

RECOMMENDATIONS
**DEVELOPING AND
ALIGNING POLICIES ON
RESEARCH SOFTWARE**
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‘Developing and Aligning Policies on Research Software: Recommendations for Research Funding and Research Performing Organisations’

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DEVELOPING AND ALIGNING POLICIES ON RESEARCH SOFTWARE

**Recommendations for Research Funding and
Research Performing Organisations**

Introduction

The objective of these recommendations is to contribute to a more robust policy framework for research software, recognising the important role of software in research. This paper highlights research software as an emerging element of open science policies and practices, and makes recommendations to research funding and research performing organisations on developing and aligning policies related to research software based on existing good practices and other resources.

The FAIR for Research Software Working Group [defines](#) research software as “source code files, algorithms, scripts, computational workflows and executables that were created during the research process or for a research purpose.” This definition makes an important distinction between research software and ‘software in research’, which refers to software components that are used for research, but lack a primary research intent. These recommendations follow this definition.

The current research software landscape sees the emergence of (policy) initiatives that aim to support the community of practice dedicated to strengthening the role of software in research communication. Notable examples include the Amsterdam Declaration on Funding Research Software Sustainability ([ADORE.software](#)), initiatives by the Research Data Alliance ([RDA](#)) and Research Software Alliance ([ReSA](#)) such as the Working Group ‘Policies in Research Organisations for Research Software’ ([PRO4RS](#)), and efforts like [Software Heritage](#).

The policy framework for research software remains nascent. Despite the emergence of various initiatives, more work remains to be done to fully support the community of practice. Building a more robust policy framework is especially urgent as the effects of new and emerging technologies, such as generative artificial intelligence and quantum computing, start having a significant impact on the research process and its communication.

Science Europe supports research funding and research performing organisations and the role they play in building a more robust policy framework for research software as part of their strategic approach to open science. This document, developed by the Science Europe Task Force on Research Software, provides recommendations for these organisations to develop and align their policies, while also emphasising the shared responsibility with other research actors. Throughout, illustrative examples of good practices will be highlighted.

Recommendations

Provide a definition of 'research software' and other key terms

Organisations should provide a definition of 'research software' to clarify what falls into the scope of their policies, notably the difference between 'research software' and 'software in research'. They should also indicate how key terms are interpreted in this field, such as sustainability, accessibility, usability, user/developer community, and so on.

Good practices and other resources

- A commonly used definition of research software can be found in Gruenpeter, M., et al. (2021). [Defining Research Software](#): a controversial discussion (version 1). Zenodo.
- An alternative definition of research software can be found in Gomez-Diaz, T. and Recio, T. [Research Software vs. Research Data I](#): Towards a Research Data definition in the Open Science context [version 2; peer review: 3 approved]. F1000Research 2022, 11:118.
- Regarding the definition of other key terms, much attention has gone to defining sustainability. For example in [a blog post by Daniel S. Katz](#) and in Barker, M., Chue Hong, N.P., Van Eijnatten, J., & Katz, D.S. (2023). [Amsterdam Declaration](#) on Funding Research Software Sustainability (0.3). Zenodo.

Specify the target audience, scope, and goals of the policy

Organisations should specify the target audience, scope, and goals of their policy on research software. This is an opportunity to raise awareness on the goals and objectives of the policy, as well as set expectations at the organisational level.

Good practices and other resources

- An example of outlining the responsibilities of those creating and managing software, as well as those supervising software creators and managers can be found in Akhmerov, A., et al. (2021). [TU Delft Research Software Policy](#). Zenodo.

Consider existing recommendations, standards, and initiatives

Organisations should build on existing good practices and other resources to develop their own policies. The discussion on research software is complex and dynamic with many emerging recommendations, standards, and initiatives. Organisations should be transparent about the initiatives they build on and are aligned with, both towards their own communities and external actors.

