Norsk institutt for luftforskning
Norwegian Institute for Air Research

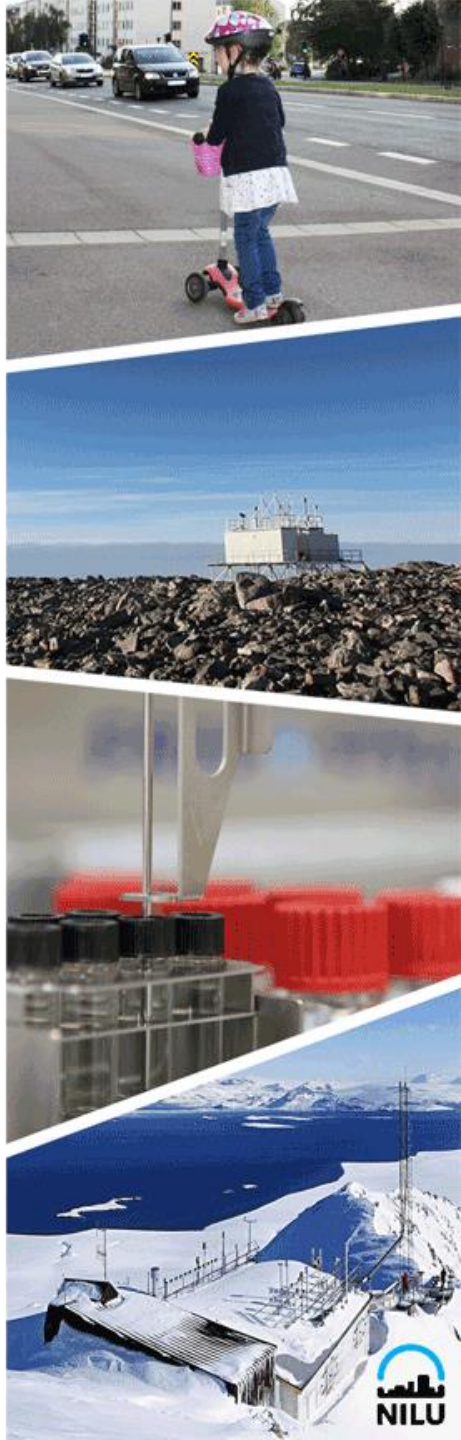
FAIRness Assessment

Experiences and tools from the ENVRI-FAIR community

Richard Rud

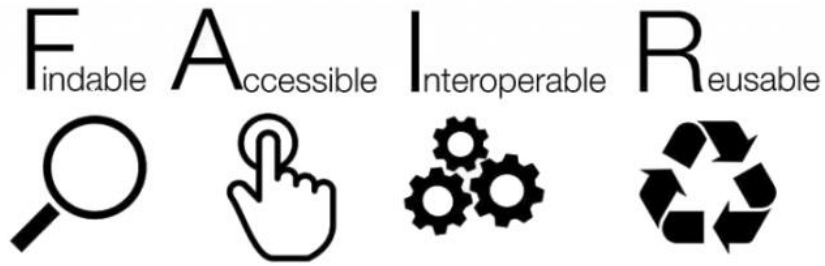
Norwegian Institute for Air Research

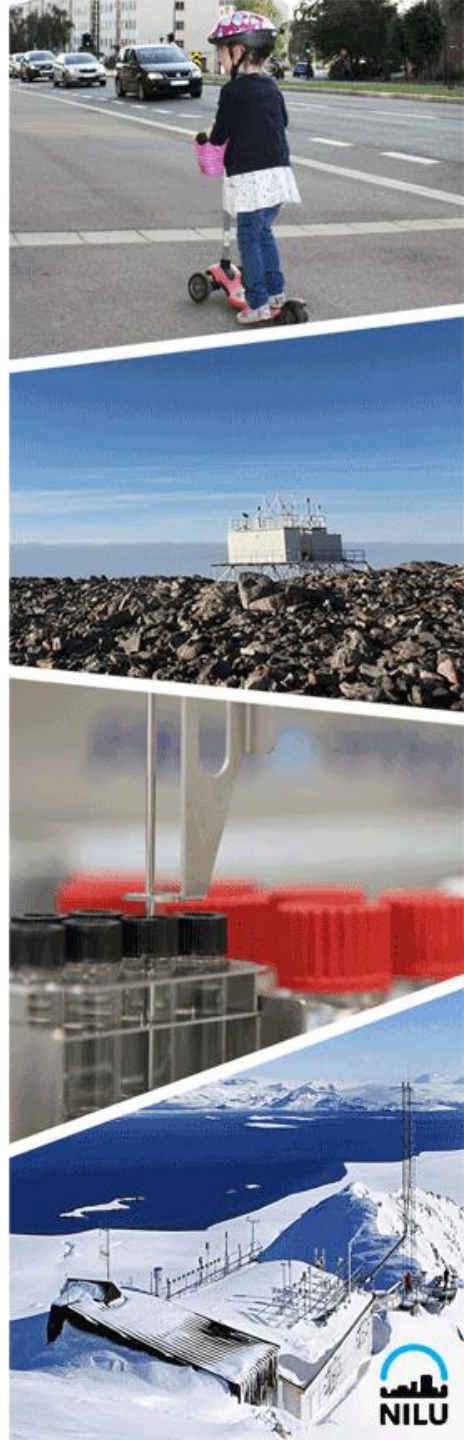
LIFE IS NOT FAIR
OUR DATA IS
ENVRI
FAIR
WWW.ENVRI.EU



Outline

1. Introduction
2. What is ENVRI-FAIR
3. NILUs role in ENVRI-FAIR
4. FAIR and FAIR evaluation
5. Results from the ENVRI-FAIRness Assessment
6. Final Remarks

