

## *Name of Proposed Working Group:*

# Discipline Specific Guidance for DMPs

### **Introduction**

Data management plans (DMPs) serve as the first step in the RDM lifecycle. They aid in recording metadata at various levels during the data description process and are intended to be adapted as a project evolves. During consultations and training focused on the concept of a *data management plan*, it becomes clear that the views of research funders and researchers differ widely on the use of DMPs. Research funders want to know what happens to the data during and after the project. Researchers, on the other hand, want support in their daily work with data and tend to see the DMP as an additional bureaucratic burden. Additionally, creating DMPs is further complicated because individual disciplines may have very different requirements and challenges for data collection and data management.

### **How can this discrepancy be overcome and researchers be supported?**

Discipline specific information about research data management is one strategy to improve engagement from researchers in writing DMPs as well as researchers gaining more value from those DMPs. Many researchers have discipline-specific research support advisors, such as faculty- or project-embedded data stewards, who can comment on their DMPs, but discipline-specific support from the get-go would facilitate this process.

It would be advantageous for researchers if these requirements and the discipline-specific contents are reflected in the DMP because this would not only support the researchers in filling out the DMPs, but it will also help increase integration of DMPs into researchers' daily work.

While one option will be to create discipline-specific DMP templates, this could lead to problems with research funders who require a specific type of template from researchers as well as add to the complexity of projects working towards machine actionable DMPs and common standards for DMPs. Similarly, discipline-specific templates would be problematic for multidisciplinary projects. Therefore, discipline-specific guidance for each question in most DMP templates needs to meet researcher, funder and interoperability needs. The information in this guidance document can then be incorporated into existing templates - and guidance documents can be consulted in tandem for multidisciplinary projects.

The following disciplines were selected by the WG as examples to further demonstrate the discipline- and sub-discipline specific data management requirements of the research community.

### **Behavioural, Educational and Social Sciences**

**Nature of research:** Behavioural, Educational and Social Sciences (BESS) consist of a wide range of sub-disciplines with RDM needs that overlap in some respects and are highly diverse in others. In general terms, BESS research consists of quantitative data, often in the form of questionnaires, qualitative data, generally in the form of text and audiovisual data, and physical data, which range from human tissues to archeological findings to paper documents. The more specific the sub-discipline, the greater the variation: for example, within the behavioural sciences, data such as neuroimages and experimental data on cognitive function are also collected. Additionally, many BESS researchers utilize GIS and other location-based data, as well as data gleaned from social media.

**Use of DMPs:** In general, DMPs are often treated as an administrative exercise in BESS research; something that must be completed for the purposes of a research grant, but which otherwise is not

very useful for guiding day-to-day research activities. If there is not a requirement to complete DMPs for funding, it may not be completed at all.

**RDM best practices and metadata standards:** BESS research has an overarching RDM framework in the form of the CESSDA Data Management Expert Guide<sup>1</sup>; this guide provides a lot of useful insight and best practices for RDM in Social Sciences in general, particularly with regards to the management of qualitative data and questionnaire data.

The Data Documentation Initiative (DDI)<sup>2</sup> is the main metadata standard for Social Sciences.

**Challenges and considerations:** The diversity of the various sub-disciplines within BESS research is a major challenge, due to the wide variety of data that may be collected under the BESS banner. The diversity of BESS research means that multiple metadata standards may be required, but at the moment there is a lack of awareness within the overall BESS community about metadata, ontologies and data documentation. BESS researchers may benefit from explanations on how to apply metadata, ontologies and documentation in a language that is applicable to their practice. Advice on how to apply specific metadata standards would also assist BESS researchers because the learning curve for applying these can be quite steep. Other challenges faced in the BESS discipline include: 1) a lack of awareness of good data management from an early stage. Without a good description of data collection in a DMP, BESS researchers often underestimate how their data collection methods may impact the quality of their data; 2) research on vulnerable populations. Much of BESS research has both privacy and ethical concerns that need to be addressed. This means there is an extra burden of managing physical consent forms and sensitive data. BESS researchers also require support on how to properly share these data with others; 3) wide variation in terms of digital competencies. Some BESS researchers have data science skills, while others feel more comfortable with pen and paper or the GUIs of Statistical Package for Social Sciences (SPSS). Ensuring that data are reusable means improving upon the digital competencies of all BESS researchers. Ultimately, BESS researchers are a highly diverse group with varying needs that often overlap with other disciplines. They require guidance on DMPs in a way that is applicable to their work so that they can see the benefit of RDM in their day-to-day tasks.

