Recommendations for a National Open Science Strategy in Austria

Open Science Network Austria OANA

Working Group "Open Science Strategy"

Summary, October 2020

Contact: katja.mayer@zsi.at, katharina.rieck@fwf.ac.at, st.reichmann@edu.uni-graz.at

Access to scientific knowledge has become much easier through digitisation and the Internet. The process of knowledge production can now be made more transparent and comprehensible than ever before. New possibilities for social application and economic exploitation of knowledge are opening up. The numerous initiatives that exist in this regard are summarised under the term Open Science. A look at international activities reveals a broad spectrum ranging from national action plans to institutional strategies. The present recommendations are based on these initiatives and provide practical advice for their coordinated implementation with regard to strategic developments in research, technology and innovation (RTI) in Austria until 2030. They are addressed to all relevant actors in the RTI system, in particular to research performing organisations, research policy, research funding organisation, memory institutions and researchers.

The recommendation paper was developed and written in 2018-2020 by the OANA Working Group "Open Science Strategy". It is intended as an impetus for the further discussion and implementation of Open Science in Austria and as a contribution and basis for a national Open Science Strategy in Austria. The OANA Working Group was established by the OANA core team after the OANA network meeting on 10.1.2018 and elaborated the recommendation paper taking into account many international strategies. The document builds on the diverse expertise and backgrounds of the authors (science, administration, library and archive, information technology, science policy, funding etc.) and reflects their personal experiences and opinions. A public consultation on the draft of the "Recommendations for a national Open Science Strategy in Austria" took place from 06.03.-19.04.2020, in which numerous stakeholders also took part, who were not represented in the Working Group. Comments and feedback were incorporated into the final version of the recommendation document, which is now available. Many thanks go to all those who, through their input and commitment, made the creation of this document possible!

OANA Working Group "Open Science Strategy" (2018 - 2020)

Katja Mayer (0000-0003-1184-595X)

Katharina Rieck (0000-0002-9316-165X)

Stefan Reichmann (0000-0003-1544-5064)

Patrick Danowski (0000-0002-6026-4409)

Anton Graschopf (0000-0001-8483-2397)

Thomas König (0000-0003-4337-5163)

Peter Kraker (0000-0002-5238-4195)

Patrick Lehner (0000-0002-0139-6030)

Falk Reckling (0000-0002-1326-1766)

Tony Ross-Hellauer (0000-0003-4470-7027)

Daniel Spichtinger (0000-0002-9601-8592)

Michalis Tzatzanis (0000-0001-8604-7456)

Stefanie Schürz (editing) (0000-0002-3816-1294)

Recommendations for Research Performing Organisations

Short Term *1-2 years*	Medium Term *5 years*	Long Term *10 years*
▸ Develop an Open Science Roadmap as part of the institutional strategy ▸ Define responsibilities and establish a national network of Open Science nodes and contact points ▸ Offer Open Science Training ▸ Establish a contact point for research data management and FAIR Data ▸ Prepare and implement the connection to the European Open Science Cloud (EOSC)	▸ Integrate Open Science into curricula and further education ▸ Prefer and support Open Infrastructures ▸ Make Open Science activities visible and evaluate them ▸ Expand evaluation processes according to Open Science criteria	▸ Establish further Open Science criteria in evaluation systems ▸ Establish Open Science as an aspect of the institutional Third Mission

Recommendations for Research Funding Organisations

Short Term *1-2 years*	Medium Term *5 years*	Long Term *10 years*
▸ Develop Open Science funding strategies ▸ Enable experiments through pilot programmes ▸ Expand evaluation processes to include Open Science criteria	▸ Support and expand review processes in line with Open Science strategies ▸ Evaluate Open Science activities ▸ Further develop programmes in line with Open Science strategies ▸ Support the pooling and opening up of successful infrastructures	▸ Promote sustainable Open Infrastructures

