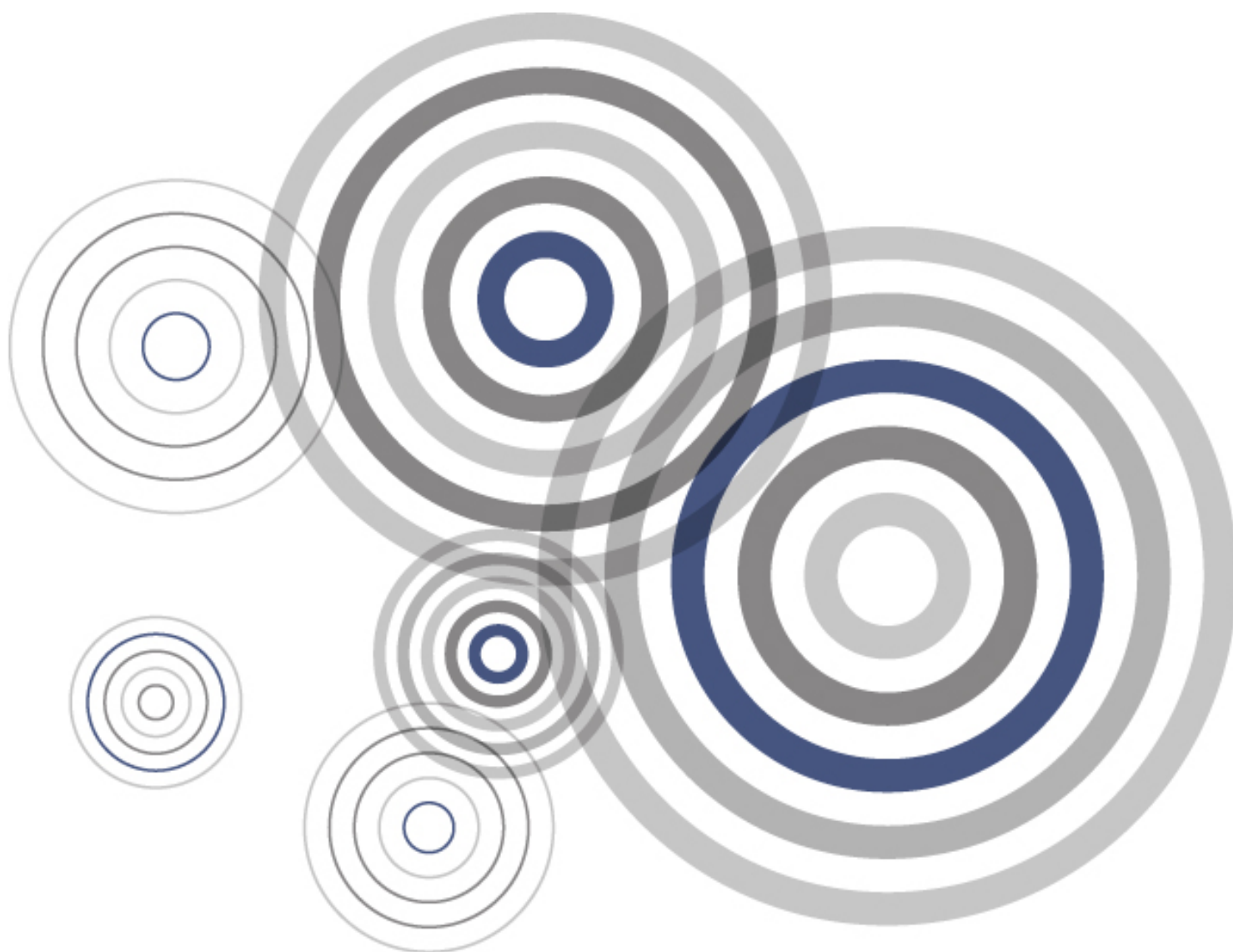


GLEIF Public

GLEIF Global LEI Data Quality Report Dictionary

Version 2.3 2018-09-05



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Data Quality Report Glossary

Term	Definition
Common Data File format (CDF)	<p>The Common Data File Formats (X-CDF) provide the specificity needed for the operational implementation of the ISO standard. The three CDF files that these reports are concerned with are:</p> <ul style="list-style-type: none"> - LEI-CDF - defines how Level 1 data, i.e. the information on 'who is who', is reported. - Relationship-Record-CDF (RR-CDF) - Defines how Level 2 data, i.e. information on 'who owns whom', is reported for LEI registrants whose direct and ultimate parents have an LEI. - Reporting Exceptions (RepEx) format - If the child legal entity reports an exception, a record in this format is generated for the parent entity. Each record refers to a child legal entity, indicates whether the exception applies to the direct or ultimate parent and provides the reporting exception.
Check	A Check is the execution of a data rule.
GLEIS	A Global LEI System (a framework) for the issuance of unambiguous LEI records.
LEI	The Legal Entity Identifier (LEI) is a unique 20-character alphanumeric code based on the ISO 17442 standard developed by the International Organization for Standardization.
Level 1	The business card information available with the LEI reference data, e.g. the official name of a legal entity and its registered address.
Level 2	Level 2 data refers to the relationship data of an LEI record and answers the question of 'who owns whom'.
LEI Issuer	'LEI Issuers' are accredited (or in process of accreditation) institutions that issue LEIs, they can also be referred to as Local Operating Units, most notably in the field 'Registration.ManagingLOU'
Source Files	The XML data file provided by an LEI Issuer, containing LEIs and their reference data according to the Common Data File format.

