

# Developing Metadata for Imagery and Gridded Data

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**Abstract** : Imagery and gridded data can be used as the sources of extracting important information and data layers in utilizing GIS. The existing metadata standard to distribute and to utilize the geographic information are mainly concentrated at the vector data and do not provide metadata components for imagery and gridded data. In this study, metadata components for imagery and gridded data have been investigated. Firstly, existing international metadata standards such as ISO and domestic standards of TTA have been analyzed. Based on the results, the draft metadata for imagery and gridded data have been proposed as the extensions of domestic metadata standard distribution. The draft metadata could contribute to build the basic standards to access and utilize proper imagery and gridded data fit to various application field, and this will be fundamental bases for activating GIS in public and private sectors.

**Keywords** : Metadata, Grid, Imagery, ISO 19115

## 1. Introduction

Imagery and gridded data are important information sources and products used within a geospatial environment as geographic information systems become the main axis of national information infrastructure. Various types of imagery and gridded data such as satellite images, land cover and vegetation maps have been actively utilized in land use monitoring, urban planning, environment management, etc. Nowadays, the distribution of the digital geographic information has been major issues in Korea since the National Geographical Information(NGIS) project initiated. Although metadata standard for distributing geographic information on the NGIS distribution network has already been proclaimed, it doesn't provide metadata components for imagery and gridded data. Therefore, it is necessary to develop metadata for imagery and gridded data to avoid duplicated data production and to enhance the efficiency in establishing geographic information systems.

In this study, metadata components for imagery and gridded data have been investigated and existing metadata standards of ISO and TTA have been compared. Based on this, the draft metadata for imagery and gridded data have been proposed as extensions from Metadata Standard for Geographic Information Distribution.

## 2. Background

### 1) Classification of Gridded Data

In international standards, the geographic information can be classified into two distinct types of data such as boundary data(vector) and coverage data(raster). Boundary data are almost feature oriented data while the gridded data are the subtype of the coverage data. Based on the spatial and attribute properties, gridded data can be classified as seen in Table 1. They can also be classified into two subclasses--imagery and thematic--based on the attribute properties. Imagery data belong to the gridded data which has the numerical representation of the physical parameters measured by an instrument while the thematic data have attribute values representing geographic features.

**Table 1. Classification of the gridded data**

Spatial/attribute property	Imagery data	Thematic data
Ungeorectified	Ungeorectified images (e.g. Landsat scene, digital airphoto, SAR).	Ungeorectified thematic data (e.g. ungeorectified land surface classification maps)
Georectified	Georectified images (e.g. orthoimages)	Georectified thematic data(e.g. global vegetation map, digital terrain models)

### 2) Metadata Components for Imagery and Gridded Data

In order to generate metadata for gridded data, in-depth analysis has been made according to the previous classification. For that, raw satellite images, digital elevation models, orthoimages, land cover and vegetation maps which are commonly used in Korea have been investigated. As a result, the major metadata components have been classified into three parts as shown in Table 2.

**Table 2. Metadata Components for Imagery and Gridded Data**

	Metadata components
Imagery and thematic data	source, source date time, algorithm, processing, dimension name/number/resolution, number of rows/columns, row/column spacing,
Imagery data	platform name, sensor name, spectral mode, path, row, corner point coordinates, processing level, cloud cover percentage, imaging condition, number of bands, sensor operational mode, collection type, instrument type, sensor reference,
Thematic data	number of topic categories, classification topic description

### 3. Existing Metadata Standards

#### 1) ISO 19115 and Extensions(ISO/TC211)

ISO/TC211(International Organization of Standardization Technical Committee 211) has made "ISO 19115 Geographic Information - Metadata" since 1996 and the standards have been approved as the international standard in 2003. ISO 19115 defines the schema required for describing geographic information and it provides information for the identification, extent, quality, spatial and temporal schema, and spatial reference and distribution of digital geographic data for vector and gridded data. ISO 19115 has been compromised of two components of the core and comprehensive metadata components. Especially, core metadata(Table 3) consists of the information mainly for the data identification and should be included when user-defined metadata actually applied.

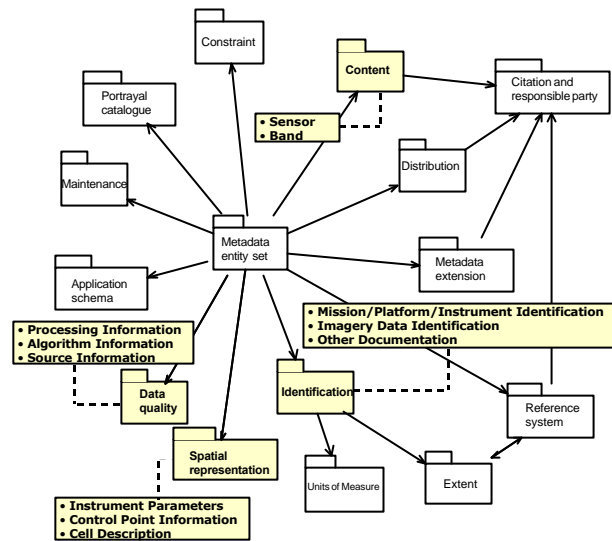
**Table 3. Core metadata**

Dataset title(M)	Spatial representation type(O)
Dataset reference date(M)	Reference system(O)
Dataset responsible party	Lineage(O)
Geographic location of the dataset(C)	On-line resource(O)
Dataset language(M)	Metadata file identifier(O)
Dataset character set(C)	Metadata standard name(O)
Dataset topic category(M)	Metadata standard version(O)
Spatial resolution of the dataset(O)	Metadata language(O)
Abstract describing the dataset(M)	Metadata character set(O)
Distribution format(O)	Metadata point of contact(M)
Additional extent information for the dataset(O)	Metadata date stamp(M)

