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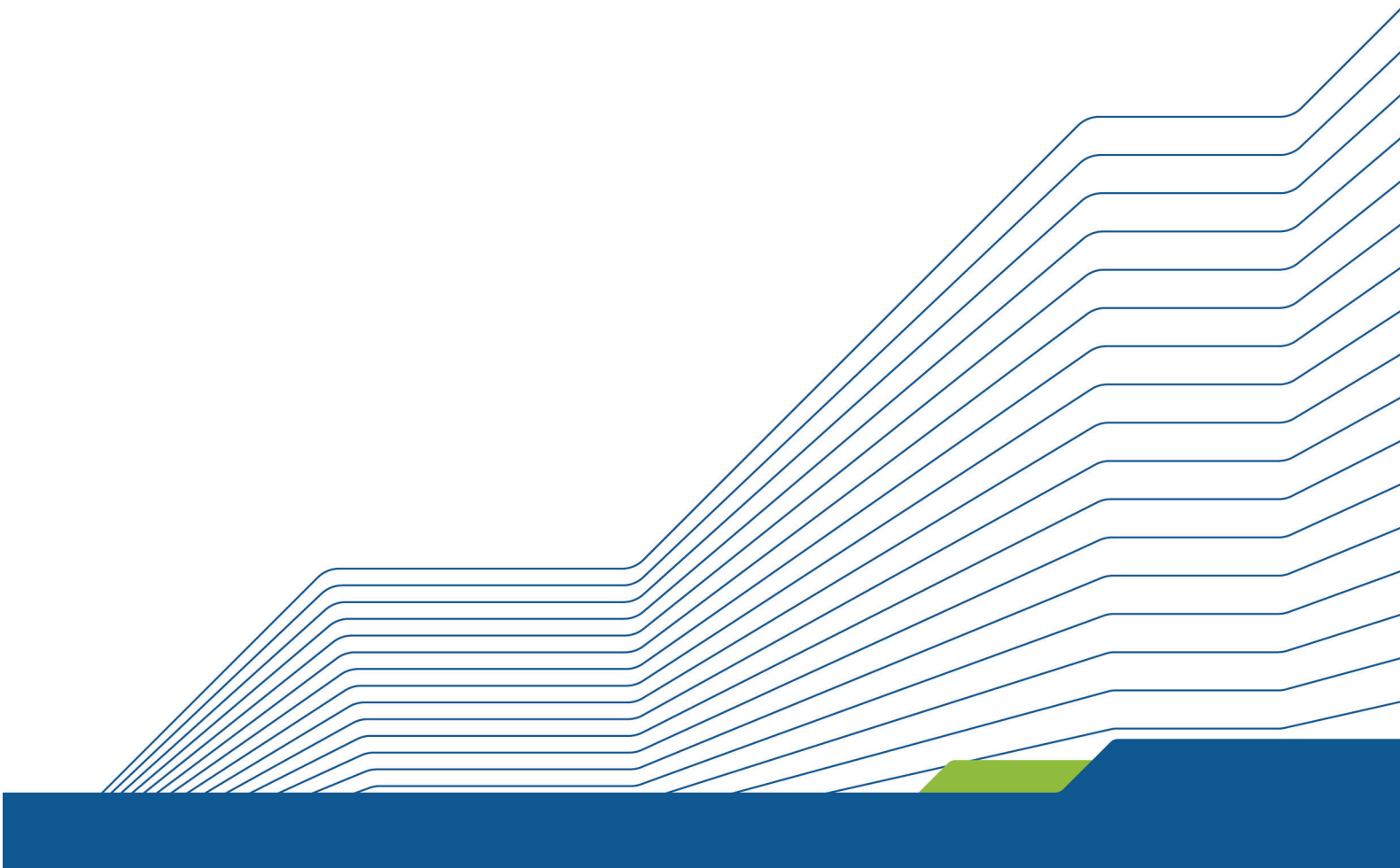
HIFIS HELMHOLTZ FEDERATED IT SERVICES

Checklist to Support the Helmholtz Centers in Implementing Policies on Sustainable Research Software



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Contents

1. Abstract

As the digitalization of research and teaching progresses, the number of software solutions developed at scientific institutions and used for the purpose of knowledge production is increasing. The accessibility and reuse of scientific results called for under the heading “open science” can be ensured in many fields only if, in addition to research data, program code is also made openly accessible.