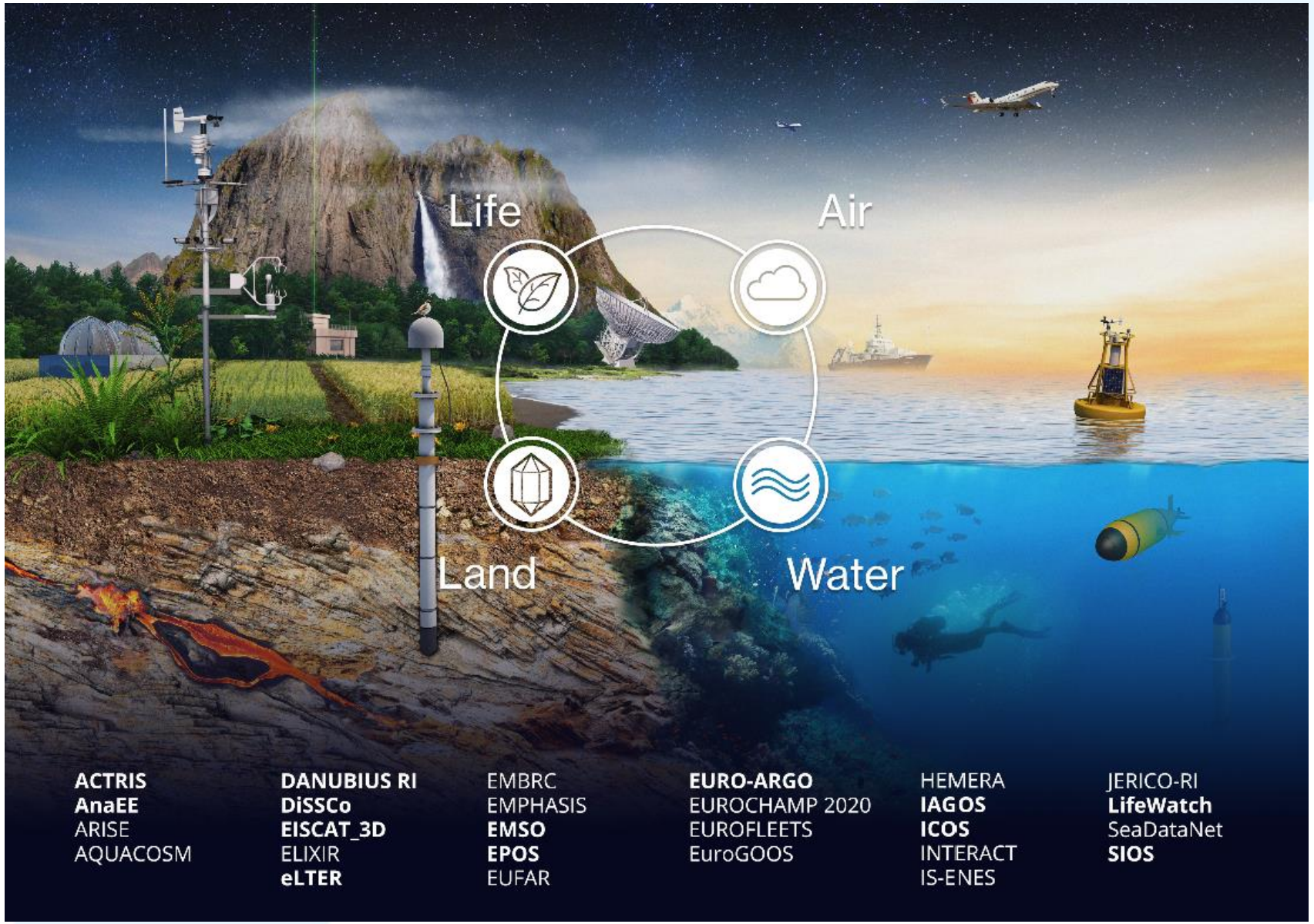




1. Introduction

- We see increasing volumes of data that will need machine actionability, moving away from human intervention when handling and processing the data
- Currently a strong push by the EU commision, NRC and others to follow the FAIR principles when managing (meta)data