Recommendations for Research Policy

Short Term *1-2 years*	Medium Term *5 years*	Long Term *10 years*
▸ Develop and implement a national Open Science Strategy ▸ Establish an Open Science Monitoring Centre ▸ Establish a clearing house for data protection and copyright issues ▸ Strengthen national Open Science initiatives	▸ Contribute to the development of a European directive on Open Science ▸ Aim for 100% Open Access by 2025 ▸ Fund sustainable and long-term Open Science infrastructure	▸ Use transparent evaluation procedures in the assessment of research activities and open metrics

Recommendations for Libraries

Short Term *1-2 years*	Medium Term *5 years*	Long Term *10 years*
▶ Negotiate transparent transformative Open Access publishing contracts	▶ Foster activities of the Austrian Academic Library Consortium (KEMÖ) to meet the growing Open Science challenges	▶ Further develop open publishing and open research infrastructures
▶ Prepare library stocks for the FAIR principles	▶ Focus on 100%-OA contracts to replace transformative agreements	
▶ (Further) develop Open Infrastructures in accordance with international standards	▶ Prepare and implement the connection to EOSC	
▶ Advice and support for researchers on open licensing	▶ Publish research data management plans (DMPs) in repositories	
▶ Create Open Access publication funds		
▶ Strengthen existing Open Science initiatives		

Recommendations for Researchers

Short Term *1-2 years*	Medium Term *5 years*	Long Term *10 years*
▶ Follow the principle "As open as possible, as closed as necessary"	▶ Network and join grassroot communities	▶ Use and/or develop open collaborative teaching and research environments
▶ Use an ORCID ID	▶ Use and develop discipline-specific metadata standards for research data	
▶ Attend Open Science Trainings	▶ Adhere to the FAIR data principles	
▶ Critically review Open Science services	▶ Establish Open Science policies at the project level	

Recommendations for Open Science in Austria

The successful transition to Open Science is based on maximising the synergies and overall coherence of the many different activities and actors involved. At the national level, these are research performing organisations[1], memory institutions such as libraries[2], researchers, as well as research policy and research funding organisations. These actors are called upon to keep an eye on the one hand on the international perspective, including the European framework of Horizon Europe, the ERA Roadmap and the Digital Single Market, and beyond Europe the goals of the UN's Agenda 2030. On the other hand, a new national RTI strategy with the 2030 horizon is expected for the end of 2020. All corresponding activities need thus to be designed on the basis of measurable goals. In the following, the OANA Working Group proposes target group specific steps to further implement all elements of Open Science in Austria.

Open Science: Recommendations for Research Performing Organisations

Short Term (1-2 years)

- **Develop an Open Science Roadmap as part of the institutional strategy:** Research Performing Institutions should develop an Open Science strategy which, as a guiding principle, specifies steps and measures for the establishment and implementation of individual Open Science elements. As a roadmap or action plan, the Open Science strategy should be part of the overall institutional strategy or vision and at the same time contribute to increasing the visibility of the Open Science agenda and activities at research institutions. One part of the Open Science strategy can be an Open Access policy. There are already numerous international models and best practices available to guide the design of institutional Open Science strategies[3]. Activities should be regularly evaluated and assessed with regard to their potential for institutional change.

- **Define responsibilities and establish a national network of Open Science nodes and contact points:** Research institutions should appoint contact persons for Open Science agendas and promote national and international networking. Contact points improve both internal and external communication. Responsibilities should be clarified and coordinated at least at management level. This approach is already being implemented very successfully for the Citizen Science domain. Open Science contact persons should be listed on a central, national website.

- **Offer Open Science Training:** Research Performing Institutions should offer training courses for e.g. data management, FAIR Data, Open Access publishing, creating Open Educational Resources and conducting Citizen Science projects. As part of a professionalisation initiative, these training courses should be incentivised, like existing support in writing grant applications or as qualification measures. Priority should be given to the principle "train the trainers".

