 2022
- Add to terms and metadata on product specification
- The elements of metadata are explicitly mentioned in regulations
- The elements of data quality report are mentioned in a template

The rules of producing digital maps
The rules of producing image maps
The rules of producing High-Definition Road Maps
The rules of Lidar Survey
The rules of national control points
The rules of aerial photogrammetry
The rules of national grid framework and producing land indices
4. The efforts to apply standards to mapping processes

**AS-IS**

- Continuous update GI standards

**The ways to overcome**

- Provide Issue Papers on Standards quarterly

- International Standards: Systematic Reviews every 5 years

- National Standards: Systematic Reviews every 5 years

- Institutional Standards: Systematic Reviews every 5 years

- New Standards every years
5. Metadata service with data: the limits and directions

- **AS-IS**
  - NGII GeoSpatial Product in each department
    - Ortho image, DEM
    - Digital Map
    - Reports on Control Point
  - Server
  - Data with short Metadata
    - Data
    - Users
  - Ortho image, DEM
  - Digital Map
  - Reports on Control Point

- **TO-BE**
  - NGII GeoSpatial Product in each department
    - Ortho image, DEM
    - Digital Map
    - Reports on Control Point
  - Server
  - Data + full Reports based on NGII standard
    - Data
    - Users
  - Reports based on NGII standards
  - Metadata
  - Quality Report
  - Data Specification
  - Reports for human and S/W

**Obstacles**

1. Old data w/o reports
2. Many Systems
3. Different Levels of Metadata
Layer-based Data models are dominant.

→ data model in GML will be prepared soon.

Some of Metadata of NGII data are provided with data.

It was difficult for people to recognize the impact of NGII Standards, complete metadata and data models are not provided.

We will invest on education and Outreach activities on standards.

More accessible and kind Standards are required.

People have filled out the metadata, then what to do with them?
6. The prospect of NGII in the future, the roles of Standards

Do good for people, society by making national maps new!

Development of geospatial data beyond 2D maps to digital twin Land
Keep the Partnerships with all the domains from Forest to Address
Beyond infrastructure beneficial to industry
Satisfying industrial requests: Smart construction, robot and logistics
Cooperation with private sectors

Operation of spatial information standards which are the bases for realizing the national digital twin

Pervasive standards
Invisible standards but work of ease
7. Conclusions

- NGII is Korean Mapping Agency and have provided National Maps and geospatial dataset.
- NGII has developed 22 Institutional Standards and developed five standards for DEM and one for SSR message and one for data model for management of control point.
- To overcome the barriers to applying NGII Institutional Standards to create geospatial information, we have tried different activities.
- We are looking forward to the positive feedback of NGII Institutional Standards to contribute interoperability after providing more complete metadata and data model for further usage.
- Digital twin is a paradigm, but digital twin land is a concrete target to achieve.
- NGII plan to have requirement-based data models to be an essential part in NGII standards and have played in the main roles to keep the consistency among data, rules and standards.
*The list of NGII Institutional Standards*


NGII-2015-3s. Metadata for Aerial Photograph (2015, revised in 2020)
NGII-2015-4s. Metadata for Orthoimage (2015, revised in 2020, revised in 2022)
NGII-2015-7s. Aerial Photograph (2015, revised in 2020)

NGII-2016-1s. Grid System Specification (2016, revised in 2021)

NGII-2021-1s. Data Model for High Definition Road Map (2021)
NGII-2021-2s. Metadata for High Definition Road Map (2021)
NGII-2021-3s. Data Product Specification for High Definition Road Map (2021)
NGII-2021-4s. Data Quality for High Definition Road Map (2021)
NGII-2021-5s. State Space Representation message specification for GNSS (2021, KS standardized (2023))
NGII-2021-6s. National Basemap Data Quality (2021)
NGII-2021-7s. National Basemap Metadata (2021)