Specification for digital geospatial data records archiving

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1 Introduction

1.1 Purpose and scope

The purpose of this document is to describe the recommended content information of digital geodata records and provide understanding of the elements needed to archive elements of geographic information systems within an Information Package.

1.2 What are geodata records and geographic information systems?

A geographic information system (GIS) is a framework for gathering, managing and analysing data. Outputs from GIS are a combination of digital **geospatial records (geodata)** and a set of **processes** for transforming basic records into outputs (information products). Outputs can be in the form of maps, lists, new sets of geodata, etc.

In order to archive GIS in such a way that the outputs from the original system can be reproduced, it is necessary to archive the processes used to manipulate data into outputs.
Geodata are any digital records, that describe an object in space using coordinates based on a geographic coordinate system and a set of descriptive elements called attributes. They mostly come in two forms, vector data (points, lines, polygons) and raster data (sets of one or multiple arrays of pixels).

Increasingly, different geospatial formats include geospatially focused datasets or databases that contain primary information about a geographic location. In addition, ancillary and supplemental data that either are included or can be derived using spatial analysis are considered necessary for the full and effective functioning, interpretation and re-use of the data.

Geodata has many properties, that define its accuracy and usability. These properties are commonly described in metadata and should also be part of the archival package. **Processes** are used to organise and transform Geodata in Geographic information systems (GIS) in order to derive value from the dataset itself as well as from the combination with other datasets and databases within the system. Hence, in order to transfer data from a GIS, it is necessary to transfer the relations between geodata and other databases and the logic with which the data was used (representation information).

2 Elements of a geodata archival information package

In order to transfer data from the original system to the open data repository or the archives, four basic groups of elements have been identified, that compose the archival information package:

- **Geodata** (data object) – This contains the actual geodata records (datasets), exported from the existing GIS system. The same geodata can be stored in one, or multiple, representations. It is recommended that at least one representation is stored in a long-term preservation format.

- **Technical documentation** (representation information) – This describes the geodata in a way, that enables unequivocal interpretation of data and reconstruction of the original data products. Technical documentation should include the attribute definition tables, logical structure of the geodatabase, structure of the GIS project, visualisation information for geodata layers (cartography, labelling, etc), logic of conducting analysis, common queries, etc.

- **Context documentation** (knowledge base) – This may contain any other information that provides contextual information for the geodata such as project reports, user manuals, interviews with the data producer, etc.

- **Geodata specific Metadata** – This includes machine-readable XML files based on geodata metadata standards (ISO 19115:2003[1], EC INSPIRE directive[2]). Any other metadata is classified as documentation. Metadata specific to the Information package is described in their respective specifications (SIP, AIP, DIP).

2.1 Geodata

According to OAIS[3], geodata presents the data object in the information package. Geodata are records representing and describing objects and phenomena in space. Geodata is always composed of the graphical part in ether vector or raster form, which has a defined location in space in the form of geographical coordinates. The descriptive part connects the graphical element with the descriptions in the form of one or more tables. In case of geodata in raster format additional tables may not always be present. When archiving geodata it is necessary to ensure that there is a well-documented graphical component, well defined descriptive attributes and geographic coordinate system.

In order to ensure long-term preservation of geodata, proprietary and undocumented formats must be converted into a long-term preservation format that is well described and defines all the necessary elements of the geospatial dataset (unique geospatial reference, usable independent of the system and well documented). Even if some formats are a *de facto* standard today, they may become unreadable in the future.

[1] https://www.iso.org/standard/26020.html
[2] https://inspire.ec.europa.eu/
[3] http://www.oais.info/

2.1.1 Vector geodata

Vector geodata are sets of coordinate pairs, representing objects in space. Depending on the geometry of the object it can be represented in form of points, lines or polygons. Vector geodata comes in many formats, depending on the system that is being preserved. Generally it takes the form of tables, where one of the columns contains the graphical information and the other columns provide descriptive information which enables the visualisation, querying and analysis of the data.

EXAMPLE

An appropriate long-term preservation format for vector geodata is the Geography Markup Language (GML) format (version 3.2.1. / ISO 19136:2007)[4]. This format is well documented, because it is an ISO standard. It contains a definition of the geospatial coordinate system and enables descriptions of both simple elements (point, line, polygon) and complex vector elements (arcs, topology definitions, etc). The GML format is not as common as some *de facto* standards, such as ESRI shapefile, however this is less important when considering long-term preservation where the ability to read it after a long period of time is critical.

