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Geographic information — Data quality —

Part 1: General requirements

Information géographique — Qualité des données —

Partie 1: Exigences générales

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 287, *Geographic Information,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 19157-1, together with ISO 19157-3, cancels and replaces the first edition (ISO 19157:2013), which has been technically revised. It also incorporates the Amendment ISO 19157:2013/Amd 1:2018.

The main changes are as follows:

— terminology has been harmonized;

— the unique identification of normative components has been added;

— the definition of the data quality model extension has been added;

— the data quality measures have been moved into a new project on a standard data quality measures register;

— the conformance requirements have been updated;

— the usage of package prefixes for type name has been omitted;

— the ‘usability’ data quality element has been removed from the model;

— a new clause on extending the standard quality model and the quality measures has been added;

— the abstract test suite has been revised;

— requirements for XML schema implementation have been added;

— information on backwards compatibility with superseded edition of this document has been included.

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A list of all parts in the ISO 19157 series can be found on the ISO website.

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Introduction

Geographic data are increasingly being shared, interchanged and used for purposes other than their producers' intended ones. Information about the quality of available geographic data is vital to the process of selecting a dataset in that the value of data are directly related to their quality. A user of geographic data can have multiple datasets from which to choose. Therefore, it is necessary to compare the quality of the datasets to determine which best fulfils the requirements of the user.

The purpose of describing the quality of geographic data is to facilitate the comparison and selection of the dataset best suited to application needs or requirements. Complete descriptions of the quality of a dataset will encourage the sharing, interchange and use of appropriate datasets. Information on the quality of geographic data allows a data producer to evaluate how well a dataset meets the criteria set forth in its product specification and assists data users in evaluating a product's ability to satisfy the requirements for their particular application. For the purpose of this evaluation, clearly-defined procedures are used in a consistent manner.

To facilitate comparisons, it is essential that the results of the quality are expressed in a comparable way and that there is a common understanding of the data quality measures that have been used. These data quality measures provide descriptors of the quality of geographic data through comparison with the universe of discourse. The use of incompatible measures makes data quality comparisons impossible to perform. This document standardizes the components and structures of data quality measures and defines commonly used data quality measures.

This document recognizes that a data producer and a data user can potentially view data quality from different perspectives. Conformance quality levels can be set using the data producer's product specification or a data user's data quality requirements. If the data user requires more data quality information than that provided by the data producer, the data user can follow the data producer's data quality evaluation process flow to get the additional information. In this case the data user requirements are treated as a product specification for the purpose of using the data producer process flow.

The objective of this document is to provide a framework for defining the quality of geographic data. This includes principles for evaluating quality, a conceptual model for handling quality information, a structure and content of data quality measures, and guidelines for reporting a quality evaluation. The framework is extensible, with rules for how to add additional data quality measures. It also provides for complex dimensions of data quality.

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Geographic information — Data quality —

Part 1:
General requirements

1 Scope

This document establishes the principles for describing the quality of geographic data. It:

— defines a well-considered system of components for describing data quality;

— defines the process for defining additional, domain-specific components for describing data quality;

— specifies components and the content structure of data quality measures;

— describes general procedures for evaluating the quality of geographic data;

— establishes principles for reporting data quality.

This document is applicable to data producers providing quality information to describe and assess how well a dataset conforms to its product specification and to data users attempting to determine whether or not specific geographic data are of sufficient quality for their particular application.

This document does not attempt to define minimum acceptable levels of quality for geographic data. Such information is usually present as a requirement in a data product specification, defined in accordance with ISO 19131, for example.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 19103:2015, *Geographic information — Conceptual schema language*

ISO 19109:2015, *Geographic information — Rules for application schema*

ISO 19115-1:2014, *Geographic information — Metadata — Part 1: Fundamentals*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
accuracy
closeness of agreement between a test result or measurement result and the true value

Note 1 to entry: In this document, the true value can be a reference value that is accepted as true.

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[SOURCE: ISO 3534-2:2006, 3.3.1, modified — Notes 1, 2 and 3 to entry have been removed. A new Note 1 to entry has been added.]

3.2
conformance
conformity
fulfilment of a requirement

Note 1 to entry: When there is no ambiguity, the modifier "conformance" may be omitted. For example, "test report" is the same as "conformance test report".

[SOURCE: ISO 19105:2022, 3.4]

3.3
conformance quality level
threshold value or set of threshold values for data quality results used to determine how well a dataset meets the criteria set forth in its data product specification or user requirements

3.4
correctness
correspondence with the universe of discourse

3.5
coverage
feature that acts as a function to return values from its range for any direct position within its domain

[SOURCE: ISO/FDIS 19123-1:—,[1)] 3.1.8]

3.6
data product specification
specification of a data product together with additional information that will enable it to be created, supplied to and used by another party

Note 1 to entry: A data product specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a data product. It may be used for production, sales, end-use or other purposes.

Note 2 to entry: A specification is a document stating requirements (see ISO 9000:2015, 3.8.7).

Note 3 to entry: A data product is a dataset or a dataset series that may be supplied (see ISO 19131:2022, 3.8),

[SOURCE: ISO 19131:2022, 3.9, modified — Notes 2 and 3 to entry have been added.]