---

[1] In this context, the term "research institution" includes not only universities and non-university research organisations, such as research departments in memory organisations, but also research infrastructures.
[2] The term "libraries" also includes research-led archives.
[3] E.g. https://repository.tudelft.nl/islandora/object/uuid%3Af2faff07-408f-4cec-bd87-0919c9e4c26f; see also https://www.leru.org/files/LERU-AP24-Open-Science-full-paper.pdf

- **Establish a contact point for research data management and FAIR Data:** Research institutions should offer or establish a centralised contact point, which provides services and support on topics such as research data management, data management plans and FAIR Data. Furthermore, the contact points could be networked to promote the exchange of information.

- **Prepare and implement the connection to the European Open Science Cloud (EOSC):** Austrian data and data infrastructures are to become part of the European Open Science Cloud (EOSC). Therefore, arrangements should be made at the institutional level to identify Austrian contributions, coordinate them at the national level and prepare them for international networking and participation.

Medium Term (2-5 years)

- **Integrate Open Science into curricula and further education:** Open Science should be included in research education curricula in a suitable manner. Courses on good scientific practice and research integrity should also address the topics of Open Access publishing, data management and curation, the development of Open Educational Resources, but also opening up research through participatory processes (e.g. Citizen Science). More detailed training and certification in Open Science should take place at the pre- or post-doc level at the latest. The development of tailored training modules can be customised on the basis of existing training materials[4].

- **Prefer and support Open Infrastructures:** Research institutions should be aware of the dangers of lock-in effects through proprietary infrastructures, especially if large parts of the scientific workflow are covered by a few providers. They should therefore give preference to open source alternatives and support Open Infrastructures that offer important disciplinary or cross-disciplinary services (the recommendations of the Sustainability Coalition for Open Science Services SCOSS[5] are helpful here). Contracts for infrastructures should be transparent and governance should reside with the relevant communities. For the establishment of Open Infrastructures, a strategic networking of research institutions and a bundling of successful Open Infrastructures for operation and maintenance is recommended.

- **Make Open Science activities visible and evaluate them**: Research institutions should make their Open Science policies, activities and actors more visible on their websites, but also through reporting, prizes, awards, etc. Measurable goals of institutional Open Science strategies should be openly evaluated on a regular basis.

- **Expand evaluation processes according to Open Science criteria:** Research institutions should develop measures to change the assessment of performance in teaching and research and sign declarations such as the San Francisco Declaration on Research Assessment (DORA[6]) [see box below]. Similarly, the Hong Kong Principles[7], the Leiden

---

[4] See for instance Foster OS https://www.fosteropenscience.eu/ OS MOOC https://opensciencemooc.eu/ and OS Handbook https://open-science-training-handbook.gitbook.io/book/
[5] https://scoss.org/
[6] https://sfdora.org/
[7] https://wcrif.org/guidance/hong-kong-principles

Manifesto[8], or the Open Science Career Assessment Matrix (OSCAM[9]) [see box on page 10] can serve as guidance for the development of measures to broaden perspectives, for instance in appointment procedures, or to promote strategic career development.

Declaration on Research Assessment (DORA)

The "Declaration on Research Assessment" (DORA) is a global initiative aimed at reducing the reliance on bibliometric indicators (such as publications and citations) in the assessment of research while increasing the use of other criteria. The Declaration contains a number of recommendations for improving research assessment. The DORA Declaration was published in 2012 and is aimed at research funders, publishers, research institutions and researchers. The Declaration has already been signed by more than 1,200 organisations and almost 14,000 researchers around the world. Signing DORA means that organisations must align their practices and procedures with the principles of the Declaration. This means that the publication medium, publisher or journal metrics such as the impact factor should not be used as criteria for assessing scientific performance. Furthermore, in addition to publications, other outputs such as prizes, conference papers, keynote speeches, major research projects, research data, software, codes, preprints, exhibitions, knowledge transfer services, science communication, licenses or patents should also be used as criteria, while the concrete evaluation criteria should always be made transparent.

