

# FAIR Implementation Profile – an Effective Way towards FAIR Community Standards

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Robert Pergl

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the European Union



# FAIR Implementation Profiles:

A scalable approach to FAIRification for researchers and infrastructure providers

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Barbara Magagna, GFF & U Twente

Chaired by: Robert Pergl, CTU in Prague <[perglr@fit.cvut.cz](mailto:perglr@fit.cvut.cz)>

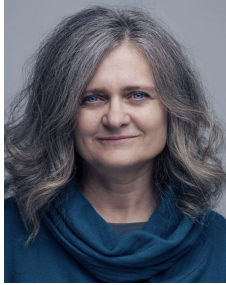
December 11, 2023

These slides are <https://osf.io/65kpc>

# Who we are:



Erik



Barbara



Simon

## FIP Development Team



Marek  
Suchánek



Tobias  
Kuhn

Some background on FIPs:

- Erik: **What is a FIP**
- Barbara: **Case study** - ENVRI-FAIR
- Simon: **Case study** - WorldFAIR
- Erik: **A vision on FIPs as infrastructure**

## 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:

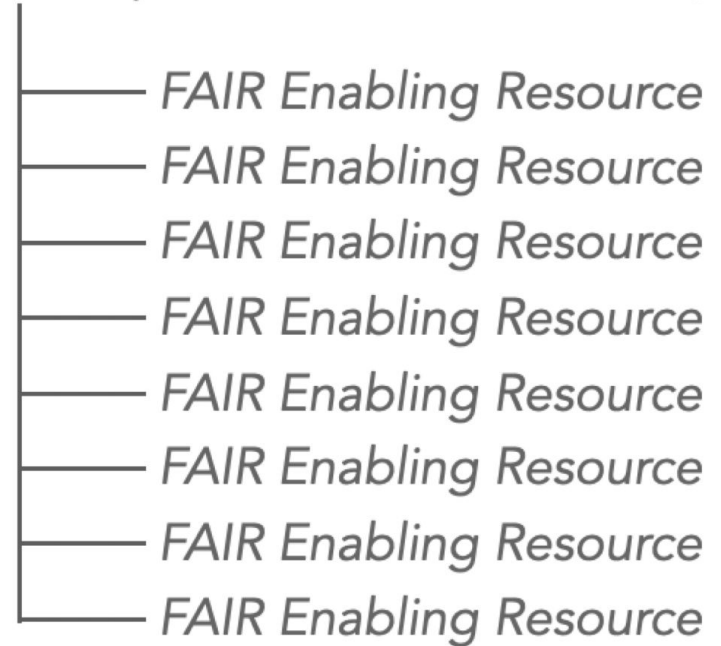
- R1. meta(data) are richly described with a plurality of accurate and relevant attributes
  - R1.1. (meta)data are released with a clear and accessible data usage license
  - R1.2. (meta)data are associated with detailed provenance
  - R1.3. (meta)data meet domain-relevant community standards

Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. *Sci Data* 3, 160018 (2016). <https://doi.org/10.1038/sdata.2016.18>

# What is a FIP?

- a list of declared **technology** choices intended to implement each of the FAIR Principles,
- made as a collective decision by the members of a particular **community** of practice.

## *FAIR Implementation Community*



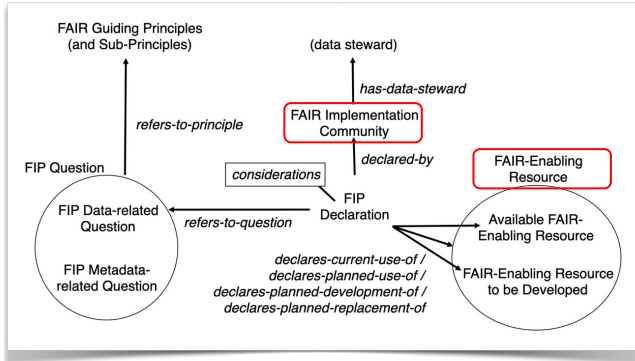
# What is a FIP?

FAIR principle	Question	FAIR enabling resource types	Your answers
<a href="#">F1</a>	What globally unique, persistent, resolvable identifiers do you use for metadata records?	Identifier service	e.g. PURL, DOI
<a href="#">F1</a>	What globally unique, persistent, resolvable identifiers do you use for datasets?	Identifier service	
<a href="#">F2</a>	Which metadata schemas do you use for findability?	Metadata schema	
<a href="#">F3</a>	What is the technology that links the persistent identifiers of your data to the metadata description?	Metadata-Data linking schema	
<a href="#">F4</a>	In which search engines are your metadata records indexed?	Registry	
<a href="#">F4</a>	In which search engines are your datasets indexed?	Registry	
<a href="#">A1.1</a>	Which standardized communication protocol do you use for metadata records?	Communication protocol	
<a href="#">A1.1</a>	Which standardized communication protocol do you use for datasets?	Communication protocol	
<a href="#">A1.2</a>	Which authentication & authorisation technique do you use for metadata records?	Authentication & authorisation service	
<a href="#">A1.2</a>	Which authentication & authorisation technique do you use for datasets?	Authentication & authorisation service	
<a href="#">A2</a>	Which metadata longevity plan do you use?	Metadata longevity	
<a href="#">I1</a>	Which knowledge representation languages (allowing machine interoperation) do you use for metadata records?	Knowledge representation language	
<a href="#">I1</a>	Which knowledge representation languages (allowing machine interoperation) do you use for datasets?	Knowledge representation language	
<a href="#">I2</a>	Which structured vocabularies do you use to annotate your metadata records?	Structured vocabularies	
<a href="#">I2</a>	Which structured vocabularies do you use to encode your datasets?	Structured vocabularies	
<a href="#">I3</a>	Which models, schema(s) do you use for your metadata records?	Metadata schema	
<a href="#">I3</a>	Which models, schema(s) do you use for your datasets?	Data schema	
<a href="#">R1.1</a>	Which usage license do you use for your metadata records?	Data usage license	
<a href="#">R1.1</a>	Which usage license do you use for your datasets?	Data usage license	
<a href="#">R1.2</a>	Which metadata schemas do you use for describing the provenance of your metadata records?	Provenance model	
<a href="#">R1.2</a>	Which metadata schemas do you use for describing the provenance of your datasets?	Provenance model	

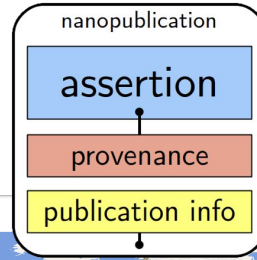
<http://bit.ly/FIPminiquestionnaire>

# What is a FIP?

## FAIR Implementation Profile (FIP) Ontology



<https://peta-pico.github.io/FAIR-nanopubs/fip/index-en.html#https://w3id.org/fair/fip/terms/declares-planned-development-of>