2.1.2 Raster geodata

Geodata in the form of raster datasets are actually array-oriented data structures, where the information is stored in the value of the pixels (or array cells) that compose the raster. In this way the raster covers a larger area and is mainly used as continuity surfaces that present remote sensing imagery, digital elevation, scanned maps, etc. This often calls for special requirements for raster formats that enable the storage of multiple types of values per location (text, number), or a combination of up to 400 colour bands (hyperspectral imagery) in one image or a multidimensional representation (netCDF) and others. Another property determining the choice of a long-term preservation format is its size.

When choosing a long-term preservation format it is necessary to ensure that all information that the original format provides is retained and that there is a well defined geospatial position of the raster and the coordinate system.

EXAMPLE 1 – TIFF

A good long-term preservation format for most raster datasets is TIFF, however in its basic form it lacks the geospatial position definition. TIFF also supports LZW as a lossless compression. The TIFF file can be augmented with additional files describing the geospatial reference.

EXAMPLE 2 – GeoTIFF

GeoTIFF is a public domain geospatial metadata standard which allows georeferencing information to be embedded within a TIFF file. However, not all there are some uncommon projected coordinate systems which are not supported. In such cases it is necessary to augment the GeoTIFF with the additional definition of the coordinate system.

[4] https://www.iso.org/standard/32554.html

2.1.3 Additional tabular information

Geodata is often a part of a complex data structure, stored in a database along with ordinary tables. In order to reproduce the information products from a GIS, it is often necessary to store additional tables with the geodata. These tables do not have their own geospatial component. In this case it is important to store the relationships and logic of the data structure, so that it can be reconstructed in the future. For long-term preservation of additional tabular information (attribute tables, codelists, etc.) along with geodata formats proposed for RDBMS archiving are used.

EXAMPLE 1 – CSV

In simple cases *.csv can be used as a text-based format for storing tabular information. It is important that the structure of the table and its nominal codepage is defined in the representation information part of the archival information package.

2.1.4 Geospatial reference

In order to properly render the geodata in any future GIS, it is necessary to specify the geospatial reference. The Coordinate Reference System (CRS) provides information about how to locate geodata objects anywhere on the earth's surface. Elements of the spatial reference system are **projection**, **geodetic datum**, and **unit of measurement.**

The CRS definition for geodata within an archival information package can be accomplished in many different ways, including:

- embedded within data itself (e.g. GML 3.2.1. and GeoTIFF);
- written in the accompanying files (e.g. GML 3.1.1. and earlier, ESRI Shapefile, TIFF, JPEG2000 and GMLJP2[5]);
- recorded in the accompanying documentation which needs to be recreated for every subsequent dataset.

Ease of use of geodata in a DIP diminishes with the number of steps needed to define the CRS for every geodata layer. If geodata was used with a standard and documented CRS, it can be referenced by linking to a well-documented list of CRS (e.g. EPSG[6]).

EXAMPLE 1 – CRS in GML 3.2.1

Georeferencing information in GML is a mandatory part of the file itself and it is embedded in the geodata file itself:

```
<gml:boundedBy>
   <gml:Envelope srsName="urn:x-ogc:def:crs:EPSG:4326">
       <gml:lowerCorner>50.23 9.23</gml:lowerCorner>
       <gml:upperCorner>50.31 9.27</gml:upperCorner>
   </gml:Envelope>
</gml:boundedBy>
```

[5] http://www.opengeospatial.org/standards/gmljp2
[6] http://www.epsg.org

The attribute “srsName” holds the value of the coordinate reference system code according to EPSG. In this example the code is 4326.

