

# Metrics and assessing FAIRness

Preliminary information gathered by workshop participants

Monday 21<sup>st</sup> November, 16.00-17.30

Theme/Workshop Chair: Mike Priddy, DANS  
 Rapporteur: Maaïke Verburg, DANS

**Context:** Agreed sets of metrics should be implemented and monitored to track changes in the FAIRness of data sets or data-related resources over time. In this respect, the development of FAIR Compliant tools and services should meet the needs of data producers and users.

## Recommendations assessed during the session:

- Recommendation 1: Provide researchers with metrics and tools to measure the adoption of the FAIR principles for research outputs

## Relevant EOSC-A Task Forces

- [EOSC Task Force on FAIR Metrics and Data Quality](#)

## Useful references

- [EOSC Multi-Annual Roadmap \(2023-2024\)](#).
- [Turning FAIR into Reality report Rec. n 23 and 25](#)
- [Recommendation for a FAIR EOSC: White paper, Rec. n7](#)

## Preliminary questions

1. What does your project or initiative do to implement metrics? Please provide any relevant links.	2
2. If your project, initiative, community or institution use tools to assess the FAIRness of datasets which do you use?	6
3. Are you aware of tools and metrics that are used to assess software FAIRness and are you utilising them in your project or initiative?	12
4. Are you aware of tools and metrics that are used to assess semantic artefacts FAIRness and are you utilising them in your project or initiative?	14
5. People who contributed to the preliminary information gathered	16

## 1. What does your project or initiative do to implement metrics? Please provide any relevant links.

Project	Input
<b>Life in Kyrgyzstan Study</b>	I am involved in the panel survey study called "Life in Kyrgyzstan" ( <a href="http://www.lifeinkyrgyzstan.org">www.lifeinkyrgyzstan.org</a> ; the LiK Study). It is a research-based, open access, multi-topic longitudinal survey of households and individuals in Kyrgyzstan. The LiK Study makes the panel dataset available for public access and this has resulted in the wide use of the LiK Study for academic research. By sharing the data, we make the data FAIR in some aspects, but not in all. For example, the metadata and documentation are basic, not comprehensive.
<b>CESSDA</b>	I am a member of EOSC A TF FAIR metrics and data quality that has explored issues related to the governance of FAIR evaluations, examined the inconsistencies between FAIR evaluation tools, and evaluate the applicability and uptake of FAIR metrics.
<b>OpenAIRE</b>	OpenAIRE has a FAIR Assessor that is developed according to the RDA FAIR Maturity Model indicators and is embedded in the Metadata Validator service to check FAIRness of metadata of content providers. OpenAIRE implements metrics for the core monitoring services that it offers to the Open Science academic and research community: a. MONITOR with tailored dashboards for funders, institutions, and b. Open Science Observatory measuring Open Science maturity per country.
<b>Open Biological and Biomedical Ontologies Foundry</b>	Not very much. The community has developed various tools related to FAIR metrics, albeit not named as such: <a href="https://obofoundry.org/resources">https://obofoundry.org/resources</a> (Ontology Analysis section).
<b>EOSC-A Long Term Data Preservation task force</b>	We will liaise with TF FAIR Metrics and Data Quality to include preservation specific requirements concerning FAIR metrics The recommendations made in the FAIR Forever study are relevant here, especially: <ul style="list-style-type: none"> <li>• Map approaches maturity modelling within EOSC so they are consistent with preservation maturity models such as DPC Rapid Assessment Model (RAM)</li> <li>• Contributing to ongoing CoreTrustSeal+FAIR preservation work for alignment of repository certification schemas with FAIR</li> <li>• Test FAIR metrics in digital preservation and research data management communities</li> </ul>
<b>EuroScienceGateway</b>	We are planning to work on automatic metrics generation. Then we plan to expose those on <a href="https://stats.galaxyproject.eu">https://stats.galaxyproject.eu</a> and subsites.



Project	Input
<b>AgroPortal</b>	We have developed the most complete FAIRness assessment methodology and tool dedicated to semantic artefacts called O'FAIRe. This metrics contains 61 questions (metrics) aligned with the 15 FAIR principles "adapted" for semantic artefacts.
<b>FOOPS!</b>	Automated Vocabulary and ontology FAIR assessment tool. ( <a href="https://w3id.org/foops/">https://w3id.org/foops/</a> ). The tool provides a lightweight assessment against each of the FAIR principles through a series of tests.
<b>LifeWatch Italy, the National Hub for biodiversity and ecosystem data and research products</b>	Currently, we do not implement metrics on our platforms. We are realising the new version of our data portal and a brand new metadata catalogue in which a FAIRness assessment tool for the different resources gathered (e.g. data, code, services, workflows, semantic artefacts) will be implemented/integrated considering what is already available (foreseen release date: August 2023).
<b>TRIPLE</b>	We do not implement them at the moment, but FAIR principles are implemented on our platform and we plan to use FAIR metrics in the future.
<b>OpenAIRE</b>	<p>We are currently building the new Metadata Validator service where, simultaneously with validating the repository's compliance to OpenAIRE guidelines it will validate the FAIRness of the repository's metadata. The service will be offered as a standalone for everyone to validate their repository's metadata or individual/specific number of records and it will also be incorporated to the PROVIDE Dashboard service of OpenAIRE.</p> <p>Additionally, OpenAIRE implements metrics via the OpenAIRE MONITOR service for the core monitoring services that it offers to the Open Science academic and research community: a. MONITOR, an on-demand service with tailor-made data and visualization monitoring dashboards for institutions, funders and research initiatives, populated with well-rounded, timely and accurate monitoring indicators of research activities, and b. Open Science Observatory measuring Open Science maturity per country. At the MONITOR service, inside the dashboards one sub-topic offers indicators and metrics on the FAIRness of the research output of the organisations. Please have a look at the public dashboards of EC: <a href="https://monitor.openaire.eu/dashboard/ec/open-science/publications/fairness">https://monitor.openaire.eu/dashboard/ec/open-science/publications/fairness</a> and University of Goettingen: <a href="https://monitor.openaire.eu/dashboard/gau/open-science/publications/fairness">https://monitor.openaire.eu/dashboard/gau/open-science/publications/fairness</a></p>
<b>LifeWatch ERIC</b>	We have used the FAIR Implementation Profile Wizard to create FIPs for the ERIC for the years 2020 and 2021, which can serve as an internal assessment of the FAIRness of our