Long Term (10 years)

- **Establish further Open Science criteria in evaluation systems:** By joining initiatives and/or supporting international declarations such as the DORA Declaration (see Box), research performing institutions are taking visible steps towards Open Science. Appropriate measures to change the assessment of performance in research and teaching should be established as standard operating procedure at research performing institutions and should be evaluated and updated on a regular basis.
- **Establish Open Science as an aspect of the institutional Third Mission:** By opening up research processes and further establishing participatory methods in knowledge generation, research not only becomes more transparent, but in many cases also more comprehensible. By applying these participatory methods, complex scientific topics can be made intelligible to a broader public. This also increases trust in science, while making scientific research more relevant to the wider public. However, this benefit can only be achieved if Open Science initiatives receive appropriate support.

---

[8] http://www.leidenmanifesto.org/
[9] https://ec.europa.eu/research/openscience/pdf/os_rewards_wgreport_final.pdf

Open Science: Recommendations for Research Funding Organisations

Short Term (1-2 years)

- **Develop Open Science funding strategies:** Research funding organisations can directly promote the openness of scientific output and processes by introducing policies on Open Science elements[10,] especially[11] when these policies are supported by mechanisms such as earmarked funding for infrastructure. For this reason, OANA recommends for all Austrian research funding organisations to first implement an Open Access policy, followed by the development of further policies towards other Open Science elements. To achieve the highest impact, funding bodies should coordinate their criteria for Open Science and join international initiatives.

- **Enable experiments through pilot programmes:** OANA recommends that research funders develop pilot programmes to gain experience in implementing support and incentive measures for Open Science. Such pilots offer the opportunity to try out new measures within a limited timeframe, create best practices and can contribute to the development of robust new funding structures. Already existing examples include the FWF's Open Research Data Pilot[12] and the FFG's Innovation Laboratories[13]. Such processes should be continuously evaluated and analysed in an international dialogue with other funding agencies.

- **Expand evaluation processes to include Open Science criteria:** New criteria for the evaluation of scientific activities and outputs should be developed and aligned with international initiatives. Research funders should sign relevant declarations such as the San Francisco Declaration on Research Assessment (DORA) or the Leiden Manifesto and align their evaluation criteria, reviews, guidelines and specifications with them[14].

Medium Term (2-5 years)

- **Support and expand review processes in line with Open Science strategies:** The implementation of Open Science criteria in review processes also requires the training of reviewers. Research funders are therefore encouraged to support reviewers accordingly and inform them in the best possible way about these criteria. Guidelines and information materials from funding agencies can be a suitable means of informing the international scientific community about criteria such as the DORA declaration, and of promoting their dissemination and establishment as a scientific standard. Furthermore, new open review processes for the evaluation of Open Science activities should be considered.

- **Evaluate Open Science activities:** The implementation of Open Science activities by researchers should be evaluated regularly and transparently. This requires the development

---

[10] See *Report of the Expert Group to the European Commission*, p. 46 https://www.eosc-portal.eu/sites/default/files/KI0518070ENN.en_.pdf

[11] See *Do authors comply when funders enforce open access to research?* https://www.nature.com/articles/d41586-018-07101-w or *Putting down roots. Securing the future of open access policies* http://repository.jisc.ac.uk/6269/10/final-KE-Report-V5.1-20JAN2016.pdf

[12] https://doi.org/10.5281/zenodo.803234

[13] https://www.ffg.at/ALT/Instrumente/Innovationslabor

[14] See as an example of good practice https://sfdora.org/good-practices/funders/

of measurable goals, such as monitoring the output of Open Access publications or the FAIRness of research data financed by research funding agencies.

- **Further develop programmes in line with Open Science strategies:** Research funding programmes should be reviewed at regular intervals with regard to the respective Open Science strategy and, if necessary, adapted and further developed.
- **Support the pooling and opening up of successful infrastructures**: Successful infrastructures that are well received by scientific communities should be opened up as much as possible through funding mechanisms. Where it makes sense, services and organisations that pursue similar goals should be merged and continued on the basis of transparent governance models.