## **Engineering and Natural Sciences**

**Nature of research:** The engineering and natural sciences are very broad disciplines. Data is generated during experiments or simulations and sometimes the developed software itself is the research data. Due to the overlap between engineering and natural sciences with many other disciplines like medicine, humanities etc, many different types of data are created and these require different research data management practices to be followed. This results in many different challenges.

**Use of DMPs:** Currently, the use of DMPs is not widespread in the engineering and natural sciences. DMPs are mostly known through publicly funded projects and the advantages of DMPs are not yet widely known within the community. During a project in the framework of “science in the digital change.”<sup>3</sup> on *DMP in mechanical engineering* at RWTH Aachen University and TU Darmstadt in 2018, engineers asked themselves while filling in a DMP: *How relevant is that for me?*. The RDM support raised the question: *How can we make it understandable for engineers?* The results showed that the

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<sup>1</sup> <https://www.cessda.eu/Training/Training-Resources/Library/Data-Management-Expert-Guide>

<sup>2</sup> <https://ddialliance.org/>

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<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUK EwiWxKe3y8LpAhXB26QKHcp1BDMQFjABegQIBBAB&url=http%3A%2F%2Flearning.fb7.rwth-aachen.de%2Fwordpress%2Fwp-content%2Fuploads%2F2017%2F09%2FPDF.pdf&usq=AOvVaw01l9zVedXtXzz3xRhkgefE>

current DMP templates have hardly been adapted for these fields and the questions are too general. This in turn means that researchers in these fields are not convinced about the usefulness of DMPs.

**RDM best practices and metadata standards:** There are hardly any best practices with regard to RDM in engineering and natural science. Researchers or individual sub-disciplines deal with RDM topics independently, like data annotation in *Wind Energy goes FAIR*<sup>4</sup>. Another initiative is the Metadata4Ing group<sup>5</sup> (special interest group of the NFDI4Ing<sup>6</sup>), which is working on a metadata schema for the engineering sciences, initially, for individual sub-disciplines. These RDM practices are not widespread. Having discipline specific DMPs will help researchers better evaluate which communities should collaborate in developing metadata standards for their field.

**Challenges and considerations:** Due to this broad spectrum of subdisciplines, the **heterogeneity of the data** is very high - from **large data sets and confidential data to data in proprietary formats**. Engineering sciences research often relies on industrial funding. This is accompanied by **non-disclosure agreements, IP considerations and patent applications**. Data storage only at the home institution (**data silos**) and **restricted data sharing**, where only the partners have access to the research data is fairly common. A discipline specific DMP would also provide input towards what should belong to the RDM best practices, specifically in engineering areas where things like metadata standards are almost non-existent. There is value in having researchers in these fields engage with the idea of **dual use** (particularly through the dmp) to ensure that implications of data sharing are well thought out -- and balanced appropriately.

### **Life Sciences - Medicine and Biology**

**Nature of research:** The biological life sciences as a whole are extremely diverse in the activities and focus of research studies. Research studies can range from natural history studies documenting the occurrence of species in a laboratory notebook to basic science examining the origin of a new species using molecular biology to applied science examining the physiological processes involved in a viral infection using clinical trials where it overlaps with medicine. More specifically, in the medical sub-discipline of the life sciences, the data collected includes patient data which has specific data management needs and considerations. Additionally, the size of data collected can vary drastically across the life sciences ranging from small experimentally constrained studies of behavior to full genome sequencing of multiple species, not to mention full human genome sequences that might become more common as patient records in the future.

**Use of DMPs:** Across the globe, numerous funding bodies provide funds for research into Life Sciences and require DMPs including National Science Foundation<sup>7</sup> (NSF), National Institute of Health<sup>8</sup> (NIH), Wellcome<sup>9</sup>, etc. Mostly DMPs are seen as mandatory administrative documents to be submitted to funding bodies and do not address disciplinary specific practices.