Project	Input
	(meta)data and tools. We did this as participants in the ENVRI FAIR project.
<b>EOSC Task Force FAIR Metrics and Data Quality</b>	As member of the EOSC Task Force FAIR Metrics and Data Quality I have contributed to 2 (EOSC Association-approved) documents: (i) on FAIR Metrics Governance, and (ii) the Apples2Apples specification for the harmonization of FAIR assessment tools.
<b>ENVRI-FAIR</b>	In ENVRI-FAIR the FAIRness of the repositories of the participating RIs was and will be assessed repeatedly by creating FAIR implementation profiles (FIPs).
<b>Blue Cloud</b>	<p>Blue Cloud provides an environment for BDIs to share their individual experiences with FAIR data and their different dataflows. Previous Blue Cloud was focused on the federation of multiple BDIs, whereas BC2026 will try to harmonize the different BDIs by coordinating web services, improving BDI APIs and try to achieve a common functionality regarding semantics.</p> <p>An example individual experience for SeaDataNet covers a historic cycle towards achieving FAIRness that entails many years and cycles and is not achieved in one or two years or by one or two FAIR tools. A cycle starts with let's say around 1000 data collection units, which supply data towards 100 data centers that each apply validation processes within their own databases. From the data centers a standard EU exchange format is applied on the data and metadata that are then used in services such as EMODnet where precision and quality is very important. This increases the demand for richer metadata and further quality control. Using these advancements the cycle starts over with a bottom-up approach starting at the data collection units to try and implement these top-down FAIR requirements.</p>
<b>FAIRtracks (also part of EuroScienceGateway)</b>	We are developing a minimal metadata exchange standard for genomic track files, which are condensed data files which are routinely generated as part of genomic datasets. We have implemented a validator to assess conformance of metadata submissions, but have not yet formally assessed the standard itself. We are interested in knowledge about relevant metrics
<b>WorldFAIR</b>	We are using FAIR Implementation Profiles to understand the current state of practice in a set of 11 case studies. This is more of an enquiry and self-assessment than a metric as such, but the FIP approach, and the related tool is worth mentioning.
<b>ELIXIR / RO-Crate</b>	FAIRsharing's spin off <a href="https://fairassist.org/#/">https://fairassist.org/#/</a> is an elixir resource. Each of our datasets have their own curation pipelines. FAIRCookbook <a href="https://faircookbook.elixir-europe.org/">https://faircookbook.elixir-europe.org/</a> and RDMkit <a href="https://rdmkit.elixir-europe.org/">https://rdmkit.elixir-europe.org/</a>

Project	Input
	offer guidelines for FAIR for all objects. Data Stewardship Wizard also has FAIR evaluation metrics associated with the DMPs <a href="https://ds-wizard.org/">https://ds-wizard.org/</a> . the FAIRplus project of ELIXIR has developed a FAIRification methodology and a maturity model. FAIRsharing support the registration of FAIRMetrics. W ELIXIR has criteria for CDR and DD services <a href="https://elixir-europe.org/platforms/data">https://elixir-europe.org/platforms/data</a> . Guidelines here <a href="https://elixir-europe.org/what-we-offer/guidelines">https://elixir-europe.org/what-we-offer/guidelines</a>
<b>CLARIN ERIC</b>	<a href="https://curation.clarin.eu/">https://curation.clarin.eu/</a> - curation dashboard to check metadata schemas, instances and links to resources
<b>DICE/EUDAT</b>	We do not implement any metric at the moment
<b>FAIR-EASE</b>	nothing done yet, but specific task dedicated to assessing the FAIRness of digital resources used and produced by the project (Earth-system research community). Plan to use FAIRsFAIR metrics and F-UJI regarding fairness assessment of data. Possible collaboration with FAIR IMPACT on this regard.
<b>Odatis - Ocean data hub of the French RI Data Terra</b>	Don't know if this is relevant to this Synchronisation Force, as this is not at european or EOSC level, but in the framework of a French project, the different marine data centers composing the Odatis French data hub have used FDMM criteria and proposed methodology ( <a href="https://doi.org/10.15497/rda00050">https://doi.org/10.15497/rda00050</a> ) to "assess" the level of FAIRness of the data they offer. And are planning to define a FIP as well.
<b>QUAREP-Limi (Quality Assessment and Reproducibility for Instruments &amp; Images in Light Microscopy)</b>	See figure 1 for an illustration of the "tiers" concept for how detailed the metadata for an imaging dataset has been captured. These guidelines have not yet been built into a generally accessible tool, but that is planned.
<b>Charité Dashboard on Responsible Research</b>	<u><a href="#">Institutional FAIR data assessment and dashboard based on FAIR data assessment with F-UJI</a></u>
<b>TRIPLE</b>	We follow the FAIR principles but don't implement FAIR metrics yet (planned)
<b>NFDI</b>	We currently have 19 funded consortia running from all kinds of different research communities. All of them apply the FAIR principles. In addition we have 4 sections working on cross-cutting topics including technical infrastructure as well as meta data and provenance.
<b>FAIROs</b>	Our tool assess the FAIRness of research objects, which is composed by an aggregation of resources. Depending on the nature of the resource (data, software, etc.), our tool applies different external tools/modules to assess the FAIRness. Finally, it aggregates all the results. Paper:



