

# INTERNATIONAL STANDARD

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## Geographic information — Quality principles

*Information géographique — Principes qualité*

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# Contents

Page

Foreword.....	iv
Introduction .....	v
1 Scope.....	1
2 Conformance .....	1
3 Normative references .....	1
4 Terms and definitions.....	2
5 Principles for describing the quality of geographic data .....	4
5.1 Components of data quality description .....	4
5.2 Data quality elements and data quality subelements .....	5
5.3 Data quality overview elements.....	7
6 Identifying the quality of geographic information .....	8
6.1 Identifying quantitative quality information .....	8
6.2 Identifying non-quantitative quality information .....	10
7 Reporting quality information.....	10
7.1 Reporting quantitative quality information .....	10
7.2 Reporting non-quantitative quality information .....	10
Annex A (normative) Abstract test suite.....	11
Annex B (informative) Data quality concepts and their use.....	14
Annex C (informative) Data quality elements, data quality subelements and data quality overview elements.....	19

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 19113 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

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## Introduction

Geographic datasets are increasingly being shared, interchanged and used for purposes other than their producers' intended ones. Information about the quality of available geographic datasets is vital to the process of selecting a dataset in that the value of data is directly related to its quality. Data users confront situations requiring different levels of data quality. Extremely accurate data is required by some data users for certain needs and less accurate data are sufficient for other needs. Information about the quality of geographic data is becoming a decisive factor for its utilization as technological advances allow the collection and use of geographic datasets whose quality can exceed that which is needed and requested by data users.

The purpose of describing the quality of geographic data is to facilitate the selection of the geographic 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 geographic datasets. A geographic dataset can be viewed as a commodity or product. Information on the quality of geographic data allows a data producer or vendor to validate how well a dataset meets the criteria set forth in its product specification and assists a data user in determining a product's ability to satisfy the requirements for their particular application.

The objective of this International Standard is to provide principles for describing the quality for geographic data and concepts for handling quality information for geographic data.

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# Geographic information — Quality principles

## 1 Scope

This International Standard establishes the principles for describing the quality of geographic data and specifies components for reporting quality information. It also provides an approach to organizing information about data quality.

This International Standard is applicable to data producers providing quality information to describe and assess how well a dataset meets its mapping of the universe of discourse as specified in the product specification, formal or implied, and to data users attempting to determine whether or not specific geographic data is of sufficient quality for their particular application. This International Standard should be considered by organizations involved in data acquisition and purchase, in such a way that it makes it possible to fulfil the intentions of the product specification. It can additionally be used for defining application schemas and describing quality requirements.

As well as being applicable to digital geographic data, the principles of this International Standard can be extended to identify, collect and report the quality information for a geographic dataset, its principles can be extended and used to identify, collect and report quality information for a dataset series or smaller groupings of data that are a subset of a dataset.

Although this International Standard is applicable to digital geographic data, its principles can be extended to many other forms of geographic data such as maps, charts and textual documents.

This International Standard does not attempt to define a minimum acceptable level of quality for geographic data.

## 2 Conformance

Any product claiming conformance with this International Standard shall pass all the requirements described in the abstract test suite presented in Annex A.

## 3 Normative references

The following referenced documents are indispensable for the application 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 19108:2002, *Geographic information — Temporal schema*

ISO 19109:—<sup>1)</sup>, *Geographic information — Rules for application schema*

ISO 19114:—<sup>1)</sup>, *Geographic information — Quality evaluation procedures*

ISO 19115:—<sup>1)</sup>, *Geographic information — Metadata*

1) To be published.

## 4 Terms and definitions

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

### 4.1

#### **accuracy**

closeness of agreement between a test result and the accepted reference value [ISO 3534-1]

NOTE A test result can be observations or measurements.

### 4.2

#### **conformance**

fulfilment of specified requirements [ISO 19105]

### 4.3

#### **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 product specification or user requirements [ISO 19114]

### 4.4

#### **data quality date**

date or range of dates on which a data quality measure is applied

### 4.5

#### **data quality element**

quantitative component documenting the quality of a dataset [ISO 19101]

NOTE The applicability of a data quality element to a dataset depends on both the dataset's content and its product specification, the result being that all data quality elements may not be applicable to all datasets.

### 4.6

#### **data quality evaluation procedure**

operation(s) used in applying and reporting quality evaluation methods and their results

### 4.7

#### **data quality measure**

evaluation of a data quality subelement

EXAMPLE The percentage of the values of an attribute that are correct.

### 4.8

#### **data quality overview element**

non-quantitative component documenting the quality of a dataset [ISO 19101]

NOTE Information about the purpose, usage and lineage of a dataset is non-quantitative quality information.

### 4.9

#### **data quality result**

value or set of values resulting from applying a data quality measure or the outcome of evaluating the obtained value or set of values against a specified conformance quality level

EXAMPLE A data quality result of "90" with a data quality value type of "percentage" reported for the data quality element and its data quality subelement "completeness, commission" is an example of a value resulting from applying a data quality measure to the data specified by a data quality scope. A data quality result of "true" with a data quality value type of "boolean variable" is an example of comparing the value (90) against a specified acceptable conformance quality level (85) and reporting an evaluation of a kind, pass or fail.

