

# Metadata as Key? Open Science, Good Research Practice and Research Integrity

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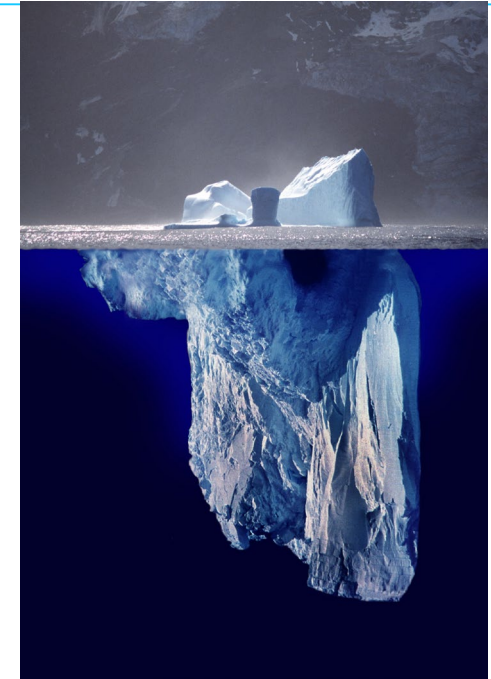
Helmholtz Association  
Helmholtz Open Science Office

HMC FAIR Friday, 23.09.2022

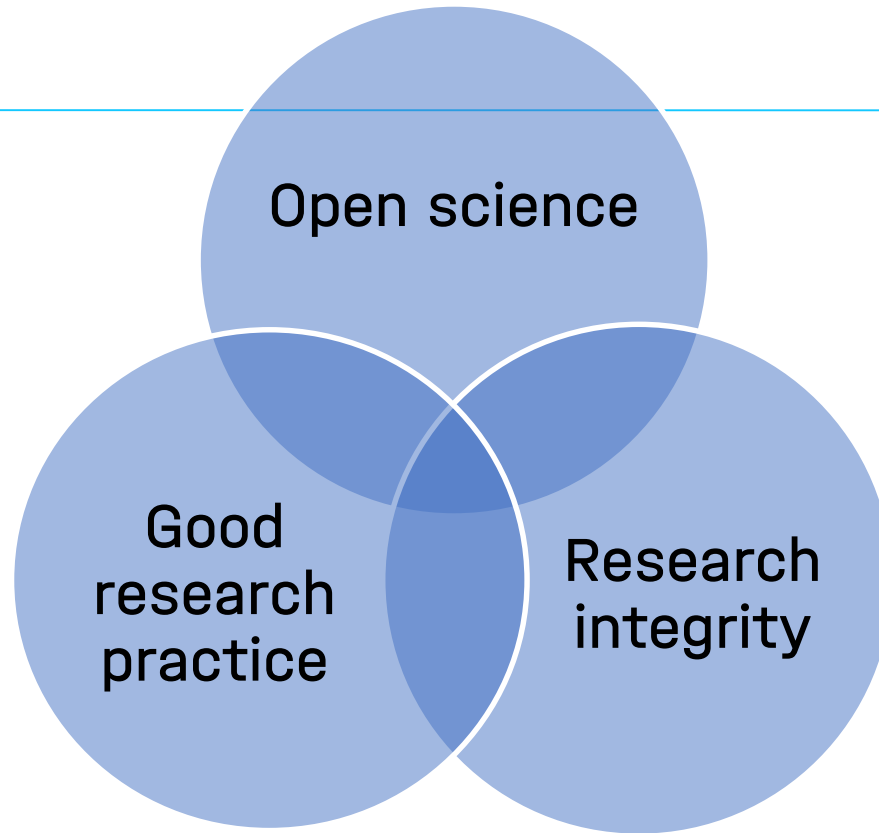
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## Metadata in

- Open science
- Research integrity
- Good research practice



<https://de.wikipedia.org/wiki/Eisbergmodell#/media/Datel:Iceberg.jpg> CC-BY-SA



Open Science

# UNESCO Recommendation on Open Science

**Open science  
increases scientific  
collaborations and sharing  
of information for the benefits  
of science and society**

**OPEN  
SCIENCE**

**makes multilingual scientific  
knowledge openly available,  
accessible and reusable for  
everyone**

**opens the processes of scientific  
knowledge creation, evaluation and  
communication to societal actors  
beyond the traditional scientific  
community.**

# UNESCO Recommendation on Open Science

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Open scientific knowledge refers to open access to scientific publications, research data, metadata, open educational resources, software, and source code and hardware ...

- Open research data ... and the accompanying metadata ... are available in a timely and user-friendly, human- and machine-readable and actionable format, in accordance with principles of good data governance and stewardship, notably the FAIR principles ...
- Federated information technology infrastructure for open science ... Technical requirements specific to every digital object of significance for science, whether a datum, a dataset, metadata, code or publication, should also be addressed.
- Community agreements ... and which define community practices for data sharing, data formats, metadata standards, ontologies and terminologies, tools and infrastructure ..
- give value to all relevant research activities and scientific outputs including high-quality FAIR data and metadata, ...

