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National Roadmap
for
Open Science

The National Roadmap for Open Science was adopted by the General Assembly of the Association of Swedish HEI's (SUHF) on 10 March 2021.
It has been revised in 2022 and adopted by SUHF's Board on 30 June.

National Roadmap for Open Science

1. Introduction

The National Roadmap for Open Science[1] was adopted by the General Assembly of the Association of Swedish HEI's (Sveriges universitets- och högskoleförbund, SUHF) on 10 March 2021. It has been revised in 2022 and adopted by SUHF's Board on 30 June.

The roadmap has been devised by SUHF's National Working Group on Research Data.

The aim of the National Roadmap for Open Science

SUHF's National Roadmap for Open Science aims to clarify the responsibilities of HEIs (HEIs) and the measures needed to accelerate work on open access to research data and research results. The aim is to create enhanced opportunities for HEIs and other stakeholders to coordinate on issues of a common nature, encourage enhanced collaboration and jointly create conditions so that researchers at Swedish HEIs, regardless of their affiliation to any particular HEI, have similar opportunities for services and support in the transition to an Open Science system.

SUHF has previously drafted a recommendation concerning a data management plan (REK 2018:1) and a recommendation concerning steering documents for research data (REK 2019:3), both of which are available at www.suhf.se

SUHF's roadmap contains supplementary comprehensive recommendations for action at HEIs within the scope of efforts to promote an Open Science system. The roadmap needs to be reviewed annually and examined to ensure it is up to date.

The roadmap is complemented by the *Guide for implementation of the Roadmap for Open Science* adopted by the SUHF Board in June 2022.[2] This contains specific proposals for actions and capabilities that need to be in place at HEIs so as to achieve the Government's target scenario of a transition to an open scientific system. It also includes an overall schedule for when these capabilities should be in place.

SUHF and Open Science

Open Science aims to jointly build a system where science is more transparent, more accessible and more reusable for research, innovation and development. The objective is for the future system for open access to be based on the FAIR principles, see below.

SUHF supports the principle whereby research that is fully or partially publicly funded should be openly accessible, according to internationally accepted principles, taking into account legal, ethical and any commercial aspects as far as possible. Making research results and research data, or descriptions of research data, openly available is valuable in order to validate research and facilitate the re-use of research with a view to creating and disseminating new knowledge.

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[1] The Open Science concept includes research on a scientific and artistic basis.
[2] Vägledning för implementering av färdplan för öppen vetenskap: https://suhf.se/publikationer/rekommendationer/

Discussions have been held at SUHF on which Open Science issues should be highlighted in particular. Access to open research data and research results to promote the openness of science and the involvement of society and citizens in research are the areas in focus. Accurate and accessible archiving and screening of all research documents, increased collaboration between HEIs, utilisation and helping to promote incentives and merits for Open Science and open access wherever possible are further areas of importance for SUHF to continue working on.

Assignment

The National Working Group on Research Data has been tasked with formulating a national Roadmap for Open Science through SUHF's coordination group for Open Science. The starting point of this Roadmap for Open Science involves making recommendations on the responsibilities of HEIs on the basis of existing decisions and strategies at both national and international level.

Delimitation

The field of Open Science is extensive and includes aspects such as open access, open data, open learning resources, open source code, open peer review and citizen science. The recommendations are limited to measures that HEIs need to implement in order to promote open access to research data and research results. Management teams at Sweden's universities and colleges form the primary target group for the Roadmap for Open Science.

About SUHF

The Association of Swedish HEIs (Sveriges universitets- och högskoleförbund, SUHF) represents the interests of universities and colleges externally and acts internally on issues where coordination is needed. Our members comprise 38 universities and colleges that participate on a voluntary basis. SUHF is an arena for discussions and standpoints on issues relating to higher education policy. Universities and colleges vary in size and orientation, which provides a broad basis for discussions on the many issues that unite them. SUHF works internationally through the European University Association (EUA), the Nordic University Association (Nordiska universitetssamarbetet, NUS) and the International Association of Universities (IAU).

2. Recommendations

In the wake of digitalisation and the transition to Open Science, a new research culture is emerging with new requirements for the correct management of research data, as well as new requirements and opportunities for the publication of both research data and research results with open access. Open Science will form part of the day-to-day lives of every researcher. Each individual researcher will be responsible for taking advantage of the demands and opportunities of the new science system, just as every HEI will be responsible for ensuring that researchers are provided with the framework, support, services and training needed to take part in and be part of Open Science.

When making the transition to an Open Science system by 2026 in line with the EUA *Agenda for Open Science 2025*[3], Sweden's HEIs should form part of a scientific ecosystem characterised by:

- Academic ownership of scientific communication and publishing.

