7 Data quality

This chapter includes a description of the data quality elements and sub-elements as well as the corresponding data quality measures that should be used to evaluate and document data quality for data sets related to the spatial data theme *Orthoimagery* (section 7.1).

It may also define requirements or recommendations about the targeted data quality results applicable for data sets related to the spatial data theme *Orthoimagery* (sections 7.2 and 7.3).

In particular, the data quality elements, sub-elements and measures specified in section 7.1 should be used for

- evaluating and documenting data quality properties and constraints of spatial objects, where such properties or constraints are defined as part of the application schema(s) (see section 5);
- evaluating and documenting data quality metadata elements of spatial data sets (see section 8); and/or
- specifying requirements or recommendations about the targeted data quality results applicable for data sets related to the spatial data theme *Orthoimagery* (see sections 7.2 and 7.3).

The descriptions of the elements and measures are based on Annex D of ISO/DIS 19157 Geographic information – Data quality.

7.1 Data quality elements

Table 3 lists all data quality elements and sub-elements that are being used in this specification. Data quality information can be evaluated at level of spatial object, spatial object type, dataset or dataset series. The level at which the evaluation is performed is given in the “Evaluation Scope” column.

The measures to be used for each of the listed data quality sub-elements are defined in the following sub-sections.

Table 3 – Data quality elements used in the spatial data theme *Orthoimagery*

Section	Data quality element	Data quality sub-element	Definition	Evaluation Scope
7.1.1	Completeness	Omission	data absent from the dataset, as described by the scope	spatial object type
7.1.2	Positional accuracy	Gridded data position accuracy	closeness of gridded data position values to values accepted as or being true	dataset series; dataset; spatial object type;

Recommendation 12 Where it is impossible to express the evaluation of a data quality element in a quantitative way, the evaluation of the element should be expressed with a textual statement as a data quality descriptive result.

7.1.1 Completeness – Omission

Recommendation 13 Omission should be evaluated and documented using Rate of missing items as specified in the tables below.

Name	Rate of missing items
Alternative name	–

Data quality element	Completeness
Data quality sub-element	Omission
Data quality basic measure	Error rate
Definition	Number of missing items in the dataset in relation to the number of items that should have been present.
Description	This data quality measure provides an assessment of the rate of pixels with at least a nil value in one band of the orthoimage. It should apply only on the areas of interest of the orthoimage, i.e. within the boundary of the footprint of the orthoimage. The data provider is expected to describe the nillvalue reason (e.g. cloud coverage, military restriction, ...) within the attribute rangeType.
Evaluation scope	spatial object type: OrthoimageCoverage
Reporting scope	data set
Parameter	–
Data quality value type	Real, percentage, ratio (example: 0,0189 ; 98,11% ; 11:582)
Data quality value structure	Single value
Source reference	ISO/DIS 19157 Geographic information – Data quality
Example	–
Measure identifier	7 (ISO/DIS 19157)

7.1.2 Positional accuracy – Gridded data position accuracy

Recommendation 14 Gridded data position accuracy should be evaluated and documented using root mean square error of planimetry or root mean square error in X or Y as specified in the tables below.

Gridded data position accuracy should be documented using root mean square error of planimetry and/or root mean square error in X or Y.

Name	**Root mean square error of planimetry**
Alternative name	RMSEP
Data quality element	Positional accuracy
Data quality sub-element	Absolute or external accuracy
Data quality basic measure	Not applicable
Definition	radius of a circle around the given point, in which the true value lies with probability P
Description	The true values of the observed coordinates *X* and *Y* are known as x_t and y_t. From this the estimator $\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}[(x_{mi} - x_t)^2 + (y_{mi} - y_t)^2]}$ yields the linear root mean square error of planimetry RMSEP = σ
Evaluation scope	Spatial object type: OrthoimageCoverage data set data set series
Reporting scope	Spatial object type: OrthoimageCoverage data set data set series
Parameter	–
Data quality value type	measure
Data quality value structure	Single value
Source reference	ISO/DIS 19157 Geographic information – Data quality
Example	–

Measure identifier	47 (ISO/DIS 19157)

Name	**Root mean square error in X or Y**
Alternative name	RMSE-x or RMSE-y
Data quality element	Positional accuracy
Data quality sub-element	Absolute or external accuracy
Data quality basic measure	One-dimensional random variable, Z
Definition	Standard deviation where the true value is not estimated from the observations but known *a priori*. X and Y are the two grid axis of the orthoimage.
Evaluation scope	Spatial object type: OrthoimageCoverage data set data set series
Reporting scope	Spatial object type: OrthoimageCoverage data set data set series
Description	The true value of an observed coordinate *X* or *Y* are known as x_t or y_t. From this the estimator $\sigma_x = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_{mi} - x_t)^2}$ yields the linear root mean square error RMSE-x = σ_x $\sigma_y = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_{mi} - y_t)^2}$ yields the linear root mean square error RMSE-y = σ_y
Parameter	–
Data quality value type	measure
Data quality value structure	Single value
Source reference	ISO/DIS 19157 Geographic information – Data quality
Example	–
Measure identifier	Adapted from 39 (ISO/DIS 19157)

NOTE

IR Requirement
Annex III, Section 3.5.5
Requirements on data quality

(1) The measures “root mean square error in X” (RMSE-x) and “root mean square error in Y” (RMSE-y) shall be provided jointly when used to assess the gridded data position of orthoimagery data.

7.2 Minimum data quality requirements

No minimum data quality requirements are defined for the spatial data theme *Orthoimagery*.

7.3 Recommendation on data quality

Recommendation 15 For the data quality elements listed in Table 4, all data sets related to the spatial data theme *Orthoimagery* should meet the specified target results.

Table 4 – Recommended minimum data quality results for spatial data theme Orthoimagery

Section	Data quality element and sub-element	Measure name(s	Target result(s	Condition
7.1.1	Completeness – Omission	Rate of missing items	0%	The target result shall be met on the areas defined by the orthoimage footprints.