URL	Type	Status	OK Ratio	Resp Time (ms)	Last Seen OK	IP Address
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	22 ms (23 ms)	2023-06-30 01:31:42	104.207.235.136
http://egg.ksbmi.ecampus.msu.edu/nanopub-server-1/	FAIR-Enabling Resource	OK	100.0%	288 ms (7900 ms)	2023-06-30 01:31:47	130.37.193.11
http://egg.ksbmi.ecampus.msu.edu/nanopub-server-2/	FAIR-Enabling Resource	OK	100.0%	202 ms (7900 ms)	2023-06-30 01:31:52	130.37.193.11
http://egg.ksbmi.ecampus.msu.edu/nanopub-server-3/	FAIR-Enabling Resource	OK	100.0%	186 ms (7900 ms)	2023-06-30 01:31:55	130.37.193.11
http://egg.ksbmi.ecampus.msu.edu/nanopub-server-4/	FAIR-Enabling Resource	OK	100.0%	193 ms (7900 ms)	2023-06-30 01:31:52	130.37.193.11
https://www.nanopubs.pub.msu.edu/	FAIR-Enabling Resource	OK	100.0%	223 ms (7900 ms)	2023-06-30 01:31:48	130.37.193.64
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	0.0%	17900 ms		130.37.53.46
http://130.65.24.144.7883/	FAIR-Enabling Resource	OK	100.0%	315 ms (8416 ms)	2023-06-30 01:31:39	130.60.24.146
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	400 ms (8016 ms)	2023-06-30 01:31:46	130.207.235.136
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	0.0%	7 (10028 ms)		143.232.228.43
https://www.nanopubs.knowi.ch/old/cyber/	FAIR-Enabling Resource	OK	0.0%	7 (7900 ms)		193.191.148.200
https://rdp.digipub.org/nanopub-server/	FAIR-Enabling Resource	OK	16.667%	244 ms (8137 ms)	2023-06-30 01:31:54	186.86.134.43
https://ftp.parc.gov.uk/	FAIR-Enabling Resource	OK	100.0%	446 ms (8810 ms)	2023-06-30 01:31:50	89.40.8.83
https://pubs.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	33 ms (34 ms)	2023-06-30 01:31:54	104.207.235.136
https://pubs.nlm.nih.gov/	FAIR-Enabling Resource	OK	0.0%	7 (7900 ms)		130.37.53.46
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	492 ms (8910 ms)	2023-06-30 01:31:53	89.40.8.83
https://pubs.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	34 ms (34 ms)	2023-06-30 01:31:46	104.207.235.136
http://130.65.24.144.7883/	FAIR-Enabling Resource	OK	100.0%	255 ms (8416 ms)	2023-06-30 01:31:46	130.60.24.146
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	462 ms (8810 ms)	2023-06-30 01:31:55	89.40.8.83

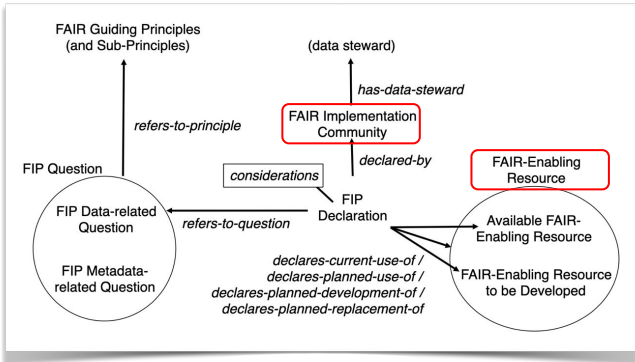
## FAIR Implementation Community

- FAIR Enabling Resource
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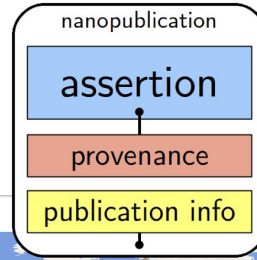


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URL	Type	Status	OK Ratio	Resp Time (ms)	Last Seen OK	IP Address
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	22 ms (24 ms)	2023-06-30 01:31:42	104.207.125.136
http://egg.ksl.stanford.edu/via/via/nanopub-server-1f	FAIR-Enabling Resource	OK	100.0%	288 ms (7900 ms)	2023-06-30 01:31:47	130.37.193.11
http://egg.ksl.stanford.edu/via/via/nanopub-server-2f	FAIR-Enabling Resource	OK	100.0%	200 ms (7900 ms)	2023-06-30 01:31:52	130.37.193.11
http://egg.ksl.stanford.edu/via/via/nanopub-server-3f	FAIR-Enabling Resource	OK	100.0%	186 ms (7900 ms)	2023-06-30 01:31:55	130.37.193.11
http://egg.ksl.stanford.edu/via/via/nanopub-server-4f	FAIR-Enabling Resource	OK	100.0%	193 ms (7900 ms)	2023-06-30 01:31:52	130.37.193.11
https://www.nature.com/doi/full/10.1038/43125a	FAIR-Enabling Resource	OK	100.0%	223 ms (7900 ms)	2023-06-30 01:31:48	130.37.193.11
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	0.0%	217900 ms		130.37.193.11
http://130.65.24.144/7883/	FAIR-Enabling Resource	OK	100.0%	315 ms (8416 ms)	2023-06-30 01:31:39	130.60.24.144
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	400 ms (7863 ms)	2023-06-30 01:31:48	130.37.193.11
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	0.0%	7110028 ms		143.202.228.43
https://www.nature.com/doi/full/10.1038/43125a	FAIR-Enabling Resource	OK	0.0%	717900 ms		130.37.193.11
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	244 ms (8033 ms)	2023-06-30 01:31:54	104.207.125.136
https://peta-pico.org/	FAIR-Enabling Resource	OK	100.0%	446 ms (8830 ms)	2023-06-30 01:31:50	89.40.8.83
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	33 ms (24 ms)	2023-06-30 01:31:54	104.207.125.136
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	0.0%	717900 ms		130.37.193.11
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	492 ms (8830 ms)	2023-06-30 01:31:53	89.40.8.83
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	34 ms (24 ms)	2023-06-30 01:31:48	104.207.125.136
http://130.65.24.144/7883/	FAIR-Enabling Resource	OK	100.0%	255 ms (8416 ms)	2023-06-30 01:31:46	130.60.24.144
https://www.ncbi.nlm.nih.gov/	FAIR-Enabling Resource	OK	100.0%	462 ms (8830 ms)	2023-06-30 01:31:55	89.40.8.83

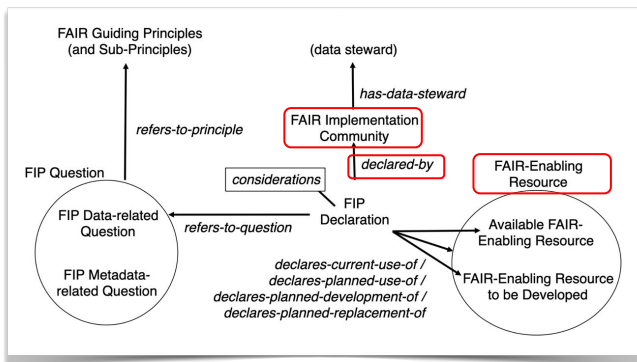
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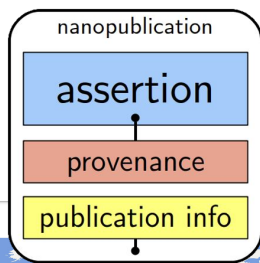


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http://egg.fair4matters.org/	FAIR-Enabling Resource	OK	100.0%	128 ms (7900 min)	2023-08-30 01:31:47	130.37.193.11
http://egg.fair4matters.org/	FAIR-Enabling Resource	OK	100.0%	202 ms (7900 min)	2023-08-30 01:31:52	130.37.193.11
http://egg.fair4matters.org/	FAIR-Enabling Resource	OK	100.0%	186 ms (7900 min)	2023-08-30 01:31:53	130.37.193.11
http://egg.fair4matters.org/	FAIR-Enabling Resource	OK	100.0%	193 ms (7900 min)	2023-08-30 01:31:52	130.37.193.11
http://server.nanopub.org/	FAIR-Enabling Resource	OK	100.0%	223 ms (7900 min)	2023-08-30 01:31:46	130.37.193.64
http://server.np.indiana.edu/	FAIR-Enabling Resource	OK	0.0%	17900 min		130.37.193.46
http://130.65.24.144/7883/	FAIR-Enabling Resource	OK	100.0%	315 ms (8416 min)	2023-08-30 01:31:39	130.65.24.144
http://server.np.indiana.edu/	FAIR-Enabling Resource	OK	100.0%	400 ms (7863 min)	2023-08-30 01:31:46	130.37.193.193
http://server.np.indiana.edu/	FAIR-Enabling Resource	OK	0.0%	7 (10028 min)		143.232.228.43
https://server.nanopub.org/	FAIR-Enabling Resource	OK	0.0%	7 (7900 min)		193.101.148.200
http://egg.fair4matters.org/	FAIR-Enabling Resource	OK	100.0%	244 ms (8137 min)	2023-08-30 01:31:54	186.86.134.41
https://peta-pico.org/	FAIR-Enabling Resource	OK	100.0%	446 ms (8830 min)	2023-08-30 01:31:50	89.40.8.83
https://nanopub.org/	FAIR-Enabling Resource	OK	100.0%	33 ms (6 min)	2023-08-30 01:31:54	194.207.125.136
https://nanopub.org/	FAIR-Enabling Resource	OK	0.0%	7 (7900 min)		130.37.193.46
https://nanopub.org/	FAIR-Enabling Resource	OK	100.0%	492 ms (8830 min)	2023-08-30 01:31:53	89.40.8.83
https://nanopub.org/	FAIR-Enabling Resource	OK	100.0%	34 ms (5 min)	2023-08-30 01:31:46	194.207.125.136
http://130.65.24.144/7883/	FAIR-Enabling Resource	OK	100.0%	255 ms (8416 min)	2023-08-30 01:31:46	130.65.24.144
https://nanopub.org/	FAIR-Enabling Resource	OK	100.0%	462 ms (8830 min)	2023-08-30 01:31:53	89.40.8.83