Term	Definition
Tachometer	For the purposes of this report, a visual representation of the LEI Total Data Quality Score, on a scale of 0 - 100 (in percentages) that resembles a traditional RPM gauge.
XSD (Schema)	The XSD (XML Schema Definition) specifies how to organize and describe the elements of any particular CDF. Where applicable, 'Schema' will be used throughout this document.
XML	Extensible Markup Language is a language that sets rules for information encoding.

1. Chapter 1: Preface

This is a general description of how the Global LEI Data Quality Report is generated from the source files provided by the LEI Issuers. It is not seen as a complementary monthly document, as it is only concerned with the general calculations, and not the specific content of each Global LEI Data Quality Report. This document structure is 'deductive' in its reasoning, working from the general structure of the formulas used in the Global LEI Data Quality Report to particular examples and specifics. Each chapter, where needed or noted, will have a particular paragraph distinguished in bold of where to find the particular element or elements in the Global LEI Data Quality Report. It is important to notice that the screenshots used in this document serve as companions to the examples provided, and might not be found with the values shown here in the Global LEI Data Quality Report.

1.1. Purpose of the Global LEI Data Quality Report

The Global Data Quality Report summarizes the results of GLEIF's assessment of the level of data quality in the Global LEI System based on a set of clearly defined data quality criteria to achieve GLEIS's quality objectives of LEIs, the Legal Entity Reference Data (LE-RD) and the relationships, whether public or private, that are:

- Open.
- Reliable.
- Trusted.

Openness assures global access without barriers to anybody who decides to analyze the data and the information that it hosts.

A system that is up-to-date, where internationally recognized standards of quality are applied, and the information is renewed constantly and scored accordingly, ensures that the data is reliable.

The rule setting of data quality, constant monitoring and reporting as well as continuous improvement of the data quality itself is the basis for trusted data.

1.2. GLEIS's Data Quality Criteria

To clarify the concept of data quality with regard to the LEI population, GLEIF has defined, in close dialog with the LEI Regulatory Oversight Committee and the LEI issuing organizations, a set of measurable quality criteria using standards developed by the International Organization for Standardization (ISO). Instituting a set of defined quality criteria establishes a transparent and objective benchmark to assess the level of data quality within the Global LEI System.

The Global LEI Data Quality Report contains the list of data quality criteria already implemented. The full defined 12 data quality criteria will be implemented over time.

Accuracy	The extent to which the data are free of identifiable errors; the degree of conformity of a data element or a data set to an authoritative source that is
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	deemed to be correct; and the degree to which the data correctly represents the truth about real-world objects.
Accessibility	Data items that are easily obtainable and legal to access with strong protections and controls built into the process.
Completeness	The degree to which all required occurrences of data are populated.
Comprehensiveness	All required data items are included - ensures that the entire scope of the data is collected with intentional limitations documented.
Consistency	The degree to which a unique piece of data holds the same value across multiple data sets.
Currency	The extent to which data are up-to-date; a datum value being up-to-date if it is current at a specific point in time, and outdated if it was previously current but then incorrect at a later time.
Integrity	The degree of conformity to defined data relationship rules (e.g., primary/foreign key referential integrity).
Provenance	History or pedigree of a property value.
Representation	The characteristic of data quality that addresses the format, pattern, legibility, and usefulness of data for its intended use.
Timeliness	The degree to which data is available when it is required.
Uniqueness	The extent to which all distinct values of data elements appear only once.
Validity	The measure of how a data value conforms to its domain value set (i.e., a set of allowable values or range of values).

1.3. GLEIS's Rule Setting

To measure the data quality criteria, Checks have been defined based on the Common Data File format. These LEI Checks are measured at different LEI data hierarchy levels:

Meta Checks are not measured in the data file itself. These checks focus on timeliness, currency and accessibility of the data. The harder it is for the general public to access the information, the lower the accessibility. The more up-to-date the files that contain the relevant information are, the more current it is. And the easier it is to access the information in a timely manner, regardless of timeframe, if it is available, the more 'timeliness' it has.

Format Checks are implemented on the file level, i.e. whether the files are compliant with the XML standard and Common Data File format. If a file is non-compliant to the standard, the information cannot be aggregated and therefore the data quality cannot be assessed. In this regard, if a data quality assessment cannot be performed for a particular source file at the end of the month, the report will be generated from the last available file that could be assessed, as this information is used for the concatenation appearing in the Global LEI Index. Starting with the LEI-CDF 2.1, RR-CDF 1.0 and RepEx 1.0, there are no more 'File' or 'Source' checks, as the schemas will enforce strict compliance. Some previous checks that were classified as 'Representation' have been deprecated, as the relevant schemas will now strictly validate these fields. At the same time, new 'Representation' checks have been added, which require ELF and RA information to be populated within the expected rules.