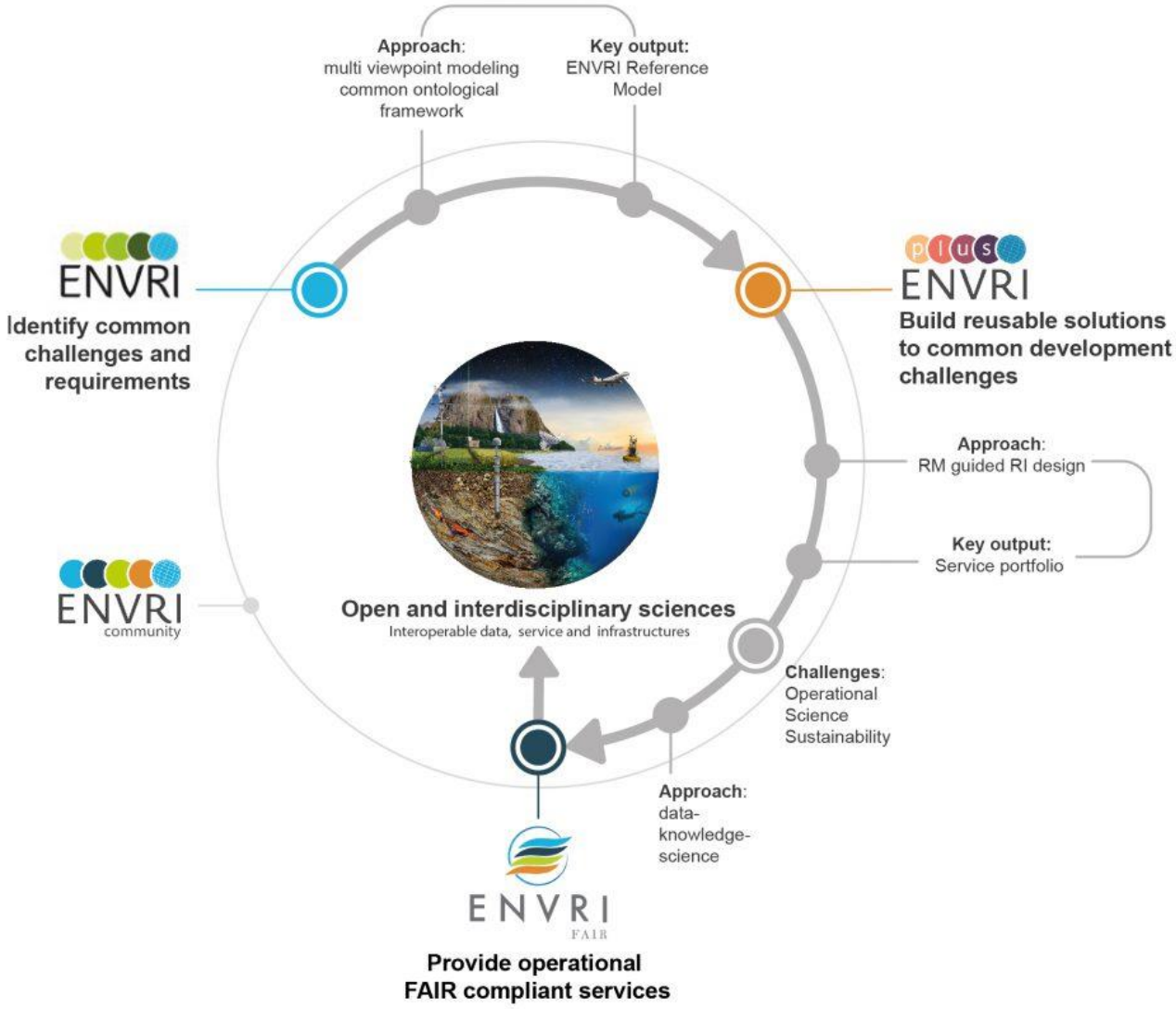
2. What is ENVRI-FAIR



The ENVRI Community is a group of Environmental Research Infrastructures (ENVRI) - currently the ENVRI community is working on the ENVRI-FAIR project, where the goal is to provide operational FAIR compliant services.

2. What is ENVRI-FAIR

- 2008: The publication of the European Strategy Forum on Research Infrastructures (ESFRI) roadmap. Expect that all the European environmental RIs would face similar challenges in their implementation
- This led to the onset of the ENVRI (2011-2014) and ENVRIplus (2015-2019)
  - These initiatives have been focusing on the integration of the European environmental research infrastructures, sharing competence and know-how
- Initiative currently continues with ENVRI-FAIR (2019-2023).
  - Now the goal is to provide operational FAIR compliant services



3. NILUs role in ENVRI-FAIR

EBAS

Handles, stores and disseminate atmospheric composition data generated by international and national frameworks.

ACTRiS
Exploring the Atmosphere

Aerosol, cloud and trace gas data mainly on short-lived atmospheric constituents.

ENVRI community

A group of Environmental Research Infrastructures (ENVRI)

EUROPEAN OPEN SCIENCE CLOUD

A European Commission initiative aiming at developing an infrastructure providing services promoting open science practices

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4. FAIR and FAIR evaluation

- The goal: Increase the FAIRness of the RIs in the ENVRI cluster
- The big question: How do we measure the FAIRness of the RIs and our progress throughout the project?
  - The assumption is that no RI after the project will be 100 % FAIR compatible
- What we have done so far in the project:
  - 2019: Project conducted a self assessment by each RI using a form
    - Form created together with GO-FAIR and FAIRsFAIR
  - 2020/2021: Mapping FAIR implementation profiles using the FIP Wizard

GO FAIR

FAIRSFAIR
Fostering Fair Data Practices in Europe

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4.1 What is a FAIR implementation Profile (FIP)?

- A list of technological choices a community makes for implementing FAIR
- Community specific FAIR Implementation Profiles are themselves captured as FAIR datasets and are made openly available to other communities for reuse.

FAIR principle	Question	FAIR enabling resource types	Your answers
F1	What globally unique, persistent, resolvable identifiers do you use for metadata records?	Identifier type	*e.g. PURL, DOI*
F1	What globally unique, persistent, resolvable identifiers do you use for datasets?	Identifier type	
F2	Which metadata schemas do you use for findability?	Metadata schema	
F3	What is the technology that links the persistent identifiers of your data to the metadata description?	Metadata-Data linking mechanism	
F4	In which search engines are your metadata records indexed?	Search engines	
F4	In which search engines are your datasets indexed?	Search engines	
A1.1	Which standardized communication protocol do you use for metadata records?	Communication protocol	
A1.1	Which standardized communication protocol do you use for datasets?	Communication protocol	
A1.2	Which authentication & authorisation technique do you use for metadata records?	Authentication & authorisation technique	
A1.2	Which authentication & authorisation technique do you use for datasets?	Authentication & authorisation technique	
A2	Which metadata longevity plan do you use?	Metadata longevity	

** Example from FIP mini-questionaire:* https://bit.ly/yourFIP

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4.3 FAIR Enabling Resources (FER)

FAIR Principles

Box 2 | The FAIR Guiding Principles

To be Findable:
F1. (meta)data are assigned a globally unique and persistent identifier
F2. data are described with rich metadata (defined by R1 below)
F3. metadata clearly and explicitly include the identifier of the data it describes
F4. (meta)data are registered or indexed in a searchable resource

To be Accessible:
A1. (meta)data are retrievable by their identifier using a standardized communications protocol
A1.1 the protocol is open, free, and universally implementable
A1.2 the protocol allows for an authentication and authorization procedure, where necessary
A2. metadata are accessible, even when the data are no longer available

To be Interoperable:
I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
I2. (meta)data use vocabularies that follow FAIR principles
I3. (meta)data include qualified references to other (meta)data

To be Reusable:
R1. meta(data) are richly described with a plurality of accurate and relevant attributes
R1.1. (meta)data are released with a clear and accessible data usage license
R1.2. (meta)data are associated with detailed provenance
R1.3. (meta)data meet domain-relevant community standards

FAIR Enabling Resource (FER)

- Choices
- Challenges

GFF

Digital objects to achieve FAIRness

FAIR Implementation Profile (FIP)

Technology choices used for addressing
each of the FAIR Principles

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FAIR principle	FAIR enabling resource types
F1	Identifier type
F2	Metadata schema
F3	Metadata-Data linking mechanism
F4	Search engines
A1.1	Communication protocol
A1.2	Authentication & authorisation technique
A2	Metadata longevity
I1	Knowledge representation language
I2	Structured vocabularies
I3	Schema/Model
R1.1	Data usage license
R1.2	Provenance model

