# NFDI<sub>4</sub>Earth

**NFDI4Earth Report** 

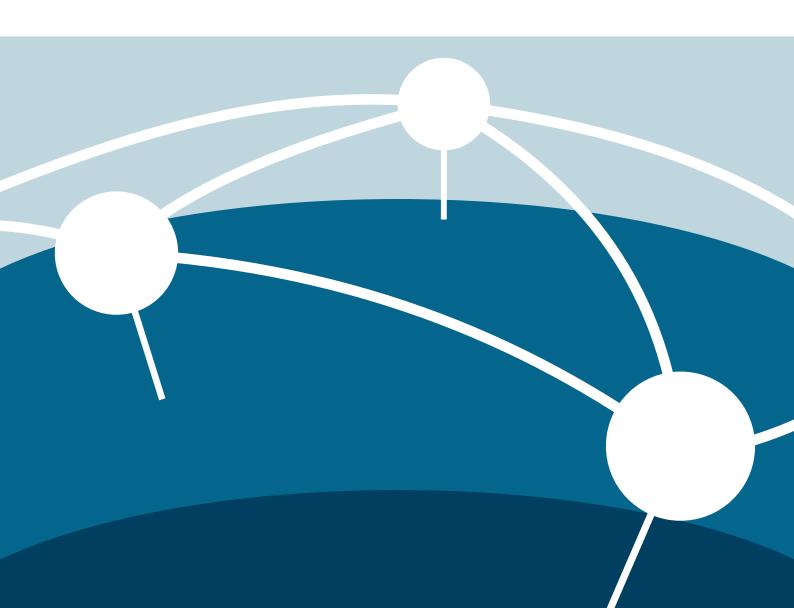
# Results of online survey on incentives for FAIR and open data practices

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nfdi4earth.de



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# **Executive summary**

To better understand the current attitudes and practices surrounding the principles of fairness and openness in research data management, an online survey targeting researchers in the German Earth System Sciences community was conducted. Participants were asked to provide insights into their current practices and into reasons that would motivate them to engage in these practices more often.

The survey started with questions about the status of the participant, the institutional affiliation and the disciplinary field of work. Then, FAIR and open data practices were addressed with four questions about the general relevance of FAIR and open data practices, the engagement in FAIR and open data practices in research and teaching/education activities, and about incentives that would motivate participants to perform FAIR and open data practices more often. This was followed by two questions about data sharing: drivers of data sharing as well as reasons for not to share data. The survey was designed to take approximately 10 min to answer.

This report presents the results of the online survey. The interpretation of the results will be part of a future follow-up report.



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### 1. Introduction

In the rapidly evolving landscape of scientific research, the principles of fairness and openness in research data management have gained significant prominence. To better understand the current attitudes and practices surrounding these principles, we conducted an online survey targeting researchers in the German Earth System Sciences community. This report presents the findings of our survey, shedding light on the perspectives and experiences of researchers in relation to FAIR and open research data practices.

The survey aimed to capture a comprehensive view of the existing practices, challenges, and opportunities associated with FAIR and open data practices in general and with the sharing of research data in particular. Participants were asked to provide insights into their current practices and into reasons that would motivate them to engage in these practices more often.

This report presents the results of the online survey. The survey is part of the work in the measure M4.2 "Towards a Cultural Change in Earth System Sciences Research Data Management" of the NFDI-Consortium 4Earth.

## 2. The survey

The survey was structured in the way that it started with questions about the status of the participant and the disciplinary field of work (see below). Then, FAIR and open data practices were addressed: about the general relevance of FAIR and open data practices, the engagement in FAIR and open data practices in research and teaching/education activities, and about incentives that would motivate participants to perform FAIR and open data practices more often. This was followed by two questions about data sharing: drivers of data sharing and reasons for not to share data. The survey was designed to take approximately 10 min to answer.

### 1. Status / Institutional affiliation / Field of work

### 2. FAIR and open data practices

- How often do you engage in certain FAIR and open data practices?
  - Research
  - Teaching/Education
- Motivations to perform FAIR and open data practices more often?

### 3. Data sharing

How important are the following drivers to share your data?



• How important are the following reasons to not share your data?

A pretest of the survey was conducted with four researchers and two persons from a university research data management team and resulted in valuable feedback especially on the clarity of the questions.

The request to participate in the online survey was distributed in October 2023. It was sent via Email to all NFDI4Earth consortium members contact persons and, as far as know, to their institutional research data management teams of participant institutions. This included the request to circulate this information in the relevant sections and departments of the respective institution. The invitation to participate in the online survey was also circulated via the NFDI4Earth email list, in the NFDI4Earth newsletter and was prominently placed on the NFDI4Earth website. The online survey was open until 17 December 2023.