The present guide is addressed to decision-makers at the Helmholtz Centers who deal with the implementation of policies on sustainable research software. They supplement a model policy that already gives the Centers a forward-looking and reusable template for drawing up rules on sustainable research software management.

2. Introduction

As the digitalization of research and teaching progresses, the number of software solutions developed at scientific institutions and used for the purpose of knowledge production is increasing. The accessibility and reuse of scientific results called for under the heading “open science” can be ensured only if, in addition to research data, program code is also made openly accessible.

The present guide is addressed to decision-makers at the Helmholtz Centers who deal with the implementation of policies on sustainable research software. It supplements a model policy that already gives the Centers a forward-looking and reusable template for drawing up rules on sustainable research software management.

That model policy [*Muster-Richtlinie*] was drafted by the Research Software Task Group of the Open Science Working Group – in consultation with other experts from the Helmholtz Association – and coordinated with the Technology Transfer and Commercial Legal Protection Working Group and the Legal Affairs Working Group.

The term *Richtlinie* is understood to mean a policy document in which a Center defines a reliable framework for research software management. Depending on the local circumstances, the document may be entitled “principles,” guidelines,” or “policy”.

The present checklist is intended as an aid for the process of implementing such a policy at a Center. Prefaced by a brief presentation of previous activities on the topic at the Helmholtz Association (3), it is divided into the sections “Preparation and Conception” (4.1), “Formulation” (4.2), “Communication” (4.3), and “Reflection and Monitoring” (4.4). When considering these sections, it is always necessary to take their coaction into account. For example, the section “Communication” refers to all phases of the implementation. The concluding chapter, “Collection of Materials” (5), lists further key documents that may be of interest when dealing with the topic.

The primary concern of the authors is to give decision-makers an overview of key aspects of relevance when implementing a policy. Depending on the Center and the research area, the local circumstances must also be taken into account.

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[1] See: https://os.helmholtz.de/open-science-in-der-helmholtz-gemeinschaft/akteure-und-ihre-rollen/arbeitskreis-open-science/muster-richtlinie-nachhaltige-forschungssoftware-an-den-helmholtz-zentren/ [Accessed on July 9, 2021].

3. Background

At the Helmholtz Centers, there have been diverse initiatives in the area of research software for some years now. Since 2016, the Research Software Task Group [2] of the Open Science Working Group[3] at the Helmholtz Association has dedicated itself to the accessibility and reuse of research software in the context of open science.

In March 2017, the Helmholtz Association Open Science Working Group adopted a position paper on this topic,[4] and in November 2017 it published the first version of "Recommendations for the Implementation of Guidelines and Policies on Research Software Management at the Helmholtz Centers."[5] After further discussion of these recommendations at the Helmholtz Association, a "Model Policy for Sustainable Research Software Management at the Helmholtz Centers"[6] was drawn up. It was adopted by the Open Science Working Group in November 2019, together with the revised recommendations.

The Software Services Cluster of the Helmholtz Federated IT Services(HIFIS)[7] platform was initiated in 2019 within the framework of the Helmholtz Information and Data Science Incubator with the aim of creating a powerful IT service platform that connects knowledge from all Helmholtz Centers.

Both the Open Science Working Group and the HIFIS platform are dedicated to the sustainable management of research software at the Helmholtz Association; this is also documented by a high degree of personnel overlap between the players. In order to further advance the topic at Helmholtz in a coordinated way, the Research Software Task Group and the Software Services Cluster of the HIFIS platform together make up the Research Software Forum at the Helmholtz Association, which was established in 2020.