# Open Science

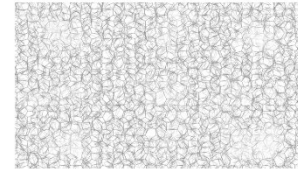
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- Cultural change in scientific working methods, organization, and communication.
- Consistently employs digitization to make all components of the scientific process (publications, research data, research software, etc.) open, traceable, reusable, and accessible to everyone (in terms of reducing technical, legal, and financial hurdles).
- Expands transparency and the possibilities for quality assurance, increases the performance of science, and promotes innovations based on scientific findings.

# Open Science in Helmholtz

- Our core topics
  - **Open Access** - access to and re-use of textual publications
  - **Open Research Data** - access to and re-use of research data
  - **Open Research Software** - access to and re-use of research software
  - **National and international network** concerning open science

## Our Core Topics



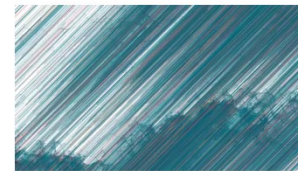
### Open Science in Helmholtz

The mission of the Helmholtz Open Science Office is to promote the cultural change towards open science. Guided by the motto "Enabling open science practices in Helmholtz!" the Helmholtz Open Science...



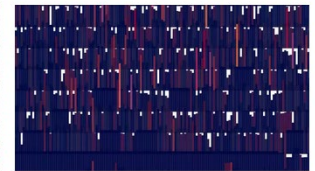
### Open Access

For open access, one of the Helmholtz Open Science Office's key endeavours is the promotion of the transformation from subscription-based access to open access.



### Open Research Data

The Centers of the Helmholtz Association conduct data-intensive research with internationally significant large-scale facilities and digital information infrastructures. The Helmholtz Open Science...



### Open Research Software

While open science calls for accessibility and reuse of scientific results, in many research areas, this can only be ensured if source code is made openly accessible in addition to the corresponding...



# Open Science in Helmholtz

- Open Science is an important cross-cutting topic
- Metadata is an important cross-cutting topic with numerous points of contact
- In the Centers:
  - digitization, research infrastructures, libraries, data centers, transfer, etc.
- In the entire Association:
  - Digital transformation, KPIs, incubator platforms, Initiative and Networking Fund, transfer, etc.

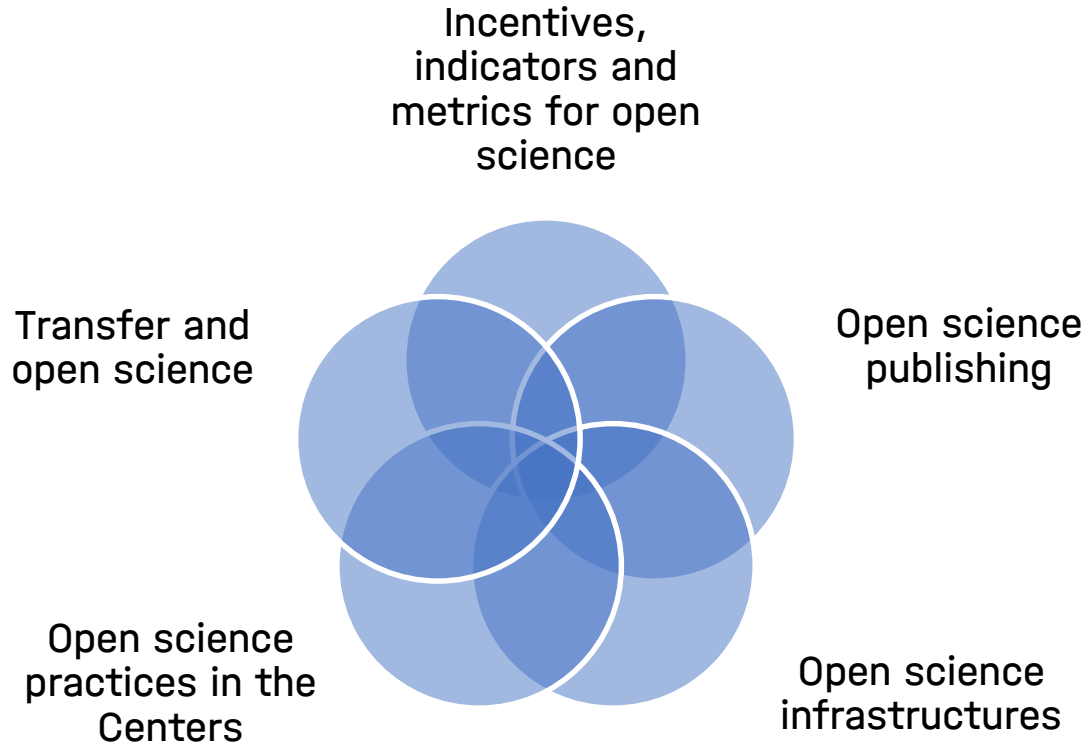
FAIR RESEARCH DATA FOR  
CULTURAL CHANGE