## **Participants**

Overall, 151 persons participated in the online survey. 115 participants completed the survey, however, one of these answers stemmed obviously from the test phase of the survey and was excluded from the analysis. Therefore, 114 completed answers were considered in the analysis of the online survey.



# 3. Results: status / institutional affiliation / field of work

### 3.1. Status

The largest (professional) status group of participants is "postdocs". 42 participants indicated to be postdocs in the survey and 32 persons checked "other" and added a job description in the free text field. However, 27 participants of the group "other" indicated to be researchers, senior scientists, "wissenschaftliche(r) Mitarbeiter(in)", or alike (Tab. 1). This group of 27 was shifted to the group of postdocs, because"postdoc" in this survey encompasses all career stages between persons with finished dissertation and professor. This results in 69 persons (60,5%) to belong to the group of "postdocs". The second largest group of participants were PhD students (n=28; 24,6%), followed by professors (n=11; 9,6%). 4 participants were Data manager/Data steward, 1 indicated to be in a leadership position, 1 participant was lecturer and 1 was BSc/MSc student.

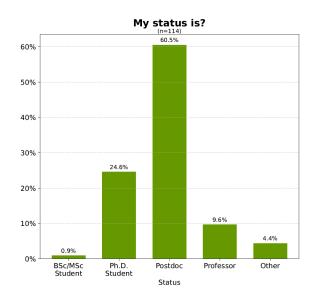


Figure 1: Status groups of participants of the online survey



**Table 1:** Free text entries for the field "My status: I respond to this survey... [Other]". \*the original quote was substituted by "Leadership position" for privacy protection reasons. "x" indicates that this participant's answer was moved to the category "postdoc"

My status: I respond to this survey [Other]: free text entries	moved to category "postdoc"
Data Manager	
data manager	
Data Steward	
"Leadership position"*	
lecturer	
research associate	x
research group lead (btw postdoc and prof)	x
Research Scientist	x
Research Staff	x
Researcher	x
scientific employee	х
scientific employee (wissenschaftliche(r) Mitarbeiter(in))	х
Scientist	x
scientist	x
Senior postdoc	x
Senior research scientist	x
Senior Researcher	x
senior researcher	x
Senior Researcher	x
senior researcher / project manager	х
senior scientist	x
staff scientist	x
wiss. Mitarbeiter	x
Wissenschaftliche Mitarbeiterin	X



## 3.2. Institutional affiliation

49 participants work at a non-university institution, 59 participants work at universities. 6 participants stated different affiliations in "other" (Fig. 2).

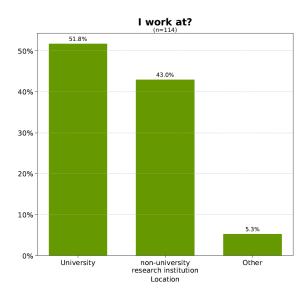
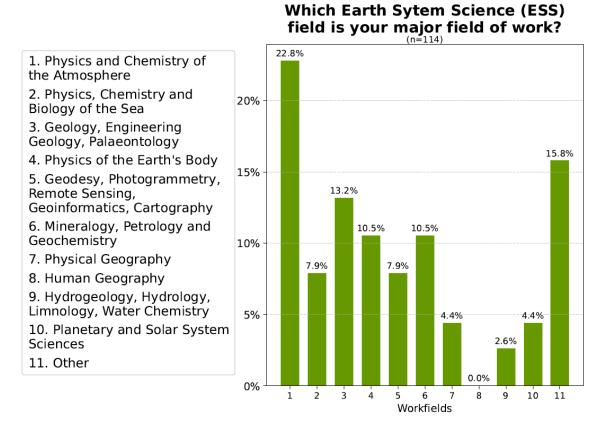


Figure 2: Bar chart of answers to the question about the institutional affiliation

**Table 2:** Free text entries for the field "I work at ... [Other]".



## 3.3. Discipline



**Figure 3:** Bar chart of answers to the question "Which Earth System Science (ESS) field is your major field of work?"

**Table 3:** Data summary of the answers for the question "Which Earth System Science (ESS) field is your major field of work?".

Discipline	[%]	n
Physics and Chemistry of the Atmosphere	22,8	26
Geology, Engineering Geology, Palaeontology	13,2	15
Physics of the Earth's Body	10,5	12
Mineralogy, Petrology and Geochemistry	10,5	12
Physics, Chemistry and Biology of the Sea	7,9	9
Geodesy, Photogrammetry, Remote Sensing, Geoinformatics, Cartography	7,9	9
Physical Geography	4,4	5
Planetary and Solar System Sciences	4,4	5
Hydrogeology, Hydrology, Limnology, Water Chemistry	2,6	3
Human Geography	0	0



Discipline	[%]	n
Other	15,8	18

# **Table 4:** Free text entries for the field "Which Earth System Science (ESS) field is your major field of work? [Other]".