Project	Input
	<a href="https://link.springer.com/chapter/10.1007/978-3-031-16802-4_6">https://link.springer.com/chapter/10.1007/978-3-031-16802-4_6</a>
<b>EGA</b>	We have a script that extracts metadata registrations stats once a week and updated the webpage (publicly available here and here). This stats also takes into account information about community, growth and bibliography. Finally, webwise, we currently use Google analytics.
<b>FAIRsharing (RDA FAIRsharing WG)</b>	FAIRsharing provides manually-curated, high quality resource (standards, databases, data policy) metadata, incl metric indicators. Users and third-party tools (e.g. the FAIR Evaluator, DSW) make use of our metadata to implement metrics and for FAIR evaluation/assessment and for repository discovery and comparison. See our documentation.
<b>European Landscape Study</b>	The project was meant to get a lanscape overview of the implementatino of FAIR practices and metrics
<b>EOSC4Cancer</b>	Project is meant to make different types of cancer data FAIR across countries in the EU. Project just started but follow FAIR principles. We haven't implement any metrics yet.
<b>FAIR Dataset Maturity Model (FAIR-DSM)</b>	<a href="https://fairplus.github.io/Data-Maturity/">https://fairplus.github.io/Data-Maturity/</a>

## 2. If your project, initiative, community or institution use tools to assess the FAIRness of datasets which do you use?

Project or initiative	Input
<b>Life in Kyrgyzstan Study</b>	We strive to do so in the future, but not comprehensively at the moment.
<b>CESSDA</b>	- CESSDA is using F-UJI to assess CESSDA Data Catalogue metadata.
<b>OpenAIRE</b>	OpenAIRE VALIDATOR: <a href="http://catalogue.openaire.eu/service/openaire.validator/overview">http://catalogue.openaire.eu/service/openaire.validator/overview</a> OpenAIRE MONITOR: <a href="http://catalogue.openaire.eu/service/openaire.funder_dashboard/overview">http://catalogue.openaire.eu/service/openaire.funder_dashboard/overview</a> Open Science Observatory: <a href="http://catalogue.openaire.eu/service/openaire.open_science_observatory/overview">http://catalogue.openaire.eu/service/openaire.open_science_observatory/overview</a>
<b>Open Biological and Biomedical Ontologies Foundry</b>	<a href="https://reusabledata.org/">https://reusabledata.org/</a>
<b>EOSC-A Long Term Data Preservation task force</b>	Aware of F-UJI Automated FAIR Data Assessment Tool but not implemented by the initiative