READ MORE

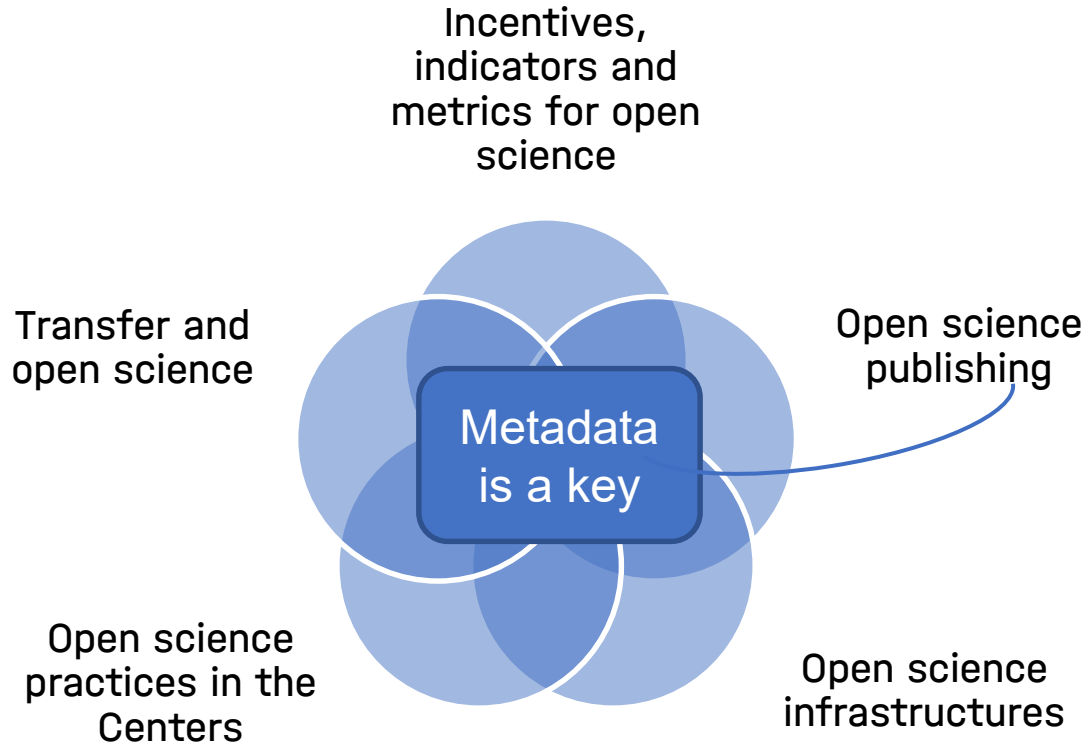


# Helmholtz Open Science Office: Enabling Open Science practices in Helmholtz!

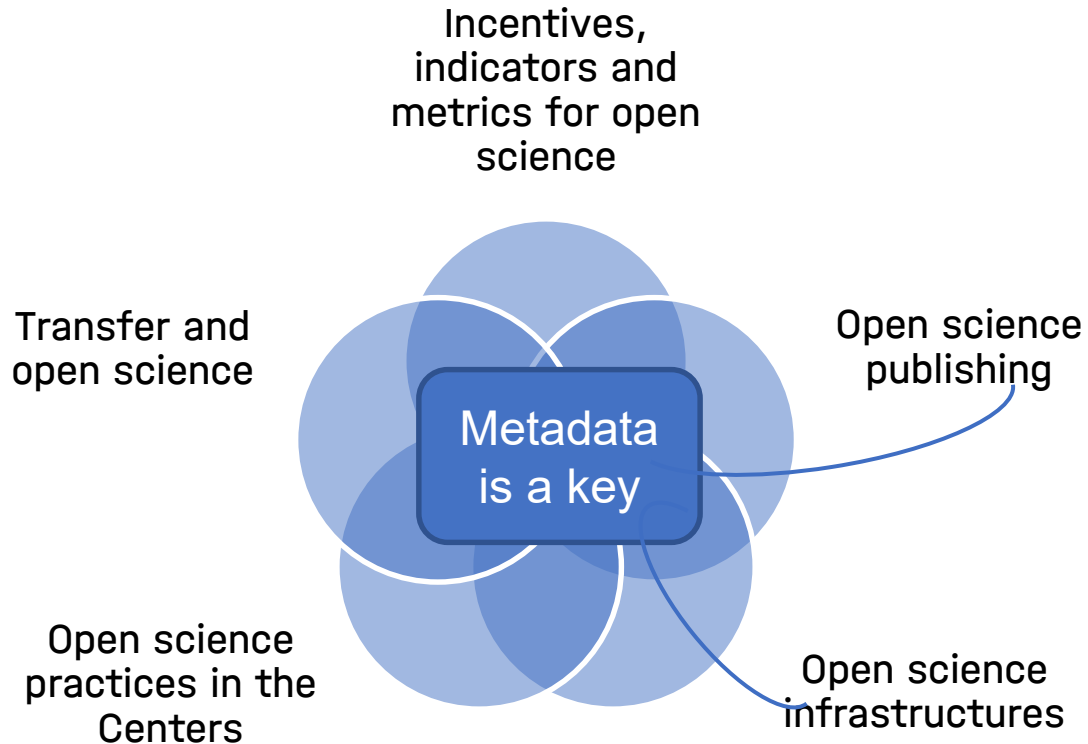