3.7
data quality
degree to which a set of inherent characteristics of data fulfils requirements

[SOURCE: ISO 8000-2:2022, 3.8.1, modified — Note 1 to entry has been removed.]

3.8
data quality measure
variable to which a value is assigned as the result of measurement of a data quality characteristic

[SOURCE: ISO/IEC 25012:2008, 4.5, modified — Note 1 to entry has been removed.]

3.9
data quality unit
combination of a scope and data quality elements

1) Under preparation. Stage at the time of publication: ISO/FDIS 19123-1:2023.

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3.10
dataset
identifiable collection of data

Note 1 to entry: A dataset can be a smaller grouping of data which, though limited by some constraint such as spatial extent or *feature type*, is located physically within a larger dataset. Theoretically, a dataset can be as small as a single *feature* or *feature attribute* contained within a larger dataset. A hardcopy map or chart can be considered a dataset.

[SOURCE: ISO 19115-1:2014, 4.3]

3.11
dataset series
collection of datasets sharing common characteristics

[SOURCE: ISO 19115-1:2014, 4.4]

3.12
feature
abstraction of real world phenomena

Note 1 to entry: A feature can occur as a type or an instance. Feature type or feature instance will be used when only one is meant.

[SOURCE: ISO 19101-1:2014, 4.1.11]

3.13
feature attribute
characteristic of a feature

Note 1 to entry: A feature attribute has a name, a data type and a value domain associated with it. A feature attribute for a feature instance also has an attribute value taken from the value domain.

[SOURCE: ISO 19101-1:2014, 4.1.12 modified — Examples 1 and 2, and Notes 2 and 3 to entry have been removed.]

3.14
feature instance
individual of a given feature type having specified feature attribute values

[SOURCE: ISO 19101-1:2014, 4.1.14]

3.15
feature operation
operation that every instance of a feature type may perform

[SOURCE: ISO 19110:2016, 3.7, modified — Example and Note 1 to entry have been removed.]

3.16
feature type
class of features having common characteristics

[SOURCE: ISO 19156:2011, 4.7]

3.17
geographic data
data with implicit or explicit reference to a location relative to the Earth

[SOURCE: ISO 19109:2015, 4.13, modified — Note 1 to entry has been removed.]

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3.18
item
anything that can be described and considered separately

Note 1 to entry: An item can be any part of a *dataset*, such as a *feature*, feature relationship, *feature attribute*, or combination of these.

[SOURCE: ISO 2859-5:2005, 3.4, modified — Example has been removed. Note 1 to entry has been added.]

3.19
lineage
provenance, source(s) and production process(es) used in producing a resource

[SOURCE: ISO 19115-1:2014, 4.9]

3.20
metadata
information about a resource

[SOURCE: ISO 19115-1:2014, 4.10]

3.21
metaquality
information describing the quality of data quality

3.22
quality
degree to which a set of inherent characteristics of an object fulfils requirements

[SOURCE: ISO 9000:2015, 3.6.2, modified — Note 1 and 2 to entry have been removed.]

3.23
quality evaluation
systematic examination of the extent to which an entity is capable of fulfilling specified requirements

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.3267, modified — Note 1 to entry has been removed.]

3.24
register
set of files containing identifiers assigned to items with descriptions of the associated items

[SOURCE: ISO 19135-1:2015, 4.1.9]

3.25
requirement
need or expectation that is stated, generally implied or obligatory

[SOURCE: ISO 9000:2015, 3.6.4, modified — Notes 1-6 to entry have been removed.]

3.26
quality evaluation report
quality report
free text document providing fully-detailed information about data quality evaluations, results and measures used

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3.27
uncertainty
measurement uncertainty
parameter, associated with the result of measurement, that characterizes the dispersion of values that could reasonably be attributed to the measurand

Note 1 to entry: Uncertainty of measurement comprises, in general, many components. Some of these components may be evaluated from the statistical distribution of the results of series of measurements and can be characterized by experimental standard deviations. The other components, which can also be characterized by standard deviations, are evaluated from assumed probability distributions based on experience or other information.

[SOURCE: ISO 19116:2019, 3.28, modified — Note 1 to entry has been removed and replaced with Note 2 to entry from ISO 19101-2:2018, 3.40.]

3.28
universe of discourse
view of the real or hypothetical world that includes everything of interest

[SOURCE: ISO 19101-1:2014, 4.1.38]

4 Abbreviated terms and packages

4.1 Abbreviated terms

ADQR	aggregated data quality result
AQL	acceptance quality limit
GML	Geographic Markup Language
UML	Unified Modelling Language
XML	Extensible Markup Language

4.2 Abbreviated packages

Abbreviations are used to denote the package that contains a class. Those abbreviations precede class names, connected by a "_". A list of those abbreviations is listed in Table 1. The International Standard in which the classes are located is indicated in parentheses.

Table 1 — Package abbreviations

CI	Citation [ISO 19115-1:2014]
DS	Dataset [ISO 19115-1:2014]
GF	General Feature [ISO 19109:2015]
LI	Lineage [ISO 19115-1:2014]
MD	Metadata [ISO 19115-1:2014]

5 Conformance

5.1 General

In this document two conformance classes are defined (see 5.2 and 5.3). The related tests are provided in the abstract test suit in Annex A.

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