**Appendix 2: FAIRsFAIR Data Objects** [**Assessment**](https://docs.google.com/document/d/1q42OjrqZ8VYsSW2Npak4J-00GbxAEm_E/edit#heading=h.650b58vigkl) **Metrics**

The following are metrics for assessing FAIRness of data objects. They are specified following the template below, which was modified from the template originally recommended by Wilkinson et al. (2018).

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| --- | --- |
| **Field** | **Description** |
| Metric Identifier | The local identifier[[1]](#footnote-0) of the metric. |
| Metric Name | The short name of the metric. |
| Metric Description | The definition of the metric, including its examples and supporting details. |
| To which FAIR principle(s) does it apply? | The FAIR principle addressed by the metric. |
| To which CoreTrustSeal requirement(s) does it apply? | The CoreTrustSeal requirements addressed by the metric. One metric may be related to more than one CoreTrustSeal requirement. |
| For which digital resource is this relevant? | The type of digital resource that will be assessed based on the metric, e.g., data or metadata. |
| Manual Assessment (User Question) | The metric question that will be addressed to users. |
| Automatic Assessment | The details on the automatic assessment of the metric, including inputs, methods and outputs. |
| Comments | A list of related resources, constraints and limitations of the proposed assessment. |

1. **Universally Unique Identifier**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-F1-01D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Universally unique identifier | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | The data is assigned with a globally unique identifier such that it can be referenced unambiguously on the Web. In other words, the identifier should be associated with only one dataset at any time. Examples of unique identifiers of data are Uniform Resource Identifier (URI), Digital Object Identifier (DOI), the Handle System, identifiers.org, w3id.org and Archival Resource Key (ARK). We make a distinction between persistence (FsF-F1-02D) and uniqueness of an identifier. An HTTP URL is globally unique, but is not persistent, whereas a DOI is both globally unique and persistent. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
| X | |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | | X | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
| X | | | | | | | | | | | | | | | |  | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the data have a universally unique identifier assigned?   * Yes * No | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Data URI | | | | | | | | Check if the identifier is based on a globally unique identifier scheme. | | | | | | | | | | | | | | * Yes * No   A successful request (Yes) returns one of the following additional results:   * Web address (if a URL is specified) * Unique identifier and the identifier scheme specified.   A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**  The following are examples of sites that list identifier schemes:   * Identifier schema compiled by FAIRsharing from various sources, <https://fairsharing.org/standards/?q=&selected_facets=type_exact:identifier%20schema> * Uniform Resource Identifier (URI) Schemes, <https://www.iana.org/assignments/uri-schemes/uri-schemes.xhtml#uri-schemes-1> * URI examples included in rfc3986, <https://tools.ietf.org/html/rfc3986#section-1.1.2> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Persistent Identifier**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-F1-02D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Persistent identifier | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | The data is assigned with a persistent identifier to ensure the resolvability of the identifier in the long term. The identifier may be resolved to its digital object (e.g., a data file or a web service that returns the data), or to a data proxy (e.g., an online page that contains metadata, including the link to access the data). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
| X | |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | | X | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
| X | | | | | | | | | | | | | | | |  | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the data have a persistent identifier assigned?   * Yes * No | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Data URI | | | | | | | | The identifier is based on a persistent identifier scheme, and it resolves to a web address where the data can be accessed. Verify the identifier resolvability through the HTTP response status codes. | | | | | | | | | | | | | | * Yes * No   A successful request (Yes) returns the following additional results:   * The persistent identifier scheme * The resolved URL   A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**   * A wiki entry on persistent identifier, <https://en.wikipedia.org/wiki/Persistent_identifier>   **Known Limitations/Constraints**   * The automatic assessment verifies the resolvability of the specified identifier, but does not assert the type of the resolved object, e.g., whether the resolved object is landing page, a file or a web service query response. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Descriptive Metadata**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-F2-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Descriptive metadata | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | Metadata is descriptive information of data. Since the metadata required depends on users and their applications, this metric focuses on core metadata, which are the minimum metadata required for data citation and discoverability. We determine the required metadata based on the existing data citation guidelines, e.g., DataCite, ESIP, and IASSIST, and metadata recommendations for data discovery, e.g., DataCite Metadata Schema and RDA Metadata Interest Group. This metric focuses on domain-agnostic core metadata; we address domain or discipline-specific metadata through the metric FsF-R1-01M. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | | F4 | | A1 | | A1.1 | | A1.2 | | A2 | | | | I1 | | I2 | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | | X | |  | | |  | |  | |  | |  | |  | | | |  | |  | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | | R4 | | R5 | | R6 | | R7 | | R8 | | | | R9 | | R10 | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | | |  | |  | |  | |  | |  | | | |  | |  | |  | | |  | | x | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Are metadata elements provided to support data discovery and citation (e.g., creator, title, data identifier, publisher, publication date/year, summary/keywords describing the data)?   * Not provided * Partially provided * Completely provided | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | **Assessment Method** | | | | | | | | | | | **Output** | | | | | | | | | | | | | | | | | | |