## Focus topics



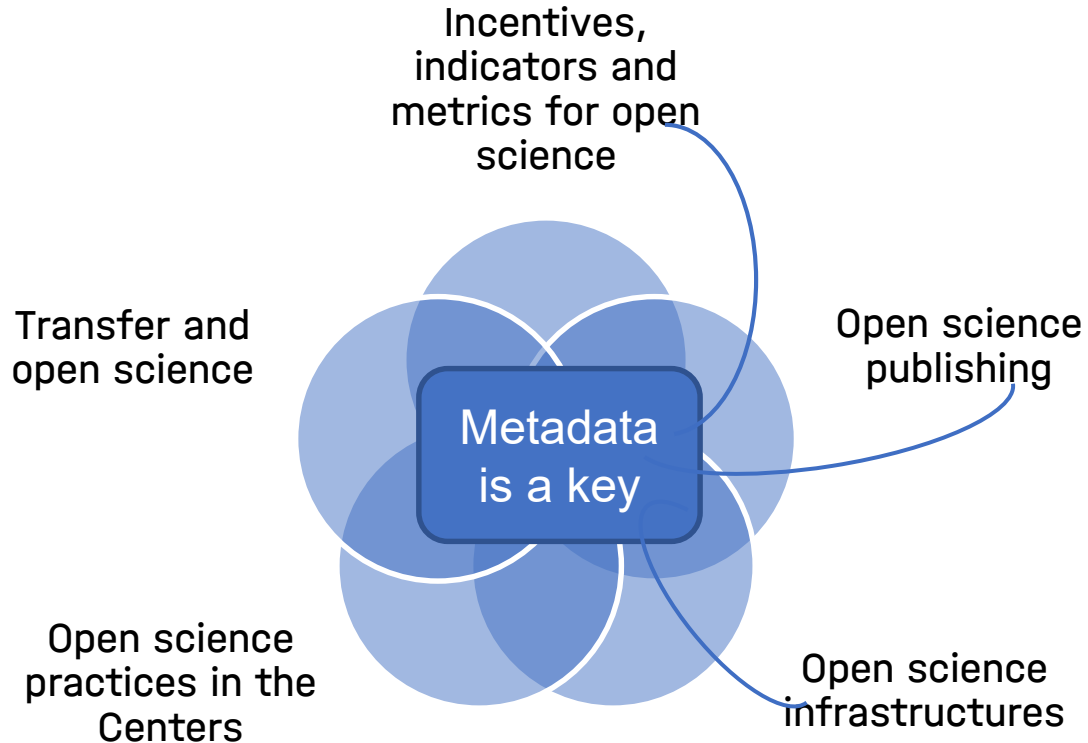
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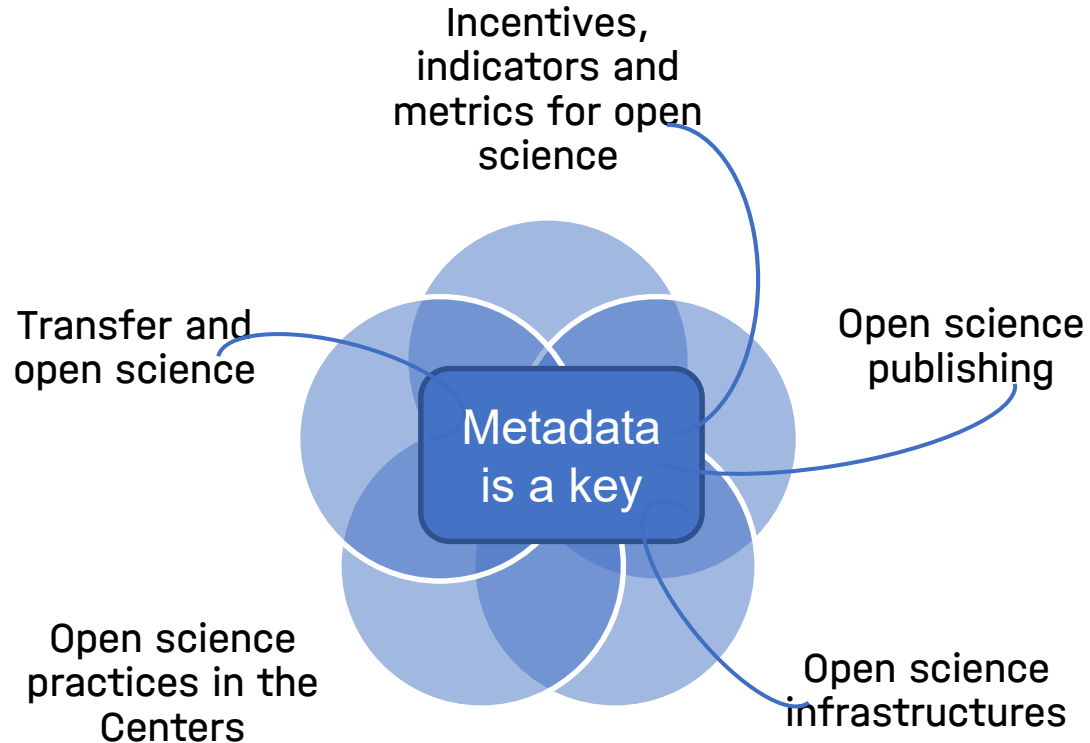
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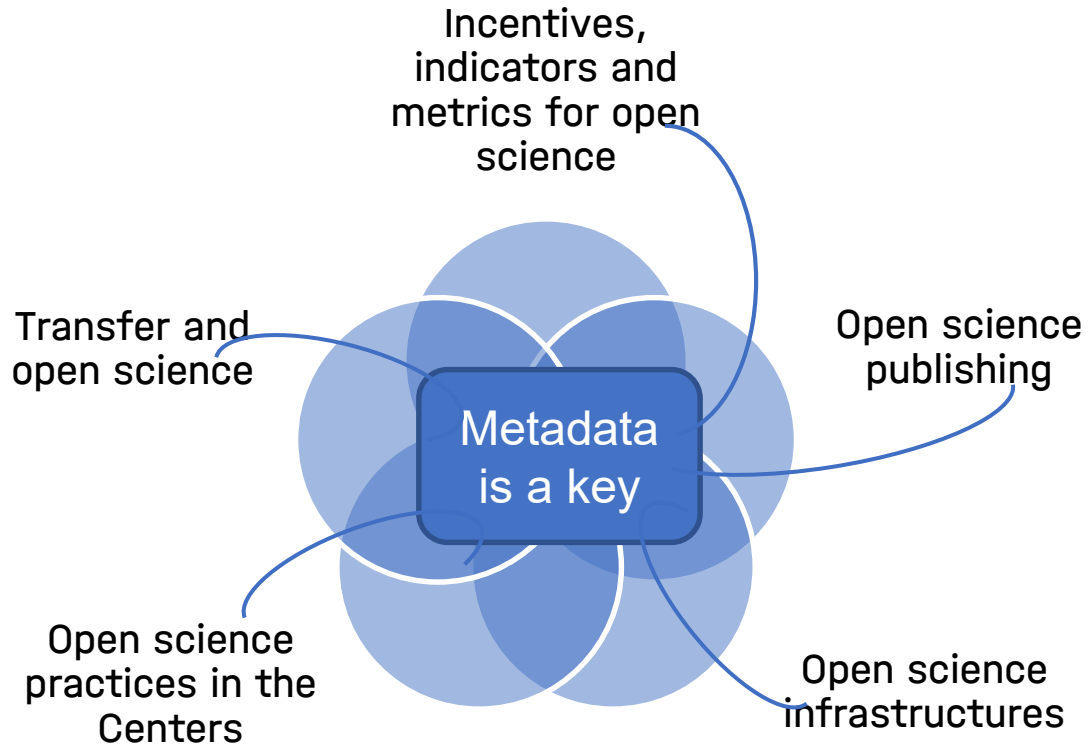