Project or initiative	Input
<b>AgroPortal</b>	Yes, in our case datasets are semantic artefacts (set of semantic concepts). AgroPortal now relies on O'FAIRe to automatically assess the level of semantic artefact hosted in the semantic artefact catalogue.
<b>FOOPS!</b>	We are in the process of creating a benchmark for FAIR semantic artifacts
<b>LifeWatch Italy, the National Hub for biodiversity and ecosystem data and research products</b>	For now we only produce a manual assessment of the minimum requirements needed for the resource to be published, i.e. rich and open metadata, use of controlled vocabularies, quality check of the resource. We are analysing the existing tools which will be used in our new data portal.
<b>TRIPLE</b>	I'm aware of various tools. Tested only FAIR checker and F-UJI.
<b>OpenAIRE</b>	We are going to use our custom built tool for assessing the FAIRness of the datasets.
<b>LifeWatch ERIC</b>	The FIP Wizard ( <a href="https://fip-wizard.ds-wizard.org/">https://fip-wizard.ds-wizard.org/</a> ) was used during the ENVRI FAIR project.
<b>EOSC Task Force FAIR Metrics and Data Quality</b>	FAIR Evaluator mainly, but also tested others.
<b>ENVRI-FAIR</b>	For the creation of the FIPs the FIP Wizard ( <a href="https://fip-wizard.ds-wizard.org/">https://fip-wizard.ds-wizard.org/</a> ) is used which was also developed within ENVRI-FAIR in collaboration with the GO FAIR Foundation.
<b>Blue Cloud</b>	SeaDataNet and Argo have used FIPs to assess their FAIRness: For the creation of the FIPs the FIP Wizard ( <a href="https://fip-wizard.ds-wizard.org/">https://fip-wizard.ds-wizard.org/</a> ) was used
<b>FAIRtracks (also part of EuroScienceGateway)</b>	FAIRtracks validator, which extends JSON Schema validator with validation of identifiers, ontology terms and intra-dataset references
<b>WorldFAIR</b>	The topic of study for WorldFAIR, at this stage, is less the datasets as such than the practices of the community.
<b>ELIXIR / RO-Crate</b>	ELIXIR has 150+ data resources that have gone through a selection process by the nodes, <a href="https://elixir-europe.org/platforms/data">https://elixir-europe.org/platforms/data</a> a subset of which have undergone a rigorous review to be "core data resources" or "deposition databases". This includes many elements of FAIR, but does not assess FAIR per se. The ELIXIR FAIRplus project has developed a FAIR maturity model, FAIRification process ( <a href="https://faircookbook.elixir-europe.org/">https://faircookbook.elixir-europe.org/</a> ) and FAIR Wizard that we plan to roll out. RDMkit ( <a href="https://rdmkit.elixir-europe.org/">https://rdmkit.elixir-europe.org/</a> ) and Data Stewardship Wizard embed FAIR into the RDM lifecycle and emphasise assistance rather than assessment.
<b>CLARIN ERIC</b>	yes, see <a href="http://curation.clarin.eu">curation.clarin.eu</a>

Project or initiative	Input
<b>DICE/EUDAT</b>	Nothing yet in production but some of the communities that are using B2SHARE have been testing recently F-UJI
<b>FAIR-EASE</b>	nothing done yet, but specific task dedicated to assessing the FAIRness of digital resources used and produced by the project (Earth-system research community). Plan to use FAIRsFAIR metrics and F-UJI regarding fairness assessment of data. Possible collaboration with FAIR IMPACT on this regard.
<b>QUAREP-LiMi (Quality Assessment and Reproducibility for Instruments &amp; Images in Light Microscopy)</b>	The current toolset focuses on "validation" of the FAIR Data Objects defined by the community (e.g. validator example) The guidelines represented by Quarep and others in the community need integrating.
<b>Charité Dashboard on Responsible Research</b>	F-UJI
<b>TRIPLE</b>	we plan to use <a href="https://fair-checker.france-bioinformatique.fr/check">https://fair-checker.france-bioinformatique.fr/check</a> (TBC)
<b>FAIROs</b>	1) datasets= F-UJI, 2) ontologies = FOOPS, 3) research object = custom module
<b>EGA</b>	We are still discussing which tool to use, or whether we should create our custom built tool
<b>FAIRsharing (RDA FAIRsharing WG)</b>	Many tools to assess FAIRness utilise our FAIRsharing API to get metadata they need to assess FAIRness. As a project, we chose to provide this information to any interested party for tool development rather than assessing FAIRness ourselves. For instance, the FAIR Evaluator uses the FAIRsharing API as well as a number of others. We also maintain fairassist.org which provides a list of such tools.
<b>European Landscape Study</b>	In this study. the F-UJI assessment tool was used to evaluate almost 8000 datasets from 31 repositories throughout Europe, to present a snapshot overview of the European landscape at that time (Links: <a href="https://data.europa.eu/doi/10.2777/3648">https://data.europa.eu/doi/10.2777/3648</a> and <a href="https://zenodo.org/communities/erdl21/?page=1&amp;size=20">https://zenodo.org/communities/erdl21/?page=1&amp;size=20</a> )
<b>FAIR Dataset Maturity Model (FAIR-DSM)</b>	We developed a dedicated tool to assess datasets against the FAIR-DSM model. <a href="https://fairdsm.biospeak.solutions/">https://fairdsm.biospeak.solutions/</a>