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[2] See: https://os.helmholtz.de/open-science-in-der-helmholtz-gemeinschaft/akteure-und-ihre-rollen/arbeitskreis-open-science/task-group-forschungssoftware/ [Accessed on July 9, 2021]
[3] See: https://os.helmholtz.de/open-science-in-der-helmholtz-gemeinschaft/akteure-und-ihre-rollen/arbeitskreis-open-science/ [Accessed on July 9, 2021]
[4] Helmholtz Association (2017). Zugang zu und Nachnutzung von wissenschaftlicher Software. Positionspapier des Arbeitskreises Open Science der Helmholtz-Gemeinschaft [Access to and Reuse of Research Software. Position Paper of the Helmholtz Association Open Science Working Group]. 2017. Online at:https://os.helmholtz.de/index.php?id=2766 [Accessed on July 9, 2021]
[5] Helmholtz Association (2019). *Empfehlungen zur Implementierung von Leit- und Richtlinien zum Umgang mit Forschungssoftware an den Helmholtz-Zentren* [Recommendations for the Implementation of Guidelines and Policies on Research Software Management at the Helmholtz Centers]. DOI: https://doi.org/10.2312/os.helmholtz.008
[6] Helmholtz Association (2019). *Muster-Richtlinie Nachhaltige Forschungssoftware an den Helmholtz-Zentren* [Model Policy on Sustainable Research Software at the Helmholtz Centers]. DOI: https://doi.org/10.2312/os.helmholtz.007
[7] See: https://hifis.net [Accessed on July 9, 2021]

To advance the topic of research software beyond the boundaries of the Helmholtz Association, the ad hoc Research Software Working Group of the priority initiative Digital Information of the Alliance of Science Organizations in Germany was established. It prepared "Recommendations on the Development, Use and Provision of Research Software"[8] (2018) and a position paper[9] (2020). Work on the topic is being continued in the priority initiative's field of action "Digital Tools – Software and Services."

Moreover, Helmholtz Association employees are involved in national and international initiatives to promote sustainable research software management. Particularly worthy of mention here is the Society for Research Software in Germany, de-RSE.[10] This initiative links persons who are active in the area of software development in Germany and ensures collaboration with research software engineers (RSEs) in other countries. One exemplary activity was the co-hosting of the first conference for research software in Germany, in which several Helmholtz Centers participated.

[8] Katerbow, M. et al. (2018). *Recommendations on the Development, Use and Provision of Research Software*. DOI: http://doi.org/10.5281/zenodo.1172988
[9] Konrad, U. et al. (2020). *Digital Services for Science – Where Is the Journey Heading?* DOI: http://doi.org/10.5281/zenodo.4301947
[10] See: https://de-rse.org/en/

4. Checklist

4.1 Preparation and Conception

Relevant aspects when preparing and conceiving a policy for sustainable research software at a Helmholtz Center:

- ✓ Clarify what existing recommendations and rules at the Center that affect the implementation of the policy must be observed. For example:
  - superordinate provisions such as the German Research Foundation (DFG) code of conduct “Guidelines for Safeguarding Good Research Practice”
  - funders’ regulations, for example, the open science requirements in Horizon Europe
  - recommendations at the level of Helmholtz[11] or the Alliance of Science Organizations in Germany[12]
  - Center-specific provisions (publication policy, transfer rules, legal provisions, sustainability activities)
  - discipline-specific provisions (e.g., citation practice for research software at relevant journals)
  - best practices of research software engineers (de-RSE)

- ✓ Exchange experiences with other Centers in advance of the targeted implementation of a policy at the Center:
  - provision of existing regulations and documents for the purpose of reusing content
  - gathering of reports of experiences with implemented processes (e.g., lessons learned)
  - further networking of participating actors at the Centers (low threshold, e.g., in the research area, see Section 4.3 “Communication”)

[11] Helmholtz Association (2017). *Zugang zu und Nachnutzung von wissenschaftlicher Software. Positionspapier des Arbeitskreises Open Science der Helmholtz-Gemeinschaft* [Access to and Reuse of Research Software. Position Paper of the Helmholtz Association Open Science Working Group]. Available online at: https://os.helmholtz.de/index.php?id=2766 [Accessed on July 9, 2021]
[12] Katerbow, M. et al. (2018). *Recommendations on the Development, Use and Provision of Research Software*. DOI: http://doi.org/10.5281/zenodo.1172988

- ✓ Ensure the involvement of relevant actors in the implementation of the policy at the Center:
  - Core premise (if it does not already exist): Support from the Center management (see Section 4.3 “Communication,” Phase 1)
  - Establish a working group with representatives on the topic from research, software development, administration (e.g., HR department/recruitment, legal department, knowledge and technology transfer), and information infrastructure (e.g., data center and library).
  - Involve persons with experience in implementing similar projects (e.g., consideration of lessons learned when implementing the rules regarding research data).