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[3] https://www.eua.eu/resources/publications/1003:the-eua-open-science-agenda-2025.html
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- A fair ecosystem for scientific publishing (i.e. transparent, diverse, affordable and sustainable, technically interoperable and driven by the scientific community).
- FAIR research data as the norm for producing and sharing scientific know-how.
- New professional profiles for data-intensive careers.
- Active involvement in the EOSC.
- A responsible, transparent and sustainable research evaluation system.
- Open Science as an integral part of research evaluation methods.
- Evaluation methods that balance qualitative and quantitative measurements.

The paradigm shift does not place new demands solely on researchers, but at least as much on HEIs and their ability to respond to these changes and demands to provide a new form of researcher support and research support services. Meeting the new demands and needs requires new competences and skills, altered and more resource-efficient organisational structures, local infrastructure with support and access to higher capacities for the correct and secure management, storage, publication and retention of research data and results and other related research documents.

Swedish HEIs need to take responsibility both individually and jointly for ensuring that researchers have the best conditions for access to support and services for managing, storing, making available and retaining both research results and research data. Getting the right support and conditions to conduct research according to the principles of Open Science should not be dependent on the HEI where one is active.

Changing direction and devising new activities, services and support systems will involve costs for HEIs in terms of financial resources, infrastructure, support functions, skills provision and effort. The paradigm shift towards an Open Science system places demands on the ability of HEIs to rearrange activities, reallocate resources and ensure the right competences and an extended responsibility and obligation to promote and actively work towards prioritising this.

Responsibilities of HEIs:

1. To create research and education environments that support, encourage, inform and educate about Open Science as a practice by adopting, implementing and supporting local steering documents or frameworks
2. To provide relevant research and education support services relating to Open Science that can meet researchers' needs for support throughout the research process, i.e. before, during and after a research project, in a resource-efficient manner
3. To aim to ensure that research data and research results are compliant with the FAIR principles as far as possible
4. To provide researchers with affordable, adequate and secure infrastructural services – compliant with the applicable regulatory framework (in particular the Freedom of the Press Act, the Public Access to Information and Secrecy Act, the Archives Act and the GDPR) and the FAIR principles – for management, storage, publication and retention of research data and research results, archiving and deletion forming an integral part of the research process and open access work
5. To actively collaborate with other HEIs, infrastructures and funders to find resource-efficient and cost-effective joint national solutions regarding steering documents, frameworks and infrastructural services
6. To promote, participate and collaborate with international stakeholders and initiatives such as the European Open Science Cloud Association (EOSC-A) and the San Francisco Declaration on Research Assessment (DORA)

7. To develop an incentive structure that promotes and assesses Open Science, such as in performance assessment and performance-based allocation of funds
8. To work to ensure that copyright for the publication and re-use of research results is not transferred exclusively to commercial scientific publishers.

3. Background, stakeholders and conditions

This section provides a brief review of the background to the current conditions for the transition to an Open Science system and the work of a few different stakeholders on these issues.

Research and education are the core missions of universities and colleges. According to the Higher Education Act, activities must be conducted in such a way that there is a close link between research, based on scientific and artistic principles, and on proven experience, and education. Furthermore, the credibility of science and good research practice must be safeguarded. The collaborative mission includes ensuring that research results and research data are disseminated and useful. As more research becomes available, faster research results can be achieved and more researchers can validate and base their research on previous results.

Open Science system 2026
In May 2016, governments in EU countries adopted Council conclusions stating that the Union should make the transition to a new system for Open Science. This decision has given rise to the term Open Science. According to the Council conclusions, publicly funded research should be published with open access.

The research bill (*Kunskap i samverkan för samhällets utmaningar och stärkt konkurrenskraft* [Knowledge in collaboration for society's challenges and strengthened competitiveness], Government Bill 2016/17:50) adopted in April 2017 states that "all scientific publications resulting from publicly funded research should be made openly accessible immediate upon publication". It also states that the research data on which these scientific publications are based should be made openly available. The target scenario is that a transition to an Open Science system should be fully implemented in Sweden by 2026.

Since 2017, the Swedish Research Council (Vetenskapsrådet, VR) has had a government mandate to coordinate the national effort to introduce open access to research data. The National Library of Sweden (Kungliga biblioteket, KB) has a similar assignment in order to coordinate efforts on open access to publications. HEIs, for their part, should promote the transition to an Open Science system through research and education environments that support, encourage and provide information on Open Science as a practice.

