

List of governance tools and resources identified in Deliverable D2.1

To be extended and refined in Deliverable D2.6 by March 2026

Please check Deliverable D2.1 for a complete version:

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Acronyms

Acronym	Description
BODC	British Oceanographic Data Centre
CF	Climate and Forecast
EPSG	European Petroleum Survey Group
GEO	Group on Earth Observations
I-ADOPT WG	Interoperable Descriptions of Observable Property Terminology WG
ISO	International Organization for Standardization
NASA	National Aeronautics and Space Administration
OGC	Open Geospatial Consortium
RDA	Research Data Alliance
SPDX	System Package Data Exchange
WIGOS	WMO Integrated Global Observing System
WMO	World Meteorological Organization



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Quality Management Systems

Name	Type	Date	
		Publication	Revision
ISO 9000:2015 Quality management systems — Fundamentals and vocabulary	Standard	2015	2024
ISO 9001:2015 Quality management systems — Requirements	Standard	2015	2021
ISO 9004:2018 Quality management — Quality of an organization — Guidance to achieve sustained success	Standard	2018	2023
ISO 19011:2018 Guidelines for Auditing Management Systems	Standard	2018	-
WMO-No. 1221 Guidelines on Quality Management in Climate Services	Guideline	2018	-

(meta)Data

Name	Type	Date	
		Publication	Revision
Management / Stewardship			
WMO-No. 1238 Manual on the High-quality Global Data Management Framework for Climate	Guideline	2019	2023
GEO Data Working Group. (2024). GEO Data Sharing and Data Management Principles. GEO Knowledge Hub. https://doi.org/10.60566/3p7vv-ykj55	Guideline	2024	-
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	Guideline	2016	-
CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Requirements 2023-2025 (V01.00). Zenodo. https://doi.org/10.5281/zenodo.7051012	Guideline	2022	-
(meta)data format and content			
WMO-No. 1060 Manual on the WMO Information System, Volume II — WMO Information System 2.0, Annex F: WMO Core Metadata Profile (VERSION 2)	Guideline	2024	-



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WMO-No. 1192 WIGOS Metadata Standard	Standard	2017	2019
Climate and Forecast (CF) Metadata Convention	?	-	-
ISO 19115-1:2014 Geographic information — Metadata, Part 1: Fundamentals	Standard	2014	2019
ISO 19162:2019 Geographic information — Well-known text representation of coordinate reference systems	Standard	2019	2024
State of the art data formats for climate data: <ul style="list-style-type: none"> - BUFR (Binary Universal Form for the Representation of meteorological data) - GRIB (GRIdded Binary, or General Regularly-distributed Information in Binary form) - NetCDF (Network Common Data Form) - HDF (Hierarchical Data Format) - Zarr - GeoTIFF - Cloud Optimised GeoTIFF (COG) 	Collection	-	-
Data citation			
Data Citation Synthesis Group: Joint Declaration of Data Citation Principles. Martone M. (ed.) San Diego CA: FORCE11; 2014 https://doi.org/10.25490/a97f-egykh	Guideline	2014	-
ESIP Data Preservation and Stewardship Committee. 2019. Data Citation Guidelines for Earth Science Data. Ver. 2. Earth Science Information Partners. https://doi.org/10.6084/m9.figshare.8441816	Guideline	2019	-
Stall, S., Bilder, G., Cannon, M. et al. Journal Production Guidance for Software and Data Citations. Sci Data 10, 656 (2023). https://doi.org/10.1038/s41597-023-02491-7	Guideline	2023	-
Ball, A., Duke, M. (2012). 'Data Citation and Linking'. DCC Briefing Papers. Edinburgh: Digital Curation Centre. Available online: /resources/briefing-papers/	Guideline	2012	-
Data licensing			
System Package Data Exchange (SPDX) License list	Collection	-	-
Validation Tools			
FAIR validation tools: <ul style="list-style-type: none"> - GO-FAIR metrics - FAIRness Implementation Plan - F-UJI validator - FAIR Checker 	-	-	-



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Software

Name	Type	Date	
		Publication	Revision
Software management / stewardship			
Barker, M., Chue Hong, N.P., Katz, D.S. et al. Introducing the FAIR Principles for research software. Sci Data 9, 622 (2022). https://doi.org/10.1038/s41597-022-01710-x	Guideline	2022	-
Software quality requirements			
ISO/IEC 5055:2021 Information technology — Software measurement — Software quality measurement — Automated source code quality measures	Standard	2021	-
Coding convention			
PEP8 - Style Guide for Python Code	Convention	2001	2013
Metadata for software			
Christophersen, Allan. Colón-Marrero , Elena. Dietrich, Dianne. Falcao, Patricia. Fox, Claire. Hanson, Karen. Kwan, Allen. McEniry, Matthew. (2023, October 17). Software Metadata Recommended Formats Guide. Software Preservation Network. https://doi.org/10.5281/zenodo.10001787	Guideline	2023	-
Matthew B. Jones, Carl Boettiger, Abby Cabunoc Mayes, Arfon Smith, Morane Gruenpeter, Valentin Lorentz, Thomas Morrell, Daniel Garijo, Peter Slaughter, Kyle Niemeyer, Yolanda Gil, Martin Fenner, Krzysztof Nowak, Mark Hahnel, Luke Coy, Alice Allen, Mercè Crosas, Ashley Sands, Neil Chue Hong, Patricia Cruse, Daniel S. Katz, Carole Goble, Bryce Mecum, Alejandra Gonzalez-Beltran, Noam Ross. 2023. CodeMeta: an exchange schema for software metadata. Version 3.0. https://w3id.org/codemeta/v3.0	Convention	2023	-
GitHub Recommendations for READMEs	Guideline	?	-
Software citation			
Smith AM, Katz DS, Niemeyer KE, FORCE11 Software Citation Working Group. (2016) Software Citation Principles. PeerJ Computer Science 2:e86. https://doi.org/10.7717/peerj-cs.86	Guidelines	2016	-
Stall, S., Bilder, G., Cannon, M. et al. Journal Production Guidance for Software and Data Citations. Sci Data 10, 656 (2023). https://doi.org/10.1038/s41597-023-02491-7	Guideline	2023	-