### Which Earth System Science (ESS) field is your major field of work? [Other]: free text entries

biogeochemistry

Biogeosciences

Climate Mitigation (Economics)

Climate science

Climate science of the atmosphere, ocean, and land cryosphere; modelling

Computational science

Cryosphere

Crystallography, Solid state physics, Mineralogy

Ecology

**Environmental Sciences** 

ESS Data Science and Management

Geophysics

Glaciology, Geophysics

Limnology and Ocean Sciences, Microbiology, Remote Sensing

Palaeoclimate

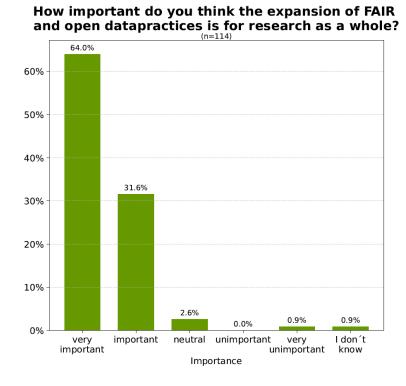
Physics of the Ocean

Terrestrial biogeochemical cycles

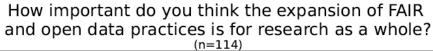


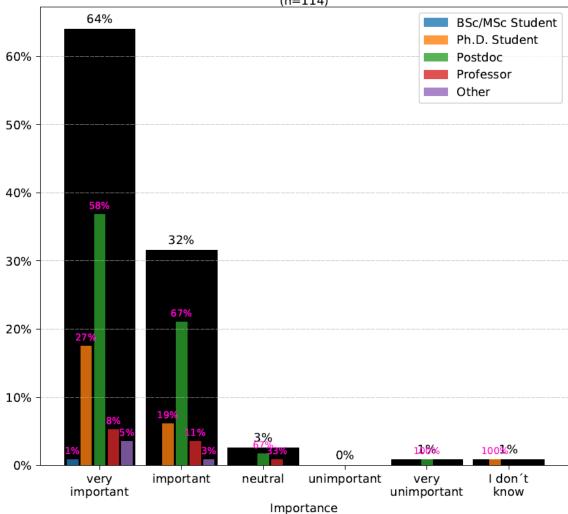
# 4. Results: FAIR and open data practices

4.1. How important do you think the expansion of FAIR and open data practices is for research as a whole?



**Figure 4:** Bar chart of answers to the question "How important do you think the expansion of FAIR and open data practices is for research as a whole?"

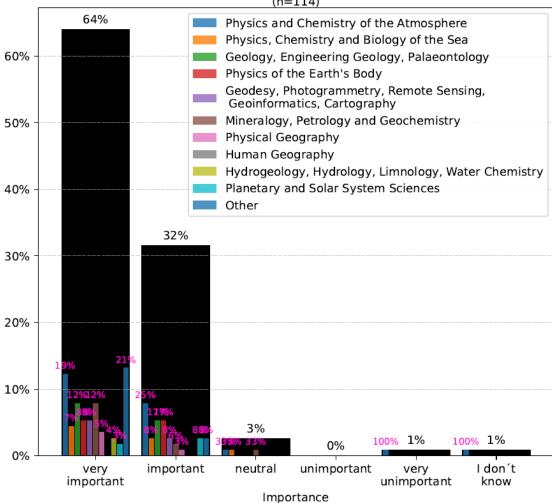




**Figure 5:** Bar chart of answers to the question "How important do you think the expansion of FAIR and open data practices is for research as a whole?" combined with status information of the participants