Public Sector Information (PSI) and open data
The Act on the Reuse of Documents from Public Administration (2010:566) (*Lagen om vidareutnyttjande av handlingar från den offentliga förvaltningen*), known as the PSI Act, has had relatively limited impact to date.

A new PSI Directive, also known as the Open Data Directive, at EU level from 2019 involves increased ambitions as regards making open data and other public digital information available. This EU directive will be implemented in Sweden through legislation.

In Government Bill 2021/22:225, the Government proposes a new law – the Public Sector Data Availability Act (*Lagen om den offentliga sektorns tillgängliggörande av data*). The Act is to be

applied by universities and colleges only in relation to research data. The same is to apply to other public authorities for that part of their activities involving conducting or funding research or making research data directly available.

The FAIR principles

One key element of Open Science is that research data should be searchable, accessible, interoperable and reusable. These principles have come to be known as FAIR (Findable, Accessible, Interoperable, Reusable). The FAIR principles have become a watchword for good data management and open access to research data, both now and in the future. They were presented in the above-mentioned Council conclusions of June 2016, and member states are invited to follow the FAIR principles in their research programmes and with regard to research funding.[4]

Research data and research results as public documents

The prevailing opinion is that research data generally constitutes public documentation.[5] Two consequences of this are that research data does not belong to the individual researcher but to the public authority, i.e. the higher education institution or equivalent public authority, and that anyone who wishes to do so has the right to request research data (public documents) from HEIs.[6] Research results comprising documents such as articles, theses and reports are also generally public documents. This means that we already have a passive form of open access to research data and research results.

Some research data and research results are protected by confidentiality under the Public Access to Information and Secrecy Act. However, the scope of confidentiality is examined only at the time of any disclosure, which means that confidentiality can never be promised in advance. On the other hand, it is of course possible, and in some cases necessary, for individual researchers to form an opinion in advance as to whether certain research data and research results are subject to confidentiality and, if so, to what extent.

The fact that research data and research results are public documents, what this involves and the extent to which different types of research data and research results are subject to confidentiality must be well known to researchers in general so as to ensure proper and appropriate handling. HEIs must take responsibility for raising the general level of awareness in this regard, but also for providing the actual means of managing research data and research results on the basis of the fact that they are public documents, including practical guidelines and storage solutions.

Archiving

Responsibility for archiving, like responsibility for publishing, rests with the HEIs themselves, and there are requirements for open access in this regard as well. The framework for public documents already provides a basis for open access to research data, research results and other research documents. However, this also assumes that these are actually dealt with for archiving and that this is done in accordance with the applicable regulations.

The National Archives of Sweden (Riksarkivet) have the right to prescribe in respect of public documents, and therefore impose requirements concerning the management and archiving of information received or created within research at HEIs that are public authorities. These requirements mean that HEIs must take action to ensure that digital research documents can

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[4] Kriterier för FAIR forskningsdata, VR 2018, Vetenskapliga publikationer och FAIR-principerna, KB, 2019.
[5] Offentlighet och sekretess i myndighets forskningsverksamhet, s. 29, Alf Bohlin 1997.
[6] Swedish Research Council report "Förslag till nationella riktlinjer för öppen tillgång till vetenskaplig information", p. 22, 2015.

be produced, handled, stored and documented in such a way that they can be presented and be comprehensible and reliable for the whole period for which they are to be retained.

Consequently, the archival requirements of HEIs in respect of research documents largely coincide with other needs related to the management and storage of research data and research results for open access and the PSI/Open Data Directive. Therefore, archiving should form an integral part of the research process and open access work.

In April 2022, the Board adopted a recommendation on the application of the regulatory framework concerning the screening and retention of research information. The recommendation has been drafted by SUHF's expert group on archive and information management. This can be viewed as an extension and expansion of recommendations 3 and 4 provided in SUHF's National Roadmap for Open Science. The recommendation is based on the existing regulatory framework It is intended to facilitate the application of the regulatory framework and create consistency at Swedish HEIs. The recommendation is available at www.suhf.se

Current challenge

Besides the HEIs and their research infrastructures, there are a number of stakeholders such as the National Library of Sweden (KB), the Swedish National Data Service (SND), the Swedish University Computer Network (SUNET) and the Swedish Research Council (VR) working with or touching upon the field of Open Science. However, there is currently no one stakeholder with overall responsibility for the field, and for coordination between the stakeholders involved Therefore, there is currently no clear national coordination and thus no structured collaboration in respect of Open Science. There are a number of stakeholders, committees and inputs addressing the issue of open data: Tobias Krantz, for example, was appointed as a special investigator for the *Organisation, control and funding of research infrastructure* committee.[7] The mandate included proposing a national e-infrastructure organisation for research. The report *Stärkt fokus på framtidens forskningsinfrastruktur [Stronger focus on future research infrastructure]*[8] was presented on 11 August 2021. VR has also submitted the report *Inriktningsförslag för organisering av svensk e-infrastruktur för forskning [Policy proposals for the organisation of Swedish e-infrastructure for research]*[9], and most recently the Swedish Research Council's coordination assignment on open access to research data 2022.[10] KB has published a report describing their work on open access.[11] In their reports, both public authorities present proposals for measures to promote the transition to an Open Science system in the future and requests for renewed coordination assignments.