EXAMPLE 2 – CRS in ESRI Shapefile (shp)

Although the ESRI shapefile is not the best choice of formats for a long-term preservation format, it could be used as a current DIP format. A SHP needs a <shapefilename>.prj file in order to be properly georeferenced. A .prj file is a .txt file, containing a definition of the coordinate reference system and all of its elements. Here is an example:

```
PROJCS["NAD_1983_UTM_Zone_10N",GEOGCS["GCS_North_American_1983",
DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137,298.257222101]],
PRIMEM["Greenwich",0],UNIT["Degree",0.0174532925199433]],
PROJECTION["Transverse_Mercator"],PARAMETER["False_Easting",500000.0],PARAMETER["Fals
e_Northing",0.0],PARAMETER["Central_Meridian",-123.0],PARAMETER["Scale_Factor",0.9996
], PARAMETER["Latitude_of_Origin",0.0],UNIT["Meter",1.0]]
```

EXAMPLE 3 – CRS in a TIFF

A TIFF raster geodata file does not contain any CRS information. A TIFF file must therefore be accompanied by the *.tfw file that contains its initial coordinates and pixel size and a *.prj file that defines the geospatial coordinate system. For example, a D240143.tif file would be accompanied by a D240143.tfw file. That is a txt file, containing information about the coordinates and the size of the first top left pixel. Here is an example:

```
0.42333
0.0
0.0
-0.42333
394250.00
```

2.1.5 Other geodata types

Geodata can be presented in different formats and as a part of different data structures (such as geometric networks, coverages, structures combining raster and vector data, etc.), as web services, automated maps, etc.

This document focuses on the fundamental structures of geodata, which are used as basic input components for complex structures. In order to replicate the complex data structures or services in the future, their organisational logic and the way they are used within applications needs to be a documented.

2.2 Technical documentation

Geodata is rarely found in a form that is sufficiently self-explanatory to be used and properly interpreted by itself. Consequently additional information is needed in order to enable the user to properly understand, interpret and use geodata. Part 2 describes the proposed technical documentation for geodata datasets.

In this document technical documentation and general contextual documentation of geodata is differentiated. The purpose of the technical documentation is to reuse geodata in a way that is similar enough to its use in the initial system. Such documentation could contain basic information (how to cartographically render a simple layer or how to set up a basic query using a simple combination of datasets) up to a detailed documentation of the initial system, that would allow the reconstruction of a technical environment in the future that could produce similar information products as the initial system.

The required documentation for geodata can be within one archival information package or it can be linked from a different IP in the same Series or Fond. When creating a SIP, it is recommended that the producer ensures the following elements of documentation (if applicable).

2.2.1 Attribute definition

Attribute definition describes the meaning and value types for each column in the table of a geodata dataset or an accompanying table.

2.2.2 Feature catalogue

The feature catalogue represents a logical structure of attributes. It provides an understanding of the meaning, use and structure of the spatial data and provides a unified classification of spatial data in feature types (classes). Feature types are distinguished by their attributes (properties), by importance and by the relationships between them. ISO 19110:2005 describes this in greater detail.[7]

2.2.3 Visualisation information

Data visualisation provides an illustration and representation of spatial data. The catalogue of cartographic symbol is a collection of agreed cartographic symbols, which are used by visualisation of spatial data sets to display objects in space. Cartographic symbols are shown in the legend, which explains their meaning.

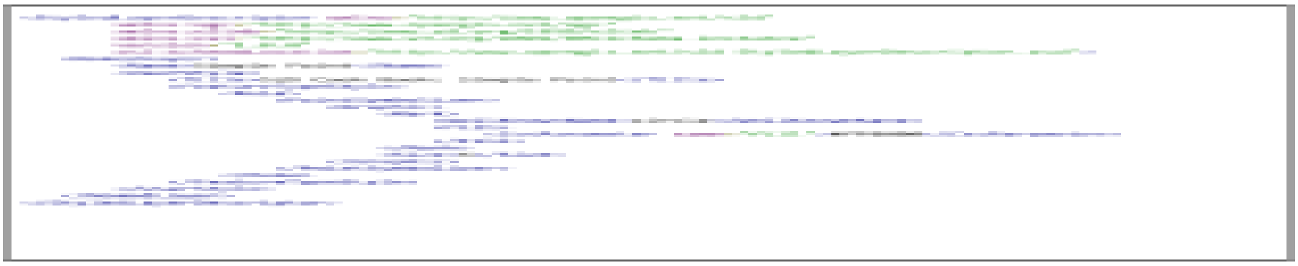
For certain geodata the visualisation is already made by the producer in the form of (geo-located) raster images or paper maps. In these cases, it is reasonable to archive that kind visualisation. For each spatial data set it is possible to produce any number of different visualisations with the appropriate software. It is proposed, that:

- every dataset is described with at least a screenshot image of the geodata dataset in full extent, to enable easy discovery and identification in the archival catalogue.
- If a cartographic key exists, it should be documented in a way that it can be reproduced in a future system to a satisfying extent.
- If geodata was used for the production of complex maps, the logic should be preserved in such a way that a similar representation is possible in the future.
- If visualisation was created using a well-documented machine-readable files, they should be preserved.