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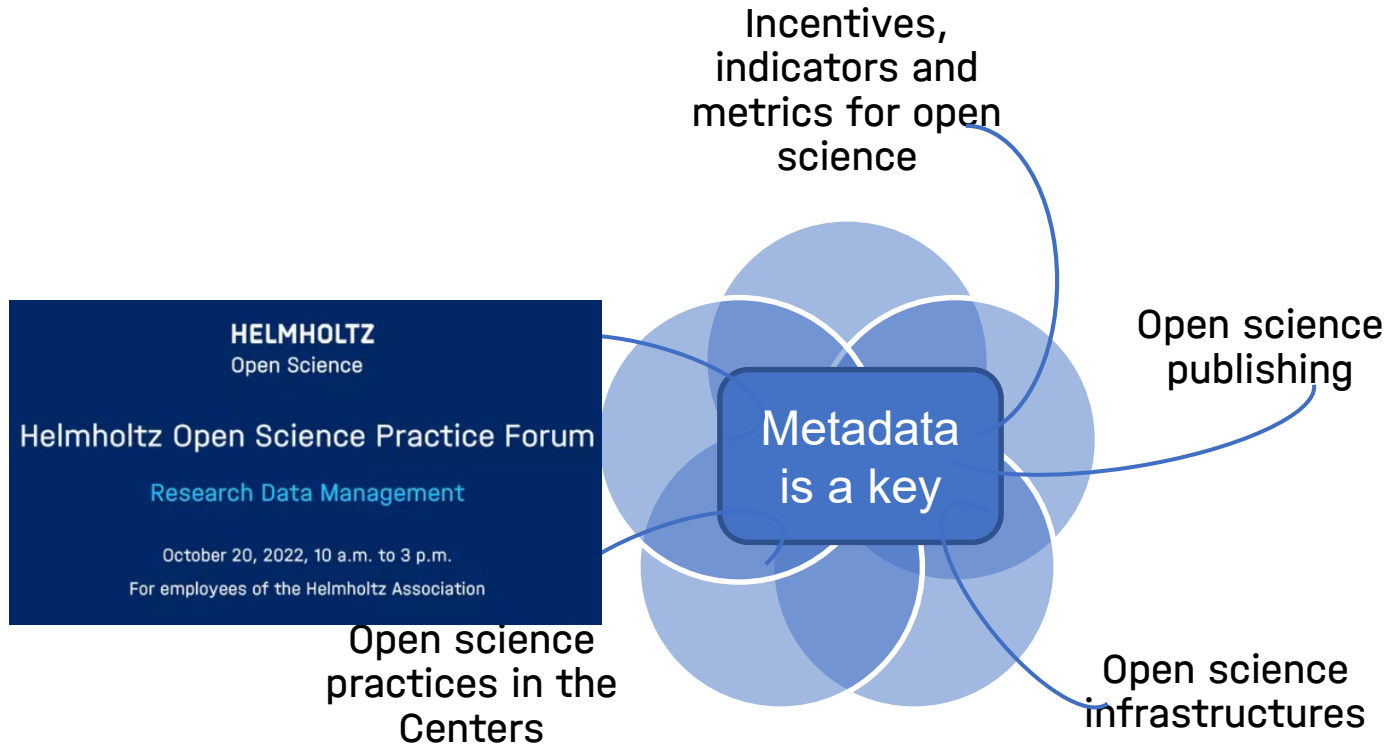
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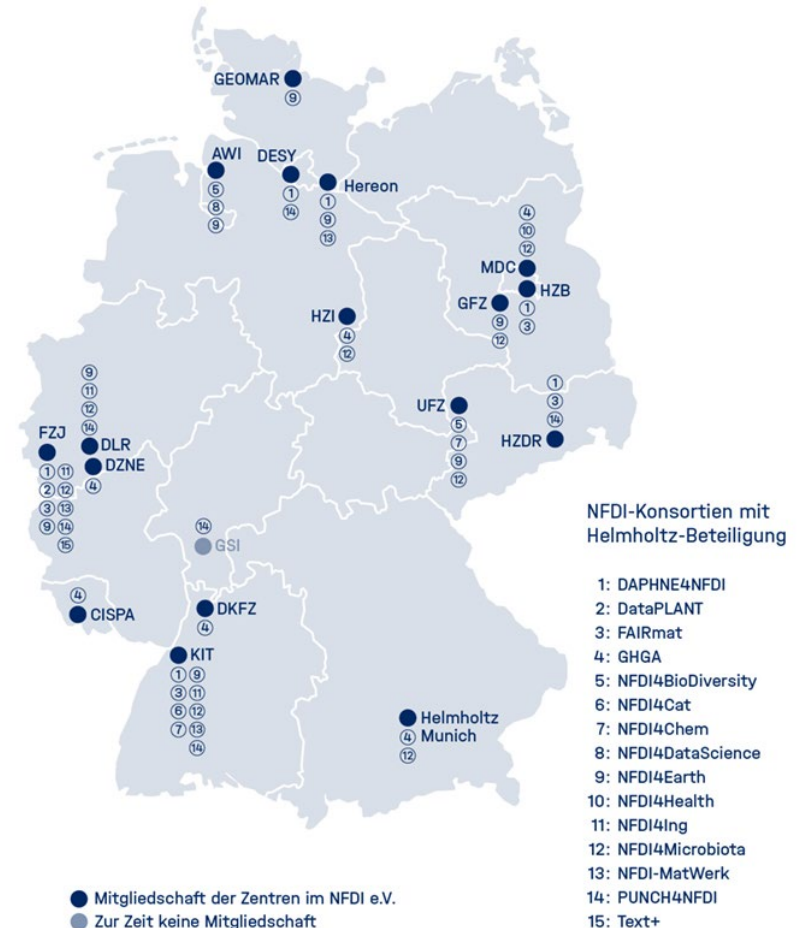