## 2.a. What successes and challenges in using the tool have you discovered?



Project or initiative	Input
<b>LifeWatch ERIC</b>	It was a very good step towards FAIR assessment. For an ERIC, it was not clear whether the best way to create a FIP was as a collection of all resources used by all the national nodes or if the highest-level of the infrastructure was to be represented. We went the first way, but perhaps separate FIPs for each national node and one only at the ERIC-level could have given a clearer idea of the current situation.
<b>EOSC Task Force FAIR Metrics and Data Quality</b>	Different tools give different results
<b>ELIXIR / RO-Crate</b>	we did have a study in 2019 looking at the FAIRness of our Core Data Resources ( <a href="https://direct.mit.edu/dint/article/2/1-2/285/10015/Considerations-for-the-Conduction-and">https://direct.mit.edu/dint/article/2/1-2/285/10015/Considerations-for-the-Conduction-and</a> ). Issues that arose include variable and mismatched interpretations of what FAIR is, inconsistent ways to access metadata and insensitive and naive handling of the challenges of production data set provision
<b>CLARIN ERIC</b>	aggregated information is sometimes difficult to interpret, often requires deeper inspection
<b>QUAREP-LiMi (Quality Assessment and Reproducibility for Instruments &amp; Images in Light Microscopy)</b>	At the level of validation, the primary challenge is helping users to understand what they have done wrong in constructing their datasets. This will inevitably become more difficult as the more abstract concepts of FAIR are introduced.
<b>FAIROs</b>	The most important challenge was how to aggregate all the results produced by each resource of the research object. It can be done in different ways. We concluded that the score is not the most important result, the explanation and the provenance is more important for users
<b>European Landscape Study</b>	This study emphasised that FAIR assessment results should not be interpreted in isolation, but always in consultation with the repository. The aim of the use of such a tool is to improve the score if possible. We also found that a lot of metadata about repositories is difficult to aggregate accurately, as it often depends on self-proclaimed information that can be outdated (e.g., re3data).
<b>FAIR Dataset Maturity Model (FAIR-DSM)</b>	<u>In FAIRplus we have used this maturity assessment approach to guide and assess FAIRification activities carried out for more than 20 IMI projects. <a href="https://fairplus-project.eu/impact/kpi-dashboard">https://fairplus-project.eu/impact/kpi-dashboard</a></u>

## 2.b. Have you experienced any limitations in their usage?

Project or initiative	Input
LifeWatch ERIC	The results returned by the SPARQL queries were not always complete, but it's been several months since we last used the wizard, so this may have already been fixed.
ENVRI-FAIR	Interoperability is often achieved by providing mappings into other standards. This is not covered in the FIPs.
<a href="#">FAIRtracks (also part of EuroScienceGateway)</a>	Validators typically provide a valid/invalid result for a dataset submission (with more details of course). It might not help the user that much in the process of how to get to a valid result
CLARIN ERIC	certain metrics require a bit of technical know-how
FAIROs	Yes, when the resources of the research object are not published in a repository. Also, the number of metrics for software is low
FAIR Dataset Maturity Model (FAIR-DSM)	The model is targetted towards data stewards so it puts forwards some assumptions that general users would find a bit more challenging to follow

## 2.c. What suggestions do you have to improve the tools and /or their usage?

Project or initiative	Input
EOSC Task Force FAIR Metrics and Data Quality	The EOSC TF's Apples2Apples spec and document shows the possible solutions we should work towards
FAIRtracks (also part of EuroScienceGateway)	In the context of metadata transformation, we have positive experience with a strategy to parse/map metadata in steps to comply with increasingly more structured requirements
ELIXIR / RO-Crate	See the Apples to Apples work and that of the EOSC-A FAIR Metrics TF to harmonise how to access metadata <a href="https://docs.google.com/document/d/1bSGbZHpmVNV CWDNPC1DSJS7pMoc7FaWM20k5K6Exzio/edit#heading=h.yeuj19lorui7">https://docs.google.com/document/d/1bSGbZHpmVNV CWDNPC1DSJS7pMoc7FaWM20k5K6Exzio/edit#heading=h.yeuj19lorui7</a>
CLARIN ERIC	see <a href="https://github.com/clarin-eric/curation-dashboard/issues">https://github.com/clarin-eric/curation-dashboard/issues</a>
QUAREP-LiMi (Quality Assessment and Reproducibility for Instruments & Images in Light Microscopy)	As a relative outsider, it's unclear how to "plug in" domain-specific guidelines into existing FAIR checks to not need to re-implement assessment from the ground up.

Project or initiative	Input
<b>FAIROs</b>	Increase the number of metrics for software assessment
<b>FAIRsharing (RDA FAIRsharing WG)</b>	To contact FAIRsharing if any tool has any questions about how to access our API to get access to our resource metadata
<b>European Landscape Study</b>	Consultation together with the use of the tool. Snapshot impressions like this are not what the tools were designed for and are not what they should be interpreted for

### 2.d. Have undertaken comparative analysis between the tools available for FAIR data assessment and is documentation available?

Project or initiative	Input
<b>LifeWatch Italy, the National Hub for biodiversity and ecosystem data and research products</b>	In progress
<b>LifeWatch ERIC</b>	No, but we expect that some sort of comparative analysis will become available through the FAIR IMPACT project.
<b>EOSC Task Force FAIR Metrics and Data Quality</b>	yes but informally, since the difference is due to the fact that it is like comparing apples to orange
<b>CLARIN ERIC</b>	Yes, we looked around (eg talked to Europeana) and found specific functionality (eg scalable link checking) lacking
<b>TRIPLE</b>	no, should do
<b>FAIRsharing (RDA FAIRsharing WG)</b>	<u>FAIRsharing is core in the Hackathon for FAIR assessment tools ("Apples to Apples Hackathon") by the EOSC Task Force on FAIR Metrics, which is working directly in this area. More info is here and here.</u>
<b>European Landscape Study</b>	Yes, a subset of datasets were also assessed in the FAIR-Enough assessment tool, documentation can be found in the report linked in column J

### 2.e. Is your project, initiative or community developing a tool or set of metrics for research data assessment and if so, why?