With regard to publishing, the National Library will coordinate work on the introduction of principles to promote the publication of scientific publications with open access. In this work, the principles for open access publishing will be formulated to take into account the principle whereby research results may be published freely in accordance with Chapter 1, Section 6 of the Higher Education Act (1992:1434). KB will consult with the Swedish Research Council when carrying out the assignment.

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[7] https://www.regeringen.se/rattsliga-dokument/kommittedirektiv/2020/05/dir.-202052/ Downloaded on 13 April 2022

[8] https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2021/08/sou-202165/ Downloaded on 13 April 2022

[9] https://www.vr.se/analys/rapporter/vara-rapporter/2020-03-12-inriktningsforslag-for-organisering-av-svensk-e-infrastruktur-for-forskning.html Downloaded on 13 April 2022

[10] https://www.vr.se/analys/rapporter/vara-rapporter/2022-03-10-vetenskapsradets-samordningsuppdrag-om-oppen-tillgang-till-forskningsdata-2022.html Downloaded on 13 April 2022

[11] https://www.kb.se/5.5b1f3a717f6b2443a925b.html Downloaded on 13 April 2022

To summarise: regardless of the different stakeholders and hopes for new future structures, Swedish universities and colleges have a great responsibility to actively make research data and research results public. Work on implementing the recommendations for Open Science should begin immediately, which presents a major challenge as there is currently no unifying stakeholder in the field. The HEIs themselves must therefore accept this responsibility.

International outlook

Work on and relating to Open Science is undoubtedly an international issue, as mentioned above in relation to the EU Council conclusions. Some other international initiatives linked directly with Open Science are described in brief below.

Plan S and cOAlition S

Plan S is an open access publishing initiative launched in 2018 by Science Europe, a collaborative body of European research funders. The aim of Plan S is for results from research carried out with funding from public research funders to be published with immediate open access. This plan is supported by cOAlition S, an international association of research funders, including Forte, Formas and Vinnova. SUHF, through the Nordic University Association (NUS), endorsed the principles of Plan S in October 2018.

The principles of Plan S mean that as many people as possible should be able to benefit from the results of publicly funded research. The researcher or the researcher's organisation retains the economic copyright and licenses the publications under Creative Commons (or equivalent) licences.[12]

The San Francisco Declaration on Research Assessment (DORA)

The San Francisco Declaration on Research Assessment, DORA, is part of an international movement that aims to promote responsible and fair assessment of research and researchers.[13] The Declaration, which was published in 2012, includes a number of recommendations for different stakeholders in the assessment of research, including universities and other research organisations. The Declaration has been translated into 20 languages, and to date it has been signed by over 1,800 organisations and 15,000 individuals all over the world.

A key theme of DORA is the requirement to prioritise qualitative indicators in research assessment. This applies to both research results and factors influencing research. For publications, the scientific content should always be the most important criterion for evaluation. Journal-based metrics such as the Journal Impact Factor should not be used as a surrogate measure of the quality of individual research articles. Another important theme of the Declaration is that research outputs (besides research publications, including datasets and software) and the impact of researchers' activities should be assessed in their entirety. DORA also requires all evaluation processes to be open and clear about the methods and criteria used.

In general, using journal-based metrics to evaluate the contribution of individual researchers to research is not recommended when a researcher is to be hired, promoted or awarded research funding. Clarity is called for in respect of the criteria used for evaluation, and factors other than scientific articles, which may also be different in nature and thus affect citation patterns such as research data, must also be taken into account.

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[12] https://forte.se/sok-finansiering/pagaende-bidrag/plan-s-och-oppen-tillgang/ Downloaded on 13 April 2022

[13] https://sfdora.org/ Downloaded on 13 April 2022

UNESCO

UNESCO has formulated a document on Open Science which was adopted in 2021. This document recommends that all member states should establish a national Open Science policy. Establishing an initial roadmap concerning the responsibilities and opportunities of HEIs to promote the transition to an Open Science system and incentives to support this can be viewed as part of the work on a future national roadmap for Open Science.[14]

A European Strategy for Data

One of the European Commission's overarching strategies focuses on *Shaping Europe's Digital Future*. Part of this strategy relates to data *(A European Strategy for Data)*. The Strategy for Data, together with the White Paper on Artificial Intelligence, focuses on the need to put people first when developing new technology. It also seeks to defend and promote European values and rights in the ways in which we design, produce and use technology.