**RDM best practices and metadata standards:** Many researchers in these areas have already adopted some RDM strategies and are actively sharing data to comply with funding and publishing

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<sup>4</sup> Hausen, Daniela, Petters, Jonathan, Martinez-Lavanchy, Paula, Vasiljevic, Nikola, Rißler-Pipka, Nanette, & Kraft, Angelina. (2019, April). IG RDM in Engineering. Zenodo. <http://doi.org/10.5281/zenodo.2640369>

<sup>5</sup> Wyngaard, Jane, de Witt, Shaun, Iglezakis, Dorothea, Hausen, Daniela, & Martinez-Lavanchy, Paula. (2020, July). Joint Session: IG RDM in Eng and sUAS Data IG at VP15. Zenodo. <http://doi.org/10.5281/zenodo.3955541>

<sup>6</sup> <https://nfdi4ing.de/>

<sup>7</sup> <https://www.nsf.gov/>

<sup>8</sup> <https://www.nih.gov/>

<sup>9</sup> <https://wellcome.org/>

requirements, however, this data is often not documented for re-use across the entire discipline. Additionally, many different metadata standards exist depending on the type of data being collected. For instance, OME-XML - Open Microscopy Environment XML (used for biological light microscopy data), Protocol Data Element Definitions (used by NIH for Clinical Trials registration), SRA Metadata (used for sequencing libraries, preparation techniques, and datafiles).

**Challenges and considerations:** Documentation can be difficult because of the **siloed nature of sub-disciplines**. Each sub-discipline varies with regards to the requirements for data management, the **presence or absence of standards**, and the culture of data sharing for reuse. Guidance around common data management techniques which could be adopted across sub-disciplines in the life sciences is vital for **inter-sub-disciplinary re-use**.

Many of the sub-disciplines across the life sciences are trying to collaborate or conduct meta-analyses of data collected across these sub-disciplines in attempts to solve large issues such as climate change, however, they are not often **utilizing common metadata or documentation standards**.

The specific care and **legal requirements** that need to be followed when **handling patient data** also adds to the complexity in terms of documentation. Sharing of medical records especially if in an anonymous form can be done efficiently only if common metadata standards are adopted.<sup>10</sup>

While we have covered several disciplines here the list of research fields that can benefit from discipline specific guidelines for their DMPs is much longer. Part of the effort in proposing this WG is to generate interest among researchers and research support members to identify if their fields would benefit from this.

## **Value Proposition**

The working group will produce the *Discipline-Specific Guidance Catalogues*, which can provide a variety of stakeholders with disciplinary-specific guidance in the creation of data management plans. The key beneficiaries will be researchers from the involved disciplines as well as all stakeholders who work closely with researchers. These can be data stewards, data managers, research data librarians, research data management experts/ officers, etc. Similarly, the respective and related communities and associations may be interested in pushing forward the discipline-specific sections to help the researchers overcome the bureaucratic hurdle and perceive the DMP as a complementary and helpful tool for research.

The acceptable mode which has the greatest benefit for each discipline will become apparent during the work of the WG.

## **Benefits to stakeholders and disciplines**

For researchers, having guidance specific for their discipline would help fill in the gap between a generic DMP and their daily practice. RDM comes in so many different flavors for different disciplines and best practices for each discipline can only be best practices if they are fine-tuned according to the needs of each specific discipline and known to practitioners in the discipline. Thus, providing discipline specific guidance for DMPs that are directly relevant to researchers' specific disciplines can make DMPs living tools that researchers can actively use. What's more, discipline specific guides can be used in conjunction to transcend individual disciplines and contribute to DMPs for multidisciplinary projects.

Often data stewards, data managers, research data librarians, research data management experts/ officers, research software engineers and others supporting researchers are hired centrally and there

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<sup>10</sup> <https://www.health-ri.nl/initiatives/personal-health-train>

is simply not enough capacity to provide in-depth discipline specific support. Therefore, these professionals would greatly benefit from having readily available the *Discipline-Specific Guidance Catalogues* that they can share with the researchers. Additionally, the *Discipline-Specific Guidance Catalogues* could be used as a training tool for individuals newly hired into these types of positions.