Project or initiative	Input
<b>OpenAIRE</b>	No

Project or initiative	Input
<b>LifeWatch ERIC</b>	<a href="https://faircookbook.elixir-europe.org/content/recipes/maturity.html?highlight=dsm">https://faircookbook.elixir-europe.org/content/recipes/maturity.html?highlight=dsm</a>
<b>Blue Cloud</b>	<u>No, but we are developing a generic and scalable Python library for assisting users to transform/map metadata from one schema to another (see also 2c)</u>
<b>WorldFAIR</b>	Our core data resources / deposition databases assessment includes elements of FAIR. The FAIRplus outcomes (see 2.) we plan to roll out across ELIXIR. work has begun on FAIR assessment of RO-Crates, in partnership with RELIANCE project
	<u>Yes, although mostly for metadata and th accessibility of data - because we need it for regular assessments of our centres</u>
<b>Odatis - Ocean data hub of the French RI Data Terra</b>	Yes, please see the previous points.
<b>Charité Dashboard on Responsible Research</b>	no
<b>OntoCommons</b>	No, we use F-UJI to assess datasets
<b>FAIROs</b>	na
<b>EGA</b>	<u>As a project, we chose to provide this information to any assessment/evaluation tool rather than assessing FAIRness ourselves. However, we also maintain fairassist.org which provides a list of such tools.</u>
<b>FAIRsharing (RDA FAIRsharing WG)</b>	No.

### 3. Are you aware of tools and metrics that are used to assess software FAIRness and are you utilising them in your project or initiative?

Project or initiative	Input
<b>Life in Kyrgyzstan Study</b>	No, not aware.
<b>CESSDA</b>	No.
<b>OpenAIRE</b>	Yes, we are involved in the EOSC-A FAIR Metrics and Data Quality TF and have been contributing to Hackathons along other FAIR assessors/assessing tools and other activities that promote community discussions and alignment.
<b>Open Biological and Biomedical Ontologies Foundry</b>	We are aware and we do not use them at the moment.

Project or initiative	Input
<b>EOSC-A Long Term Data Preservation task force</b>	No
<b>EuroScienceGateway</b>	OpenEBench and we have OpenEBench linked from within Galaxy tools.
<b>AgroPortal</b>	No, except codemeta to describe software metadata.
<b>LifeWatch Italy, the National Hub for biodiversity and ecosystem data and research products</b>	Not currently in use but we are analyzing several existing initiatives related to FAIR Research Software: <a href="https://www.fair-software.eu/">https://www.fair-software.eu/</a> ; <a href="https://workflows.community/groups/fair/">https://workflows.community/groups/fair/</a> ; <a href="https://faircookbook.elixir-europe.org/content/recipes/assessing-fairness/fair-assessment-fairshake.html">https://faircookbook.elixir-europe.org/content/recipes/assessing-fairness/fair-assessment-fairshake.html</a> ; <a href="https://docs.nih-cfde.org/en/latest/the-fair-cookbook/content/recipes/Compliance/fair-api/">https://docs.nih-cfde.org/en/latest/the-fair-cookbook/content/recipes/Compliance/fair-api/</a>
<b>TRIPLE</b>	Not using them
<b>OpenAIRE</b>	Yes we are aware of tools and metrics used and we are taking into account several if them while building our service For metrics we based our tool on the RDA's FAIRness data maturity model and the FAIRsFAIR Data Object Assessment Metrics..
<b>LifeWatch ERIC</b>	No, but we'd be interested to know if those existing may be suitable to assess services, which is one of the most important types of resources in our ERIC.
<b>EOSC Task Force FAIR Metrics and Data Quality</b>	See list at <a href="https://fairassist.org">https://fairassist.org</a>
<b>ENVRI-FAIR</b>	FAIRsFAIR assessment report on FAIRness of software <a href="https://zenodo.org/record/4095092#.Y3sttXbMJ D8">https://zenodo.org/record/4095092#.Y3sttXbMJ D8</a>
<b>Blue Cloud</b>	We are aware of the 10 rules to make Vocabularies FAIR and the FAIR Semantics Recommendations papers but really not any tools
<b><u>FAIRtracks (also part of EuroScienceGateway)</u></b>	We are aware of tools and metrics to assess software FAIRness are developed within the context of ELIXIR, but have not utilized them.
<b>WorldFAIR</b>	Yes, no.
<b>ELIXIR / RO-Crate</b>	Yes. We have FAIR Workflows and FAIR software too, following FAIR4RS and a metadata framework for workflow registration in <a href="https://www.workflowhub.org/">WorkflowHub.org</a> .
<b>DICE/EUDAT</b>	no
<b><u>FAIR-EASE</u></b>	nothing done yet, but specific task dedicated to assessing the FAIRness of digital resources used and produced by the project (Earth-system research community). Will study FAIR4RS criteria and FAIR4VRE

Project or initiative	Input
	WG outputs. FAIR IMPACT work on this type of DO will be very useful as well.
<b>TRIPLE</b>	i'm aware but not utilizing
<b>FAIROs</b>	We are aware of some tools like howfaris and somef. We plan to use somef to extract metadata from README files to assess the reusability principles.
<b>EGA</b>	We are aware of some tools, but we are not utilising them (yet)
<b>FAIRsharing (RDA FAIRsharing WG)</b>	<u>We are aware of FAIR4RS</u> as part of the RDA, and the <u>RSE</u> community, both of which are good resources to further explore.