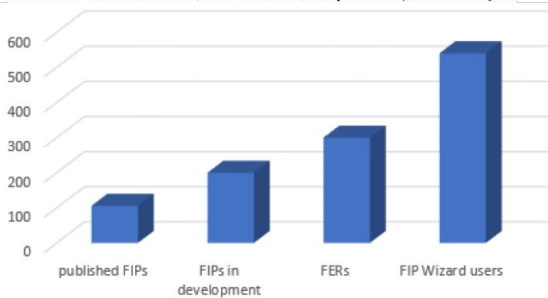
## FAIR Implementation Community





# FIP as a community effort

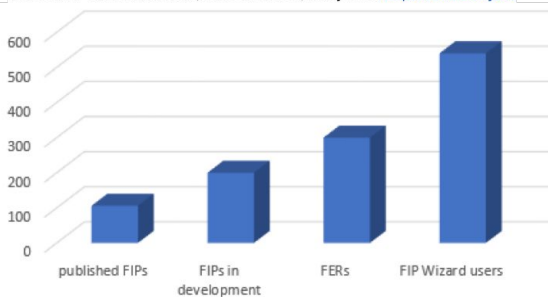
- FIP.1 GO FAIR Implementation Network Meeting, Leiden / January 2019 <https://osf.io/2gnf4/>
- FIP.2 FAIR Convergence Matrix (& FIP) Working Group / January 2019 <https://osf.io/n7uwp/>
- FIP.3 ENVRI-FAIR (Survey and Analysis) / May 2019 <https://osf.io/wcgze/>
- FIP.4 Pre-Symposium Convergence Workshops (Social Sciences) / October 2020 <https://osf.io/r2hzc/>
- FIP.5 Pre-Symposium Convergence Workshops (Life Sciences 2) / October 2020 <https://osf.io/r2hzc/>
- FIP.6 Pre-Symposium Convergence Workshops (Oceanography) / October 2020 <https://osf.io/r2hzc/>
- FIP.7 Pre-Symposium Convergence Workshops (Materials) / November 2020 <https://osf.io/r2hzc/>
- FIP.8 Pre-Symposium Convergence Workshops (Environmental) / November 2020 <https://osf.io/r2hzc/>
- FIP.9 Pre-Symposium Convergence Workshops (Life Sciences 1) / November 2020 <https://osf.io/r2hzc/>
- FIP.10 ENVRI-FAIR (FIP for Purpose: assessment 3) / January 2022 <https://osf.io/7n5yp/>
- FIP.11 NICEST-2 (Climate) / October 2022 <https://osf.io/5xbw/>
- FIP.12 VODAN-Africa / October 2022 <https://osf.io/cnr86/>
- FIP.13 ODESSEI / September 2022 <https://osf.io/yc2j/>
- FIP.14 GLOPID-R (Pandemic Pact) / December 2022 <https://osf.io/m6thx/>
- FIP.15 PARC (FIP training) / January 2023 <https://osf.io/g2xy5/>
- FIP.16 PARC (Human Biomonitoring and Environmental Data) / January 2023 <https://osf.io/vc475/>
- FIP.17 Health-Holland (TWOC & C4Y) / February 2023 <https://osf.io/f76eh/>
- FIP.18 PARC (NORMAN Ecotox) / March 2023 <https://osf.io/xgmy/>
- FIP.19 PARC (PARC FAIR Convergence Matrix) / May 2023 <https://osf.io/2p64d/>
- FIP.20 3PFF Summer School (PARC & LACDR) / July 2023 <https://osf.io/ezy6c/>



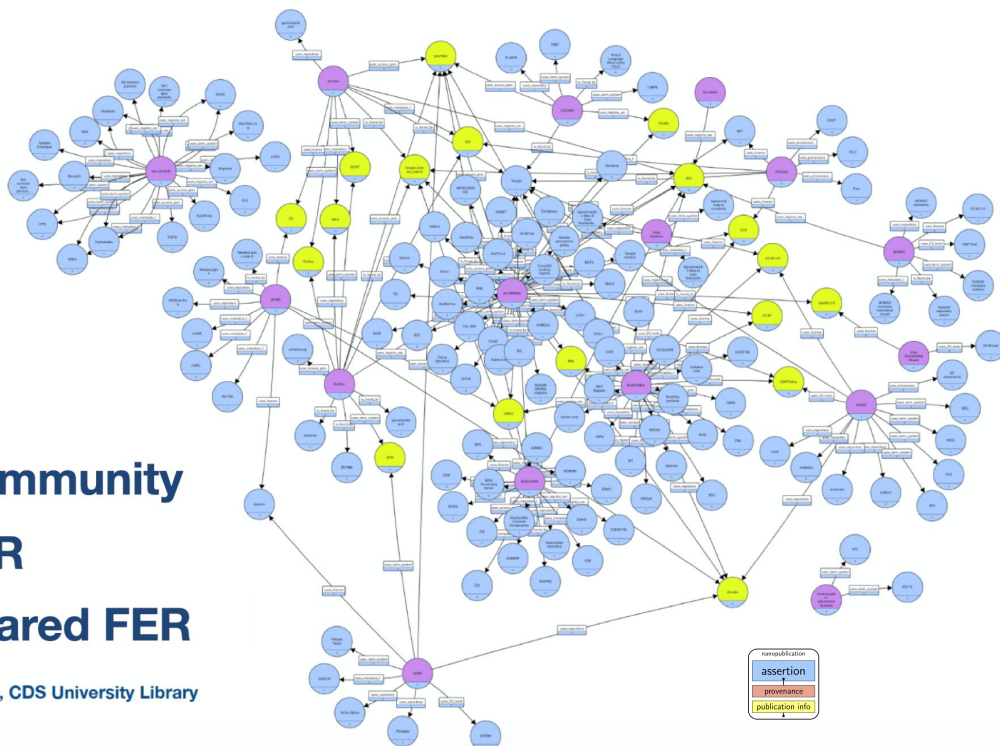
107 FIPs have been published and about 200 FIPs are in development involving more than 500 users from more than 125 communities.