Long Term (10 years)

- **Promote sustainable Open Infrastructures:** Research funders should participate in the development and establishment of Open Infrastructure in order to ensure the long-term and sustainable openness and accessibility of scientific output. In the area of Open Access, for example, this is already being actively implemented by several Austrian institutions including the FWF through funding of platforms such as OAPEN, Europe PMC and arXiv[15]. Funding agencies should support networking and the creation of alliances for the operation of successful research infrastructures. OANA recommends the development of mechanisms that contribute to the support of research infrastructures independent of project durations, which are implemented nationally and internationally through coordinated action by research funding agencies. Such measures could include the establishment of overhead costs or Open Science flat rates.

Open Science: Recommendations for Research Policy

Short Term (1-2 years)

- **Develop and implement a national Open Science strategy:** In order to remain a frontrunner in the field of Open Science, Austria should develop a national Open Science strategy as suggested in the "Recommendation (EU) of the Commission 2018/790 of 25 April 2018 on access to and preservation of scientific information"[16]. An action plan for the implementation of Open Science in line with the RTI Strategy 2030 should be created following international models and involving all relevant national stakeholders, networks and initiatives. The development of national measures and objectives of the strategy should be coordinated by a central authority.
- **Establish an Open Science Monitoring Centre:** An agency for the monitoring and evaluation of Open Access publications, research data and Open Educational Resources should be established in Austria, which should operate in conjunction with the Open Science contact points of the research institutions. To this end, already existing,

---

[15] https://www.fwf.ac.at/de/forschungsfoerderung/open-access-policy/open-access-fuer-referierte-publikationen/open-access-publikationsmodelle/
[16] https://eur-lex.europa.eu/legal-content/DE/TXT/HTML/?uri=CELEX:32018H0790&from=EN

sustainable structures should be commissioned and financially supported. Through evaluation processes datasets can be created, which can be used as a basis for decision processes regarding future measures.

- **Establish a clearing house for data protection and copyright issues:** The OANA Working Group "Legal aspects of Open Science"[17] encourages the creation of a clearing house for legal issues. In Open Science, data protection, copyright, as well as exploitation rights and licensing models are particularly important issues. Individual institutions currently suffer from limited competences in this regard. A central contact point would pool knowledge and services and could act more efficiently.
- **Strengthen national Open Science initiatives**: Initiatives such as the Forum New Media Austria (FNMA) and the Austrian Academic Library Consortium (KEMÖ) should be strengthened, as these initiatives can make valuable contributions to Open Science and provide important impulses for Austrian research policy.

Medium Term (2-5 years)

- **Contribute to the development of a European Union directive on Open Science:** Austria should participate in the development of a European directive on Open Science in order to position its interests in the best possible way.
- **Aim for 100% Open Access by 2025**: Austria is well on its way to implementing the OANA "Recommendations for the Implementation of Open Access in Austria" of 2016. The networking of institutions via the Austrian Academic Library Consortium (KEMÖ) should be further expanded to enable the conclusion of additional Open Access publishing agreements and alternative, non-commercial publication models and infrastructures, both on a national and international basis, should be strengthened. In order to achieve this goal, incentives could be provided to universities for gradually increasing the Open Access quota.
- **Fund sustainable and long-term Open Science infrastructure:** Stable infrastructure is needed in order to be able to conduct sustainable research. In the future, these should not just be funded on a project basis but should also be converted into long-term financing through other instruments, with the added benefit of avoiding lock-in effects. When developing such instruments, however, it should be considered that important infrastructures exist both within and outside of the university sector. A prerequisite for any funding should therefore be that all involved infrastructures are open. It is of central importance to recognise the FAIR data principles, the principle of reusability (open source, open interfaces and licences) and the need for robust community governance, i.e. the involvement of the scientific community in the management of the infrastructures. Funded infrastructures should be evaluated routinely and transparently based on their success and potential to pool resources and needs. In particular, interoperability and synergies with regard to EOSC should be promoted.