'Checks' (as used throughout this document) then apply to mandatory and optional elements, format per element, plausibility checks like value ranges, relationships between elements of one record (Relation Checks between fields of one LEI record), as well as relationships and/or parent exceptions (for Level 2 data). These checks comprise the totality of the checks for a data quality assessment file.

Additionally, there are several Checks (not strictly associated with this data quality assessment) on multiple records (Relation Checks between data in the upload file and data in the LEI repository). A prominent example of the latter is the check for duplicates. These checks ensure internal consistency in the ecosystem: they serve as a second level threshold of trust, firstly when the information gathered by the LEI Issuer is truthful and valid, and secondly, when the information is unique, and the relevant relationships from these records can verifiably be based on actual parameters.

The list of implemented data quality checks can be downloaded from GLEIF's website: LEI Data -> GLEIF Data Quality Management -> Supporting Documents -> Data Quality Rule Setting.

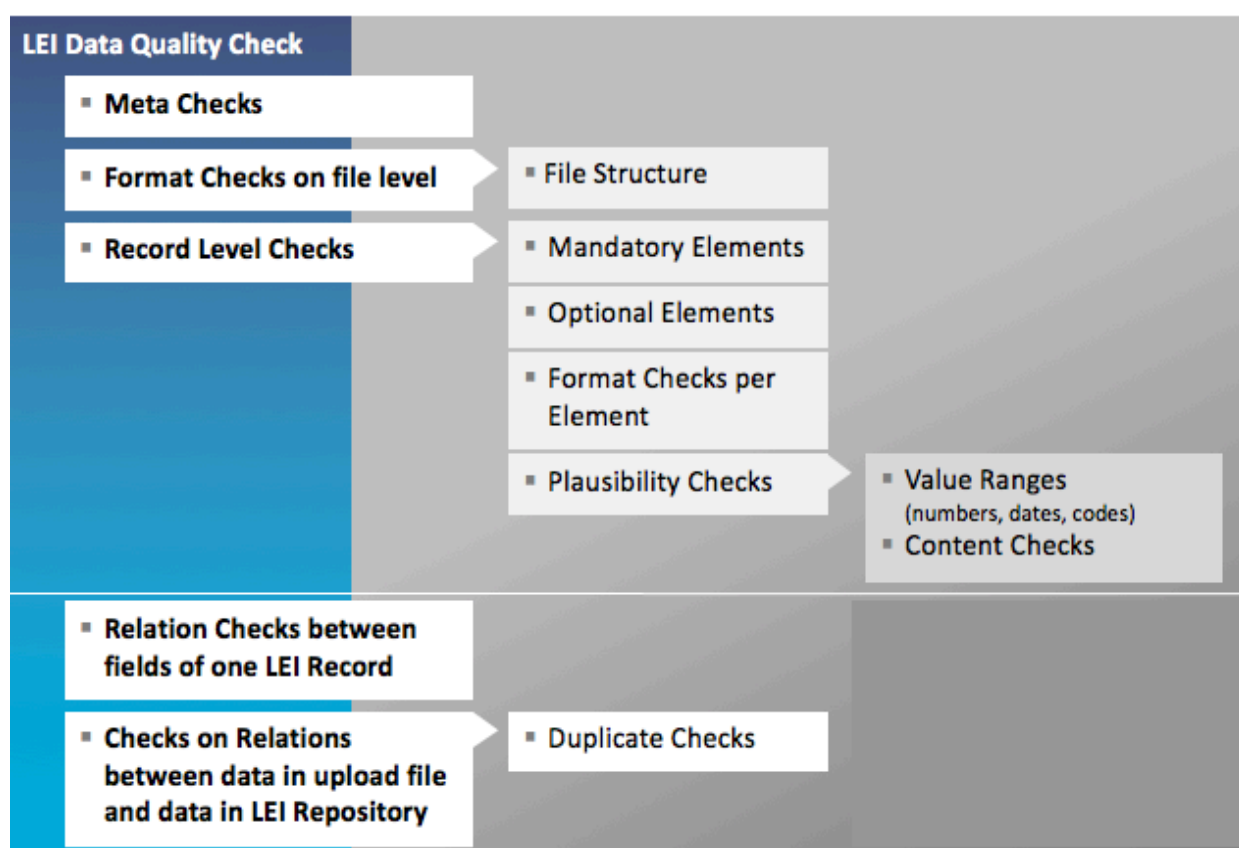


Figure 1 GLEIS's data quality rule setting.

1.4. GLEIS's Maturity Levels

Maturity levels define the evolution of improvements in processes associated with what is measured. Therefore, they are scored differently from data quality criteria: while the scoring rules apply in a similar way, higher maturity levels can only be scored if the previous maturity level is fully achieved.

The following maturity levels apply:

Level 1 – 'Required Quality' (must be 100 percent for all data records).

Level 2 – 'Expected Quality' (should be 100 percent).

Level 3 – 'Excellent Quality' (the higher the better).

2. Chapter 2: Data Quality Score

This chapter describes the Checks and their relationship with the scores they generate. First the 12 data quality criteria are introduced for which individual quality scores are calculated. The total data quality score is the average of these individual scores.

All files are based on the Common Data File format, for each type (LEI Records (LEI-CDF), Relationship Records (RR-CDF) and Exception Records (RepEx)).