# FIP as a community effort

- FIP.1 GO FAIR Implementation Network Meeting, Leiden / January 2019 <https://osf.io/2gnf4/>
- FIP.2 FAIR Convergence Matrix (& FIP) Working Group / January 2019 <https://osf.io/n7uwp/>
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- FIP.13 ODESSEI / September 2022 <https://osf.io/ycr2j/>
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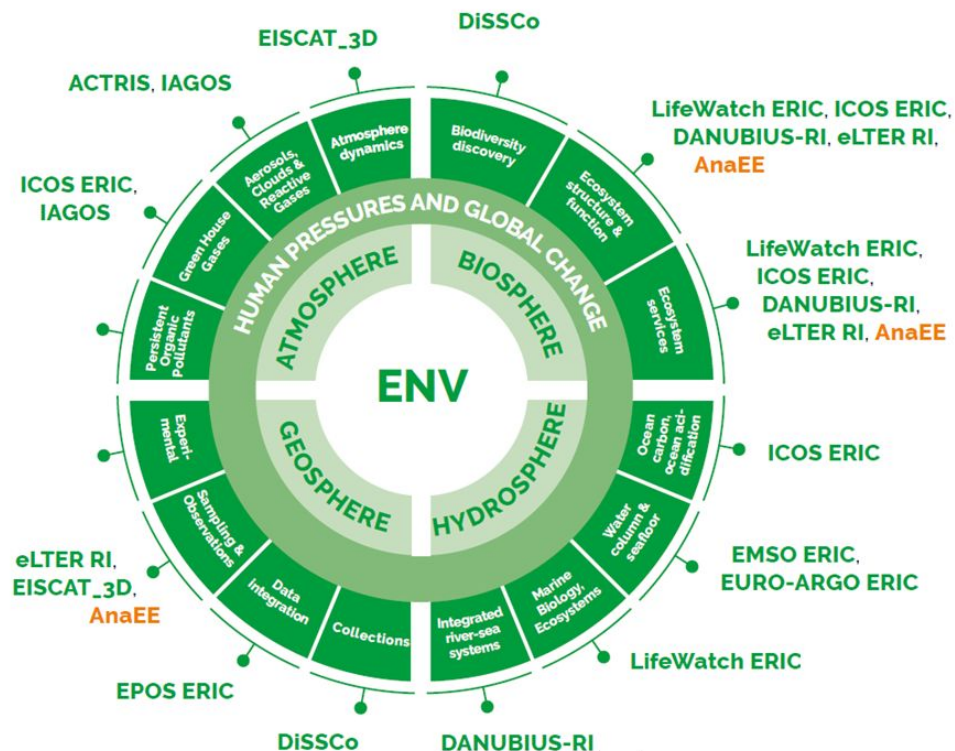
Kristina Hettne, CDS University Library







# ENVRI-FAIR use case: ENVironmental Research Infrastructures building FAIR services Accessible for society, Innovation and Research (2019-2022)

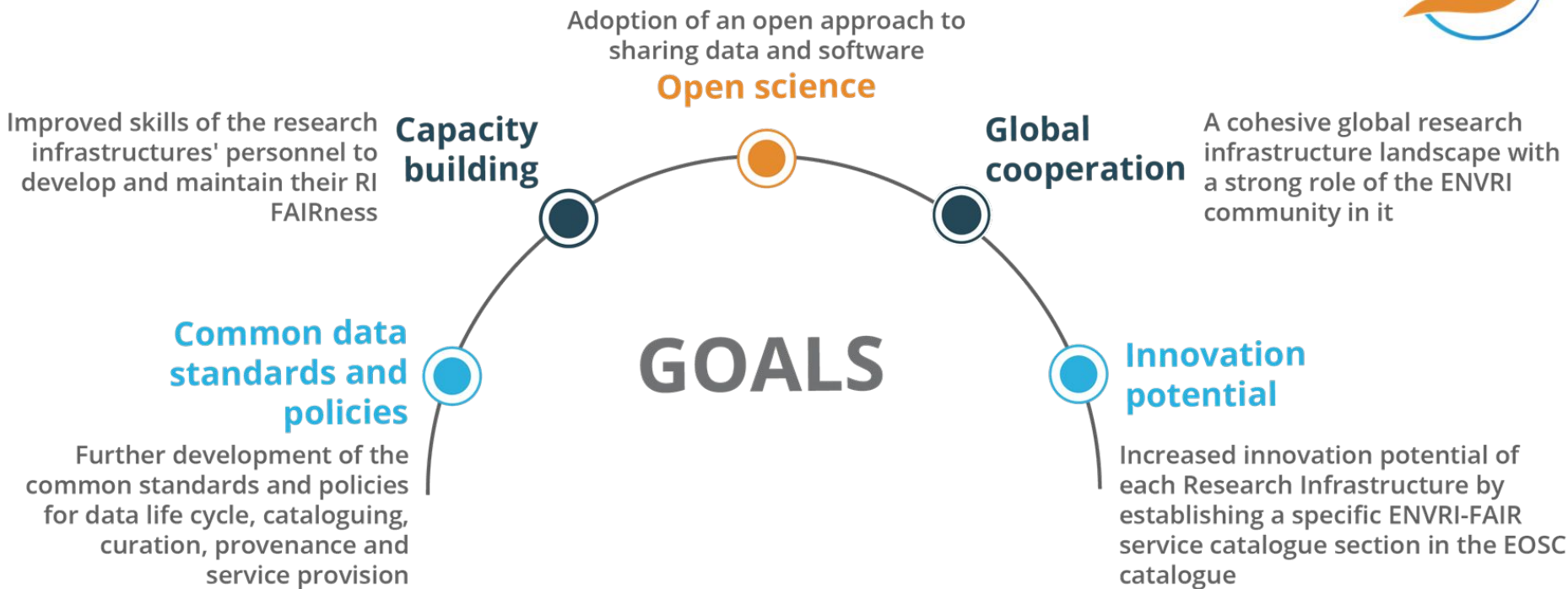


## Environmental Research Infrastructures

- provide data and research products from all four subdomains of the Earth system
- data are crucial European contributions to global-scale monitoring of the state of the Earth
- data are vital for assessing past and defining future policies, and for the development of environment-friendly innovations
- provide research data and services at EOSC through the ENVRI-Hub



## ENVRI-FAIR goals:



**Starting point:** 39 Partners and 14 Research Infrastructures (13 ESFRI RIs, one Data Infrastructure) with a **highly diverse level of maturity** concerning FAIR data and services



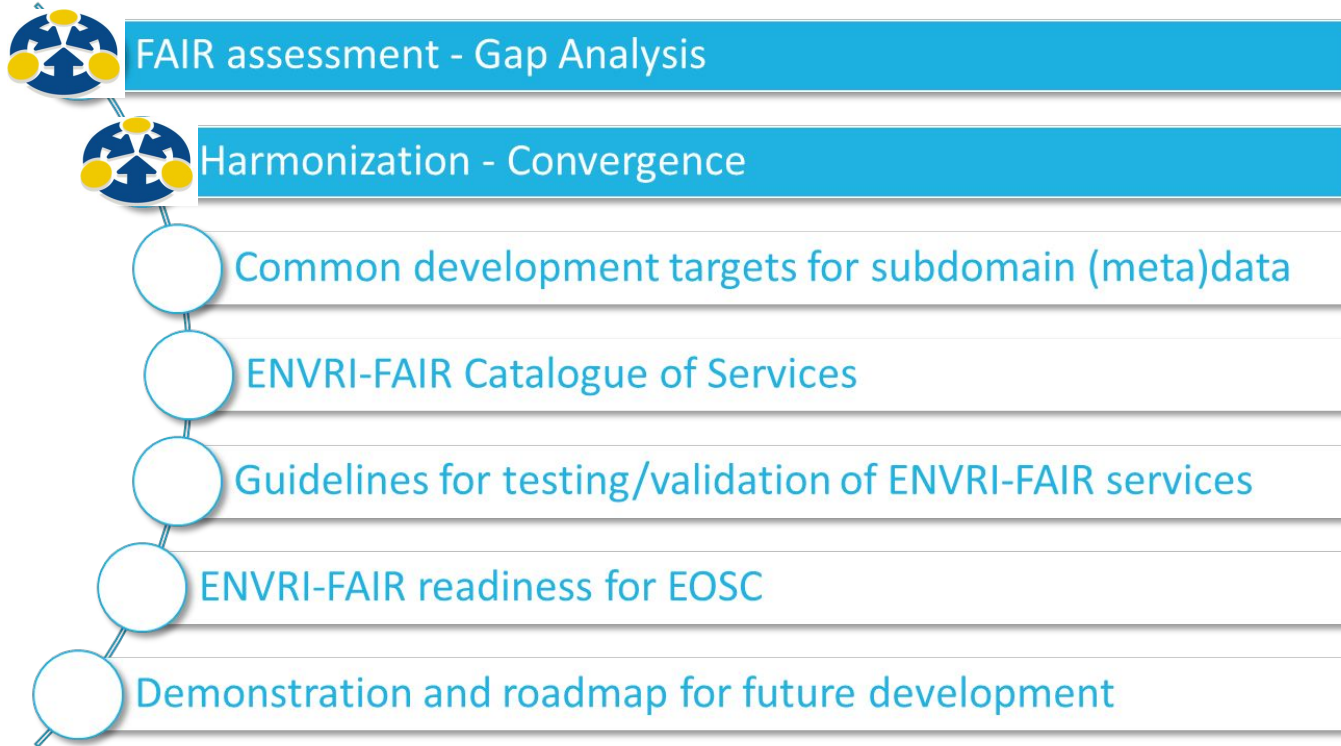
## ENVRI-FAIR WP 5 goals:

- FAIR assessment - Gap Analysis
- Harmonization – Convergence
- Common development targets for subdomain (meta)data
- ENVRI-FAIR Catalogue of Services
- Guidelines for testing/validation of ENVRI-FAIR services
- ENVRI-FAIR readiness for EOSC
- Demonstration and roadmap for future development



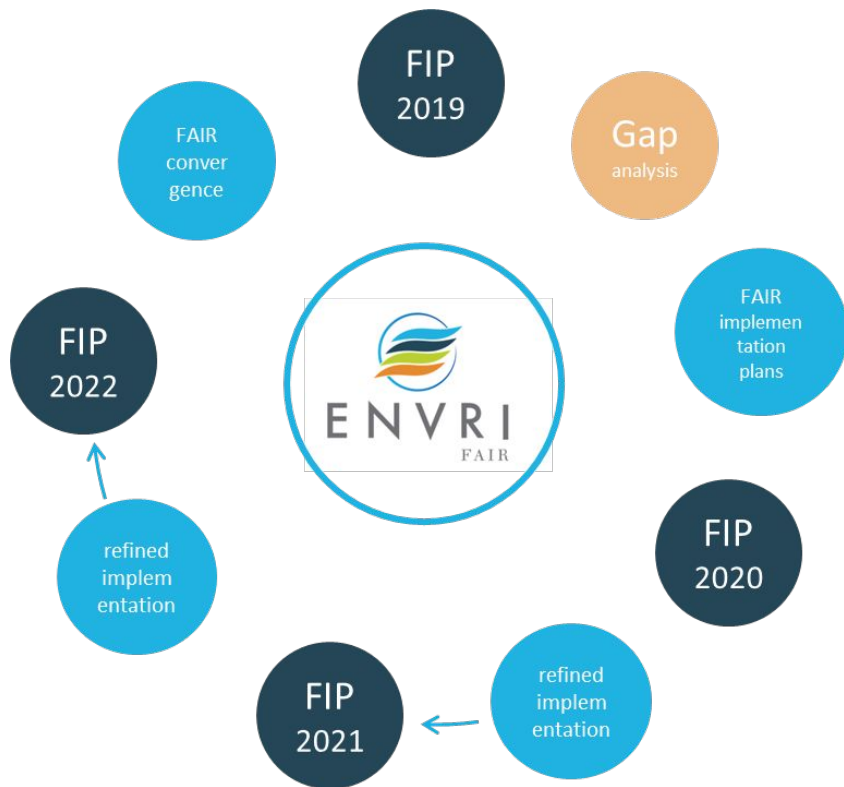


## ENVRI-FAIR WP5 goals achieved with FIPs:





## ENVRI-FAIR goals:



- FAIR Assessments updated manually using FIPs
- Gap analysis
- FAIR Implementation Plans
- Refined implementations



FAIR Convergence



## Use of FAIR Enabling Resources:

Domain	RI	Repository	2019	2020	2021	2022
ATM	ACTRIS	ACTRIS_CLU	12	12	16	17
		ACTRIS_DVAS	4	4	14	17
		ACTRIS_GRES	20	21	26	27
		ACTRIS_InSitu	8	15	19	21
		ACTRIS-ARES	7	7	20	25
		ACTRIS-ASC	16	16	21	21
	EISCAT 3D	EISCAT	14	16	18	15
	IAGOS	iagos	28	30	32	36
ICOS	ICOS	30	43	43	43	
SIOS	sios	21	24	23	29	
MAR	ArgoGdac	ArgoGdac	17	16	20	25
	EMSO	EMSO	15	15	12	12
	ICOS	ICOS	30	43	43	43
	LifeWatch-ERIC	lw-marine	24	29	29	32
	SeaDataNet	SeaDataNet-CDI	22	29	33	36
		SeaDataNet-Sextant	17	17	20	20
SOL	EPOS-ERIC	EPOS-ERIC	22		15	27
ECO	Anaee	Anaee	17	19	20	20
		AnaEE_CREA	12	12	12	
	DANUBIUS	DANUBIUS	7		16	16
	DiSSCo	DiSSCo	9	19	20	18
	eLTER-RI	eLTER-RI	28	29	30	36
	ICOS	ICOS	30	43	43	43
	LifeWatch-ERIC	LWERIC_Ecosystem	22	34	36	33
	SIOS	sios	21	24	23	29

- 🌐 Number of FIPs : 85
- 🌐 Average FIP length: 28 FERs
- 🌐 Total numbers of FERs declared: 206
- 🌐 Max number of unique FERs in a FIP: 43

# Resource overlap & convergence



2021	ACTRIS_DVAS	ACTRIS_GRES	ACTRIS_InSitu	ACTRIS_CLU	ACTRIS-ARES	ACTRIS_ASC	IAGOS	EISCAT	ArgoGdac2	EMSO	Iw-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
Iw-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

High impact on FAIR Convergence in the atmosphere domain

- Gap analysis of FAIR-ness and common implementation plan
- Common reference vocabulary for observed variables in atmospheric subdomain
- Common concept for identifying entities in data production
- Agreement on common base technology for authentication
- Common concept for attribution, citation string and acknowledgement
- Common concept for licences on data products across RI
- Metadata mapping to DCAT-AP and services registered in ENVRI-Hub
- Implementation of common protocols on machine-to-machine level to provide access to (meta)data

# WorldFAIR: Global cooperation on FAIR data policy and practice

- Two-year project to advance implementation of the FAIR principles in a range of disciplines, or cross-disciplinary research areas.
- **Funded by the European Union, HORIZON-WIDERA-2021-ERA-0 — Project: 101058393**
- Global project with beneficiaries outside the EU.
- Institutions in France, Belgium, Cyprus, Denmark, Germany, Ireland, Norway; Australia, Brazil, Kenya, New Zealand, USA; UK.
- Includes **authoritative international entities** (e.g. IUPAC, OneGeochemistry, GBIF, ODIS); connections with important projects or standards organisations (e.g. NanoCommons, DDI Alliance, OHDSI, TDWG, SalUrbAL).
- **Important partnership between CODATA and Research Data Alliance.**
- WorldFAIR website: <https://worldfair-project.eu/>
- WorldFAIR outputs: <https://zenodo.org/communities/worldfair-project/>
- WorldFAIR webinar series: <https://bit.ly/WorldFAIR-Webinar-Series>