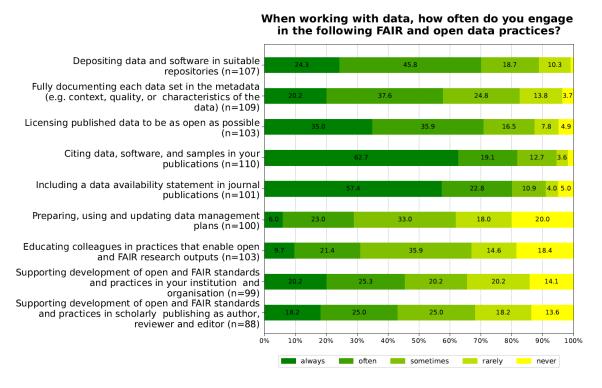


# How important do you think the expansion of FAIR and open data practices is for research as a whole?

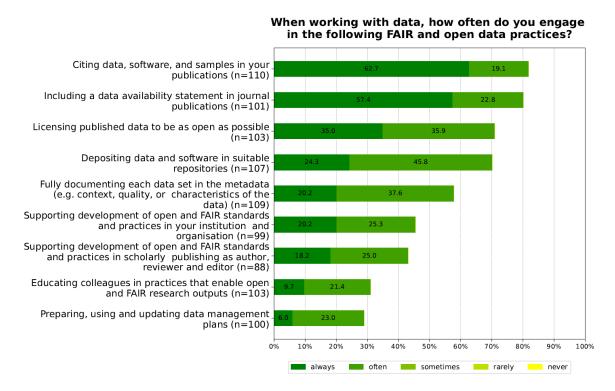


**Figure 6:** Bar chart of answers to the question "How important do you think the expansion of FAIR and open data practices is for research as a whole?" combined with disciplinary affiliation information of the participants

# 4.2. When working with data, how often do you engage in the following FAIR and open data practices?



**Figure 7:** Bar chart of answers to the question "When working with data, how often do you engage in the following FAIR and open data practices?" N<114 indicates that some participants clicked on the option "not applicable to me" (the latter is not shown in the bar chart). Example: "Depositing data and software in suitable repositories" was ranked by 107 participants, 7 participants clicked on "not applicable to me"



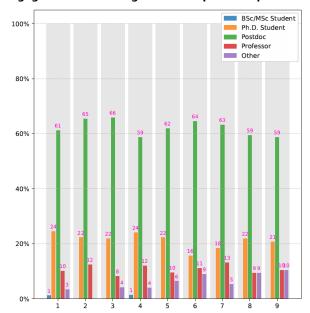
**Figure 8:** Bar chart of answers to the question "When working with data, how often do you engage in the following FAIR and open data practices?", only answers "always" and "often", ordered in terms of percentage of answers



### When working with data, how often do you engage in the following FAIR and open data practices?

# Answers 1. Citing data, software, and samples in your publications 2. Including a data availability statement in journal publications

- 3. Licensing published data to be as open as possible
- 4. Depositing data and software in suitable repositories
- 5. Fully documenting each data set in the metadata (e.g. context, quality, or characteristics of the data)
- 6. Supporting development of open and FAIR standards and practices in your institution and organisation
- Supporting development of open and FAIR standards and practices in scholarly publishing as author, reviewer and editor
- 8. Educating colleagues in practices that enable open and FAIR research outputs
- 9. Preparing, using and updating data management plans

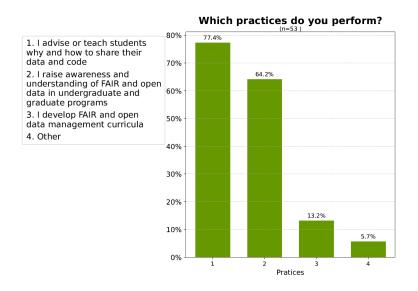


**Figure 9:** Bar chart of answers to the question "When working with data, how often do you engage in the following FAIR and open data practices?", only answers "always" and "often" (see Fig. 8, calculated to 100%, grey bars in the background), combined with status information of the participants



# 4.3. In case you are designing curricula, teaching students or supervising PhD students, which of the following practices do you perform?

While the previous question related to research practices, this question relates to teaching and training of FAIR and open research practices and management.



**Figure 10:** Bar chart of answers to the question "In case you are designing curricula, teaching students or supervising PhD students, which of the following practices do you perform?". N=53 participants answered positively at least on one of the options 1-4; 61 participants clicked on the option "not applicable to me" (the latter is not shown in the bar chart)

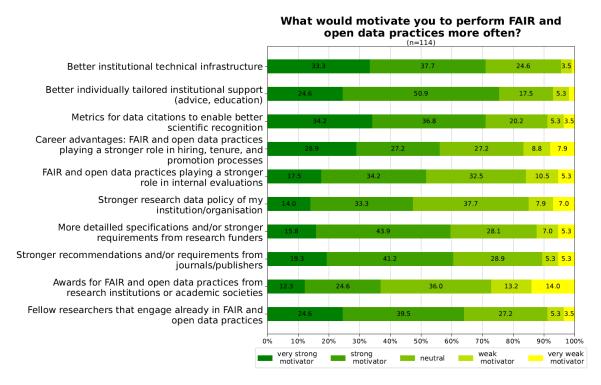
**Table 5:** Free text entries for the field "In case you are designing curricula, teaching students or supervising PhD students, which of the following practices do you perform?... [Other]".