GLEIF obtains each of these files daily per LEI Issuer:

- One LEI-CDF file.
- One RR-CDF file.
- One RepEx file.

The first file comprises one or more LEI records, each containing data fields relevant to the Legal Entity (i.e. Legal Name, Address, Country etc.), while the RR and RepEx files contain information on the relationships or reporting exception.

The omission, inclusion or intra- and inter-relationship of fields is evaluated by Checks that yield either 'success'/'not applicable' (1) or 'failure' (0). These results are used to create the monthly Global LEI data quality report.

2.1. General Descriptors

The 12 defined data quality criteria are the measure points for the overall data quality:

Accuracy, Accessibility, Completeness, Comprehensiveness, Consistency, Currency, Integrity, Provenance, Representation, Timeliness, Uniqueness, Validity.

2.2. Conceptual Calculation

The score (Q_s) for every data quality criterion is calculated as follows. Each Check represents only one data quality criterion, regardless of the possible overlap they might have, and each check results into a value of 1 or 0.

Each Check is of type 'If X then Y', where 'X' is described as a 'Check precondition' and 'Y' is the 'Check description'. If a Record, relationship or exception do not fall into the 'Check precondition', this check is 'not applicable'. If it passes the precondition and goes into the description and the value does not fulfil 'Y', the check is a fail (i.e. returns the value of 0).

The general formula for scoring the data quality criteria is the following. Note that this formula is applied either to each 'record' when concerned with the contents of a particular LEI record, relationship or exception (as the checks are record based, meaning they start from the LEI record and move onwards).

$$Q_s = \frac{\sum_{i=1}^I q_i}{I}$$

Equation 1

Where:

- Q_s is the quality score for the respective quality criterion.
- q_i is the i^{th} check result for the respective quality criterion with:

$$q_i = \begin{cases} 1 & \text{if check is "success" or "not applicable"} \\ 0 & \text{if check is "failed"} \end{cases}$$
- I is the total number of data quality checks performed for the respective quality criterion.

Quality criteria scores (Q_s) are the percentages of “successful” and “not applicable” data quality checks in relation to the total number of data quality checks for the respective quality criterion.

An added layer of complexity arises when considering that any particular source file might contain more than one LEI record. A 'Check' is any particular Check that is applied to individual LEI records. To illustrate we assume 10 Record Checks and an LEI Issuer supplying a file with 100 LEI records. This would result in a total of 1,000 checks being performed:

$$(I = 10 \text{ records} * 100 \text{ LEI Records}).$$

Example 1:

In a scenario where only one LEI Issuer exists, which publishes only one LEI record ('record 1' in the table below), this source file is run through 10 'Validity' Checks. This LEI Issuer failed its first and tenth checks (i.e. $q_{1,10} = 0$) and had a 'not applicable' in its 3rd and 7th checks. All other Checks were successful. Note that both non-applicable and successful checks are regarded as positive Checks (i.e. $q_i = 1$). Therefore:

	LEI Issuer
1 st "Check" for Validity for LEI record 1	$q_1 = 0$
2 nd "Check" for Validity for LEI record 1	$q_2 = 1$
3 rd "Check" for Validity for LEI record 1	$q_3 = 1$
4 th "Check" for Validity for LEI record 1	$q_4 = 1$
5 th "Check" for Validity for LEI record 1	$q_5 = 1$
6 th "Check" for Validity for LEI record 1	$q_6 = 1$
7 th "Check" for Validity for LEI record 1	$q_7 = 1$
8 th "Check" for Validity for LEI record 1	$q_8 = 1$
9 th "Check" for Validity for LEI record 1	$q_9 = 1$

	LEI Issuer
10 th "Record Check" for Validity for LEI record 1	$q_{10} = 0$
Total performed Checks	$I = 10$

Table 1 Quality Checks for the first example.

In this scenario, the total number of Checks performed for 'Validity' would be 10 ($I = 10$). In the following equation, this example shows that - as noted earlier - when a Check is considered not applicable, it is counted as a success (to avoid penalizing the score).

According to Equation 1, the quality score for 'Validity' would be the following:

$$Q_s = \frac{\sum_{i=1}^{10} q_i}{10} = \frac{0 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 0}{10} = 0.8$$

Equation 2

In the Global LEI Data Quality Report

In the example referred in the previous formula, this means that in the Data Quality Report, the overall 'Validity' for that month would be 80%:

Data Quality Criteria	Aug	Jul
Accessibility	100.00 %	N/A
Accuracy	100.00 %	99.99 %
Completeness	100.00 %	99.93 %
Comprehensiveness	100.00 %	100.00 %
Consistency	100.00 %	99.93 %
Currency	98.10 %	99.99 %
Integrity	100.00 %	99.99 %
Provenance	100.00 %	N/A
Representation	100.00 %	N/A
Uniqueness	100.00 %	99.99 %
Validity	80.00 %	99.99 %

Figure 2 The Data Quality Criteria per month, and how it is to be found in the report.

In general, quality scores will be presented as percentages. So for example 0.8 will be represented as 80%. A full example of the calculation of the remaining quality criteria will be provided in section 2.6.

The quality scores in the previous formula can apply to a multitude of records with a simple extension.