| * Name/URL of the metadata standard * URL of the machine-readable metadata document | | | | | | Use the metadata standard name/URL to identify elements (fields) representing core metadata in the standard. Verify presence/absence of the elements in the metadata document. | | | | | | | | | | | * No * Yes, partial metadata * Yes, all metadata   A successful request (Yes) returns metadata url, and the key-value pairs of the analyzed metadata elements.  A failed request (No) returns an error message. | | | | | | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**  The following sites list examples of metadata standards for data:   * <https://fairsharing.org/standards/> * <http://rd-alliance.github.io/metadata-directory/standards/> * <http://www.dcc.ac.uk/resources/metadata-standards/list>   **Known Limitations/Constraints**   * The URLs (metadata standard and metadata document) provided by the user might be broken or not accessible (e.g., proprietary standard). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Inclusion of Data Identifier in Metadata**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-F3-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Inclusion of data identifier in metadata | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | The metadata includes the identifier of the data such that users can access the data through the metadata. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | | X | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | | X | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the metadata include the data identifier?   * Yes * No | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Data URI * Name/URL of the metadata standard * URL of the machine-readable metadata document | | | | | | | | Verify the presence/absence of the data identifier through metadata element(s). For example, the metadata element ‘identifier’ may be used to represent data identifier in the Datacite Metadata Schema v4.  Check if it is active (or web-resolvable) | | | | | | | | | | | | | | * Yes * No   A successful request (Yes) returns the following additional results:   * The metadata element and its value (data URI), and its status.   A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Known Limitations/Constraints**   * It might be possible that the user specifies the URL of a data landing page instead of the URI of the data in the metadata document. * A metadata standard may include various elements (fields) through which a data URI may be specified. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Searchable Metadata**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-F4-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Searchable metadata | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | This metric refers to various ways through which the metadata of data is exposed or offered in a machine-readable format. For example, metadata may be offered through a general or domain/discipline specific metadata registry. It may be embedded as structured data (e.g., schema.org implementation) on a data page for use by web search engines such as Google and Bing. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | | X | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | | X | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Is the metadata offered in such a way that it can be harvested?   * Metadata is not offered * Metadata is offered through a metadata registry, e.g., general-purpose, domain/discipline specific or institutional registries * Metadata is offered as structured data on the data page for use by a web search engine | | | | | | | | | | | | | | | | | | | | | | | | | Conditional multiple-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Data URI * Query URL of the metadata registry for retrieving the machine-readable metadata document. | | | | | | | | Resolve the data URI and test the structured data on the data landing page  Test if the query URL returns the metadata of the data | | | | | | | | | | | | | | * No * Yes, metadata registry * Yes, structured data   A successful request (Yes) returns the metadata elements used in testing (e.g., title, author) and their values.  A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Known Limitations/Constraints**   * In order to verify that the metadata is findable through a web search engine, we should perform a search through a web search engine API based on the data identifier and its descriptive metadata. However, most of the web search engine APIs (e.g., Google Custom Search, Bing Web Search API) offer a limited number of free search queries. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Data Access Level**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-A1-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Data access level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | This metric determines if the metadata includes the level of access to the data such as public, embargoed, restricted, or closed (metadata only) access. Public data are openly accessible, e.g., through FTP/HTTP-based direct download. Embargoed access refers to data that will become openly available after a specific date. For example, a data author may release their data after having published their findings from the data. Access to restricted data is limited, e.g. because of commercial, sensitive, or other confidentiality reasons or the data are only accessible via a subscription or a fee. Restricted data may be available to a particular group of users or after permission is granted. For embargoed access, the date the data will be made publicly available should be specified in the metadata. For restricted data, the metadata should include the conditions of access to the data (e.g., point of contact or instructions to access the data). This metric is related to the data usage licence metric (FsF-R1.1-01M). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | | X | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | | X | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the metadata include a statement on the level of access to the data?   * Yes * No   If yes, select the level of access to the data   * Public access * Embargoed access * Restricted access * Metadata only access * None of the above   (One of the following questions will be addressed to the user if the user selects ‘Embargoed access’ or ‘Restricted access’)  If the data is embargoed, does the metadata include the date the data will be released publically?   * Yes * No   If access to the data is restricted, does the metadata include access conditions, e.g., point of contact or instructions to access the data?   * Yes * No | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Name/URL of the metadata standard * URL of the machine-readable metadata document | | | | | | | | Verify the presence/absence of data access level through metadata element(s). If it is embargoed data, check if the embargo end date is specified. If it is restricted data, check if the data access conditions are specified. | | | | | | | | | | | | | | The response returns the access level of data, and related metadata (if the data is embargoed or restricted data).  If no access level is specified in the metadata, it returns ‘not found’. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**   * **Creative Commons License, <https://creativecommons.org/share-your-work/licensing-examples/>** * **EU Vocabulary on access rights: <https://op.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/access-right>** * Open Digital Rights Language (ODRL) Information Model 2.2, <https://www.w3.org/TR/odrl-model/> * COAR Controlled Vocabulary for Access Rights,<http://vocabularies.coar-repositories.org/documentation/access_rights/> * Archival Access Rights Vocabulary,<http://sandbox.metadataregistry.org/concept/list/vocabulary_id/251.html> * Eprints AccessRights Vocabulary Encoding Scheme, <http://www.ukoln.ac.uk/repositories/digirep/index/Eprints_AccessRights_Vocabulary_Encoding_Scheme>   **Known Limitations/Constraints**   * The metadata standard used may not include elements for representing access levels and conditions. * The access level information may be expressed in an unstructured manner, e.g., as a ‘comment’ in the metadata document. * This assessment should be complemented with the evaluation on the data access mechanism based on the specified access rights, e.g., data is not accessible, data is accessible semi-automatically (mediated access to data via data custodian) or automatically. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Metadata Preservation**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-A2-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Metadata preservation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | Metadata should be preserved even when the data they represent are no longer available or lost. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | |  | |  | |  | | X | | |  | |  | | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | | X | | |  | | |  | |  | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Is there a statement indicating that the metadata remains available once the dataset becomes unavailable?   * Yes * No | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * The URL of the metadata preservation document | | | | | | | | Check if the document URL returns a web resource through HTTP response status codes. | | | | | | | | | | | | | | * Accessible over the web * Not accessible over the web | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Known Limitations/Constraints**   * Continued access to metadata depends on a data repository‘s preservation practice which is usually documented in the repository’s service policies or statements. The automatic assessment checks the accessibility of the document. Future assessment of the metric should also consider the machine readability of the document. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Semantic Representation of Metadata**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-I1-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Semantic representation of metadata | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | To make metadata more understandable to humans and machines, they are described with semantic vocabularies. Ontology, thesaurus, taxonomy are kinds of semantic vocabularies, and they come with different degrees of expressiveness, structure, and inferential power. Metadata may use semantic vocabularies in various ways. For example, semantic vocabularies may be embedded as controlled vocabularies in the metadata or the metadata web page (e.g., microformats and RDFa or JSON-LD). Metadata may also be published as linked data using semantic vocabularies. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | |  | |  | |  | |  | | | X | |  | | |  | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | | X | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the metadata use any semantic vocabularies (e.g., ontologies, thesauri, taxonomies)?   * No * Yes, semantic vocabularies embedded in the metadata * Yes, metadata is published as linked data using semantic vocabularies | | | | | | | | | | | | | | | | | | | | | | | | | Conditional multiple-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Metadata URI, if it resolves to a metadata page * URL to access the machine-readable metadata document | | | | | | | | Resolve the metadata URI and extract structured data from the metadata page  Check the content type of the return header of the metadata document, e.g., application/rdf+xml  or application/ld+json  Check if rdf or json documents can be retrieved by content negotiation (accept header) | | | | | | | | | | | | | | * No * Yes, embedded vocabularies. * Yes, linked data.   A successful request (Yes) returns the serialization format of the metadata.  