In case you are designing curricula, teaching students or supervising PhD students, which of the following practices do you perform?... [Other]: free text entries

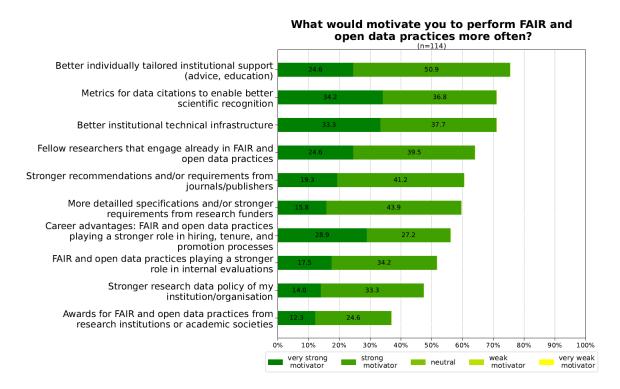
I am not teacher, only researcher

Recommend NFDI4Earth academy

# 4.4. What would motivate you to perform FAIR and open data practices more often?



**Figure 11:** Bar chart of answers to the question "What would motivate you to perform FAIR and open data practices more often?"



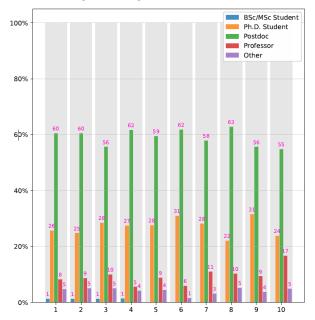
**Figure 12:** Bar chart of answers to the question "What would motivate you to perform FAIR and open data practices more often?". Only answers "very strong motivator" and "strong motivator", ordered in terms of percentage of answers



### What would motivate you to perform FAIR and open data practices more often?

# Answers 1. Better individually tailored institutional support (advice, education) 2. Metrics for data citations to enable better scientific recognition 3. Better institutional technical

- infrastructure
  4. Fellow researchers that engage already in FAIR and open data practices
- 5. Stronger recommendations and/or requirements from journals/publishers
- 6. More detailled specifications and/or stronger requirements from research funders
- Career advantages: FAIR and open data practices playing a stronger role in hiring, tenure, and promotion processes
- 8. FAIR and open data practices playing a stronger role in internal evaluations
- 9. Stronger research data policy of my institution/organisation
- 10. Awards for FAIR and open data practices from research institutions or academic societies

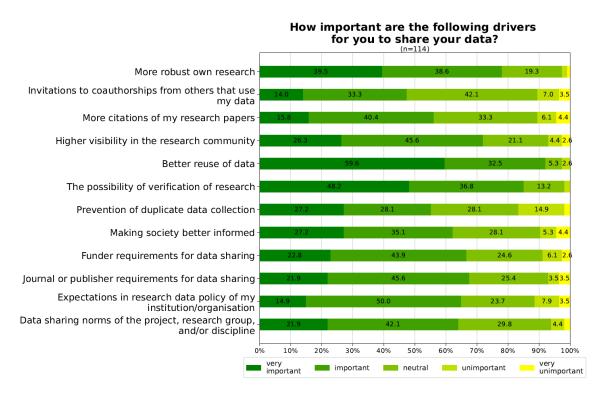


**Figure 13:** Bar chart of answers to the question "What would motivate you to perform FAIR and open data practices more often?". Only answers "very strong motivator" and "strong motivator" (see Fig. 12, calculated to 100%, grey bars in the background), combined with status information of the participants



# 5. Results: Data sharing

### 5.1. How important are the following drivers for you to share your data?



**Figure 14:** Bar chart of answers to the question "How important are the following drivers for you to share your data?"

**Table 6:** Free text entries for the field "How important are the following drivers for you to share your data?... [Other]".

### How important are the following drivers for you to share your data?... [Other]: free text entries

(1) We might not be able to collect data in certain areas due to political and/or environmental restrictions (scientific marine research)! (2) Cuts in the research budget might result in reusing egacy data. (3) FAIR data enables AI.

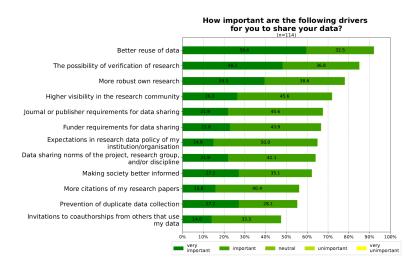
Allows for worldwide and syntheses studies.