### 4.10

#### **data quality scope**

extent or characteristic(s) of the data for which quality information is reported



**NOTE** A data quality scope for a dataset can comprise a dataset series to which the dataset belongs, the dataset itself, or a smaller grouping of data located physically within the dataset sharing common characteristics. Common characteristics can be an identified feature type, feature attribute, or feature relationship; data collection criteria; original source; or a specified geographic or temporal extent.

#### 4.11

##### **data quality subelement**

component of a data quality element describing a certain aspect of that data quality element

#### 4.12

##### **data quality value type**

value type for reporting a data quality result

**EXAMPLE** “boolean variable”, “percentage”, “ratio”

**NOTE** A data quality value type is always provided for a data quality result.

#### 4.13

##### **data quality value unit**

value unit for reporting a data quality result

**EXAMPLE** “metre”

**NOTE** A data quality value unit is provided only when applicable for a data quality result.

#### 4.14

##### **dataset**

identifiable collection of data [ISO 19115]

**NOTE** A dataset may 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 may be as small as a single feature or feature attribute contained within a larger dataset.

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#### 4.15

##### **dataset series**

collection of datasets sharing the same product specification [ISO 19115]

#### 4.16

##### **feature**

abstraction of real world phenomena [ISO 19101]

**NOTE** A feature may occur as a type or an instance. Feature type or feature instance should be used when only one is meant.

#### 4.17

##### **feature attribute**

characteristic of a feature [ISO 19101]

**NOTE** 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.

#### 4.18

##### **feature operation**

operation that every instance of a feature type may perform [ISO 19110]

**EXAMPLE 1** An operation upon the feature type “dam” is to raise the dam. The result of this operation is to raise the level of water in a reservoir.

**EXAMPLE 2** An operation by the feature type “dam” might be to block vessels from navigating along a watercourse.

**NOTE** Feature operations provide a basis for feature type definitions.

**4.19**

**metadata**

data about data [ISO 19115]

**4.20**

**product specification**

description of the universe of discourse and a specification for mapping the universe of discourse to a dataset

**4.21**

**quality**

totality of characteristics of a product that bear on its ability to satisfy stated and implied needs [ISO 19101]

**4.22**

**universe of discourse**

view of the real or hypothetical world that includes everything of interest [ISO 19101]

**5 Principles for describing the quality of geographic data**

**5.1 Components of data quality description**

This International Standard can be used when

- identifying and reporting quality information;
- evaluating the quality of a dataset;
- developing product specifications and user requirements;
- specifying application schemas.

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ISO 19114 and ISO 19115 describe schemas for reporting quality information.

ISO 19114 provides the framework for evaluating the quality of a dataset.

ISO 19109 describes the development of application schemas.

A quality description can be applied to a dataset series, a dataset or a smaller grouping of data located physically within the dataset sharing common characteristics so that its quality can be evaluated.

The quality of a dataset shall be described using two components:

- data quality elements;
- data quality overview elements.

Data quality elements, together with data quality subelements and the descriptors of a data quality subelement, describe how well a dataset meets the criteria set forth in its product specification and provide quantitative quality information.

Data quality overview elements provide general, non-quantitative information.

NOTE Data quality overview elements are critical for assessing the quality of a dataset for a particular application that differs from the intended application.

This International Standard recognizes that quantitative and non-quantitative quality information may have associated quality.

The quality about quality information may include a measure of the confidence or the reliability of the quality information. This type of information is recorded in ISO 19114's quality evaluation report.

Figure 1 provides an overview of data quality information.

Annex B provides a discussion of data quality concepts used to establish the components for describing the quality of geographic data.