#### 4. Are you aware of tools and metrics that are used to assess semantic artefacts FAIRness and are you utilising them in your project or initiative?

Project or initiative	Input
<b>Life in Kyrgyzstan Study</b>	No, not aware.
<b>CESSDA</b>	No.
<b>Open Biological and Biomedical Ontologies Foundry</b>	<u>We use the OBO Dashboard for assessing ontology FAIRNESS:</u> <a href="http://dashboard.obofoundry.org/dashboard/index.html">http://dashboard.obofoundry.org/dashboard/index.html</a>
<b>EOSC-A Long Term Data Preservation task force</b>	No
<b>AgroPortal</b>	Same that question #2. The other tool available for semantic artefact is FOOPS developed by UPM. Other relevant studies are described in the related work section of : <a href="https://hal.archives-ouvertes.fr/lirmm-03630233">https://hal.archives-ouvertes.fr/lirmm-03630233</a>
<b>FOOPS!</b>	Related paper: <a href="https://foops.linkeddata.es/assets/iswc_2021_demo.pdf">https://foops.linkeddata.es/assets/iswc_2021_demo.pdf</a>
<b>LifeWatch Italy, the National Hub for biodiversity and ecosystem data and research products</b>	O'FAIRe: Ontology FAIRness evaluator and we will integrate in EcoPortal repository ( <a href="https://ecoportal.lifewatch.eu/">https://ecoportal.lifewatch.eu/</a> ) for semantic artefacts for the ecological domain and metadated on the LifeWatch ERIC metadata catalogue <a href="https://metadatalogue.lifewatch.eu/srv/eng/catalog.search#/home">https://metadatalogue.lifewatch.eu/srv/eng/catalog.search#/home</a>
<b>TRIPLE</b>	Not using them
<b>LifeWatch ERIC</b>	We are aware of O'FAIRe, which we'll work to incorporate in EcoPortal over the course of FAIR IMPACT.
<b>EOSC Task Force FAIR Metrics and Data Quality</b>	<a href="https://fairassist.org">See list at https://fairassist.org</a>

Project or initiative	Input
<b>ENVRI-FAIR</b>	FAIRsFAIR report D2.5 FAIR Semantics Recommendations <a href="https://zenodo.org/record/4314321#.Y3suYnbMJD8">https://zenodo.org/record/4314321#.Y3suYnbMJD8</a> and Cox SJD, Gonzalez-Beltran AN, Magagna B, Marinescu M-C (2021) Ten simple rules for making a vocabulary FAIR. PLoS Comput Biol 17(6): e1009041. <a href="https://doi.org/10.1371/journal.pcbi.1009041">https://doi.org/10.1371/journal.pcbi.1009041</a>
<b><u>FAIRtracks (also part of EuroScienceGateway)</u></b>	We are making use of Identifiers.org to <u>validate</u> PIDs and Ontology Lookup Service to validate ontology terms. We also used FAIRsharing to (informally) assess the quality of ontologies. Interested in learning about other approaches
<b>WorldFAIR</b>	<u>Not so much a tool or metric, strictly speaking, but a lot of the case studies are looking at the recommendations in Cox et al.</u> <a href="https://doi.org/10.1371/journal.pcbi.1009041">https://doi.org/10.1371/journal.pcbi.1009041</a>
<b>ELIXIR / RO-Crate</b>	<u>Yes.</u> <a href="https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1009041">https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1009041</a> and <a href="https://ceur-ws.org/Vol-3127/paper-15.pdf">https://ceur-ws.org/Vol-3127/paper-15.pdf</a> (Features of a FAIR vocabulary)
<b>CLARIN ERIC</b>	<u>Yes, see Concepts section of e.g.</u> <a href="https://curation.clarin.eu/profile/clarin_eu_cr1_p_1357720977507.html">https://curation.clarin.eu/profile/clarin_eu_cr1_p_1357720977507.html</a>
<b>DICE/EUDAT</b>	no
<b><u>FAIR-EASE</u></b>	nothing done yet, but specific task dedicated to assessing the FAIRness of semantic artefacts used and produced by the project (Earth-system research community). Plan to use O'FAIRe regarding fairness assessment of Semantic Artefacts.
<b>TRIPLE</b>	not aware
<b>OntoCommons</b>	Yes
<b>FAIROs</b>	Yes. In fact we use FOOPS to assess ontologies
<b>EGA</b>	We are aware of some tools, but we are not utilising them (yet)
<b>FAIRsharing (RDA FAIRsharing WG)</b>	no

#### 4.a Is your project, initiative or infrastructure developing a tool or metrics?

Project or initiative	Input
<b>LifeWatch Italy, the National Hub for biodiversity and ecosystem data and research products</b>	No
<b>WorldFAIR</b>	One of the outputs of WorldFAIR, based on the findings from the FIPs exercise and the work of the case studies,