Enable adaption and repurposing of research output ("frugal innovation")

enhance reliability of research outputs

European and German law

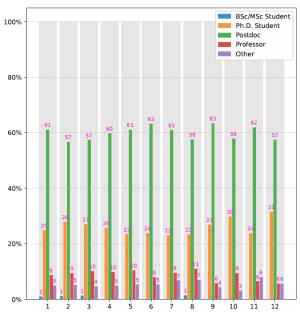
It's fun :)



**Figure 15:** Bar chart of answers to the question "How important are the following drivers for you to share your data?". Only answers "very important" and "important", ordered in terms of percentage of answers.

#### How important are the following drivers for you to share your data?

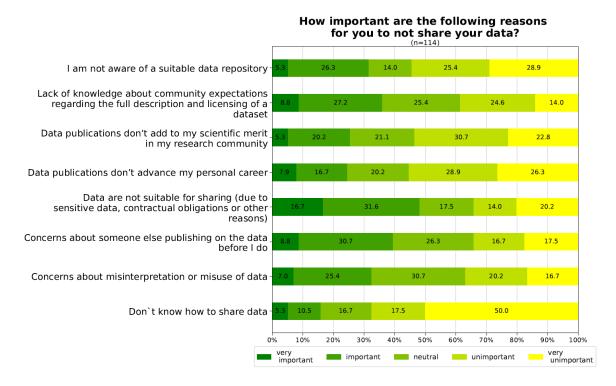
### Answers 1. Better reuse of data 2. The possibility of verification of research 3. More robust own research 4. Higher visibility in the research community 5. Journal or publisher requirements for data sharing 6. Funder requirements for data sharing 7. Expectations in research data policy of my institution/organisation 8. Data sharing norms of the project, research group, and/or discipline 9. Making society better informed 10. More citations of my research papers 11. Prevention of duplicate data collection 12. Invitations to coauthorships from others that use my data



**Figure 16:** Bar chart of answers to the question "How important are the following drivers for you to share your data?". Only answers "very important" and "important" (see Fig. 16, calculated to 100%, grey bars in the background), combined with status information of the participants



### 5.2. How important are the following reasons for you to not share your data?



**Figure 17:** Bar chart of answers to the question "How important are the following reasons for you to not share your data?"

**Table 7:** Free text entries for the field "How important are the following reasons for you to not share your data?... [Other]".

### How important are the following reasons for you to not share your data?... [Other]: free text entries

(1) Takes time, which I do not have and am not paid for. (2) Starting proper data sharing needs ressources to implement standards for meta-data or to merge meta-data standards to own data. (3) Formats for data sharing are either not defined or are not applicable to my data-sets. I simply do not know, what to share (huge binary data sets or interpreted data tables?). I work in a group that develops new monitoring tools, and as such has very unique data sets...

a lot of work

Adding sufficient documentation and metadata is time consuming

Becoming legally vulnerable in case of misuse or other problems

Being scooped by organizations with more manpower and resources is a real threat that should not be underestimated, and I have witnessed that in connection with gross misinterpretation and miserable science, which is then also bad for the reputation of the data set itself.

Comment on "Concerns about misinterpretation or misuse of data": Therefore, data descriptor papers should be accompanied by potentially misinterpretable data.

data might be so specific that there might not be common interest in them

data preliminary, missing QC and hence not published.



#### How important are the following reasons for you to not share your data?... [Other]: free text entries

For a very massive amount of modeling data, it can be a real drag if we have to adjust the data format and add, by the community required, metadata information. Sometimes the labor resources are not always available.

I don't think these questions are properly phrased. What is the correct answer to "I am not aware of a suitable data repository" when I am aware of repositories, but I don't want to store data in them?

If "data sharing" her includes "software code": I do not think, multi-year efforts in writing software code should be shared within a single click.

It happened to me that my repositories were cited and not the accompanying publications themselves. One time not even due to an error of the authors, but the journal changed the reference list during typesetting cancelling the paper citation and leaving only the data and code doi. That is very unpleasant considering that only the paper citations are accounted in research metrics.

It takes a lot of time to prepare the metadata and the actual data submission: important

Like to emphasize that main barrier in our research field is content protection (e.g. occurrence of endangered species or economically minerals), however, techniques like blurring of data points can often applied.

Makes the publishing process more time consuming. There are already so many forms to fill

no resources (esp. time)

no standard data format, very complicated to bring data in useable format for other researchers, as data acquisition is complex and non-standard with inhouse developed unique equipment

Research work is still carried out and needs first to be published until data should be available. This is in particular important for Ph.D. projects.