2.3. Checks

Immediately to the right of the previous screenshot the ‘# Checks’ column is located. This indicates, on a per row basis, the count of checks per quality criterion. As there is no weighting between the checks, this helps to visualize why a particular quality criterion might be over or under represented in the score calculation.

Checks
1
8
3
2
21
1
18
2
2
2
15

Figure 3 The # Checks column, and how it is to be found in the report.

2.4. Failed records

To the right of the previous column, the ‘# Failed Records’ column is located. This column shows the count of records that failed at least 1 check of any particular criterion. Next to the integer number, in parenthesis, is the percentage of records that are failing checks of this particular criterion in relation to the total count of checks performed of this same type.

Failed Records
0 (0 %)
0 (0 %)
0 (0 %)
0 (0 %)
0 (0 %)
19 (1.90 %)
0 (0 %)
0 (0 %)
0 (0 %)
0 (0 %)
200 (20.00 %)

Figure 4 The # Failed Records column, and how it is to be found in the report.

2.5. Top 5 failing checks

Under the ‘Data Quality Heat Map in Covered Countries’, the ‘Top 5 failing checks’ table is located. This table lists those data quality checks that failed most in the reporting month. If there are no failed checks this table will remain empty. If there are less than 5 distinct checks being failed, only the ones being failed will be listed. The key ‘C000XXX’ on the left will list the check number as it is to be found in the current Data Quality Rule Setting document, the document that describes all data quality checks. Next to it, the number of records that failed this check, to the right of that, the number of LEI Issuers that are failing this check for at least one record and finally, to its right, the LEI Issuer/s that fails this check the most in relation to the size of their portfolio.

Top 5 Failing Checks

	# Failed Records	# LEI Issuers	LEI Issuer with highest amount in %
C000153	163,870	9	Major City International Bank Limited
C000245	157,888	47	Bank of China
C000260	50,530	30	Bank of China
C000269	46,546	24	Bank of China
C000249	41,480	13	Bank of China

Figure 5 The # Failed Records table, and how it is to be found in the report.

2.6. LEI Total Data Quality Score

The total data quality score of the data quality criteria takes the average of the individual quality criteria scores (as previously mentioned Q_s). This average is **not** weighted by data quality criteria, meaning that each data quality criteria contributes equally to the total data quality score. The LEI Total Data Quality score (TQ_s) is therefore:

$$TQ_s = \frac{\sum_{s=1}^N Q_s}{N}$$

Equation 3

Where:

- TQ_s is the total data quality score.
- s in the summation is an index representing individual quality criteria.
- Q_s is the quality score for each respective quality criterion.
- N is the number of quality criteria for which there are Checks implemented.

Example 2:

In the following example we assume 11 data quality criteria and 11,000 performed Checks (1,000 checks per criterion). The results of the checks are to be found in the following table:

Criteria	Success	Failure	Not Applicable	Total Checks Performed
Accessibility	1,000	0	0	1,000
Accuracy	1,000	0	0	1,000
Completeness	1,000	0	0	1,000
Comprehensiveness	1,000	0	0	1,000
Consistency	0	0	1,000	1,000
Currency	981	19	0	1,000
Integrity	0	0	1,000	1,000
Provenance	1,000	0	0	1,000
Representation	500	0	500	1,000
Uniqueness	1,000	0	0	1,000
Validity	0	200	800	1,000
Total	7,481	219	3,300	11,000

Table 2 Quality Criteria Checks for the second example.

In this example each quality score, according to Equation 1, is then the following (expressed in percentages):

Criteria	Scores (in percentages)
Accessibility	100.00%
Accuracy	100.00%
Completeness	100.00%
Comprehensiveness	100.00%
Consistency	100.00%
Currency	98.10%

Integrity	100.00%
Provenance	100.00%
Representation	100.00%
Uniqueness	100.00%
Validity	80.00%

Table 3 Quality criteria and scores

For details on calculating the individual quality criteria scores using Equation 1, please refer to Example 1 in Section 2.2.

The total data quality score for this example, according to Equation 3, would be then:

$$TQ_s = \frac{1 + 1 + 1 + 1 + 1 + 0.981 + 1 + 1 + 1 + 1 + 0.80}{11} = 0.9800$$

In the Global LEI Data Quality Report

In the Global LEI Data Quality Report the LEI Total Data Quality Score is shown both in the tachometer (current month, Figure 6, truncating to the first two decimal places) and the trend chart (current and previous months, Figure 7):

LEI Total Data Quality Score

The LEI Total Data Quality Score is calculated as the equal weighted average of the 8 'Data Quality Criteria' listed below.

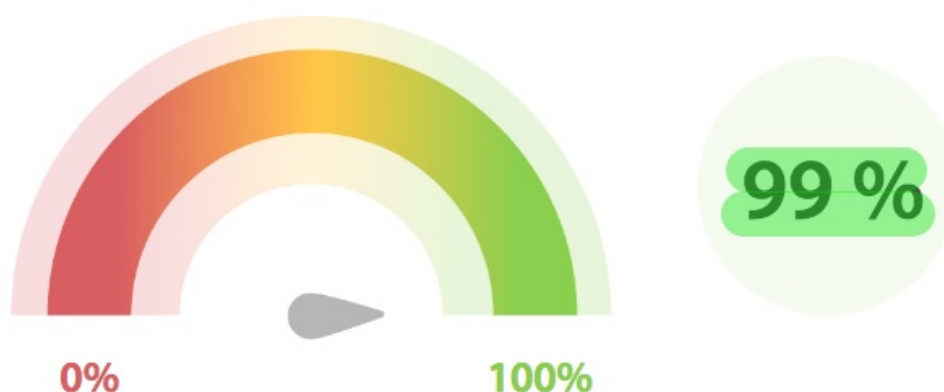


Figure 6 The LEI Total Data Quality Score displayed as a tachometer (for the month referred in the report).