Project or initiative	Input
	will be a set of recommendations for more domain-sensitive FAIR assessment. We have no intention to build a tool, but we hope to make useful and evidence-based recommendations to guide communities in good practice, and thereby enrich and target recommendations for FAIR assessment of those communities.
<b>ELIXIR / RO-Crate</b>	no
<b>TRIPLE</b>	na
<b>OntoCommons</b>	We developed simple metrics for SA based on FAIR Semantics recommendations
<b>FAIROs</b>	No, we are end users of FOOPS

#### 4.b What successes and challenges in using the tool have you discovered?

Project or initiative	Input
<b>LifeWatch ERIC</b>	Metadata alignment is required for the tool to be operable in EcoPortal, which is not a trivial task. There is also some worrying about publicly indicating semantic artefacts as less or more FAIR than others and what the purpose of such public indication might that be.
<b>OntoCommons</b>	The metrics were developed as a series of simple questions.
<b>FAIROs</b>	We have integrated FOOPS in our tool

#### 4.c Have you experienced any limitations in their usage?

Project or initiative	Input
<b>FAIRtracks (also part of EuroScienceGateway)</b>	FAIRsharing: Assessing the quality of ontologies was helped by browsing the FAIRsharing records, especially the endorsements. However, in the end, it was a manual process. Could this process be improved?
<b>OntoCommons</b>	Evaluation is manual.
<b>FAIROs</b>	Not for the moment

### 5. People who contributed to the preliminary information gathered

Project or initiative	Name	Surname	Affiliation	Country
Life in Kyrgyzstan Study	Damir	Esenaliev	Leibniz Institute of Vegetable and Ornamental Crops (IGZ)	Germany



Project or initiative	Name	Surname	Affiliation	Country
CESSDA	Mari	Kleemola	Tampere University	Finland
OpenAIRE	Elli	Papadopoulou	ATHENA RC / OpenAIRE	Greece
Open Biological and Biomedical Ontologies Foundry	Nicolas	Matentzoglou	Semanticly	Greece
EOSC-A Long Term Data Preservation task force	Roxanne	Wyns	KU Leuven	Belgium
EuroScienceGateway	Bjoern	Gruening	Uni-Freiburg	Germany
AgroPortal	Clement	Jonquet	INRAE	France
FOOPS!	Daniel	Garijo	UPM	Spain
LifeWatch Italy	Ilaria	Rosati	National research Council	Italy
TRIPLE	Arnaud	Gingold	OPERAS-Aix Marseille University	France
The project of French national catalogue of individual health data collections (FReSH, for France Recherche en Santé Humaine) is currently in preparation phase	Baudoin	Lesya	Inserm	France
OpenAIRE	Leonidas	Pispiringas	OpenAIRE	Greece
LifeWatch ERIC	Xeni	Kechagioglou	LifeWatch ERIC	EU
EOSC Task Force FAIR Metrics and Data Quality	Susanna-Assunta	Sansone	ELIXIR Interoperability Platform co-lead	EU
ENVRI-FAIR	Katrin	Seemeyer	Forschungszentrum Juelich	Germany
Blue Cloud	Alexandra	Kokkinaki	NOC-BODC, Blue Cloud	United Kingdom
<a href="#">FAIRtracks (also part of EuroScienceGateway)</a>	Sveinung	Gundersen	ELIXIR Norway, University of Oslo	Norway
WorldFAIR	Ari	ASMI	RDA Association (EU)	Finland
WorldFAIR	Simon	Hodson	CODATA	France
ELIXIR / RO-Crate	Carole	Goble	UNIMAN	UK (and Europe)
	Hiba	Djebabria	INRAE	ALgeria

Project or initiative	Name	Surname	Affiliation	Country
CLARIN ERIC	Dieter	Van Uytvanck	CLARIN ERIC	NL
DICE/EUDAT	Debora	Testi	CINECA	Italy
<a href="#">FAIR-EASE</a>	Marine	Vernet	Data Terra RI	France
<a href="#">Odatis - Ocean data hub of the French RI Data Terra</a>	Marine	Vernet	Data Terra RI	France
<a href="#">QUAREP-LiMi (Quality Assessment and Reproducibility for Instruments &amp; Images in Light Microscopy)</a>	Josh	Moore	NFDI4BIOIMAGE	Germany
Charité Dashboard on Responsible Research	Jan	Taubitz	BIH QUEST Center for Responsible Research at Charité - Universitätsmedizin Berlin	Germany
TRIPLE	Arnaud	Gingold	OPERAS-AMU	Belgium/France
ISIDORe / By-COVID	Romain	David	ERINHA	Belgium administratively
FAIR DO Forum	Christophe	Blanchi	DONA Foundation	Switzerland
<a href="#">NFDI</a>	York	Sure-Vetter	National Research Data Infrastructure (NFDI)	Germany
OntoCommons	Yann	Le Franc	e-Science Data Factory	France
FAIROs	Daniel & Esteban	Garijo & Gonzalez	UPM	Spain
EGA	Aina	Jene	CRG	Spain
FAIRsharing (RDA FAIRsharing WG)	Allyson	Lister	University of Oxford	UK
European Landscape Study	Maaïke	Verburg	DANS	Netherlands
EOSC4Cancer	Sergi	Aguiló	BSC	Spain
FAIR Dataset Maturity Model (FAIR-DSM)	Ibrahim	Emam	Imperial College	UK