- ✓ Define the scope of application of the policy, taking into account the following parameters. For example, clarify:
  - content
  - scope
  - degree of detail
  - bindingness
  - governance and target group

- ✓ Define the procedure for drafting the policy. For example, clarify:
  - timetable
  - drafting and coordination process
  - responsibilities
  - entry into force

4.2 Formulation

Relevant aspects when formulating a policy on sustainable research software at a Helmholtz Center:

- ✓ State the motivation for implementing a policy at the Center:
  - Formulate the arguments for open research software (at the Center).
  - Compliance: Specify the framework conditions imposed by funders (e.g., research funding organizations).
  - Knowledge about the current discussions on the topic, for example, overview on FAIR software[13]
  - Consider the baseline situation at the Center.
  - Refer to general statements by Helmholtz on openness.
  - Refer to other internal provisions.
  - Describe the internal software culture at the Center.
  - Consider possible reservations about open research software.
- ✓ Define the scope of application of the policy, for example:
  - Clarify the following questions: Who will be affected by the policy? Will the policy also affect cooperation projects and visiting researchers?
- ✓ Select from the model policy the building blocks that are relevant at the Center.
  - Draft the structure and specify the scope; if applicable also specify accompanying documents:
    - sustainability
    - development, use, and reuse of research software
    - support and advice services
    - quality assurance and archiving
    - continuing professional development, career prospects (incl. recognition), and networking

[13] See Fig./Table in Katz, D. S., Gruenpeter, M., & Honeyman, T. (2021). Taking a fresh look at FAIR for research software. *Patterns*, 2(5), 100267. DOI: https://doi.org/10.1016/j.patter.2021.100267

- provision, publication, and citation
- legal aspects and licenses[14]
- scientific and economic exploitation aspects

✓ Consider current topics and challenges from the environment that must be taken into account when formulating the policy, for example:

- the digitalization strategy of the Helmholtz Association and the Center
- FAIR software
- sustainability in software development
- repeatability, reproducibility, reusability through open source and rights of use
- interplay of source code repositories and software publications, as well as versioning
- indicators to measure, for example, the relevance and value of software
- occupational fields and career opportunities for research software engineers (RSEs)

✓ Refer to forms, services, and infrastructures of the Center that are to be taken into account for the policy.

✓ Define key terms in a glossary.

✓ Refer to relevant references in the policy.

✓ Decide on a revision cycle for the policy.

[14] See also the decision trees in Struck et al. (2020). *A Guide for Publishing, Using, and Licensing Research Software in Germany*. DOI: https://doi.org/10.5281/zenodo.4327148 and current overview literature, e.g.: Bazuine, M. et al.(2021). *Tu Delft Guidelines on Research Software: Licensing, Registration and Commercialisation*. DOI: https://doi.org/10.5281/zenodo.4629635, (see Chapter 5, "Collection of Material")

4.3 Communication

Relevant aspects when communicating a policy on sustainable software at a Helmholtz Center:

Phase 1: Preparation

- ✓ Core premise (if it does not already exist): Enlist the support of the Center management regarding:
  - budget
  - suitable contact persons with a mandate
- ✓ Analyze the target group: Identify relevant persons in the preparatory phase
  - research
  - software development
  - administration (e.g. HR department/recruitment, legal department, knowledge and technology transfer)
  - information infrastructure (e.g., data center and library)
- ✓ When making the selection, ensure that good coverage of the organizational units at the Center is achieved, and avoid gaps if at all possible.
- ✓ Ensure the involvement of the identified actors, for example in
  - clarifying responsibilities
  - clarifying the timetable

Phase 2: Implementation

- ✓ Involve the managers of the scientific organization units (department, institute, etc.).
- ✓ Pool competencies and designate clear contact persons during the implementation of the policy
  - where appropriate, by service centers, e.g., on legal issues (for this purpose, exchanges with HIFIS, or even establish a central legal advice service) or transfer.
- ✓ Participatory formats for the collaborative drafting of the policy that include all those affected by it, e.g.:
  - interactive events

- writing workshops

✓ Communicate the process of policy development, for example:

- project website (incl. status/progress)
- shared distribution lists: report on the launch and the progress
- communication with other Centers
- communication in the research area

✓ Communication for support services

- provision of internal resources

✓ Initiate an RSE network at the Center as a sounding board for the process.