In the LEI Total Data Quality Score Trend, three icons per month will appear. As a blue circle, the LEI Total Data Quality Score will be displayed. As a green triangle, the LEI Issuer that has the highest data quality score based on its own file and as a red triangle, the LEI Issuer with the lowest data quality score. All of these symbols will have their percentage value with two decimals to the left of them.

LEI Total Data Quality Score Trend

Progress achieved with regard to the continuous optimization of the data quality based on the LEI Total Data Quality Score.

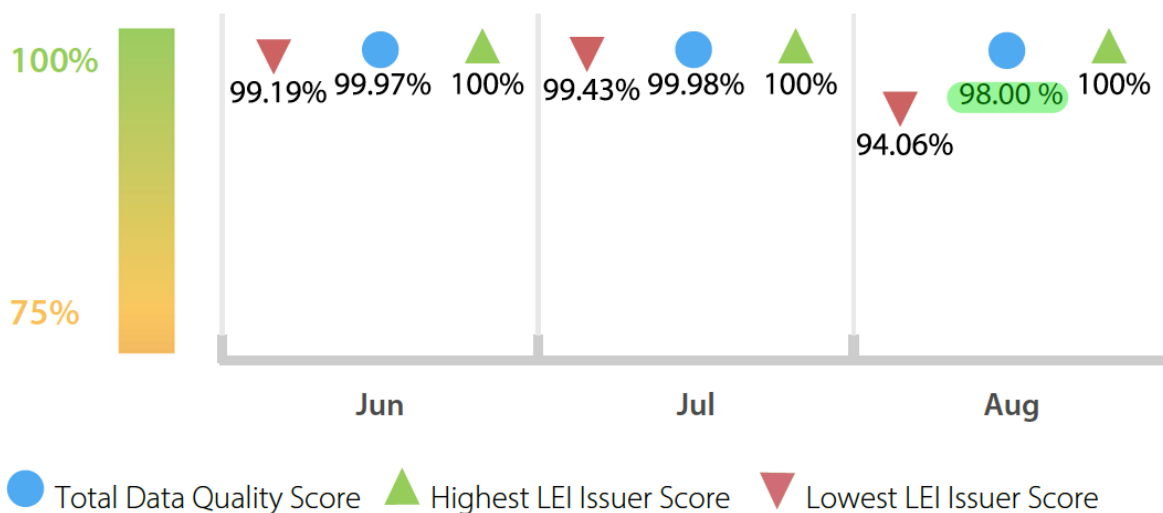


Figure 7 The LEI Total Data Quality Score Trend, where the most current value is also present in the tachometer.

2.7. Data Quality Heat Map in Covered Countries

The quality scores per country based on the Entity.LegalAddress.Country field of the individual LEI records (as per the ISO-3166 standard) .

The colors represented in the heatmap show the overall data quality score achieved by all LEI issuing organizations, which issue LEIs in the country:

Red (equal or less than 90%); orange (above 90% and equal or less than 95%); yellow (above 95% and equal or less than 98%); green (above 98% and equal or less than 100%).

The formula for the calculation of the quality scores for individual countries is similar to the total quality scores, that means, it takes into consideration the average of the quality criteria:

$$TQ_{Country} = \frac{\sum_{i=1}^{N_{Country}} q_{i,Country}}{N_{Country}}$$

Equation 4

Where:

- $TQ_{Country}$ is the total data quality score for a given country.
- $q_{i,Country}$ is the i^{th} check result for a given country:

$$q_{i,Country} = \begin{cases} 1 & \text{if check is "success" or "not applicable"} \\ 0 & \text{if check is "failed"} \end{cases}$$
- $N_{Country}$ is the number of Checks performed for the respective country.

In the LEI Issuer Data Quality Report

The following heatmap shows the coverage of all LEI Issuer with the colors previously described, countries that are not covered are greyed out:

Data Quality Heat Map in Covered Countries

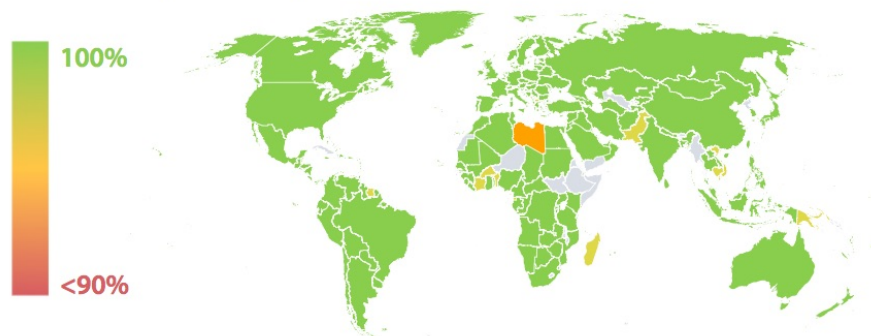


Figure 8 Heatmap.