WorldFAIR



# WorldFAIR Partners





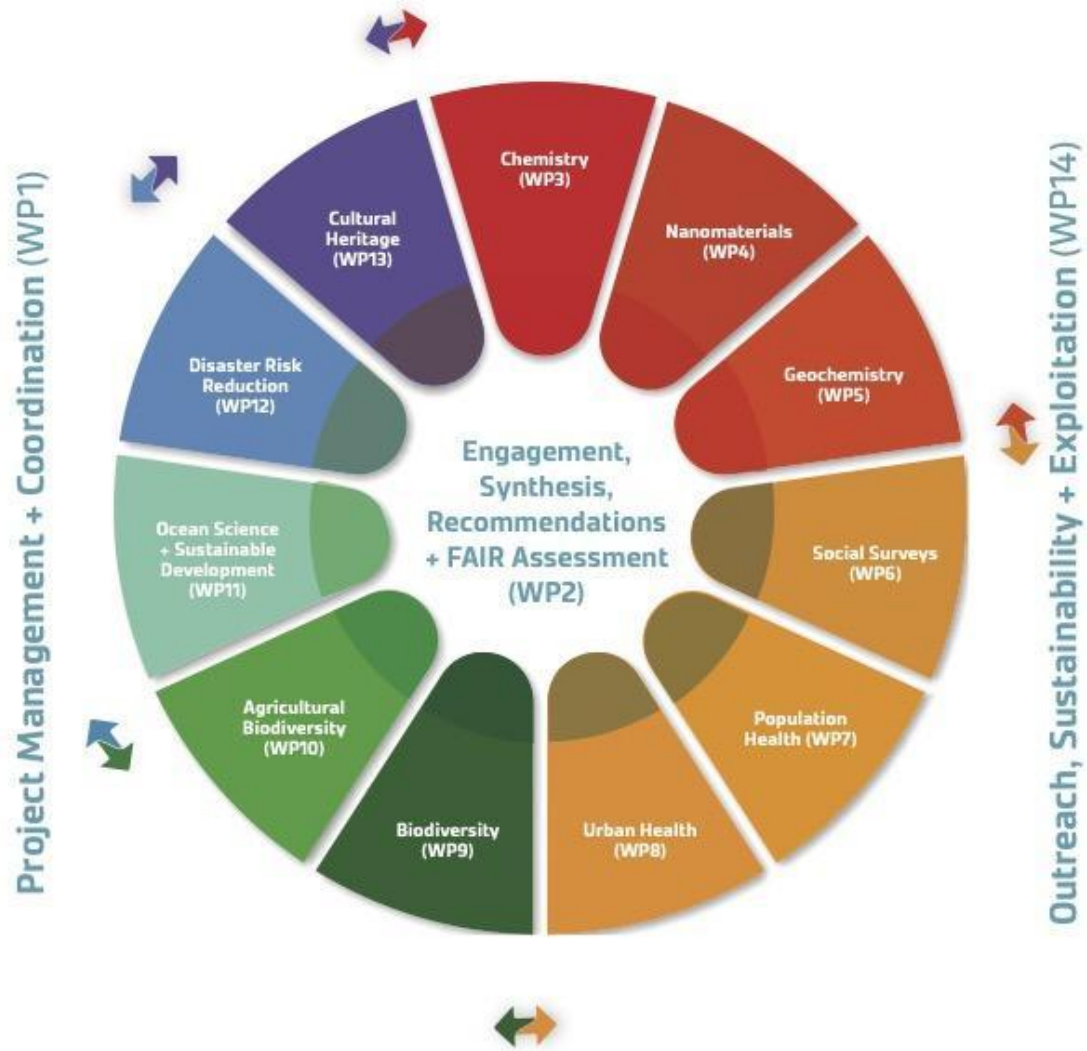
# Interoperability Frameworks

- Among the most important, but most challenging, recommendations of the **Turning FAIR into Reality** report, is R.4:
- ‘Develop **interoperability frameworks** for FAIR sharing within disciplines and for interdisciplinary research: Research communities need to be supported to develop interoperability frameworks that define their practices for data sharing, data formats, metadata standards, tools and infrastructure. **To support interdisciplinary research, these interoperability frameworks should be articulated in common ways and adopt global standards where relevant.**’
- Very strong focus on the I and the R of FAIR.
- Core driver of CODATA-ISC Decadal Programme and WorldFAIR project



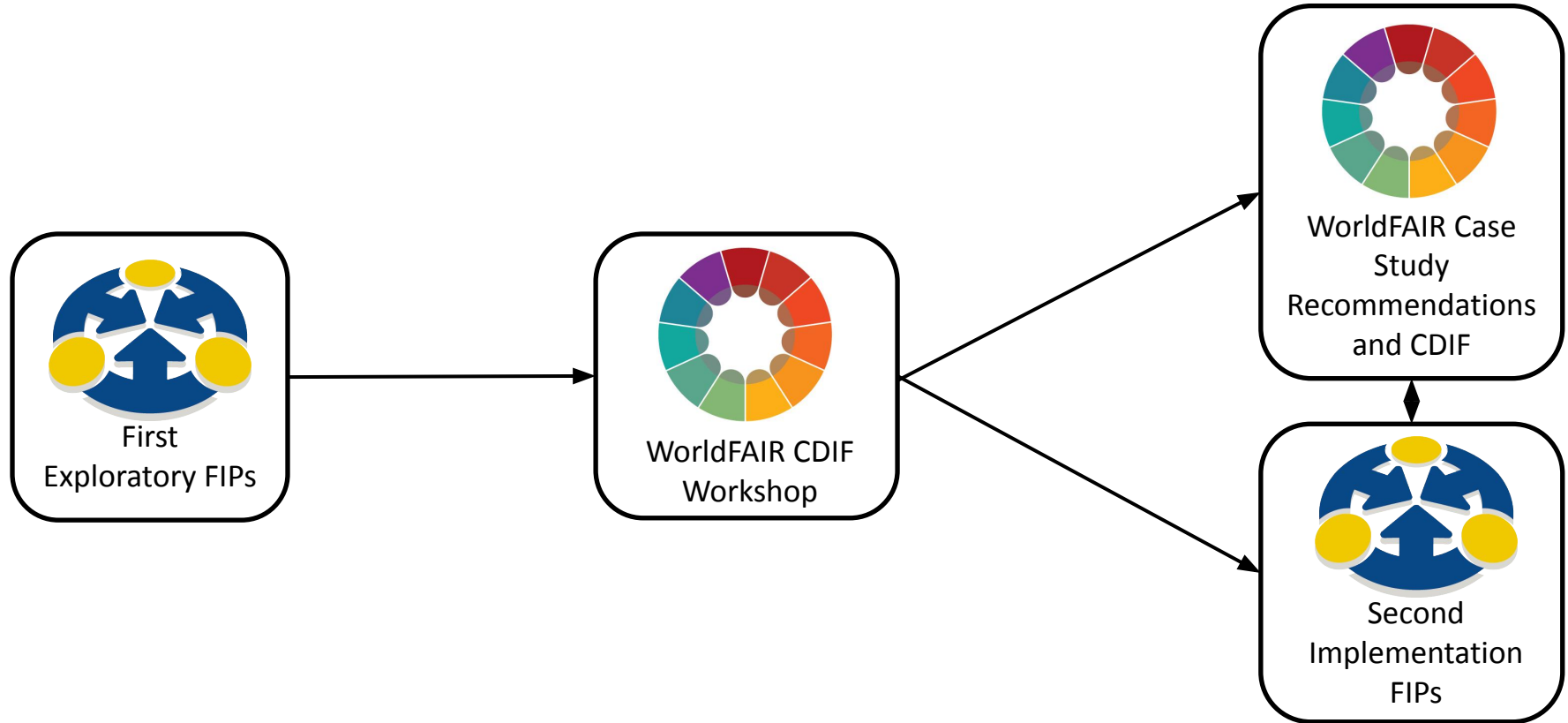
# WorldFAIR Case Studies

- **Chemistry** – making IUPAC assets FAIR
- **Nanomaterials** – applying Nanoinchi and FAIR recommendations in Nanosafety.
- **Geochemistry** – recommendations for FAIR in geochemistry, particularly vocabularies.
- **Social Surveys Data** – data harmonisation between ESS and AussiESS.
- **Population Health** – INSPIRE - Integration of population surveys with clinical and genomics data for COVID-19 research in eastern and southern Africa.
- **Urban Health** – terminologies and making urban health data FAIR
- **Biodiversity** – improving GBIF data model in collaboration with TDWG - GBIF (Global Biodiversity Information Facility)
- **Agricultural Biodiversity** – pollinator data (KALRO, Embrapa, Meise, HiveTracks)
- **Ocean Science** – Implementing FAIR in the ODIS (Ocean Data and Information System) for the UNESCO Oceans' decade.
- **Disaster Risk Reduction** – recommendations on making DRR data and terminologies FAIR, case studies in Africa and Pacific Islands
- **Cultural Heritage** – recommendations on making cultural heritage data FAIR (particularly digital representation of heritage artefacts)