[7] https://www.iso.org/standard/39965.html

EXAMPLE 1 – SLD files

SLD[8] is an OGC[9] standard for symbology is the OGC Styled Layer Description XML format (sld files). If the producer cannot provide the Archive with SLD files, these can be recreated from the description which is provided in the documentation in QGIS. Raster files can have a colour map associated with the pixel value. The SLD standard is used for rendering geodata in OGC web services and therefore could be used as an appropriate input for an easier DIP creation in the future.



Listing 26: Example of an SLD file

2.2.4 Table relationships

If the IP contains two or more geospatial datasets, or additional tables, and if it is applicable, the technical documentation should describe the relationships between tables in a database or within a GIS project, in order to enable the reconstruction of queries and provide greater understanding of the usage of complex data structures (e.g. topologies, geometric networks, etc).

2.2.5 GIS Project (logical structure of layers)

When a larger GIS project (containing many geodata datasets and additional tables) is documented in order to be able to reproduce an information product (a web service), or repeat a workflow, the following should be documented:

- Logical structure of geodata layers and tables in a GIS Projects;
- Geodata layer properties (definition query, scale-dependent display, visualisation parameters, etc);
- Labelling (which layers were used for labelling, scale-dependent display of labels, text rendering properties, etc).

2.2.6 Common queries and geoprocessing workflows

In order to produce information products in the initial GIS, there is often a requirement to run certain database queries or geo-specific processes (geoprocessing workflows). Common information products from a Geographic Information system are maps, lists, charts, new geodata derived from existing data, web services, etc. In order to reproduce this type of GIS information product in the future, documentation of the queries and geoprocessing workflows is needed.

2.3 General (contextual) documentation

This part of the archival information package describes all remaining information about the geodata. Included here are links to relevant documentation describing the lineage and provenance of the spatial data set. The documentation includes user manuals, related practices in the EU and worldwide, methodological rules, scientific articles, publications, etc.

[8] SLD – Styled Layer Description: https://portal.opengeospatial.org/files/?artifact_id=22364
[9] http://www.opengeospatial.org/

2.4 Metadata folder

Archival metadata for the Geo IP are the same as for all other data and are defined in other specifications and will be stored on the upper metadata folder.

In general GIS systems describe the geospatial dataset with additional technical and descriptive metadata. In some systems the metadata structure is proprietary and in others metadata adheres to local or global standards. Technical metadata can be derived from the dataset (geometry type, number of records, etc.), however the descriptive data must be entered by the data creator or its manager. This is the part that should be considered as part of the information package. In reality systems are often encountered where the geodata is not accompanied by adequate metadata.

Different descriptive information may be available for each individual dataset depending on the age of the GIS systems:

- None or very limited (metadata can be derived from separate documentation);
- Metadata is available in separate files that are not in a machine-readable format (PDF, unstructured text, etc.);
- Metadata is available in machine-readable format (XML or other).

Geodata specific metadata commonly contains descriptions that are specific to geodata (CRS info, bounding coordinates, scale, etc.) and are not be easily added to archival contextual metadata formats like ISADG or EAD without extending the schema. It is recommended that this geodata specific metadata is stored as content of the data, which can be used to harvest elements from descriptive metadata of the information package (GEO IP).

It is recommended, that the producer provides metadata based on existing metadata standards for Geodata (ISO 19115:2003 or later)[10] or its adoption by the European Directive INSPIRE.