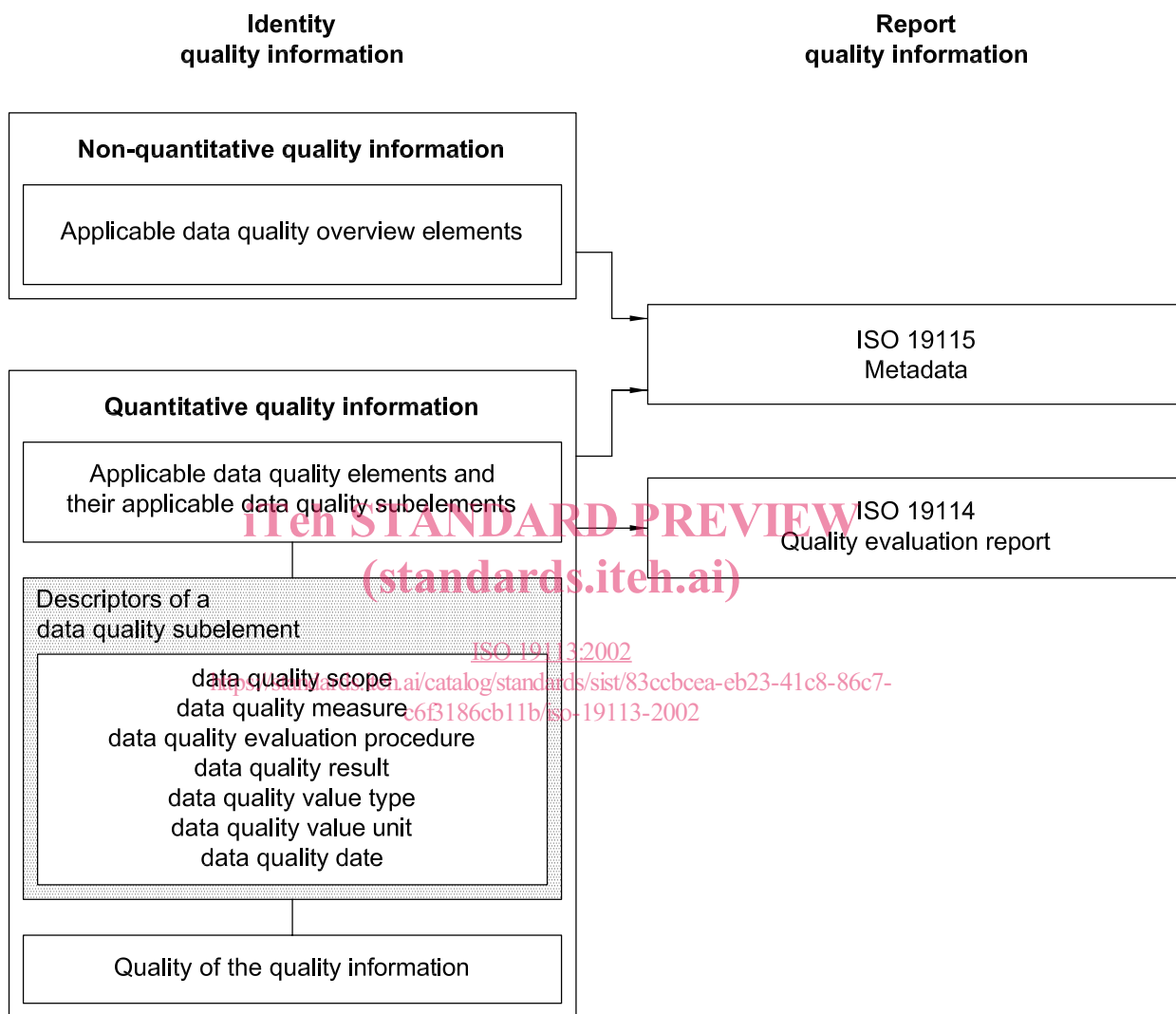


Figure 1 — An overview of data quality information

## 5.2 Data quality elements and data quality subelements

### 5.2.1 Data quality elements

The following data quality elements, where applicable, shall be used to describe how well a dataset meets the criteria set forth in its product specification:

- completeness: presence and absence of features, their attributes and relationships;
- logical consistency: degree of adherence to logical rules of data structure, attribution and relationships (data structure can be conceptual, logical or physical);
- positional accuracy: accuracy of the position of features;

- temporal accuracy: accuracy of the temporal attributes and temporal relationships of features;
- thematic accuracy: accuracy of quantitative attributes and the correctness of non-quantitative attributes and of the classifications of features and their relationships.

Additional data quality elements may be created to describe a component of the quantitative quality of a dataset not addressed in this International Standard.

### 5.2.2 Data quality subelements

For the data quality elements identified in 5.2.1, the following data quality subelements where applicable shall be used to describe aspects of the quantitative quality of a dataset:

- completeness;
  - commission: excess data present in a dataset,
  - omission: data absent from a dataset.
- logical consistency;
  - conceptual consistency: adherence to rules of the conceptual schema,
  - domain consistency: adherence of values to the value domains,
  - format consistency: degree to which data is stored in accordance with the physical structure of the dataset,
  - topological consistency: correctness of the explicitly encoded topological characteristics of a dataset.
- positional accuracy;
  - absolute or external accuracy: closeness of reported coordinate values to values accepted as or being true,
  - relative or internal accuracy: closeness of the relative positions of features in a dataset to their respective relative positions accepted as or being true,
  - gridded data position accuracy: closeness of gridded data position values to values accepted as or being true.
- temporal accuracy;
  - accuracy of a time measurement: correctness of the temporal references of an item (reporting of error in time measurement),
  - temporal consistency: correctness of ordered events or sequences, if reported,
  - temporal validity: validity of data with respect to time.
- thematic accuracy;
  - classification correctness: comparison of the classes assigned to features or their attributes to a universe of discourse (e.g. ground truth or reference dataset),
  - non-quantitative attribute correctness: correctness of non-quantitative attributes,
  - quantitative attribute accuracy: accuracy of quantitative attributes.

Additional data quality subelements may be created for any of the data quality elements.