Many research funders, universities and non-university institutions, as well as publishers expect some type of information about data management and/or accessibility from researchers. Depending on the funding agency, university, etc., this information can be provided in various forms - from a well-structured DMP to non-structured, individual information in a continuous text. Numerous institutions are realizing the importance of hiring dedicated RDM support professionals as well as establishing institutional RDM policies. Yet, most institutions are still in the early days and are only able to provide central and rather generic support instead of disciplinary support. Additionally, it is a challenge to find data support professionals with disciplinary specific knowledge. Discipline-specific guidance can allow institutions to provide more tailored support to researchers, resulting in a better return on their investments. Therefore, institutions would also benefit from their data support professionals having access to *Discipline-Specific Guidance Catalogues*.

An increasing number of funders are mandating delivery of DMPs, as they endorse open science and FAIR data principles. If researchers have resources available to them explaining the disciplinary best practices, such as the *Discipline-Specific Guidance Catalogues*, they can more efficiently apply open science and FAIR data principles in their daily practice.

Researchers are often looking for guidance on what specifically to include in their DMPs. In response, researchers are often directed to use DMP tools which allow researchers to build DMPs following funder-specific structure and section-specific guidance. However, this guidance is often subject agnostic, thus leading to DMPs that may be well written and meet the funding agencies requirements, but are not actually applicable to a researcher's project, as it is missing specific, contextual information. The guidance of DMP tools, such as DMP Online, DMP Tool or RDMO., could be improved if information from the *Discipline-Specific Guidance Catalogues* is incorporated. Here, however, it must be further clarified in detail how exactly the discipline-specific adaptation can be implemented. Possibilities are the adaptation of questions, answers and/ or help texts in these tools. If no adaptation is possible, a separate sheet will be developed for the respective disciplines and solutions will be sought. For this form of a *Discipline-Specific Guidance Catalogue* it must then be checked whether it can be implemented in the respective tools or if the guidance can be distributed to the researchers in other ways, such as consultation with RDM experts/ officers. The *Discipline-Specific Guidance Catalogues* will also be available for download on discipline and RDM relevant websites.

In some research fields such as engineering sciences, industry partners are of great importance. In these cases, documentation plays a very important role, such as the non-disclosure agreements at the beginning. A discipline-specific DMP can include the non-disclosure agreements and supplement them over time.

Discipline-specific guidance for data management is valuable to publishers who support open data sharing through data accessibility requirements and policies. With this guidance, publishers can determine if there are discipline specific requirements and/or repositories best suited for the types of data that commonly are associated with articles in their journal. If there are, publishers can provide these best practices and guidance to publishing authors which could ultimately lead to increased discoverability of data associated with published articles and interoperability between datasets.

Repository curators frequently receive poorly curated data in self-deposit repositories. This poorly curated data stems from a lack of researcher training and discipline specific guidance that can be directly applied. The Discipline-Specific Guidance Catalogues could providing researchers with discipline-specific management practices which would ultimately improve the curation of their data through engaged data management planning and actions.

### **Engagement with existing work in this area**

In addition to the Active Data Management Plans IG, there are at the moment two WGs (Exposing Data Management Plans WG and DMP Common Standard WG) focusing on the topic of DMPs. The work of this proposed WG will complement their work and bring in the perspective of researchers.

In connection with the RDA, there are also GoFAIR groups that need to be taken into consideration for working together. For example, the FAIR Implementation Profiles (FIP) should be mentioned, where Krsitina Hettne has offered herself as a liasion. Many thanks.

Further, there is some evidence that supports researchers' need for subject-specific support for DMPs and the helpful nature of such tools. For instance, in engineering, at RWTH Aachen University and the Technical University of Darmstadt, a project was carried out in 2018/19 in the framework of "science in the digital change."<sup>11</sup> Together with engineers, a first draft of a DMP template for engineering science was developed. In workshops and world cafes engineers could evaluate, add, and delete help texts, questions, and answers based on the Research Data Management Organiser DMP template<sup>12</sup>. The results of the project were already presented in Helsinki at P14 in the Research Data Management in Engineering IG. Further considerations were also made during the session in a focus group. In a subsequent telephone conference, it was then considered that it would be useful to discuss these considerations with several sciences simultaneously and in a greater context.