R1.3 Community specific metadata -> the FIP as a whole

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4.4 How do we create the FIPs

Manually

Community description	
Name of Community	*e.g. ENVRI*
Description of Community	
Supporting Links	
Research Domain	*e.g. Environmental Sciences*
Data Steward	*e.g. ORCID #*
Date of FIP creation	

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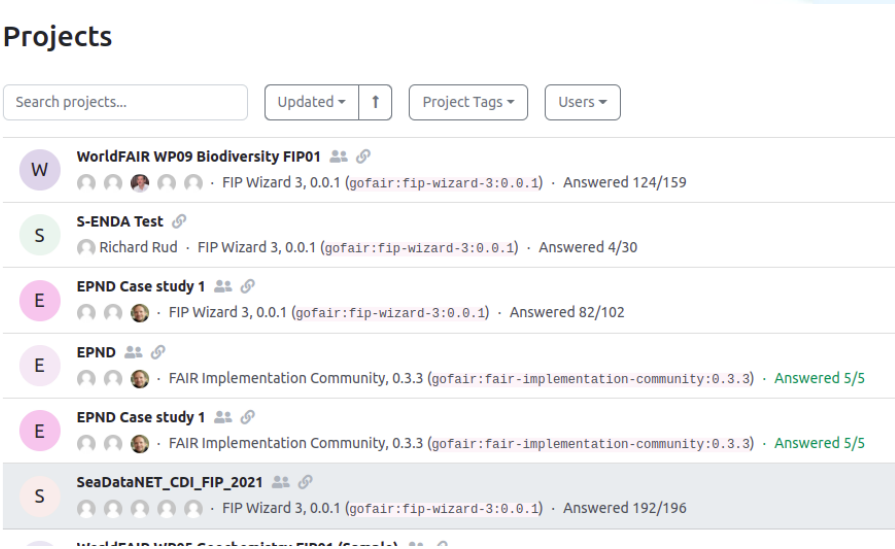
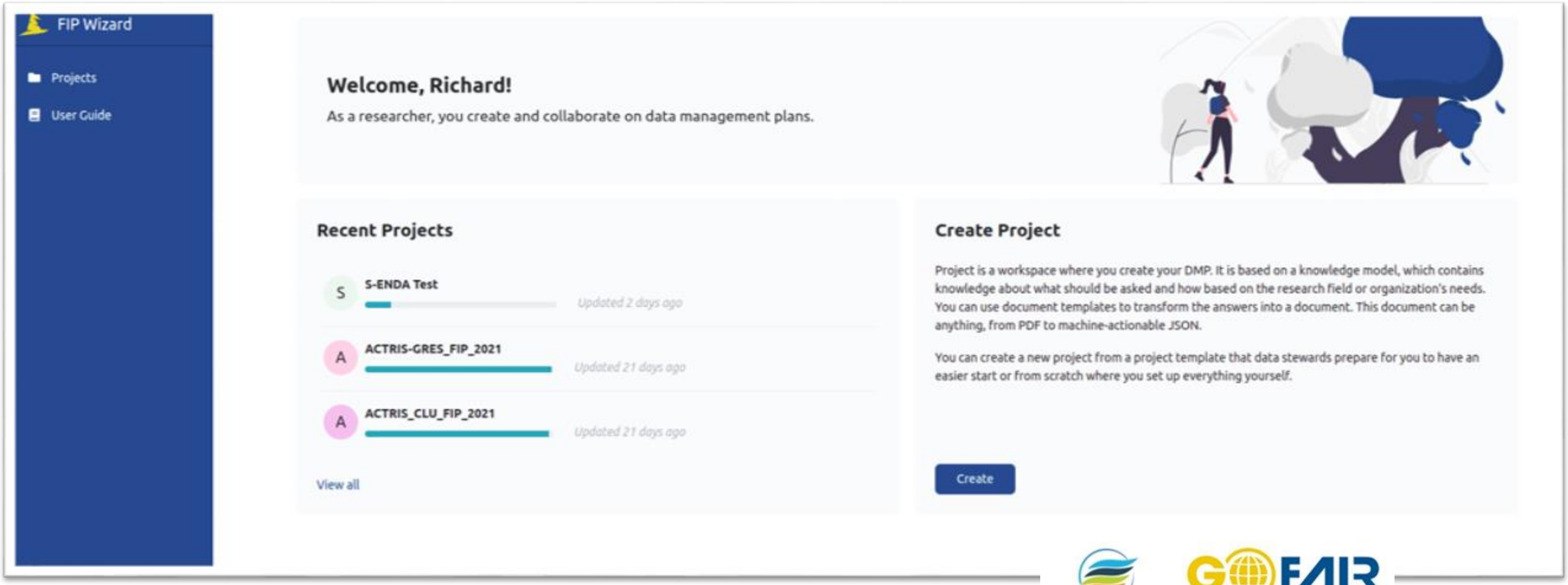
A2	Which metadata longevity plan do you use?	Metadata longevity	
I1	Which knowledge representation languages (allowing machine interoperation) do you use for metadata records?	Knowledge representation language	
I1	Which knowledge representation languages (allowing machine interoperation) do you use for datasets?	Knowledge representation language	
I2	Which structured vocabularies do you use to annotate your metadata records?	Structured vocabularies	
I2	Which structured vocabularies do you use to encode your datasets?	Structured vocabularies	
I3	Which models, schema(s) do you use for your metadata records?	Metadata schema	
I3	Which models, schema(s) do you use for your datasets?	Data schema	
R1.1	Which usage license do you use for your metadata records?	Data usage license	
R1.1	Which usage license do you use for your datasets?	Data usage license	
R1.2	Which metadata schemas do you use for describing the provenance of your metadata records?	Provenance model	
R1.2	Which metadata schemas do you use for describing the provenance of your datasets?	Provenance model	