According to the mandatory elements, that are used in describing datasets by the INSPIRE directive, we propose that the following metadata elements are present within the descriptive metadata structure for each geospatial dataset, which is present in the data folder:

[10] https://www.iso.org/standard/26020.html

1	**Resource title**	*Name by which the cited resource is known.*
2	**Resource abstract**	*Brief narrative summary of the content of the resource(s).*
3	**Resource type**	*Scope to which metadata applies.* *This is the type of resource being described by the metadata and it is filled in with a value from a classification of the resource based on its scope. The choice of Resource Type will be probably the first decision made by the user and it will define the metadata elements that should be filled.* *(e.g. dataset).*
4	**Unique resource identifier**	*Value uniquely identifying an object within a namespace.*
5	**Resource language**	*Language(s) used within the datasets.*
6	**Topic category**	*Main theme(s) of the dataset (e.g. hydrography, administrative areas, transportation, etc).*
7	**Keyword value**	*Commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject.*
8	**Originating controlled vocabulary**	*Name of the formally registered thesaurus or a similar authoritative source of keywords.*
9	**Geographic bounding box**	*Western-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east). Eastern-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east). Northern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north). Southern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north).*
10	**Temporal extent**	*Time period covered by the content of the dataset.*
11	**Date of publication**	*Reference date for the cited resource - publication.*
12	**Date of last revision**	*Reference date for the cited resource - revision.*
13	**Date of creation**	*Reference date for the cited resource - creation.*
14	**Lineage**	*General explanation of the data producer's knowledge about the lineage of a dataset. This information can also reference other documents, that cover this description in greater detail explaining more about how*

		and from what source datasets were creates, methodology of the process, etc.
15	**Spatial resolution**	*Equivalent scale: level of detail expressed as the scale denominator of a comparable hardcopy map or chart.* *Distance: ground sample distance.*
16	**Specification**	*Citation of the product specification or user requirement against which data is being evaluated.*
17	**Limitations on public access [and use]**	*Access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource* *Limitations on public access:* *Access constraints - e.g. otherRestrictions (limitation not listed).* *Other constraints - e.g. no limitations.* *Classification - e.g. unclassified.*
18	**Conditions applying to access and use**	*Restrictions on the access and use of a resource or metadata.*
19	**Responsible party**	*Identification of, and means of communication with, person(s) and organisation(s) associated with the resource(s).*
20	**Responsible party role**	*Function performed by the responsible party.*
21	**Metadata point of contact**	*Party responsible for the metadata information.*
22	**Metadata date**	*Date that the metadata was created.*
23	**Metadata language**	*Language used for documenting metadata.*

3 Example structures of a Geodata archival information package (GEO IP)

This section provides possible information package structures containing geodata (GEO IP). Following the Common Specification for Information Packages at least one representation should be put in the representation directory (Figure 1).