Good practices and other resources

- Existing recommendations, standards, and initiatives include the commitments of the Coalition for Advancing Research Assessment ([CoARA](#)) and [ADORE.software](#). The CoARA commitments are specifically relevant for improving the recognition of research software development for scholarly careers (cf. infra).
- Existing services and infrastructures that support the creation and preservation of research software include [Software Heritage](#), [Zenodo](#), [GitHub](#), and so on.

Provide guidance regarding research software management

Organisations should provide guidance regarding the development and implementation of research software management plans, whenever relevant. They should consider that these plans may differ depending on specific use cases or applications.

A research software management plan is understood here as a plan that describes what software is to be used and how software is to be developed, maintained, and curated in the course of a research project. It ensures a comprehensive understanding of roles and responsibilities regarding software within a project and guides researchers and research support staff. Software management plans can be set up according to a template.

A software management plan usually comprises questions and guidance regarding: (1) type(s) of software that are being used and/or produced, (2) software storage, curation, and maintenance, (3) software documentation, (4) licensing and intellectual property, (5) software citation, (6) responsibilities regarding research software management, (7) long-term use, and (8) community management.

Good practices and other resources

- Examples of guidance regarding research software management can be found in the [national guide](#) to research software management created by the Dutch Research Council (NWO), the guidelines on [writing and using a software management plan](#) developed by the [Software Sustainability Institute](#), and the [resources on people, policy, and infrastructure](#) provided by ReSA.
- Gomez-Diaz, T. and Romier, G. (2018). [Research Software Management Plan Template v3.2](#). Projet PRESOFT, bilingual document (FR/EN). Zenodo Preprint 2018.
- Grossmann, Y.V., Lanza, G., Biernacka, K., Hasler, T., and Helbig, K. (2024). [Software Management Plans – Current Concepts, Tools, and Application](#). *Data Science Journal* 2024 23: 43.

Place research software within organisational strategies and the broader research landscape

Research software policies should be developed and implemented by organisations as part of their organisational strategies, and placed within the broader context of the changing research landscape.

Connecting research software policies to organisational strategies is the responsibility of each independent organisation. Placing them in the broader research landscape is a joint effort by universities, research funding and research performing organisations, libraries, learned societies, infrastructures, and researchers at all career stages. This includes supporting the development of infrastructures, offering training programmes, and improving the recognition of research software development for scholarly careers (in alignment with the CoARA commitments), among other important elements. These and more are necessary to create a research landscape in which research software plays an integral role and makes an effective contribution.

Good practices and other resources

- Documented strategic approaches to research, open science, and research assessment reform are starting points to place research software in the organisation's broader strategy and in the changing research landscape. Resources include an organisation's mission, strategy, or vision documents, or a dedicated policy (or policies) at the organisational, regional, and/or (inter)national level.
- Examples include the [Thematic Digital Competence Centres](#) by NWO, and the [Research Software Infrastructures funding programme](#) by the German Research Foundation (DFG). At national level, the [Netherlands eScience Center](#) is an example; at the international level, [ReSA](#) is an

organisation specifically committed to placing research software within the broader research landscape. Broader resources on open science and research assessment reform include the [UNESCO Recommendation on Open Science](#) and [CoARA](#).

Further Engagement

These recommendations reflect Science Europe's strategic commitment to [advancing open science](#) as an integral component of the research ecosystem, alongside efforts to [reform research assessment](#) practices that promote positive research cultures. These priorities underscore the collective responsibility of Science Europe's members to shape the future of research in Europe and beyond.

Science Europe will further explore research software in alignment with its work on open research data, including the practical guides on [internationally aligning](#) data management policies and procedures and ensuring the [long-term sustain-](#)

[ability](#) of research data. The good practices and other resources in this document will be considered in this effort.

The collaborative efforts of Science Europe's research funding and research performing member organisations contribute to a more robust research policy framework, including for research software. An [overview of their respective actions](#) within national and disciplinary contexts is available. The [Science Europe Working Group on Open Science](#) in particular serves as a platform for dialogue, facilitating alignment between the initiatives taken by its Member Organisations.



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