A further approach are the Domain Data Protocols for empirical educational research<sup>13</sup>. These protocols describe concretely and with reference to the specific data type all relevant aspects of research data management with regard to data quality, data preparation, data documentation, work organisation, handling of legal requirements as well as FAIR principles.

The approach presented here represents a different type of data management plan and is specifically adapted to the particular needs of the discipline.

In addition to these examples, the WG would like to mention the example of psychology. The tool DataWiz was developed for this special field, which is an open source assistance system for data management in psychology

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<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUK EwiWxKe3y8LpAhXB26QKHcp1BDMQFjABegQIBBAB&url=http%3A%2F%2Felearning.fb7.rwth-aachen.de%2Fwordpress%2Fwp-content%2Fuploads%2F2017%2F09%2FPDF.pdf&usq=AOvVaw0119zVedXtXzz3xRhkgefE>

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<https://www.gesis.org/en/research/external-funding-projects/overview-external-funding-projects/ddp-bildung>

The support and benefits for researchers could be expanded through the expertise present at RDA. Therefore, it is important to involve the discipline specific RDA groups like Health Data IG, Social Science Research Data IG and Biodiversity Data Integration IG in conducting this work.

### **Working plan**

The WG will provide *Discipline-Specific Guidance Catalogues* for the above mentioned disciplines. On the one hand, these catalogues will reflect the current situation in the respective discipline and take into account topics like FAIR and Open Data. From our experience in consulting and training, we find that discipline-specific advice is often already being applied for supporting researchers. However, the lack of a guiding framework on this advice could lead to inconsistencies between researchers or uncertainty for how discipline-specific data stewards should best advise their researchers. This WG will therefore help to address this and create a framework to support both researchers and discipline-specific data stewards in writing DMPs.

The Guidance for creating DMP questions from the Science Europe Practice Guide<sup>14</sup> to the International Alignment of Data Management will be used as a basis upon which the discipline-specific guidance will be developed.

### **Milestones and Deliverable**

#### **M1: Identification of What is Already Known, Knowledge Gaps, Overlaps and Additional Use Cases (0 - 6 months)**

To provide comprehensive discipline-specific guidance on DMPs, an initial survey of the current state of disciplinary-specific DMPs is required. Furthermore, it may be beneficial to determine if additional use cases for other disciplines should be included in the discipline-specific guidance. The survey will cover the current state of disciplinary-specific DMPs, knowledge or service gaps, overlaps between disciplines, possible use cases, and methods of presenting discipline-specific guidance in a final deliverable.

This information will be collected through the following instruments:

1. Online survey filled in by researchers and discipline-specific data stewards
2. At the end of the survey, participants can provide further contact information for phone or email interviews

The online survey will be distributed via major RDM mailing lists. WG members will also coordinate with any RDM Community Managers they know to share the survey with as many researchers and discipline-specific data stewards as possible. The online survey will also be discussed at RDA P16, where a BoF and group discussions will provide further insight on this topic.

#### **M2: Discussions with disciplinary experts (6 - 10 months)**

In order to create guidance that is based on disciplinary-specific requirements, members of the WG will reach out to disciplinary researchers and discipline-specific data stewards to facilitate in-depth discussions of DMPs. These experts will be approached directly, either online or in person during workshops or RDA plenaries, with the assistance of RDM community managers, or as follow-ups to the online survey. Using a semi-structured interview methodology, researchers and discipline-specific data stewards will be asked about their experience using DMPs and what attributes, functions, or

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<sup>14</sup> [https://www.scienceeurope.org/media/jezkhnoo/se\\_rdm\\_practical\\_guide\\_final.pdf](https://www.scienceeurope.org/media/jezkhnoo/se_rdm_practical_guide_final.pdf)

features would be most useful to them. Additionally, discipline-specific data stewards will be asked how researchers in their discipline would benefit from tailored DMPs.