3. Chapter 3: Quality Maturity Levels

Maturity levels define the evolution of improvements in processes associated with what is measured. Therefore, the total maturity level score is aggregated differently from the total data quality score: while the scoring rules for the individual maturity levels apply in the same fashion, the scores for higher maturity levels will only contribute to the total score if the previous maturity level is fully reached (i.e. 100% score).

The GLEIS maturity level score is reported as a number between 0 and 3, with two decimals. For this, the individual maturity level scores are aggregated, subject to the above rule that a maturity level is only considered if the previous maturity level was fully reached.

As an example, assuming the maturity level scores:

- Maturity level 1: 99%.
- Maturity level 2: 100%.
- Maturity level 3: 100%.

The aggregated score would be 0.99. Note that maturity levels 2 and 3 do not affect the aggregated score, as maturity level 1 is not fully reached. The same example is illustrated in more detail in Example 3.

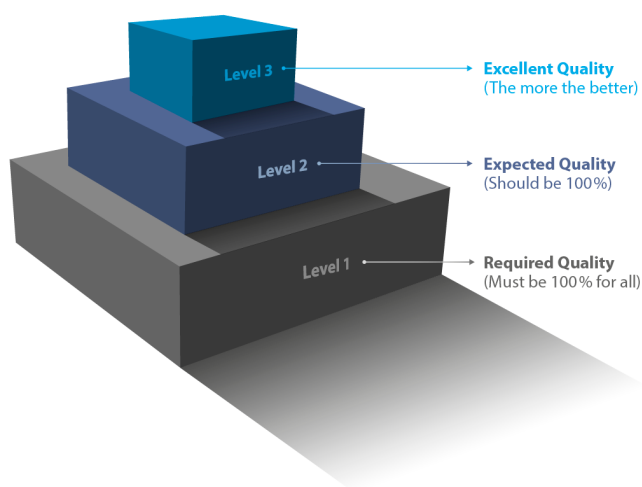


Figure 9 Maturity mode.

General Descriptors

There are 3 maturity levels:

- 1 - Required: This level reflects repeatable success and is achieved when the following data quality checks are attained:
 - all format checks on file level succeed.
 - all record level checks regarding mandatory elements and format checks per element succeed.

- all relation checks between fields of one LEI record succeed.
- 2 - Expected: This level shows the managed success and is reached when the following data quality checks are passed:
 - all record level checks regarding optional elements and plausibility checks succeed.
 - all checks on relations between data in upload file and data in LEI repository succeed.
- 3 - Excellent: The third level is that of optimized success.

The maturity level scores are also calculated based on the source files received by GLEIF. As per before, the GLEIS will get one associated maturity level score as per these calculations, based on the information from these files. The maturity levels are mutually exclusive and non-overlapping. This means that a particular Check can only count for one maturity level.

The general formula for maturity levels is conceptually identical to the one for the quality criteria scores (see Equation 1). The only difference is, that the “grouping” is now based on the maturity levels as opposed to the data quality criteria, as emphasized by the variable names:

$$ML_s = \frac{\sum_{i=1}^I ml_i}{I}$$

Equation 5

Where:

- ML_s is the maturity level score for the particular maturity level.
- ml_i is the i^{th} check result for the particular maturity level with:

$$ml_i = \begin{cases} 1 & \text{if check is "success" or "not applicable"} \\ 0 & \text{if check is "failed"} \end{cases}$$
- I is the number of total checks performed for the respective maturity level.

The numerator in the above formula is essentially the number of successful and non-applicable Checks for the respective maturity level.

In the Global LEI Data Quality Report

Like the LEI Total Data Quality Score, the GLEIS quality maturity level model shows the maturity of the full system during the assessment. The model shows the maturity level as per the assessment at the top (Average maturity level) in a 2 decimal notation. Underneath, the model will also show the ratio of LEI Issuers that achieve any particular maturity level (both as a fraction and as a percentage). Note that achieving one maturity level higher, indicates that also a lower has been achieved.

Quality Maturity Level

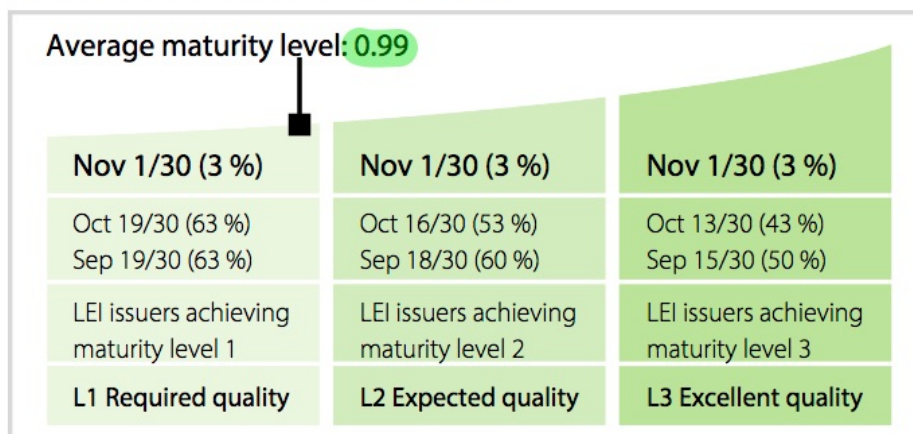


Figure 10 The aggregated Quality Maturity Level score and counts of LEI Issuers achieving the individual maturity levels

Example 3:

This section elaborates on the example in section 2.2 assuming 300 performed Checks. The following table shows the three maturity levels and the hypothetical number of checks associated with the respective maturity level.