Automated tool



4.4 FIP Wizard



ENVRI FAIR GO FAIR CODEVENCE

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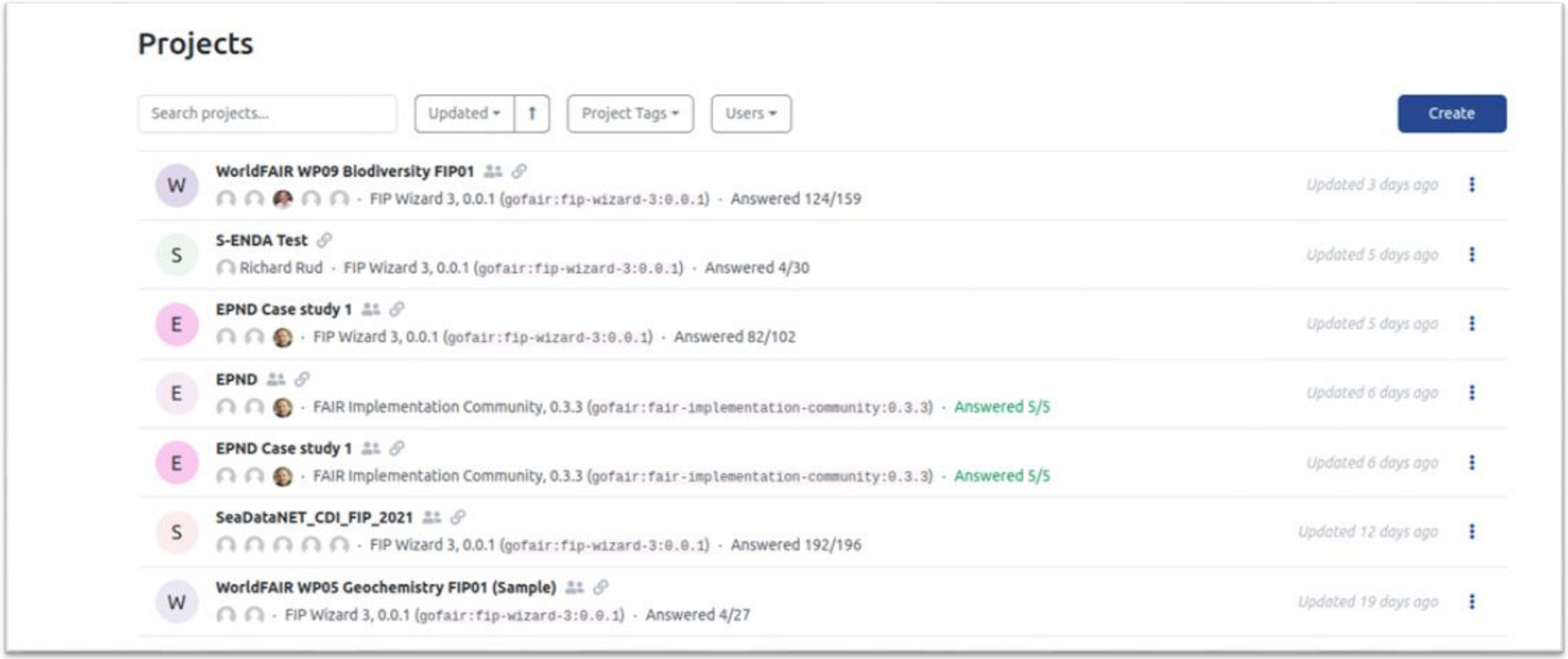
4.4 FIP Wizard



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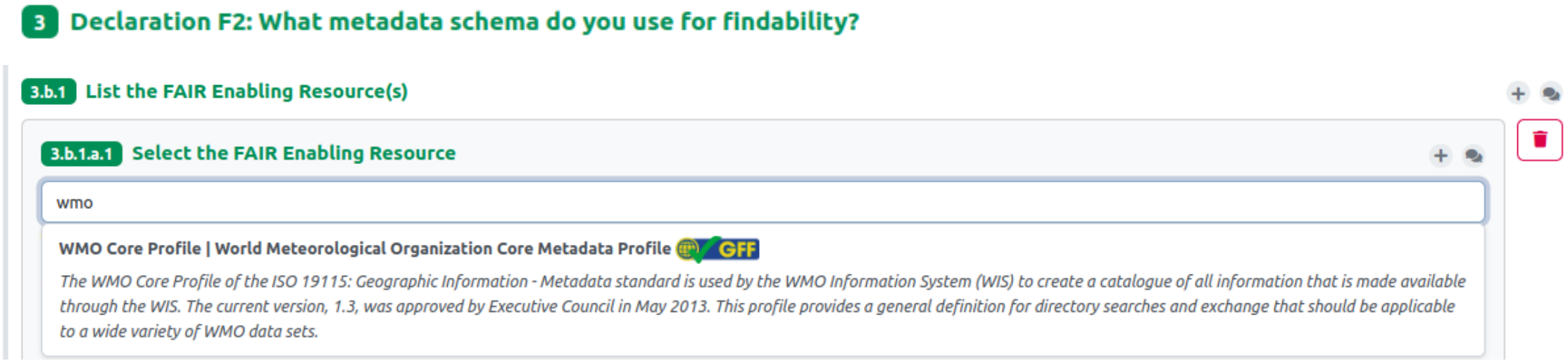
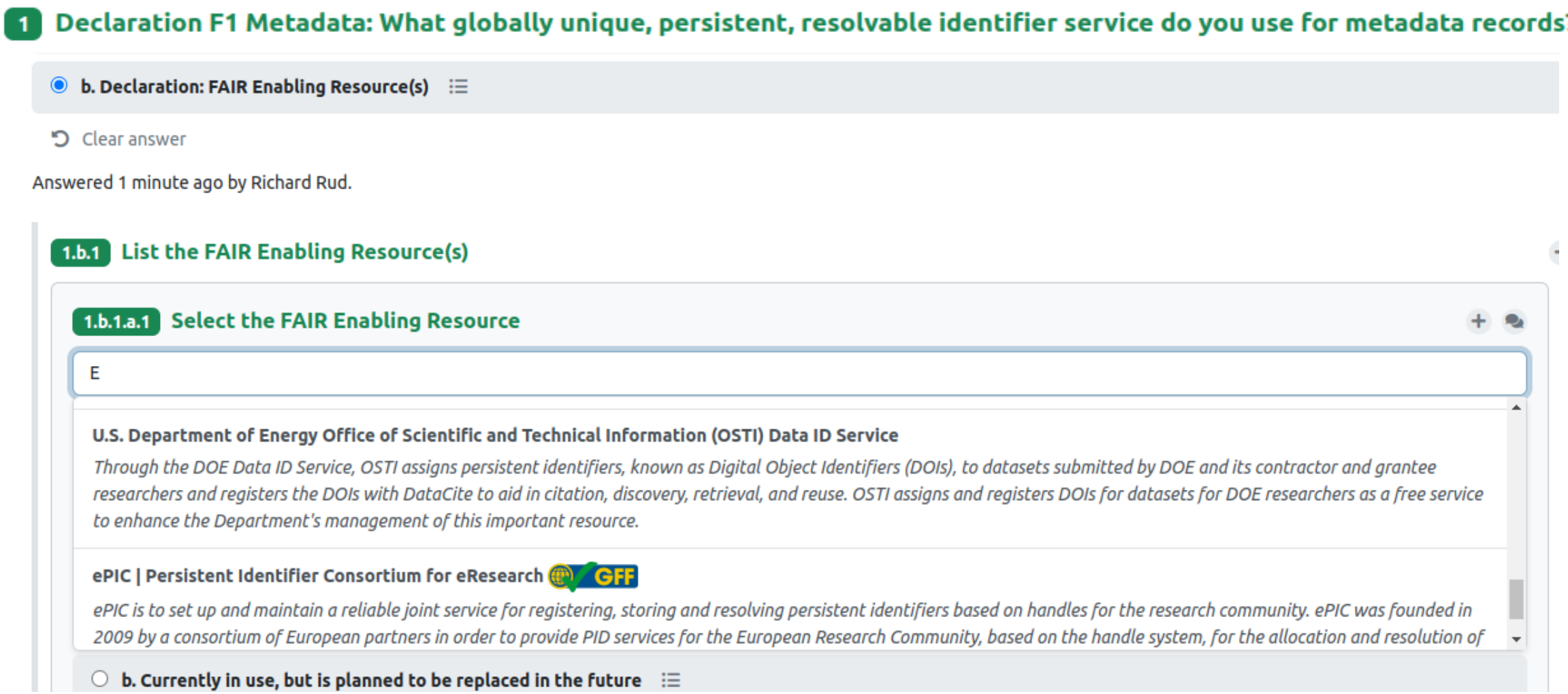
4.4 FIP Wizard