### **M3: Creation of guidance document (10 - 13 months)**

Based on the results of M1 and M2, a final guidance document will be created. This will address any knowledge gaps that were mentioned in the online survey and in-person interviews, as well as summarize any guidance that overlaps across disciplines. The WG will run a sprint to address these issues with the assistance of research data management experts in all of the use-case disciplines identified.

### **M4: Dissemination and adoption of guidance document for test cases (13 - 18 months)**

Once the final guidance documents are created, the WG will promote the documents to stakeholders through a variety of channels, such as social media or professional associations and conferences. As part of this promotion, the WG will encourage users to serve as test cases for the guidance. By obtaining feedback on the document, the WG can refine the guidance so that it is useful in a variety of situations and possibly uncover more potential use cases. These test cases may also be shared with stakeholders and potential guidance document users to promote the adoption of the guidance.

### **D1: Online Survey Overview (after 8 months)**

The survey details, including questions used, methodology and the audience that was targeted will also be shared. This can act as a resource for the future when fields that have not been covered in this WG can use it to develop their own discipline specific guidelines.

### **D2: Discipline-specific Guidance Overview (after 18 months)**

A document will be created that provides guidance for each use-case discipline for every DMP question addressed in Science Europe Practice Guide. This document will be shared with DMP software providers to utilize as they see fit. It will also be shared with funders who can opt to include the document with the other information provided to researchers creating DMPs using funder templates. Lastly, the WG will use their connections with RDM Community Managers to make sure that discipline-specific data stewards at research institutions are aware of the guidance document so that they can implement it in their daily work and refer to it as needed.

## **Adoption plan/ Outcomes**

Major/Preliminary outcomes of the WG will include the following:

- Results from landscape analysis
- A structured framework for developing disciplinary DMP guidelines
- Disciplinary guidance for:
  - Behavioural, Education and Social Sciences
  - Engineering and Natural Sciences,
  - Life Sciences - Medicine and Biology
- Outreach and liaison with the DMP community via plenaries, particularly research groups and DMP tool providers
- Preliminary results from adoption cases and associated testing

As part of our adoption plans, we intend to work closely with the various tool providers, specifically RDM Organiser, DMPTool, DMPonline, Data Stewardship Wizard etc, to ensure the guidelines can be reused in these platforms. We have already solicited inputs from these groups to ensure participation.

We have also liaised with the Active DMP Interest Group and will collaborate with them to ensure the successful delivery, outreach and adoption of outputs.

The co-chairs and initial members are placed internationally and we are running a BoF session at plenary 16 in Costa Rica in order to raise interest and broaden membership.

The co-chairs cooperate in several RDA-groups, including:

- Research Data Management in Engineering IG
- Engaging Researchers with Data IG
- Active Data Management Planning IG
- Libraries for Research Data IG

We intend to foster links with other RDA groups, specifically those addressing research community needs.

The co-chairs cooperate in different national groups on DMPs and RDM such as

- Research Data Management Organiser (RDMO) steering group member
- DMP-AG of DINI/ nector in Germany.
- National Coordination Point for Research Data Management (LCRDM) in The Netherlands
- Data Stewards Interest Group, Dutch Techcentre for Life Sciences, the Netherlands
- Research Data Access and Preservation Association, USA
- Data Curation Network, USA
- FORCE11, USA
- Digital Library Federation, USA

The co-chairs and the initial members are also active in discipline-specific groups such as

- National Research Data Infrastructure for Engineers (NFDI4Ing)
- National Research Data Infrastructure for Chemistry (NFDI4Chem)
- National Research Data Infrastructure for Earth (NFDI4Earth)
- National Consultative Body for Social Sciences (DSW); The Netherlands
- Consortium of European Social Science Data Archives (CESSDA); EU-wide

### **List of initial members**

<b>Name</b>	<b>Affiliation</b>	<b>Role / interest/ Stakeholder group</b>	<b>Country</b>	<b>Chair</b>
Daniela Hausen	RWTH Aachen University	Chair of IG Research Data Management in Engineering	Germany	x
Briana Ezray	Pennsylvania State University		USA	x
Shannon Sheridan	University of Wyoming		USA	x
Ivonne Anders	DKRZ - German Climate Computing Center		Germany	x
Yasemin Turkyilmaz -	TU Delft	Data Steward(Engineering	Netherlands	x