# WorldFAIR Methodology



# WorldFAIR Methodology

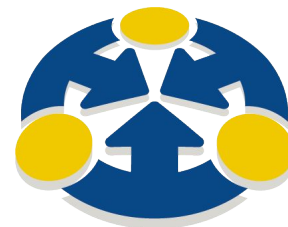
## WorldFAIR(+) Methodology

1. Identify and scope new Case Studies (or Petals): i.e. a research group, institution, project with which an OSC is working.
2. FAIR Implementation Profile (FIP) Workshop(s)
3. Depending on the Case Study, this could involve one or many FIPs.
  1. Guided and collaboration creation of the FAIR Implementation Profile; can cover the 'here and now' and indicate aspirations.
4. Methodology for modelling research processes to identify necessary provenance information and key organising concepts ('Objects of Interest' and 'Conceptual Variables').
5. Interoperability Framework Workshop
  1. Takes the FIP(s) and the 'organising concepts' as starting points.
  2. Detailed, structured discussion of data model, metadata, semantics, representation, etc.
  3. Iterative discussion in relation to domain practice and the emerging CDIF.
  4. Recommendations for an Interoperability Framework from the Case Study.
6. Co-design an implementation plan and an aspirational FIP.



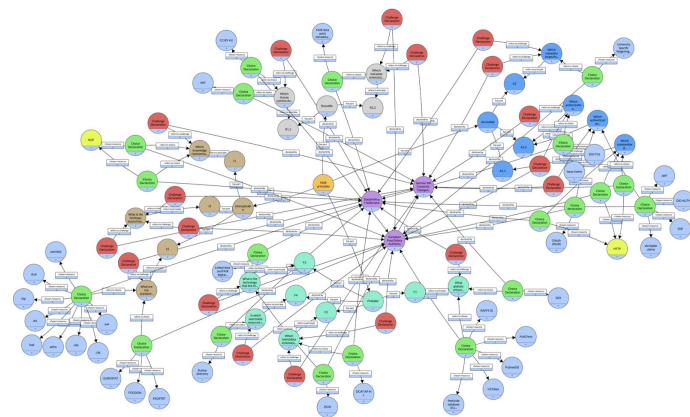
# What are FAIR Implementation Profiles (FIPs)?

- A methodology for understanding the practices of a community in relation to FAIR.
- Developed by the GO FAIR initiative: ‘a collection of FAIR implementation choices made by a community of practice for each of the FAIR Principles’.
- Set of questions, relating to each of the FAIR principles and sub-principles, for data and metadata, that allow a ‘community’ to state the FAIR Enabling Resources it uses to make data and metadata FAIR for each of the principles.
- Supported by an online tool: <https://fip-wizard.ds-wizard.org/>
- Allows the publication of the FIPs as nanopublications, allowing machine referencing and visualisation of practice across a range of research areas.
- **Valuable as a tool to enable a community to reflect on current and potential practice to improve FAIRness.**
- **Report ‘FAIR Implementation Profiles (FIPs) in WorldFAIR: What Have We Learnt?’: <https://doi.org/10.5281/zenodo.7378109>**



 FIP Wizard

Figure from  
<https://www.go-fair.org/how-to-go-fair/fair-implementation-profile/>, Figure courtesy of Barbra Magagna, Umweltbundesamt GmbH and Kristina Hettne, CDS University Library Leiden



# FIPs: value to WorldFAIR

- Very useful tool for understanding current and potential FAIR practices in a given community.
- Assists in focusing reflection on practice, how this may be improved.
- Essential for the WorldFAIR approach, as it:
  - Helps identify shared practices across domains.
    - See analysis of this in WorldFAIR D11.1 ‘An assessment of the Ocean Data priority areas for development and implementation’  
<https://doi.org/10.5281/zenodo.7682399>
  - Helps towards the functional breakdown and solutions in CDIF.

## 9.2 Appendix Two: FAIR Implementation Profile for AUSSI-ESS (managed by ADA)

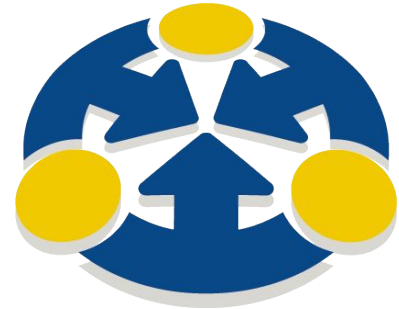
This table summarises the FAIR Implementation Profile for the ADA services supporting the AUSSI-ESS through the ADA Dataverse and related services.

Table 6 FAIR Implementation Profile (FER) for AUSSI-ESS – Australian Data Archive

FAIR Principle name	Referring to MetaData/Data	FIP question	FER Enabling Resource used in WPO6 Social Surveys
F1	MD	What globally unique, persistent, resolvable identifier service do you use for metadata records?	DataCite DOI resolution service
F1	D	What globally unique, persistent, resolvable identifier service do you use for datasets?	DataCite DOI resolution service
F2	MD	What metadata schemas do you use for findability?	DDI Codebook Version 2.1
F2	MD	What metadata schemas do you use for findability?	DataCite metadata schema version 3.1
F3	D	What is the schema that links the persistent identifiers of your data to the metadata description?	No implementation choice has been made by this community
F4	MD	Which service do you use to publish your metadata records?	ADA Dataverse
F4	D	Which service do you use to publish your datasets?	ADA Dataverse
A1.1	MD	Which standardized communication protocol do you use for metadata records?	HTTPS Hypertext Transfer Protocol Secure
A1.1	MD	Which standardized communication protocol do you use for metadata records?	REST Representational state transfer
A1.1	D	Which standardized communication protocol do you use for datasets?	HTTPS Hypertext Transfer Protocol Secure
A1.1	D	Which standardized communication protocol do you use for datasets?	REST Representational state transfer
A1.2	MD	Which authentication & authorisation service do you use for metadata records?	None for open records; SAML2 Security Assertion Markup Language 2.0
A1.2	D	Which authentication & authorisation service do you use for datasets?	SAML2 Security Assertion Markup Language 2.0
A2	MD	What metadata preservation policy do you use?	RDA Core Trust Seal Certification
I1	MD	What knowledge representation language (allowing machine interoperation) do you use for metadata records?	JSON JavaScript Notation Object
I1	MD	What knowledge representation language (allowing machine interoperation) do you use for metadata records?	XMLS eXtensible Markup Language Schema

# How have WorldFAIR Case Studies used FIPs?

- FIPs used to assist comparison of practice across the European Social Survey and the Australian Social Survey. Helped identify shared infrastructural needs (registries) and fed into recommendations.
  - See D6.1 'Cross-national Social Sciences survey FAIR implementation case studies', pp.24-27: <https://doi.org/10.5281/zenodo.7599652>
- Used in analysis to identify 'both generic and domain-specific (meta)data exchange conventions and FERs with high potential to bridge other WorldFAIR case studies to and with ODIS (Oceans Data Information System).
  - See D11.1 'An assessment of the Ocean Data priority areas for development and implementation', pp.16-28: <https://doi.org/10.5281/zenodo.7682399>
- Two FIPs used to help understand 1, the 'FAIR application of IUPAC standards in supporting chemistry data exchange', and 2, 'the FAIR status of IUPAC standards for those who need to use them'.
  - See D3.1 'Digital recommendations for Chemistry FAIR data policy and practice', pp.42-44 (discussion of FERs, FIPs and CDIF in chemistry and across domains) and 59-67 (FIPs): <https://doi.org/10.5281/zenodo.7887283>
- Extended discussion of the FIPs process and reflections on implications for diverse data in nanomaterials / nano-safety domains.
  - See D4.1 'Nanomaterials domain-specific FAIRification mapping', pp.59-74 (As-Is' Nanomaterials FIP): <https://doi.org/10.5281/zenodo.7887341>
- FIPs as a basis guide (work in progress) for good practice in urban health and for the SALURBAL project.
  - See D8.1 'Urban Health Data - Guidelines and Recommendations', pp.11-14 (discussion) and pp.28-57 (FAIR Primer for the SALURBAL data platform): <https://doi.org/10.5281/zenodo.7887523>