4.4 FIP Wizard



*GO-FAIR Foundation Badge

4.4 FIP Wizard

2 Declaration R1.1 Datasets: Which usage license do you use for your datasets?

Digital resources and their metadata must always, without exception, include a license that describes under which conditions the resource can be used, even if that is "unconditional". By default, resources cannot be legally used without this clarity. Note also that a license that cannot be found by an agent, is effectively the same as no license at all. Furthermore, the license may be different for a data resource and the metadata that describes it, which has implications for the indexing of metadata v.v. findability. It also reiterates the need to separate and permalink data and metadata. This is a clear public domain statement, an equivalent such as terms of use or computer protocol to digitally facilitate an operation (for instance a smart contract). Thus, the absence of a license does not indicate "open", but rather creates legal uncertainty that will deter (in fact, in many cases legally prevent) reuse. Note also that the combination of resources with permissive as well as more restrictive license conditions may lead to adverse effects, and ultimately preclude the use of the combined resources for particular purposes. In order to facilitate reuse, the license chosen should be as open as possible.(see additional criteria GFF)

To summarize, this question requests a FAIR Enabling Resource of type "data usage license" which is a document that describes the conditions under which a digital object can be legally used.

- ○ **a. Declaration: No implementation choice has been made by this community**
- ◉ **b. Declaration: FAIR Enabling Resource(s)**

Clear answer

Answered less than 10 seconds ago by Richard Rud.

2.b.1 List the FAIR Enabling Resource(s)

2.b.1.a.1 Select the FAIR Enabling Resource

Redistribution and use in source and binary forms, with or without modification, are permitted provided that some conditions are met.

CC BY 4.0 | Attribution 4.0 International GFF

Using this licence you are free to share and adapt the resource but you must give appropriate credit.

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Using this license you are free to share and adapt the resource but you must give appropriate credit.

5. Results from the ENVRI-FAIRness Assessment

		2019	2020	2021
AIR	ACTRIS_DVAS	☑	☑	☑
	ACTRIS-Gres FIP	☑	☑	☑
	ACRIS-inSitu	☑	☑	☑
	ACTRIS_ARES	☐	☑	☑
	ACTRIS_CLU_FIP	☑	☑	☑
	ACTRIS-ASC	☑	☑	☑
	IAGOS	☑	☑	☑
	EISCAT_FIP	☑	☑	☑
WATER	ARGO	☑	☑	☑
	EMSO ERIC FIP	☐	☐	☑
	LW marine	☑	☑	☑
	SeaDataNet-CDI	☑	☑	☑
	SeaDataNet-Sextant	☑	☑	☑
LAND	EPOS	☐	☐	☑
LIFE	AnaEE	☑	☑	☑
	AnaEE-Crea	☑	☑	☑
	Danubius	☐	☐	☑
	DiSSCo_FIP	☐	☑	☑
	eLTER-RI	☑	☑	☑
	LWERIC Ecosystem	☑	☑	☑
multi-domain	ICOS FIP	☑	☑	☑
	SIOS FIP	☑	☑	☑
	Total count: 57	17	18	22

- FIP statistics
  - 22 communities
  - 57 FAIR Implementation Profiles
  - 178 FAIR enabling resources have been listed and declared

**Results from ENVRI FAIRness assessment, work led by Barbara Magagna and conducted by all partners all partners (Project Review|1 March 2022)*