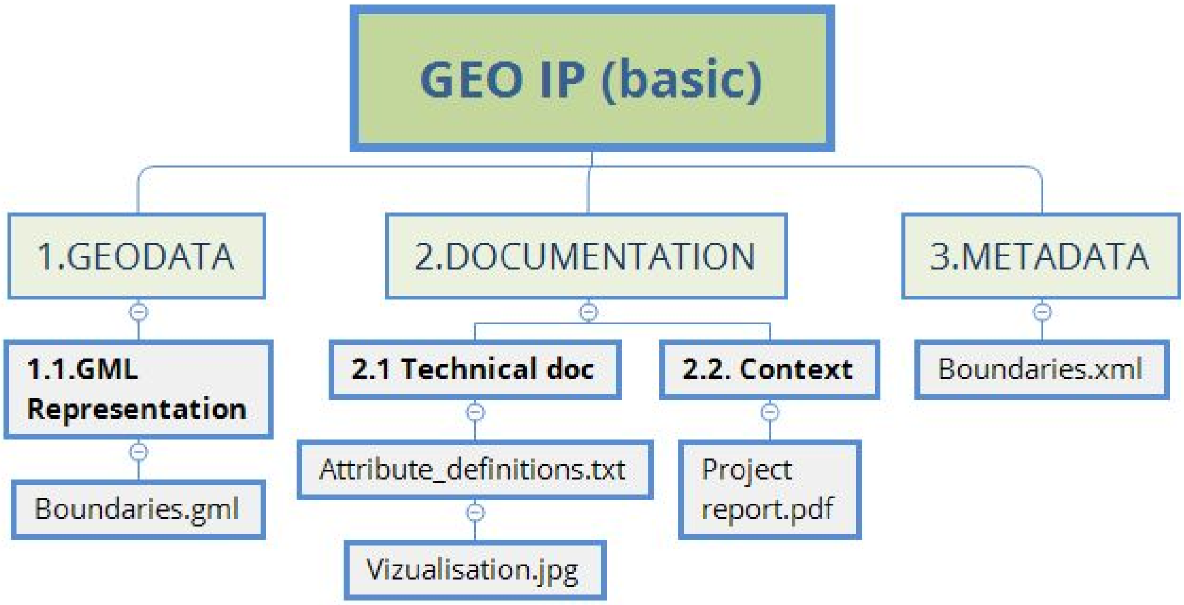


Figure 1: Basic Geodata IP

Figure 1 shows a very basic example, containing only one representation of vector geodata in GML format, which could be used as a long-term preservation format. Additional documentation is stored in other folders.

Technical documentation describes the meaning of attribute values in the table of the Boundaries.gml geodata layer and shows an overview image of how the data was visualised.

The IP Package contains only one representation folder (in this case named 'geodata'- although the use of other names is allowed) and the additional documentation is stored within that representation. The geodata specific metadata are to be stored within the "Metadata" folder under the "Geodata" folder. Other scenarios are also possible, such as multiple representations of the same geodata in the same IP and different possibilities of storing additional documentation.

3.1 GeoSIP containing multiple vector representations

In this case, a GeoSIP package contains one representation in GML format and an original representation of the same data in ESRI Shapefile format. All other documentation required to properly interpret both representations is put in the documentation folder (Figure 2). It is also possible to include a logical link to additional documentation stored in a different SIP (in case of a larger time series of the same data or similar records but from different organisational units).

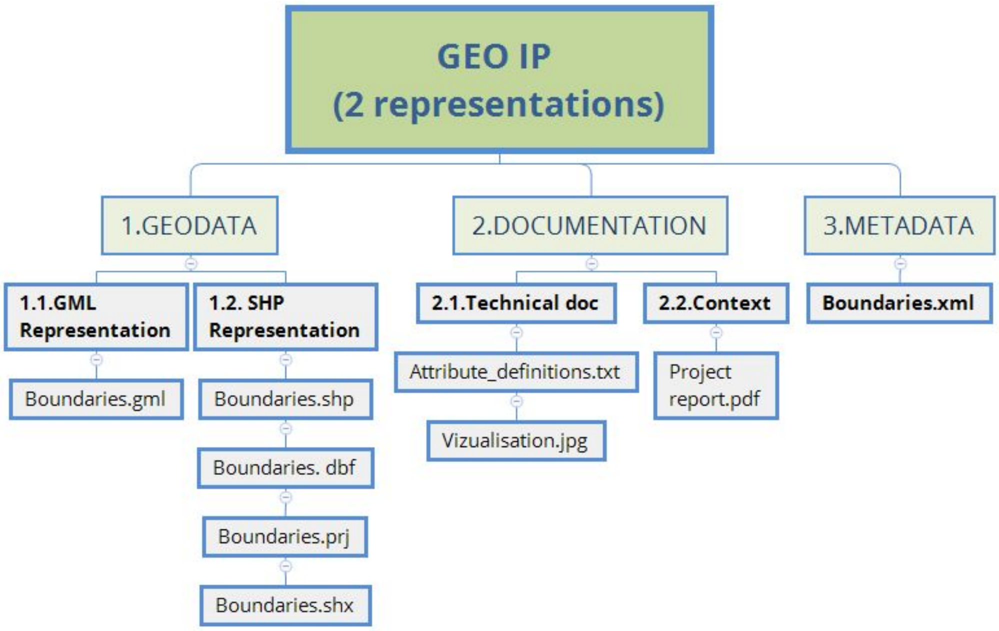


Figure 2: Folder structure of the GeoSIP containing multiple vector representations and documentation on the top

3.2 GeoSIP containing one representation of multiple raster datasets

In this case, the IP package contains one representation of multiple raster images covering an area with an accompanying vector file – containing positions of the raster images (Figure 2). Documentation for the raster datasets is located in the top documentation folder. In a case of a large volume of data we could split the data into multiple SIPs and record the organisation of the split within the documentation folder.