# Metadata is key for success of

## NFDI

- The role of metadata is elementary in a data-driven strategy
- Numerous consortia of the **National Research Data Infrastructure (NFDI)** are being implemented with substantial Helmholtz participation



# Research data repositories and portals

Basic infrastructures for open science:

- Repositories hold metadata
- Metadata on repositories
- An overview offers [re3data](#) - Registry of Research Data Repositories

**re3data.org**  
REGISTRY OF RESEARCH DATA REPOSITORIES

Filter

- Subjects ⊞
- Content Types ⊞
- Countries ⊞
- AID systems ⊞
- API ⊞
- Certificates ⊞
- Data access ⊞
- Data access restrictions ⊞
- Database access ⊞
- Database access restrictions ⊞
- Database licenses ⊞
- Data licenses ⊞
- Data upload ⊞
- Data upload restrictions ⊞
- Enhanced publication ⊞
- Institution responsibility type ⊞
- Institution type ⊞
- Keywords ⊞
- Metadata standards ⊞
- PID systems ⊞
- Provider types ⊞
- Quality management ⊞
- Repository languages ⊞
- Software ⊞
- Syndications ⊞
- Repository types ⊞
- Versioning ⊞

# Research Integrity

# European Code of Conduct of Research Integrity

The European Code of Conduct for Research Integrity serves the European research community as a framework for self-regulation across all scientific and scholarly disciplines and for all research settings.

The 2017 revised edition of the Code addresses emerging challenges emanating from technological developments, open science, citizen science and social media, among other areas.

The European Commission recognises the Code as the reference document for research integrity for all EU-funded research projects and as a model for organisations and researchers across Europe.