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GitHub Software Citation Recommendations - Integration with Zenodo	Guideline	-	-
Software licenses			
System Package Data Exchange (SPDX) License list	Collection	-	-

Vocabulary

Name	Type	Date	
		Publication	Revision
Vocabulary Topic: information technology			
ISO/IEC 2382:2015 Information technology — Vocabulary	Standard	2015	2025
Schema.org : schemas (vocabularies) for structured data on the Internet	?	2015	-
WMO Codes Registry : collection of data and file formats used for meteorological and climatological data.	Collection	?	?
Magagna, B., Moncoiffé, G., Devaraju, A., Stoica, M., Schindler, S., Pamment, A., & RDA I-ADOPT WG. (2022). Interoperable Descriptions of Observable Property Terminologies (I-ADOPT) WG Outputs and Recommendations (1.1.0). Zenodo. https://doi.org/10.15497/RDA00071	Collection	?	?
Vocabulary Topic: Earth Science			
NASA - Global Change Master Directory (GCMD) - Keywords: set of controlled vocabularies in Earth Science. (GUI viewer)	?	-	-
EPSG Geodetic Parameter Dataset (EPSG Registry)	?	-	-
Core Controlled Vocabularies (CVs) for CMIP6	?	?	?
Vocabulary topic: biology			
WoRMS (World Register of Marine Species)	Taxonomy	-	-
Integrated Taxonomic Information Systems (ITIS) : taxonomy of global species	Taxonomy	-	-
Vocabulary topic: chemistry			
International Union of Pure and Applied Chemistry (IUPAC) Recommendations	Guideline	-	-



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Vocabulary topic: Multiple			
The NERC Vocabulary Server (NVS), National Oceanography Centre - British Oceanographic Data Centre (BODC), https://vocab.nerc.ac.uk	?	-	-
BODC-approved data storage units (http://vocab.nerc.ac.uk/collection/P06/current/), British Oceanographic Data Centre (2024)	?	2024	-
BODC Parameter Usage Vocabulary (http://vocab.nerc.ac.uk/collection/P01/current/) British Oceanographic Data Centre (2025)	?	2025	-
GEneral Multilingual Environmental Thesaurus (GEMET)	?	2021	-
Australian Research Data Commons (ARDC)	?	-	-
International Council for the Exploration of the Sea (ICES)	?	-	-
Quantity, Unit, Dimension and Type (QUDT)	Ontology	?	?
Unified Code for Units Measure (UCUM)	Code system	?	?
UDUNITS (C library for units of physical quantities)	Library	?	?

Other resources

- [EOPortal](#) - List of Earth Observation satellites, the instruments onboard and other details.
- WMO No. 8 Guide to Instruments and Methods of Observations, Volume III - Observing Systems
- [SeaDataNet](#): Pan-European infrastructure for ocean and marine data management
- [ES-DOC](#): System and database for documentation of CMIP experiments and participating modelling systems and configurations.
- [Attribute Convention for Data Discovery \(ACDD\)](#): Discoverability of climate datasets.
- [CMIP Specification](#): Specification of global climate and earth system model experiments, model output data formats, dissemination and archiving.
- [CORDEX Specification](#): Specification of downscaling experiments by regional climate models, model output format, dissemination and archiving.
- [PROJ](#): generic coordinate transformation software
- Matentzoglou et al A Simple Standard for Sharing Ontological Mappings (SSSOM), Database, Volume 2022, 2022, baac035, <https://doi.org/10.1093/database/baac035>
- Metadata access interfaces:
 - REST or RESTful APIs (REpresentational State Transfer Application Programming Interfaces)
 - Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH)
 - GraphQL APIs: <https://graphql.org/>
 - OGC Web Catalogue Service (WCAS) or Catalogue Service for the Web (CSW).
 - [INSPIRE](#) (Infrastructure for Spatial Information in Europe) Directive of the EU
 - GeoDCAT-AP profile of the W3C DCAT application for data portals
 - OGC services endpoints: WMS, WFS, WCS and SPARQL
- Data access:



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- OGC + CSW -> Web Map Service (WMS), Web Feature Service (WFS), Web Coverage Service (WCS), Web Processing Service (WPS)
- HTTP Server data access
- Globus and GridFTP file transfers
- OpenDAP
- Live Access Server (LAS)
- List of Metadata standards compiled by the Digital Curation Center:
<https://www.dcc.ac.uk/guidance/standards/metadata>



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