M: Mandatory, C: Conditional, O: Optional

While the ISO 19115 does provide some provisions for imagery

and gridded data, the requirements were not fully developed at the time ISO 19115 was drafted. As a result, "ISO 19115 Part 2 : Extensions for imagery and gridded data" was proposed and approved as a new work item in 2003. This will extend the existing ISO 19115 by defining the schema required for describing imagery and gridded data, mostly in four major sections : identification, data quality, spatial representation, and content information section. Figure 1 shows the extended entities in those sections. Recently, FGDC Remote Sensing Metadata Extensions have played a role as the base document for establishing ISO 19115 Part 2.



**Fig. 1. Metadata package and extended entities in ISO 19115 Part 2**

#### 2) Metadata Standard for Geographic Information Distribution(TTA)

Metadata Standard for Geographic Information Distribution have been developed and proposed metadata to promote efficient sharing of spatial data in Korea, which was approved by TTA(Telecommunications Technology Association) in 2002. This consists of seven sections : metadata entity set, identification, data quality, reference system, distribution, extent, and citation and responsible party section. However, it only contains minimum requirement of the metadata components, mostly focused on vector data. Therefore, this can not provide information such as mission/platform/instrument identification, grid spatial dimension/resolution, and the georeferencing of the gridded data, which is the most essential information for end-user application.

#### 3) Suggestions

According to the previous analysis of existing metadata standards, ISO/TC211 has been drafting new metadata for imagery and gridded data and only the drafted metadata schema

is available now. Moreover, no metadata standard for imagery and gridded data has not been developed yet in Korea. Therefore, the most efficient way to develop metadata is defining minimum metadata components for the purpose of distribution. After developing minimum metadata components, comprehensive metadata for imagery and gridded data can be established as ISO 19115 Part 2 to establish an international standard in the future. For that, existing metadata standards have been compared and the results was applied to design the metadata schema for imagery and gridded data.

#### 4. Draft Metadata for Imagery and Gridded Data

The draft metadata has been proposed to support distributing gridded data including imagery and thematic data in Korea. The metadata standards have been drafted in the consideration of the interoperability with existing metadata standards and minimum extensions for describing imagery and gridded data focused on distribution purpose. Figure 2 shows the method of drafting metadata in this study. This draft metadata contains all components of core metadata in ISO 19115 and Metadata Standard for Geographic Information Distribution developed by TTA.

As a result of comparing existing metadata standards, 12 sections of metadata have been extracted. This has five new sections such as constraints, maintenance, spatial representation, content and metadata extension section, and extended entities in three existing sections. Table 4 shows those sections and entities which are extracted from ISO 19115 Part 2 and extended from metadata standard for distributing geographic information.

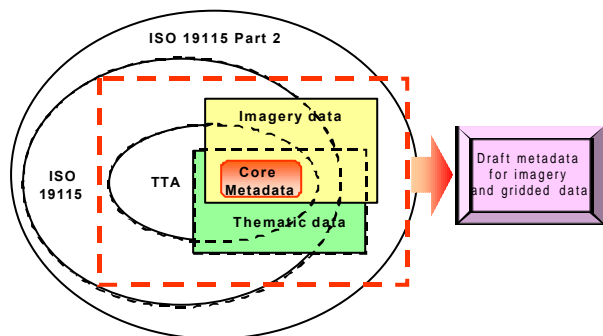


Fig. 2 method of drafting the metadata

Table 4. Extended sections and entities from Metadata Standard for Geographic Information Distribution(TTA)

Section	Extended metadata components
Identification	<ul style="list-style-type: none"> <li>• other documentation(citation)</li> <li>• mission/platform/instrument identification</li> <li>• number of topic categories,</li> <li>• aggregation data information</li> </ul>
Constraints	<ul style="list-style-type: none"> <li>• classification</li> </ul>

Maintenance	<ul style="list-style-type: none"> <li>• update frequency</li> </ul>
Spatial Representation	<ul style="list-style-type: none"> <li>• dimension(name, size, resolution)</li> <li>• cell geometry</li> <li>• transformation parameter availability</li> <li>• storage order(band interleaving)</li> </ul>
Content	<ul style="list-style-type: none"> <li>• attribute description</li> <li>• content type</li> <li>• imaging condition</li> <li>• processing level code</li> <li>• sequence identifier(band identification)</li> <li>• sequence length(number of bands)</li> <li>• sensor operational mode</li> <li>• sensor collector type</li> <li>• sensor reference</li> </ul>
Metadata Extension	<ul style="list-style-type: none"> <li>• extension elements information</li> </ul>
Extent	<ul style="list-style-type: none"> <li>• polygon</li> </ul>
Citation and responsible party	<ul style="list-style-type: none"> <li>• series</li> </ul>

#### 5. Conclusions

Metadata standard proposed from this study provides essential information to access and utilize imagery and gridded data in terms of its complicated nature of data structure. Considering that ISO 19115 Part 2 has just initiated new work in 2003, metadata for imagery and gridded data have been defined with the minimum number of metadata components for data distribution. In the near future, more comprehensive metadata for imagery and gridded data should be established as ISO 19115 Part 2 has been fully drafted as the International Standard.

This draft of metadata standard could contribute to build the basic standards to access and utilize proper imagery and gridded data fit to various application field, and this will be fundamental bases for activating GIS in public and private sectors.

#### 6. References

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