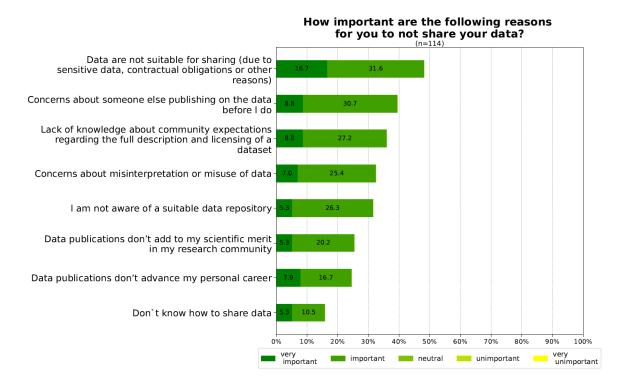
Security reasons, intellectual property protection, commercial interest

Technical challenges: the data I generate (spatially resolved maps and point measurements located on a sample surface (often thin sections) is hard to sensibly archive, as it would be very important to preserve \*where\* on the sample the data was taken with high precision, with realation to an overview image and other spatially resolved datasets from the same sample. This is currently not available.

There are no reasons for not sharing data as research is funded by taxes unless data has been paid by companies not bound by law to publish.

There is still no good way to share terabytes of model output. Thus, we always have to extract data for a few variables (those used in publications) rather than sharing all of the model output. It would be valuable if there were a repository where all raw model output could be uploaded.

Too large data sets to be fully shared on a public repository volume of data



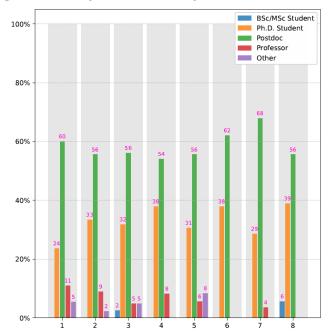
**Figure 18:** Bar chart of answers to the question "How important are the following reasons for you to not share your data?". Only answers "very important" and important", ordered in terms of percentage of answers



### How important are the following reasons for you to not share your data?

#### Answers

- Data are not suitable for sharing (due to sensitive data, contractual obligations or other reasons)
- 2. Concerns about someone else publishing on the data before I do
- 3. Lack of knowledge about community expectations regarding the full description and licensing of a dataset
- 4. Concerns about misinterpretation or misuse of data
- 5. I am not aware of a suitable data repository
- 6. Data publications don't add to my scientific merit in my research community
- 7. Data publications don't advance my personal career
- 8. Don't know how to share data



**Figure 19:** Bar chart of answers to the question "How important are the following reasons for you to not share your data?". Only answers "very important" and "important" (see Fig. 18, calculated to 100%, grey bars in the background), combined with status information of the participants



# A. Appendix

A.1. Outline of the online survey on "Incentives for FAIR and open data practices"

# Incentives for FAIR and open data practices

With this online survey, the NFDI4Earth (https://www.nfdi4earth.de/) addresses researchers, but also students, in the German Earth System Science (ESS) community. NFDI4Earth aims to get insights on which FAIR and open data practices are already in use and which incentives should be created or strengthened to increase uptake of FAIR and open data practices.

For more information about our understanding of FAIR and open data practices, click here (https://www.geo.fu-berlin.de/en/forschung/forschungsdaten/FAIR-and-open-data-practices/index.html).

It will take approximately 10 min to answer this survey. If you are interested in the results of this survey, you may get a notification when the results of this survey are published. For that purpose you can leave your E-mail address at the end of this survey.

This online survey is part of the NFDI4Earth Measure 4.2 (https://www.nfdi4earth.de/2coordinate/cultural-change) "Towards a Cultural Change in ESS Research Data Management". Contact for this survey: Andreas Hübner, Freie Universität Berlin (Email (mailto:andreas.huebner@fu-berlin.de))

There are 15 questions in this survey.

# Allgemeines

My status: I respond to this survey
*
● Choose one of the following answers Please choose only one of the following:
as a BSc/MSc Student
as a Ph.D. Student
as a Postdoc
as a Professor
as a (other than above):
I work at *
<ul><li>● Choose one of the following answers</li><li>Please choose only one of the following:</li></ul>
an university
a non-university research institution (German: außeruniversitäre Forschungseinrichtung)
another type of institution:
This is a single choice question. In case you work in two or more types of institutions, please tick the institution that is the most relevant to your work.