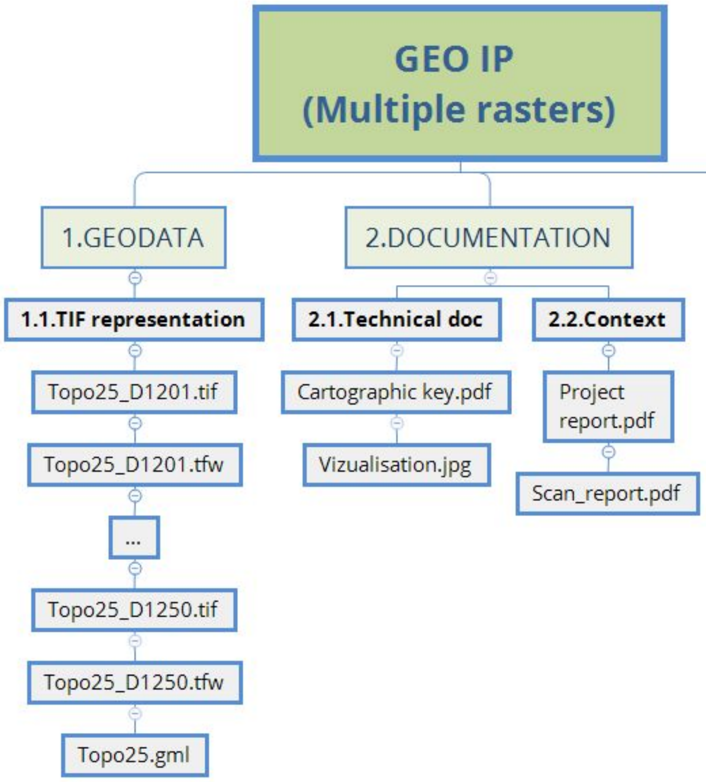


Figure 3: Folder structure of the GeoSIP containing one representation of multiple rasters

3.3 Proposed cardinality for elements in a GEO IP

In this section we describe the proposed cardinality of elements within the GEO IP according to the types of elements it holds. If we only store records in the form of geospatial datasets, see the following table:

Geodata elements

	Information	Description	Cardinality	Examples of documentation
VECTOR DATA				
	Graphical information		1..n	
	Data attributes		1..n	
	Geo referencing information		1..n	
	Visualisation information		0..n	
	GIS Metadata[11]		0..n	
RASTER DATA				
	Graphical information		1..n	
	Data attributes		0..n	
	Geo referencing information		1..n	
	Visualisation information		0..n	
	GIS Metadata			
ADJACENT TABLES (if applicable)				

[11] GIS Metadata refers to the information covered in section 2.4 of this document

	Attribute definition		1..n	
	Object catalogue		0..n	
	Relationship to geodata		1..n	

GIS System elements

When preserving a more complex GIS, the Geo IP should also contain the following elements:

	Information	Description	Cardinality	Examples of documentation
GIS PROJECT STRUCTURE				
	List of elements in a project		1..n	
	Object relations (geodata layers		1..n	
	Geo referencing transformations		1..n	
			0..n	
VISUALISATION				
	Data layer properties		0..n	
	Labeling		0..n	
	Map visualisation		0..n	
GIS System logic				
	Common queries		1..n	
	Geoprocessing workflows		0..n	
	Common reports		0..n	

4 Appendices

4.1 Appendix I – Proposed metadata descriptions for Geodata in ISADG

The following table is based on the EAD3 standard and INSPIRE Metadata Implementing Rules: Technical Guidelines, based on EN ISO 19115 version 1.3. Further information on EAD elements can be found in the TagLibrary-VersionEAD3.pdf available at**:**

http://www2.archivists.org/sites/all/files/TagLibrary-VersionEAD3.pdf

and INSPIRE Metadata Implementation Rules at:

http://inspire.jrc.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf.