<https://www.allea.org/wp-content/uploads/2017/05/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017.pdf>



## The European Code of Conduct for Research Integrity

# Fundamental Principles of Research Integrity

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- **Reliability** in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.
- Honesty in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.
- Respect for colleagues, research participants, society, ecosystems, cultural heritage and the environment.
- **Accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts.

# Code of Conduct defines good research practices in this context

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- Research Environment
- Training, Supervision and Mentoring
- Research Procedures
- Safeguards
- Data Practices and Management
- Collaborative Working
- Publication and Dissemination
- Reviewing, Evaluating and Editing

# Metadata as key to research integrity and open science

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- Research Environment

Research institutions and organisations support proper infrastructure for the management and protection of data and research materials in all their forms (encompassing qualitative and quantitative data, protocols, processes, other research artefacts and associated metadata) that are necessary for reproducibility, traceability and accountability.

- Training, Supervision and Mentoring
- Research Procedures
- Safeguards
- Data Practices and Management
- Collaborative Working
- Publication and Dissemination
- Reviewing, Evaluating and Editing

# Metadata as key to research integrity and open science

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- Research Environment
- Training, Supervision and Mentoring
- Research Procedures
  - Researchers design, carry out, analyse and document research in a careful and well-considered manner.
- Safeguards
- Data Practices and Management
- Collaborative Working
- Publication and Dissemination
- Reviewing, Evaluating and Editing



# Metadata as key to research integrity and open science

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- Research Environment
- Training, Supervision and Mentoring
- Research Procedures
- Safeguards
- Data Practices and Management

Researchers, research institutions and organisations ensure access to data is as open as possible, as closed as necessary, and where appropriate in line with the **FAIR Principles** (Findable, Accessible, Interoperable and Re-usable) for data management.

... provide transparency about **how to access** or **make use** of their data and research materials.

... acknowledge data as legitimate and **citable products** of research.

- Collaborative Working
- Publication and Dissemination
- Reviewing, Evaluating and Editing

# ERAC Standing Working Group on Open Science and Innovation

## Guideline Report on Research Integrity and Open Science



### Cross-cutting issues:

- "... the importance of open science as a mechanism for reinforcing research integrity, while, at the same time, research integrity contributes to open science" ([Guideline Report on Research Integrity and Open Science, 2021, p. 2](#)).
- "Communicate about Open Science and Research Integrity in a positive way, as two fundamental and complementary pathways towards excellent science and greater social impact of research" ([Guideline Report on Research Integrity and Open Science, 2021, p. 4](#)).

Good research practice

## Good Research Practice

### Guidelines for Safeguarding Good Research Practice

The aim of the Code is to enable the intended audience - researchers as well as heads of universities and non-university research institutions - to align their internal structures, processes and actions with the guidelines for good research practice. The intention is to create a deeply rooted culture of research integrity at higher education institutions, focusing less on breaches of good research practice and more on the professional ethics of researchers.



#### [Overview: Good Research Practice](#) >

[German Research Ombudsman](#) >

[Misconduct Investigation Procedure](#) >

[Training Events on Good Research Practice and Events for Ombudspersons](#) >

[International Standards](#) >

# Guidelines for safeguarding good research practice

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As of 1 August 2019, all universities and non-university research institutions will be required to implement the 19 guidelines in a legally binding manner to be eligible to receive DFG funding. For those universities and non-university research institutions that have already implemented the relevant requirements set out in the DFG white paper “Safeguarding Good Scientific Practice” in a binding manner, there is a four-year transition period for implementing the guidelines contained in the Code. This period ends on 31 July 2023.

# Guidelines for safeguarding good research practice

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## Structure

Principles: Guidelines 1-6

Research process: Guidelines 7-17

Non-Compliance with Good Research Practice, Procedures: Guidelines 18-19

# Research Process

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Guideline 7: Cross-phase quality assurance

Guideline 8: Stakeholders, responsibilities and roles

Guideline 9: Research design

Guideline 10: Legal and ethical frameworks, usage rights

Guideline 11: Methods and standards

Guideline 12: Documentation

Guideline 13: Providing public access to research results

Guideline 14: Authorship

Guideline 15: Publication medium

Guideline 16: Confidentiality and neutrality of review processes and discussions

Guideline 17: Archiving

# Research Process

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Guideline 7: Cross-phase quality assurance

Guideline 8: Stakeholders, responsibilities and roles

Guideline 9: Research design

Guideline 10: Legal and ethical frameworks, usage rights

**Some notes on the guidelines with a closer look on metadata  
and open science**

Guideline 11: Methods and standards

Guideline 12: Documentation

Guideline 13: Providing public access to research results

Guideline 14: Authorship

Guideline 15: Publication medium

Guideline 16: Confidentiality and neutrality of review processes and discussions

Guideline 17: Archiving



# Research Process

Guideline 7: Cross-phase quality assurance

Guideline 8: Stakeholders, responsibilities and roles

Guideline 9: **Some notes on the guidelines with a closer look on metadata**

Guideline 10: Legal and ethical framework, open science rights

**and open science**

Guideline 11: Methods and standards

Guideline 12: Documentation

Guideline 13: **See also: Helmholtz Open Science Briefing: Good (Digital) Research Practice and**