WorldFAIR

# FAIR Implementation and FAIR Assessment

## FAIR Implementation and FAIR Assessment

- A lot of effort being put into FAIR Assessment.
- The priority for WorldFAIR is to help enable research communities to develop, articulate and implement FAIR practices.
- How do we assess FAIRness effectively when practices are still emerging? Need for domain sensitive FAIR recommendations.
- **The FAIR Implementation Profiles horse should come before the FAIR assessment cart.**

## FIPs and FIP Wizard in WorldFAIR

- Very useful as an hermeneutic exercise with each community.
- Useful in identifying technical (metadata and semantic) points of contact across domains.
- FIPs and FER graph could provide a visualisation of practice
- Genuine potential in a platform for sharing FIPs as readily visualisable and explorable nanopublications. Will FAIR Connect provide this?  
<https://fairconnect.pro/>



# A vision on FIPs as infrastructure

FIP workshops  
sponsored by funding  
agency

Qualified / endorsed FAIR  
Implementation Profile

Auto-informed FAIR data  
management plan (template)

FAIR data management  
implemented in a project

FAIR  
Evaluation

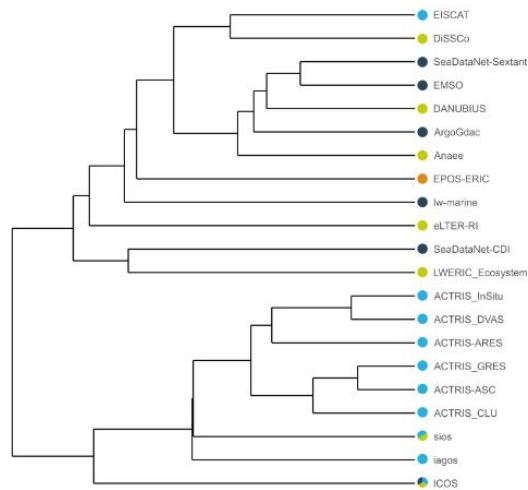
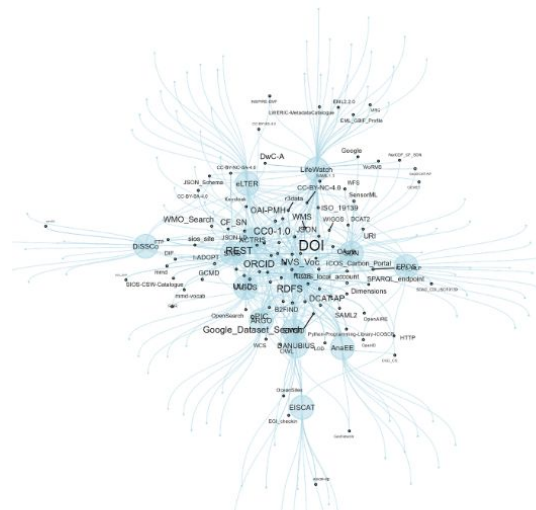


1 Hettne, Kristina Maria et al. 'FIP2DMP: Linking Data Management Plans with FAIR Implementation Profiles'. 1 Jan. 2023 : 23 – 27. <https://content.iospress.com/articles/fair-connect/fc221515>

2 Wilkinson, M. D., Sansone, S.-A., Grootveld Marjan, Nordling, J., Dennis, R., & Hecker, D. (2022). FAIR Assessment Tools: Towards an "Apples to Apples" Comparisons. Zenodo. <https://doi.org/10.5281/zenodo.7463421>

# A vision on FIPs as infrastructure

- Objective FAIR **Assessment**
  - Manual
  - Automated tools
- Smart **FAIRification**
  - Community objectives (R1.3)
  - Ecosystem landscape
- Catalyze **Convergence**
  - Cross-domain
  - Machine-learning
- Guides FAIR **Practices**
  - FIP2DMP





# FAIR Well !



## Three-Point FAIRification Framework

Home > How to GO FAIR <https://www.go-fair.org/how-to-go-fair/>

### How to GO FAIR

Since its beginning in early 2018, the GO FAIR community has been working towards implementations of the **FAIR Guiding Principles**. This collective effort has resulted in a three-point framework that formulates the essential steps towards the end goal, a global Internet of FAIR Data and Services where data are Findable, Accessible, Interoperable and Reusable (**FAIR**) for machines.

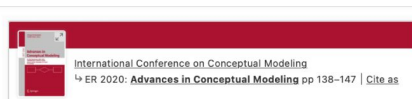


### A framework guiding FAIRification

The Three-point FAIRification Framework provides practical "how to" guidance to stakeholders seeking to go FAIR.

Moreover, by following this framework, stakeholders can rest assured that their efforts toward FAIRification will be optimally coordinated with the efforts of other stakeholders in the GO FAIR community. The three-point framework maximizes reuse of existing resources, maximizes interoperability, and accelerates convergence on standards and technologies supporting FAIR data and services.

- Typically, the FAIRification process begins when a community of practice considers its domain-relevant metadata requirements and other policy considerations, and formulates these considerations as machine-actionable metadata components. These considerations can be guided in **Metadata for Machines (M4M)** Workshops.



### Reusable FAIR Implementation Profiles as Accelerators of FAIR Convergence

[Erik Schultes](#), [Barbara Magagna](#), [Kristina Maria Hettne](#), [Robert Perol](#), [Marek Suchánek](#) & [Tobias Kuhn](#)

Conference paper | [First Online: 22 December 2020](#)

741 Accesses | 1 Citations

Part of the [Lecture Notes in Computer Science](#) book series (LNPS, volume 12584)

### Abstract

Powerful incentives are driving the adoption of FAIR practices among a broad cross-section of stakeholders. This adoption process must factor in numerous considerations regarding the use of both domain-specific and infrastructural resources. These considerations must be made for each of the FAIR Guiding Principles and include supra-domain objectives such as the maximum reuse of existing resources (i.e., minimised reinvention of the wheel) or maximum interoperation with existing FAIR data and services. Despite the complexity of this task, it is likely that the majority of the decisions will be repeated across communities and that communities can expedite their own FAIR adoption process by judiciously reusing the implementation choices already made by others. To leverage these redundancies and accelerate convergence onto widespread reuse of FAIR implementations, we have developed the concept of FAIR implementation Profile (FIP) that captures the comprehensive set of implementation choices made at the discretion of individual communities of practice. The collection of community-specific FIPs compose an online resource called the FIP Convergence Matrix which can be used to track the evolving landscape of FAIR implementations and inform optimisation around reuse and interoperation. Ready-made and well-tested FIPs created by trusted communities will find widespread reuse among other communities and could vastly accelerate decision making on well-informed implementations of the FAIR Principles within and particularly between domains.

Lecture Notes in Computer Science vol 12584. Springer, Cham.

[https://doi.org/10.1007/978-3-030-65847-2\\_13](https://doi.org/10.1007/978-3-030-65847-2_13)

Peterseil, J., Offenthaler, I., Wohner, C., Magagna, B., Schultes, E., Lund Myhre, C., Jeffery, K., Bailo, D., Dobler, D., Portier, M., Dema, C., Vaira, L., & Rosati, I. (2023). ENVRI-FAIR D5.6: Synthesis and future strategy (Version 1). Zenodo.

<https://doi.org/10.5281/zenodo.8118948>



Gregory, A., & Hodson, S. (2022). WorldFAIR Project (D2.1) 'FAIR Implementation Profiles (FIPs) in WorldFAIR: What Have We Learnt?' (1.0). Zenodo. <https://doi.org/10.5281/zenodo.7378109>