INSPIRE el. Nr.	INSPIRE el. Name	Explanation	Metadata data type	Proposed Cardinality	ISDG code	Comments
2.1.1	Xpath expression	An XPath expression indicating the metadata element within the ISO 19115 / ISO 19119 UML model	text	1..1	/	
2.1.2	ISO Schemas Location	Official ISO schemas (ISO AP or ISO 19139) are currently found in two separate locations: 1) ISO repository for publicly available standards (http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/). 2.) OGC Schema repository (http://schemas.opengis.net/iso/19139/20070417/)		?	/	
2.2.1	Resource title	Name by which the cited resource is known	text	1..1	3.1.2 Title	
2.2.2	Resource abstract	Brief narrative summary of the content of the resource(s)	text	0..1	3.3.1 Scope and content	
2.2.3	Resource type	Scope to which metadata applies	CodeList	0..1	(?) 3.1.5 Extent and medium of the unit of description	CodeList (see annex B.5.25 of ISO 19115)
2.2.4	Resource locator	Location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme	URL	0..*	/	
2.2.4.1	Resource locator for datasets and data series	Location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme	URL	0..*	/	

2.2.4.2	Resource locator for Services	Location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme	URL	0..*	/	
2.2.5	Unique resource identifier	Value uniquely identifying an object within a namespace	text	0..1	3.1.1 Reference code	
2.2.6	Coupled resource	Provides information about the datasets that the service operates on	URI	0..*	(?) 3.5.3 Related units of description	
2.2.7	Resource language	Language(s) used within the datasets	CodeList	0..*	3.4.3 Language/scripts of material	LanguageCode (ISO/TS 19139)
2.3.1	Topic category (Specifično za INSPIRE)	Main theme(s) of the dataset	CodeList	1..1	?	Descriptor? List of values. See Part D 2 of the INSPIRE Metadata Regulation 1205/2008/EC) ISO19115:B.5.27 MD_TopicCategoryCode
2.3.2	Spatial data service type	A service type name from a registry of services	CodeList	0..1	?	Descriptor? List of values. See section 1.3.1 in INSPIRE Metadata Implementing Rules
2.4.1	Keyword value	Commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject	text	0..*	?	Descriptor!
2.4.2	Originating controlled vocabulary	Name of the formally registered thesaurus or a similar authoritative source of keywords	text	0..1	/	
2.5.1	Geographic bounding box	Western-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east). Eastern-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east) Northern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north) Southern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north).	Decimal	0..*	/	
2.6.1	Temporal extent	Time period covered by the content of the dataset	Date	1..*	3.1.3 Date(s)	
2.6.2	Date of publication	Reference date for the cited resource – publication	Date	0..1	3.1.3 Date(s)	

2.6.3	Date of last revision	Reference date for the cited resource – revision	Date	0..1	3.1.3 Date(s)	
2.6.4	Date of creation	Reference date for the cited resource – creation	Date	0..1	3.1.3 Date(s)	
2.7.1	Lineage	General explanation of the data producer's knowledge about the lineage of a dataset	text	0..1	/	
2.7.2	Spatial resolution	• Equivalent scale: level of detail expressed as the scale denominator of a comparable hardcopy map or chart • Distance: ground sample distance	text	0..1	Additional	
2.8.1	Degree	This is the degree of conformity of the resource to the implementing rules adopted under Article 7(1) of INSPIRE Directive 2007/2/EC or other specification.	?	?	/	
2.8.2	Specification	Citation of the product specification or user requirement against which data is being evaluated	?	?	/	
2.9.1	Limitations on public access [and use]	Access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource	CodeList	1..1	3.4.1 Conditions governing access	
						Basic list of limitations (ISO 19115 B.5.24)
						Description of limitations
						Level of secret (ISO 19115 B.5.11)
2.9.2	Conditions applying to access and use	Restrictions on the access and use of a resource or metadata	text	1..1	**3.4.1 Conditions governing access;** 3.4.2 Conditions governing reproduction; 3.4.4 Physical characteristics and technical requirements	
2.10.1	Responsible party	Identification of, and means of communication with, person(s) and organisation(s) associated with the resource(s)	text	1..1	/	

2.10.2	Responsible party role	Function performed by the responsible party	CodeList	1..1	/	
2.11.1	Metadata point of contact	Party responsible for the metadata information	text	0..1	/	
2.11.2	Metadata date	Date that the metadata was created	Date	0..1	/	
2.11.3	Metadata language	Language used for documenting metadata	CodeList	0..1	/	

Table1: Metadata for geodata