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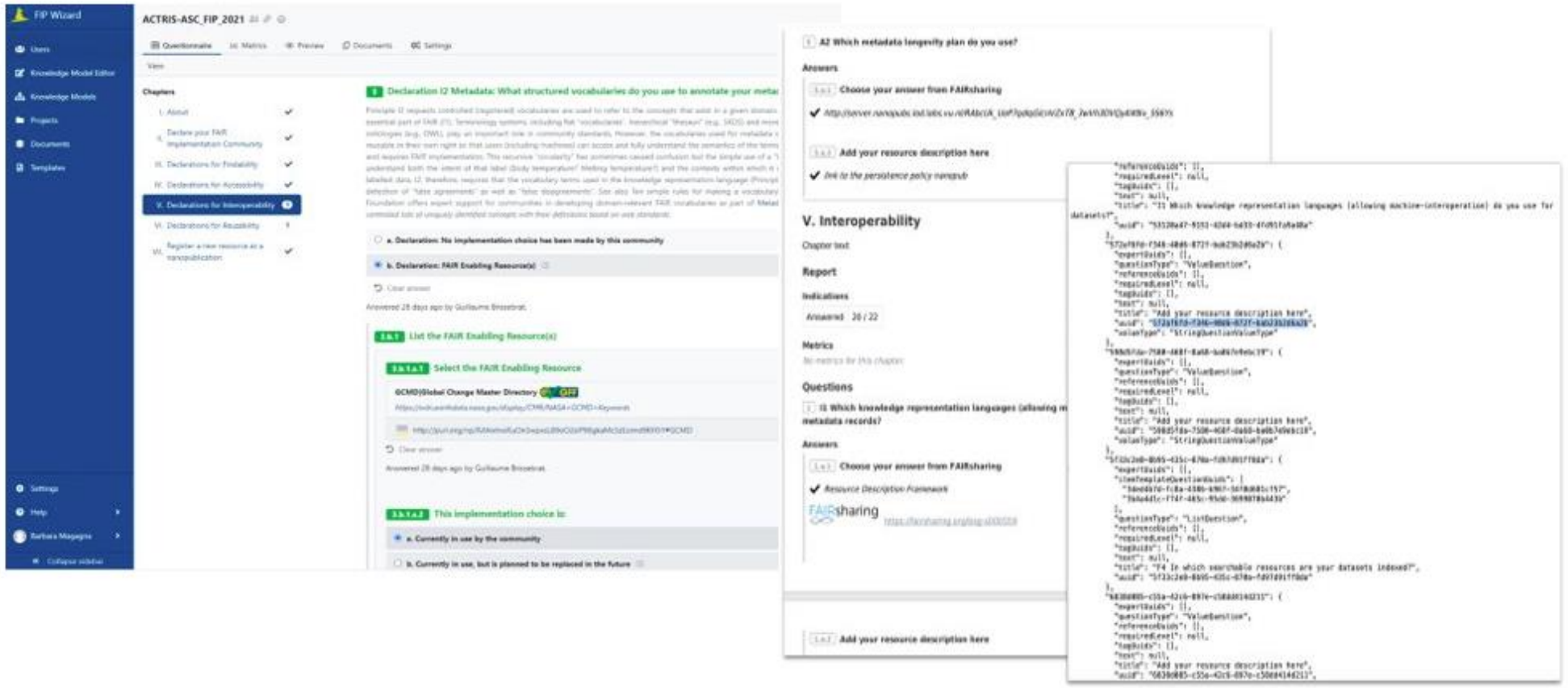
5. Results from the ENVRI-FAIRness Assessment



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6. FAIR convergence and FAIR enabling resource overlap

2021	ACTRIS_DVAS	ACTRIS_GRES	ACTRIS_InSitu	ACTRIS_CLU	ACTRIS-ARES	ACTRIS_ASC	IAGOS	EISCAT	ArgoGdac2	EMSO	lw-marine	SeaDataNet-CDI	SeaDataNet-Sextant	EPOS-ERIC	Anaee	AnaEE_CREA	DANUBIUS	DiSSCo	eLTER-RI	LWERIC_Ecosystem	ICOS	SIOS	
ACTRIS_DVAS		11	11	8	8	11	9	2	6	4	4	2	5	3	7	4	4	3	4	5	7	7	125
ACTRIS_GRES	11		13	13	11	18	19	4	10	5	9	3	9	7	9	5	7	5	9	7	16	13	203
ACTRIS_InSitu	11	13		10	8	12	13	3	8	5	5	5	8	4	7	4	5	3	6	7	11	13	161
ACTRIS-ARES	8	11	8	8		9	12	3	7	4	5	1	4	5	4	4	5	2	5	5	13	7	130
ACTRIS_CLU	8	13	10		8	12	10	3	8	4	6	2	7	6	5	4	5	5	7	6	10	7	146
ACTRIS_ASC	11	18	12	12	9		14	3	9	5	8	2	8	5	8	4	6	5	7	6	10	11	173
IAGOS	9	19	13	10	12	14		4	11	6	10	7	12	7	9	5	7	6	12	10	20	13	216
EISCAT	2	4	3	3	3	3	4		5	2	3	3	3	2	2	2	1	1	5	1	7	2	61
ArgoGdac	6	10	8	8	7	9	11	5		8	7	6	10	3	6	5	6	4	5	7	14	6	151
EMSO	4	5	5	4	4	5	6	2	8		4	4	7	3	4	4	4	1	2	6	7	4	93
lw-marine	4	9	5	6	5	8	10	3	7	4		3	7	4	6	5	5	9	10	9	13	5	137
SeaDataNet-CDI	2	3	5	2	1	2	7	3	6	4	3		10	2	3	2	4	1	4	7	8	6	85
SeaDataNet-Sextant	5	9	8	7	4	8	12	3	10	7	7	10		4	8	5	6	3	8	9	12	9	154
EPOS-ERIC	3	7	4	6	5	5	7	2	3	3	4	2	4		3	3	1	4	7	4	8	5	90
Anaee	7	9	7	5	4	8	9	2	6	4	6	3	8	3		7	6	2	6	7	8	8	125
AnaEE_CREA	4	5	4	4	4	4	5	2	5	4	5	2	5	3	7		4	2	3	5	7	3	87
DANUBIUS	4	7	5	5	5	6	7	1	6	4	5	4	6	1	6	4		1	3	5	8	6	99
DiSSCo	3	5	3	5	2	5	6	1	4	1	9	1	3	4	2	2	1		5	3	7	2	74
eLTER-RI	4	9	6	7	5	7	12	5	5	2	10	4	8	7	6	3	3	5		6	12	8	134
LWERIC_Ecosystem	5	7	7	6	5	6	10	1	7	6	9	7	9	4	7	5	5	3	6		9	6	130
ICOS	7	16	11	10	13	10	20	7	14	7	13	8	12	8	8	7	8	7	12	9		11	218
SIOS	7	13	13	7	7	11	13	2	6	4	5	6	9	5	8	3	6	2	8	6	11		152
	125	203	161	146	130	173	216	61	151	93	137	85	154	90	125	87	99	74	134	130	218	152	2944