A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**   * A list of content types are available athttps://www.iana.org/assignments/media-types/media-types.xhtml   **Known Limitations/Constraints**   * The automatic assessment checks the presence of the structured data in the metadata document, not their contents, e.g., if the vocabularies used are in appropriate context and accessible over the web. * RDF data can be expressed in a number of different ways, e.g., RDF/XML, Turtle, RDFa and RDF/JSON. Therefore, different serialization formats should be considered as part of the automatic assessment. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Qualified References to Related Entities**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-I3-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Qualified references to related entities | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | Linking data to its related entities will increase its FAIRness, and the linking information should be captured as part of the metadata. A rich research graph (e.g., PID graph) can be formed by aggregating the entities connections from different data providers. A data object may be linked to its prior version, other datasets in the same data collection, related publications, source (instrument), data creators or collectors and organization (e.g., funder and hosting institution). Qualified references refer to the meaningful links between data and its related entities expressed through relation types. It is also essential to test if the URL of the related entities are active. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | | X | | |  | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | | X | | |  | |  | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the metadata include qualified references (links) between the data and its related entities?   * Yes * No | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * URL of the machine-readable metadata document | | | | | | | | Check the metadata elements which indicate the relationship between data and related entities.  Check if the URL of the related entity is active. | | | | | | | | | | | | | | * Yes * No   A successful request (Yes) returns the URL and type of the related entities and their status (active, not active).  A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**   * The DataCite Metadata Schema specifies relation types between research entities, https://schema.datacite.org/meta/kernel-4.3/include/datacite-relationType-v4.xsd   **Known Limitations/Constraints**   * Different metadata schemas may use different properties to specify the relation between data and its related entities. * The automatic assessment regards any relation between a data and its related entities as success. It does not consider the number or types of relations. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Community-Driven Metadata**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-R1-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Community-driven metadata | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | In addition to core metadata required to support data citation and discovery (FsF-F2-01M), metadata to support data reusability should be made available following community metadata standards. Community metadata standards may exhibit different levels of readiness. Some communities have well-established metadata standards, e.g., geospatial (19115), biodiversity (DarwinCore, ABCD, EML), social science (DDI). In contrast, others, including new domains, may have limited or standards that are under development, e.g., engineering and linguistics. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | | X | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | | X | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the metadata meet a community-endorsed standard?   * Yes * No * Standard unknown/unavailable | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Subject area * URL of the metadata standard * URL of the machine-readable metadata document that meets the specified standard | | | | | | | | Based on the specified subject area, verify if the specified metadata standard is listed as one of the community-endorsed standards from a metadata registry.  Use namespace elements and attributes to test if the metadata document is formatted based on the standard. | | | | | | | | | | | | | | * Yes * No * Standard unknown   A successful request (Yes) returns the URL of the community standard.  A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**  Examples of the community metadata standards and their status are available at FAIRSharing (https://fairsharing.org/standards/) and RDA Metadata Directory (<http://rd-alliance.github.io/metadata-directory/subjects/>).  **Known Limitations/Constraints**   * Metadata completeness is conditioned by the best practices and metadata standards within a given discipline or domain. Future evaluation of the metric should also consider metadata completeness, i.e., the degree to which the metadata are specified based on a standard of the data domain. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Data Content Description**

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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-R1-02M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Data content description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | This metric evaluates if the content descriptions specified in the metadata conform with the actual data. Examples of content descriptions are variables measured, methods, structure, MIME type, and size. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | | X | |  | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | | X | | |  | |  | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Do the content descriptions specified in the metadata conform with the data?   * Content description not specified * Fully conformed * Somewhat conformed * Not conformed | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Name/URL of the metadata standard * URL of the machine-readable metadata document * Data URI | | | | | | | | Verify the presence/absence of metadata elements representing content description of the data. If the related metadata are specified, retrieve the data and identify its properties such as size and media type (MIME).  