Phase 3: Follow-Up

✓ Regular feedback events (see Section 4.4, “Reflection and Monitoring”)

✓ Low-threshold communication channels for questions about the policy, for example:

- Mattermost channel
- wikis

✓ Give visibility to central offerings

- training for specialist personnel and knowledge building at management level
- establishment of central offerings to develop the skills of research software engineers
- Provide legal departments with relevant expertise (if necessary, externally).

✓ Build up internal competencies.

✓ Build internal communities.

✓ Internal workshops as a tool for imparting basic knowledge

✓ Exchanges with other Centers about current positive and negative experiences during the implementation process – best practice

✓ Carry the policy into existing external RSE communities.

4.4 Reflection and Monitoring

Relevant aspects when reflecting on and monitoring a policy on sustainable research software at a Helmholtz Center:

- ✓ Create internal feedback channels at the Center to check whether there are problems in implementing the policy; feed the results back to the management of the Center.
- ✓ Create feedback channels to external stakeholders to check whether they and their interests are reflected in the implementation of the policy at the Center.
- ✓ Define procedures to measure the success of the implementation of the policy (reporting), for example, regular assessment of the implementation of the policy or (further) development of key performance indicators.
- ✓ “Learning policy” – Ensure that the policy is optimized when problematic sections are identified or changes occur in the environment.
- ✓ Embed this process in the change management within the framework of cultural change toward open science.

5. Collection of Material

This chapter provides information on relevant and reusable material from the Helmholtz Centers and other parties.

Anzt, H. et al. (2021). An environment for sustainable research software in Germany and beyond: Current state, open challenges, and call for action. *F1000Research*, *9, 295*. DOI: https://doi.org/10.12688/f1000research.23224.2

Bazuine, M. et al. (2021). *TU Delft Guidelines on Research Software: Licensing, Registration and Commercialisation*. DOI: https://doi.org/10.5281/zenodo.4629635

European Commission (2020): *Scholarly infrastructures for research software. Report from the EOSC Executive Board Working Group (WG) Architecture Task Force (TF) SIRS*. Online unter: https://op.europa.eu/en/publication-detail/-/publication/145fd0f3-3907-11eb-b27b-01aa75ed71a1 [Accessed on Juli 9, 2021]

Katerbow, M. et al. (2018). *Recommendations on the Development, Use and Provision of Research Software.* DOI: http://doi.org/10.5281/zenodo.1172988

Konrad, U. et al. (2020). *Digital Services for Science – Where Is the Journey Heading?* DOI: http://doi.org/10.5281/zenodo.4301947

Helmholtz Association (2019). *Empfehlungen zur Implementierung von Leit- und Richtlinien zum Umgang mit Forschungssoftware an den Helmholtz-Zentren* [Recommendations for the Implementation of Guidelines and Policies on Research Software Management at the Helmholtz Centers]. 2019. DOI: https://doi.org/10.2312/os.helmholtz.008

Helmholtz Association (2019). *Muster-Richtlinie Nachhaltige Forschungssoftware an den Helmholtz-Zentren* [Model Policy on Sustainable Research Software at the Helmholtz Centers]. DOI: https://doi.org/10.2312/os.helmholtz.007

Helmholtz Association (2017). *Zugang zu und Nachnutzung von wissenschaftlicher Software. Positionspapier des Arbeitskreises Open Science der Helmholtz-Gemeinschaft* [Access to and Reuse of Research Software. Position Paper of the Open Science Working Group of the Helmholtz Association]. 2017. Online unter: https://os.helmholtz.de/index.php?id=2766 [Abgerufen am 09.07.2021]

Helmholtz Association (2016). *Report des Helmholtz Open Science Workshop „Zugangzu und Nachnutzung von wissenschaftlicher Software“ #hgfos16*. 2016. DOI: http://doi.org/10.2312/lis.17.01

Struck, A. et al. (2020): *A Guide for Publishing, Using, and Licensing Research Software in Germany*. DOI: https://doi.org/10.5281/zenodo.4327148

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