The European Strategy for Data aims to create a single market for data that will ensure Europe's global competitiveness and data sovereignty. Common European databases will make more data available to more stakeholders for free throughout the EU. The strategy also involves quality assurance of data, as well as development of legislation for data control, access and reuse. The development of data processing infrastructures and data sharing tools is also part of the strategy, as is the establishment of the European Open Science Cloud, a European collaborative platform or portal for research data.

European Open Science Cloud

The European Open Science Cloud (EOSC) is a key instrument, what is known as a co-programmed partnership programme, for implementing the EU's Open Science and digital single market agenda.

The EOSC aims to enable the sharing of open and FAIR research data across national borders, subject areas in Europe and globally. Swedish stakeholders – such as universities, institutes, research infrastructures, funders and private stakeholders – have the opportunity to participate in the EOSC partnership by becoming members of EOSC Association, which are legal entities under Belgian law, right from the outset and thus contribute to building up the EOSC.

SUHF is a member of the EOSC Association (EOSC-A) through its host organisation, Stockholm University. In dialogue with all HEIs, SUHF has agreed to act as a national stakeholder and has therefore set up a reference group in September 2020 comprising both management representatives and researchers from universities and colleges.[15]

The HEI-owned digital infrastructures Swedish National Data Service (SND) and the current Swedish National Infrastructure for Computing (SNIC) are members through the University of Gothenburg and Uppsala University, respectively. Chalmers University of Technology, Karolinska Institutet, Linnaeus University, Lund University, the Swedish University of Agricultural Sciences, Umeå University and the research council Formas, as well as the European Spallation Source (ESS) research infrastructure are also members. The Swedish Research Council is appointed by the Government to be a mandated organisation in Sweden.

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[14] UNESCO's Open Science Recommendation: https://en.unesco.org/science-sustainable-future/open-science/recommendation Downloaded 13 April 2022

[15] https://www.vr.se/uppdrag/oppen-vetenskap/oppen-tillgang-till-forskningsdata/pa-gang-i-arbetet-med-oppen-tillgang-till-forskningsdata.html Downloaded 13 April 2022
https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-cloud Downloaded 13 April 2022

4. Summary

There is currently no one stakeholder with overall responsibility for Open Science, which has presented a major obstacle to Swedish development in this field. Of course, Sweden has a number of local and national initiatives, but as the issue of Open Science concerns everything from open access to research data, research results and publications to citizen science and open source code, going forward Sweden needs a stakeholder with overall responsibility for the field.

A proposal along these lines can be found, for example, in the report prepared by the Swedish Research Council and the University reference group for research infrastructures (URFI).[16] However, change in this direction will take a long time, which is why it is particularly important for HEIs to start implementing the recommendations proposed in this roadmap promptly:

1. To create research and education environments that support, encourage, inform and educate about Open Science as a practice by adopting, implementing and supporting local steering documents or frameworks
2. To provide relevant research and education support services relating to Open Science that can meet researchers' needs for support throughout the research process, i.e. before, during and after a research project, in a resource-efficient manner
3. To aim to ensure that research data and research results are compliant with the FAIR principles as far as possible
4. To provide researchers with affordable, adequate and secure infrastructural services – compliant with the applicable regulatory framework (in particular the Freedom of the Press Act, the Public Access to Information and Secrecy Act, the Archives Act and the GDPR) and the FAIR principles – for management, storage, publication and retention of research data and research results, archiving and deletion forming an integral part of the research process and open access work
5. To actively collaborate with other HEIs, infrastructures and funders to find resource-efficient and cost-effective joint national solutions regarding steering documents, frameworks and infrastructural services
6. To promote, participate and collaborate with international stakeholders and initiatives such as the European Open Science Cloud (EOSC) and the San Francisco Declaration on Research Assessment (DORA)
7. To develop an incentive structure that promotes and assesses Open Science, such as in performance assessment and performance-based allocation of funds
8. To work to ensure that copyright for the publication and re-use of research results is not transferred exclusively to commercial scientific publishers.

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[16] https://www.vr.se/analys/rapporter/vara-rapporter/2020-03-12-inriktningsforslag-for-organisering-av-svensk-e-infrastruktur-for-forskning.html Downloaded 13 April 2022