Compare the metadata values with the data properties values. | | | | | | | | | | | | | | * No content descriptions * Yes * No   A successful request (Yes) returns the key-value pairs of media type and size.  A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**   * Model for Tabular Data and Metadata on the Web, https://www.w3.org/TR/tabular-data-model/   **Known Limitations/Constraints**   * The automatic assessment is limited to the evaluation of the size and media type of the data. Other data content descriptions (e.g., method, variable measured) cannot be assessed programmatically due to the challenge of parsing different types of data, and unstructured content descriptions included in a data file. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Data Usage License**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-R1.1-01M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Data Usage Licence | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | In general, all data should be licensed because otherwise, users cannot easily reuse them in a legally sound way. This includes standard (e.g., Creative Commons) or bespoke licenses, and rights statement which indicate the conditions under which data can be reused. It is highly recommended to use a standard, machine-readable license such that it can be interpreted by machines and humans. In order to inform users about what rights they have to use a dataset, the license information should be specified as part of the dataset’s metadata. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | | X | |  | |  | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  | X | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | |  | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Does the metadata include licence information under which the data can be reused?   * Yes * No * Not applicable | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * URL of the metadata standard * URL of the machine-readable metadata document | | | | | | | | Verify the presence/absence of licence information through metadata element(s).  If a license URL is provided, test if it is active.  Using the provided metadata, search a licence registry to determine if the license specified is free and open source. | | | | | | | | | | | | | | * Yes * No   A successful request (Yes) returns the status of the licence (active, not active), and additional information retrieved from the licence registry (e.g., free and open source), if applicable.  A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**   * A list of commonly used licences is available at the SPDX License (<https://spdx.org/licenses/>). * Rights statements of cultural heritage objects, https://rightsstatements.org/page/1.0/?language=en   **Known Limitations/Constraints**   * The automatic assessment checks if the licence information provided as part of the metadata. It does not validate if the specified licence is the most appropriate licence for the data. * In some cases, a data author may specify a brief contact information to convey permission to use his data. This method is insufficient, unless the information point to the location of the license or rights statement. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. **Standard File Format**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Field** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Identifier | FsF-R1.3-01D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Name | Standard file format | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metric Description | File formats refer to methods for encoding digital information. For example, CSV for tabular data, NetCDF for multidimensional data and GeoTIFF for raster imagery. Data should be made available in a standard file format that is accepted by the research community to enable data sharing and reuse. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To which FAIR principle(s) does it apply? | F1 | | F2 | | F3 | | F4 | | | A1 | | A1.1 | | A1.2 | | A2 | | | I1 | | I2 | | | I3 | | | R1 | | R1.1 | | R1.2 | | R1.3 | |
|  | |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | | X | |
| To which CoreTrustSeal requirement(s) does it apply? | R1 | R2 | | R3 | | R4 | | | R5 | | R6 | | R7 | | R8 | | | R9 | | R10 | | | R11 | | | R12 | | R13 | | R14 | | R15 | | R16 |
|  |  | |  | |  | | |  | |  | |  | |  | | |  | |  | | |  | | |  | |  | |  | | X | |  |
| For which digital resource is this relevant? | **Data** | | | | | | | | | | | | | | | | **Metadata** | | | | | | | | | | | | | | | | | |
| X | | | | | | | | | | | | | | | |  | | | | | | | | | | | | | | | | | |
| **Manual Assessment (User Question)** | | | | | | | | | | | | | | | | | | | | | | | | | **Question Type** | | | | | | | | | |
| Is the data available in a standard file format?   * Yes * No | | | | | | | | | | | | | | | | | | | | | | | | | Single-choice question | | | | | | | | | |
| **Automatic Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Input** | | | | | | | | **Assessment Method** | | | | | | | | | | | | | | **Output** | | | | | | | | | | | | | |
| * Data URI | | | | | | | | Retrieve media type of the resource from the header of HTTP response. Verify if the specified format is listed in a file format registry. | | | | | | | | | | | | | | * Yes * No   A successful request (Yes) returns the media type.  A failed request (No) returns an error message. | | | | | | | | | | | | | |
| **Comments** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Resources**   * A list of common media types, <https://www.iana.org/assignments/media-types/media-types.xhtml> * Examples of recommended file formats based on data types, <https://www.ukdataservice.ac.uk/manage-data/format/recommended-formats.aspx> * Public file format registry, <https://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=new> * List of open formats, https://en.wikipedia.org/wiki/List\_of\_open\_formats   **Known Limitations/Constraints**   * The file formats recommended by the community of the data should be determined prior to testing the metric. * A data URI may resolve to a compressed file (\*.zip) which contains actual data files. The compressed file should be extracted to identify the actual file format. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. The identifiers should be registered with globally unique identifiers when the metrics are finalized and implemented. [↑](#footnote-ref-0)