Most frequent FERs	count
DOI|Digital Object Identifier	33
CC BY 4.0|Attribution 4.0 International	29
HTTPS|Hypertext Transfer Protocol Secure	27
PROV-O|The PROV Ontology	25
NetCDF CF-1.7	23
DataCite	20
Open Data	19
ISO 19115|Geographic information - Metadata	16
NetCDF|Network Common Data Form	14
Handle System	13
NVS|NERC Vocabulary Service	13
REST|Representational state transfer	13
DataCite Metadata Scheme	12
ORCID|Open Researcher and Contributor ID	12
RDFS|Resource Description Framework Schema	12
XMLS|eXtensible Markup Language Schema	12
OPeNDAP|Open-source Project for a Network Data Access Proto	11

**Results from ENVRI FAIRness assessment, work led by Barbara Magagna and conducted by all partners all partners (Project Review\|1 March 2022)*

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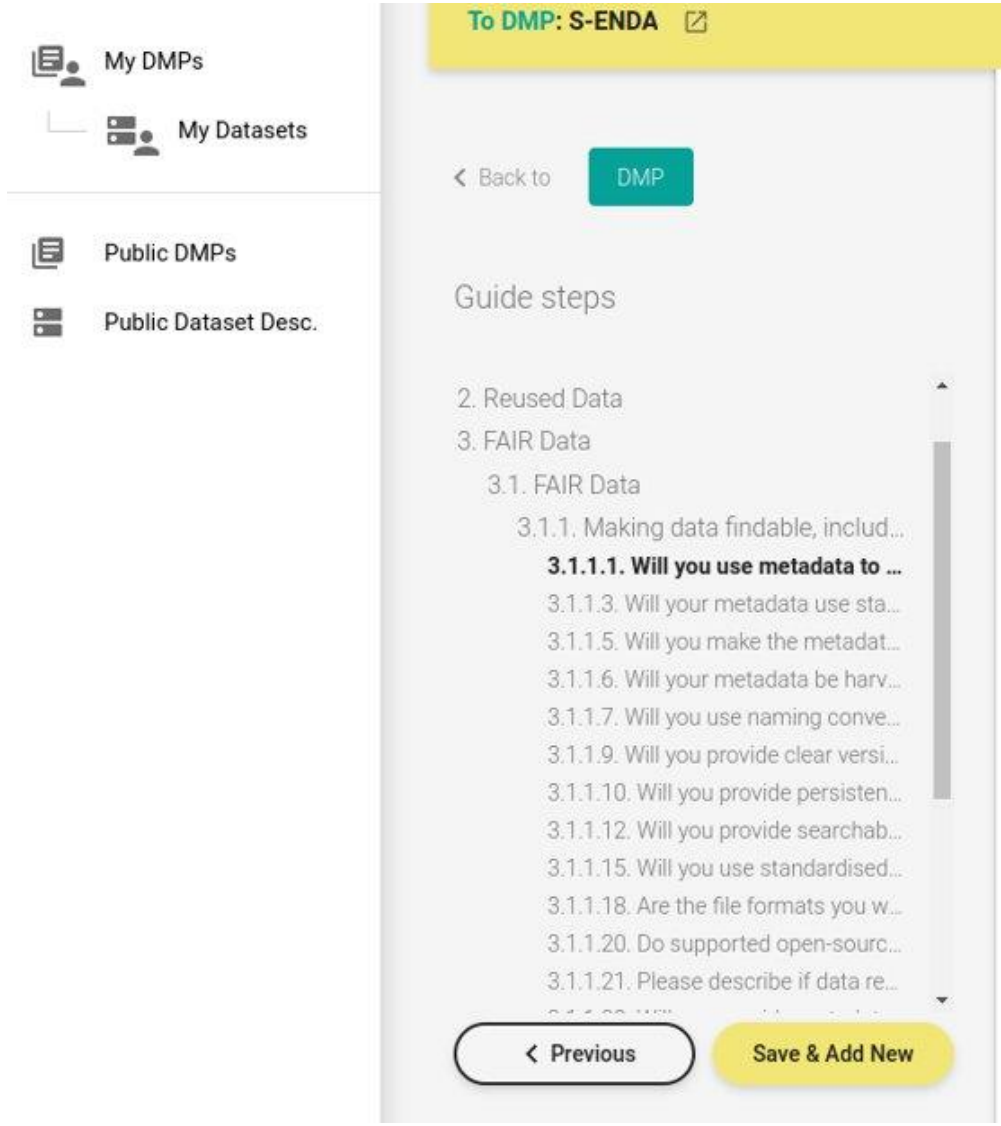
6. Final Remarks

- Many evaluators and organizations
- Different interpretations of the FAIR principles as well as tools and online forms
- Work being done on mapping FIP onto the Data Management Plan (DMP)
  - E.g. Argos that we use
  - Common Machine readable formats
  - Reuse FIPs within a community for you DMP to make sure that the things you are doing comply with the community
- Is this something for S-ENDA?



Useful resources

- FIP Wizard documentation: https://fip-wizard.readthedocs.io/en/latest/about/about.html
- FIP Wizard: https://fip-wizard.ds-wizard.org/
- ENVRI-FAIR: https://envri.eu/home-envri-fair/
- FIP mini-questionnaire: https://bit.ly/yourFIP
- Data Management platform: https://argos.openaire.eu/splash/
- FIP Wizard 2.0 - User Guide: https://osf.io/4bfcy

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Thank you and **FAIR** well!

www.nilu.no