Maturity Level	Total Checks Performed
1	100
2	100
3	100
Total	300

Table 4 Example of maturity levels and number of associated checks

The following check results are assumed:

Maturity Level	Success	Failure	Not Applicable	Total Checks Performed
1	99	1	0	100
2	100	0	0	100
3	0	0	100	100
Total	199	1	100	300

Table 5 Extended maturity level scores

The scores for the maturity levels are calculated with Equation 5. In this example, the maturity level score for the 1st level is 99%, as one check is 'Failure', and for the 2nd and 3rd maturity level (although for this last one all checks are 'Non-applicable' and therefore successful, as the score is calculated as 1 – failed checks) the scores are 100%, but will not be considered in the aggregated score as maturity level 1 did not achieve 100% (as stated in chapter 3, paragraph 4). The GLEIS quality maturity level score is thus 0.99.

4. Chapter 4: Statistics

4.1. LEI Totals

The 'Totals' part contains general information about the LEI data. Note that the same restrictions as from section 1.2 apply for every measurement in this section:

- Total LEI records: The count of LEIs present in the Global LEI Index as of the assessment.
- New Issued LEIs: The count of LEIs that entered the Global LEI Index in status ISSUED as per the assessment in the report month.
- Renewed LEIs: The count of LEIs that were set to LAPSED during the report month.
- New lapsed LEIs: The count of LEIs that switched their RegistrationStatus into LAPSED.
- Countries: The number of countries covered by LEIs in the Global LEI Index.
- LEI Issuers: The count of LEI Issuers that submitted at least one file during the assessment period.

In the Global LEI Data Quality Report

The following figure shows any particular Totals table, with the percentage change:

Totals	Values
Total LEI records	803,708 (+16.75 %)
New issued LEIs	113,983 (+14.71 %)
Renewed LEIs	27,678 (-5.94 %)
New lapsed LEIs *	6,776 (+0.75 %)
Countries	212 (+2.41 %)
LEI Issuers	30 (+/-0 %)

Figure 11 GLEIS Totals measurement, with percentage assignment.

Percentage assignment

For this chapter, the values displayed are followed by a number in parenthesis. This percentage assignment represents the change that was measured from the previous assessment to the current assessment. The numbers are positive (+X%) when there is an increase with regards to the previous month, and negative (-X%) when the number decreases. Note that there is no judgement on whether this value is inherently positive or negative, it only shows the change. The percentage assignment is used throughout this chapter.

4.2. Level 2 Info

This table shows the count of LEIs that have ownership relationships to parents with LEIs.

It also shows the count of LEIs that currently report a complete set of parent information (either relationships or exceptions).

Level 2 Info	Values
LEIs with LEI parent relationships	3,228 (> 100 %)
LEIs with complete parent information	2,586 (-12.87 %)

Figure 12 Level 2 info, with percentage assignment.

4.1. Duplicates

Underneath the previous table, the information on Duplicates is to be found:

- Total LEIs marked as duplicate: total number of LEI records in the Global LEI Index with a RegistrationStatus of DUPLICATE.
- Duplicate percentage of total LEI records: total number of LEI records in the Global LEI Index with a RegistrationStatus of DUPLICATE / Total LEI records in the Global LEI Index.
- LEIs marked as duplicate this month: total number of LEI records, whose RegistrationStatus was set to DUPLICATE during the report month.

Duplicates	Values
Total LEIs marked as duplicate **	2,250 (N/A)
Duplicate percentage of total LEI records	< 1 % (N/A)
LEIs marked as duplicate this month	109 (N/A)

Figure 13 Duplicates info, with percentage assignment.

4.2. Challenges

The 'Challenges' table shows a tabular representation of the statistics related to the challenges received by GLEIF's central Challenge facility. Note that any particular LEI could be transferred by the end of the assessment, this would not be taken into account in this section:

- Challenges this month: The challenges that were received by GLEIF during the assessment period.
- Duplicates found this month: Challenges that, after assessment by the LEI Issuer involved (only 1 per challenge), resulted in an Exclusivity/Uniqueness violation via the challenge facility.
- Updates to entity information this month: Challenges that after assessment by the LEI Issuer involved, resulted in an update to the entity information for a particular LEI, via the challenge facility.

In the Global LEI Data Quality Report

The tabular representation of the Challenges, with respective percentage assignments, looks as follows:

Challenges	Values
Challenges this month	113 (-43.50 %)
Duplicates found this month	147 (-23.83 %)
Updates to entity information this month	128 (-20.00 %)

Figure 14 LEI Issuer Challenges with percentage assignments.