Guideline 14: **Open Science Support and Best Practices for Implementing the DFG Code of**

Guideline 15: **Conduct "Guidelines for Safeguarding Good Research Practice"**

Guideline 16: **DOI: <https://doi.org/10.48440/os.helmholtz.052>**

Guideline 17: Confidentiality and neutrality of review process and discussions

Guideline 17: Archiving



# Metadata - Guideline 7: Cross-phase quality assurance

*“When research findings are made publicly available ... the quality assurance mechanisms used are always explained ... ”*

- Useful tools for the quality assurance of digitalized research include, for example, the FAIR criteria for digital research data; and persistent identifiers (PIDs)
- To ensure in addition to the long-term accessibility of research data also the reproducibility and reuse of the results, the corresponding research processes should be documented.

# Metadata - Guideline 10: Legal and ethical frameworks, usage rights

“The legal framework of a research project includes documented agreements on usage rights relating to data and results generated by the project ...”

- requires information on licences, “as open as possible and as closed as necessary”

# Metadata - Guideline 11: Methods and standards

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*"To answer research questions, researchers use scientifically sound and appropriate methods ..."*

- needs **documentation** of used standards

# Metadata - Guideline 12: Documentation

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*"Researchers document all information relevant to the production of a research result ...to allow the result to be reviewed and assessed ..."*

- With a little help from metadata ...
- Metadata are machine-readable, standardized documentation

# Metadata - Guideline 14: Authorship

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*"...Authors seek to ensure that, as far as possible, their contributions are identified by publishers or infrastructure providers such that they can be correctly cited by users."*

- Again metadata helps
  - with questions on provenance
  - crediting all contributions, see Contributor Roles Taxonomy (CRediT)

# Open science combines perfectly with research integrity and good research practice

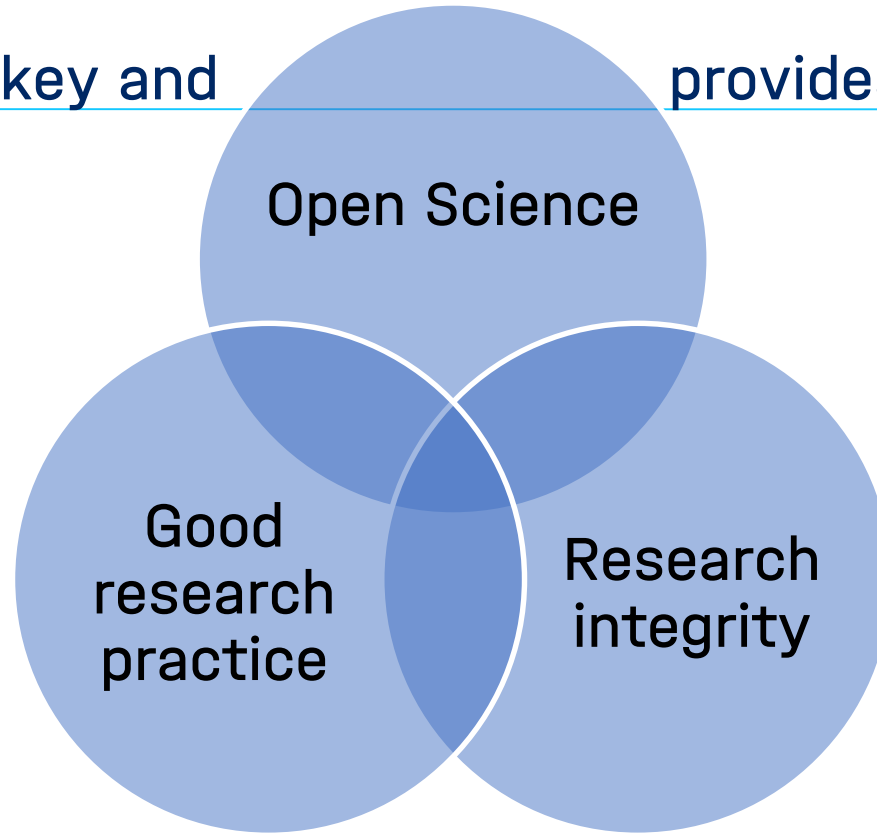
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## Open science, research integrity and good research practice

- Foster **cultural change** in scientific working methods, organization, and communication.
- Consistently employ **digitization** to make all components of the scientific process (publications, research data, research software, etc.) open, traceable, reusable, and accessible to everyone (in terms of reducing technical, legal, and financial hurdles).
- Expand **transparency** and the possibilities for **quality assurance**, increase the **performance** of science, and promote **innovations** based on scientific findings.

Metadata is a key and

provides a common basis





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# Without appropriate metadata, data-sharing mandates are pointless

# HELMHOLTZ

## Open Science

### Keep in touch

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- Twitter - [@helmholtz\\_os](https://twitter.com/helmholtz_os)
- Website - <https://os.helmholtz.de>
- Mailing list for members of Helmholtz - [Helmholtz Open Science Professionals](#)
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Thank you for your attention!

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