# A1 a-d 1

Which Earth Sytem Science (ESS) field is your major field of work?
*
• Choose one of the following answers Please choose only one of the following:
Physics and Chemistry of the Atmosphere
Physics, Chemistry and Biology of the Sea
Geology, Engineering Geology, Palaeontology
O Physics of the Earth's Body
Geodesy, Photogrammetry, Remote Sensing, Geoinformatics, Cartography
Mineralogy, Petrology and Geochemistry
O Physical Geography
Human Geography
Hydrogeology, Hydrology, Limnology, Water Chemistry
Planetary and Solar System Sciences
Other:
This is a single choice question. In case you work in two or more fields, please tick the field that is the most relevant to your work.
your work.
How important do you think the expansion of FAIR and open data practices is for research as a whole? *
● Choose one of the following answers Please choose only one of the following:
overy important
important
neutral
unimportant
very unimportant
I don't know

A1 a-d 2

epositing data and software suitable repositories  ully documenting each data et in the metadata (e.g. ontext, quality, or naracteristics of the data)  censing published data to be	0	0	$\bigcirc$		
et in the metadata (e.g. ontext, quality, or naracteristics of the data)	$\bigcirc$	$\bigcirc$			
censing published data to be					
s open as possible	$\bigcirc$	$\bigcirc$	$\bigcirc$		
iting data, software, and amples in your publications	$\bigcirc$		$\bigcirc$		
cluding a data availability atement in journal ublications	$\bigcirc$		$\bigcirc$		
reparing, using and updating ata management plans	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	
ducating colleagues in ractices that enable open and AIR research outputs			$\bigcirc$		
upporting development of pen and FAIR standards and ractices in your institution and organisation		0	0	0	
upporting development of pen and FAIR standards and ractices in scholarly ublishing as author, reviewer and editor		0			

In case you are designing curricula, teaching students or supervising PhD students, which of the following practices do you perform?
❶ Check all that apply
Please choose <b>all</b> that apply:
I advise or teach students why and how to share their data and code  I raise awareness and understanding of FAIR and open data in undergraduate and graduate programs
I develop FAIR and open data management curricula
Not applicable to me
Other:

B2 a 1-4

	very important	important	neutral	unimportant	very unimportant
lore robust own research			$\bigcirc$	$\bigcirc$	$\bigcirc$
ovitations to coauthorships om others that use my data			$\bigcirc$		$\circ$
lore citations of my research apers			$\bigcirc$		$\circ$
igher visibility in the research ommunity	$\bigcirc$		$\bigcirc$		$\circ$
etter reuse of data			$\bigcirc$	$\bigcirc$	
he possibility of verification of esearch	$\bigcirc$		$\bigcirc$		$\circ$
revention of duplicate data ollection	$\bigcirc$		$\bigcirc$	$\circ$	$\circ$
Making society better informed			$\bigcirc$		
under requirements for data haring	$\bigcirc$		$\bigcirc$		$\bigcirc$
ournal or publisher equirements for data sharing	$\bigcirc$		$\bigcirc$	$\circ$	$\circ$
expectations in research data olicy of my nstitution/organisation	$\bigcirc$			$\circ$	$\bigcirc$
Pata sharing norms of the project, research group, and/or liscipline				$\circ$	$\bigcirc$
like to mention (an)othe	r driver(s):				

A1 a-d 3

# How important are the following reasons for you to not share your data? \* Please choose the appropriate response for each item: very very unimportant important important neutral unimportant I am not aware of a suitable data repository Lack of knowledge about community expectations regarding the full description and licensing of a dataset Data publications don't add to my scientific merit in my research community Data publications don't advance my personal career Data are not suitable for sharing (due to sensitive data, contractual obligations or other reasons) Concerns about someone else publishing on the data before I **Concerns about** misinterpretation or misuse of data Don't know how to share data Other reasons for **not** sharing your data: Please write your answer here:

A1 a-d 4

# What would motivate you to perform FAIR and open data practices more often? \* Please choose the appropriate response for each item: very strong weak very weak strong motivator motivator motivator neutral motivator Better institutional technical infrastructure Better individually tailored institutional support (advice, education) Metrics for data citations to enable better scientific recognition Career advantages: FAIR and open data practices playing a stronger role in hiring, tenure, and promotion processes FAIR and open data practices playing a stronger role in internal evaluations Stronger research data policy of my institution/organisation More detailled specifications and/or stronger requirements from research funders Stronger recommendations and/or requirements from journals/publishers Awards for FAIR and open data practices from research institutions or academic societies Fellow researchers that engage already in FAIR and open data practices Other motivator(s): Please write your answer here:

Finally, we would like to give you the opportunity to leave a comment on this questionaire about FAIR and open data practices.
Please write your answer here:
I am interested to read about the results of this survey. Please send me a notification to the following E-mail address when the results of this survey are published.
Please write your answer here:

18.12.2023 - 09:06

Submit your survey.

Thank you for completing this survey.