---

[17] Core team of the Open Science Network Austria (OANA), Working Group "Legal aspects of Open Science" (2019, May 17): Einrichtung einer Clearing-Stelle für Datenschutz- und Urheberrechtsfragen gemeinsam für alle Forschungsinstitutionen. Empfehlungspapier (Version 1.0). Zenodo. http://doi.org/10.5281/zenodo.2862171

Long Term (10 years)

- **Use transparent evaluation procedures in the assessment of research activities and open metrics:** National evaluation and application procedures should be open and transparent. Support should be given to adapting academic career models to the criteria of the Open Science Career Assessment Matrix OSCAM [see box below]. Research and teaching at funded institutions should be presented and evaluated in a transparent and open manner.

Open Science Career Assessment Matrix (OS-CAM)

Researchers are the key to the successful implementation of Open Science. The evaluation of researchers cannot be reduced to a single number but must include multidimensional criteria to reflect the full range of their achievements. A much broader evaluation, which also makes reference to Open Science, is therefore urgently needed. The EU Expert Group on Rewards has developed the Open Science Career Assessment Matrix (OA-CAM) for this very purpose as early as 2017[18]. It covers all career levels, from first stage researcher (R1) of the European Framework for Research Careers to senior positions (R4) and complements or replaces existing assessment systems.

Open Science: Recommendations for Libraries

Short Term (1-2 years)

- **Negotiate transparent transformative Open Access publishing contracts:** All license agreements with publishers should contain an Open Access component, be cost-neutral and result in authors with an affiliation to an Austrian institution being able to publish Open Access automatically and free of charge. The prices, costs and contractual texts of these transformative Open Access agreements (e.g. Read & Publish agreements) should be made public and registered in international databases such as the ESAC Registry[19] to ensure international comparability.
- **Prepare library stocks for the FAIR principles:** Libraries should check their digital collections and metadata for compliance with the FAIR principles and take steps to prepare and process them accordingly where necessary. Findability, access, interoperability and reuse of collections have always been part of the core business of libraries and in a digitised world should be based on international standards. Many libraries act as contact points for questions about FAIR-Data and should therefore set an example in implementing these principles.
- **(Further) Develop Open Infrastructures in accordance with international standards:** In addition to collections, libraries should also examine the existing institutional

---

[18] https://ec.europa.eu/research/openscience/index.cfm?pg=rewards_wg
[19] https://esac-initiative.org/about/transformative-agreements/agreement-registry/

infrastructure and adapt it to international standards where necessary. For instance, publication repositories should be listed in the Directory of Open Access Repositories[20] and provide interfaces for easy exchange of documents. Research data repositories should aim for international certifications such as those provided by the Core Trust Seal[21].

- **Advice and support for researchers on open licensing:** Researchers often encounter legal issues when publishing scientific output. Libraries can be contact points for questions of this kind and cooperate with the suggested clearing house for data protection and copyright issues (see Recommendations for Research Policy).

- **Create Open Access publication funds:** Open Access publication costs for publishing agreements, alternative publication formats and platforms should be managed centrally at the library within the framework of an Open Access publication fund. The instalment of dedicated publication funds helps to provide an overview of institutional expenditure on Open Access and to ensure continuous monitoring. The gradual reallocation of a growing proportion of the library budget to support the production of open content should be supported.

- **Strengthen existing Open Science initiatives:** Existing forums and networks such as the University Library Forum (UBIFO) and the consortium body for negotiating agreements with large publishing houses, the Austrian Academic Library Consortium (KEMÖ), should be strengthened. For many years now, a cooperative working style has been developed among national academic libraries which among others led to Austria becoming one of the leading nations in the field of Open Access to publications. This frontrunner role should be secured and expanded, towards other aspects of Open Science.

Medium Term (2-5 years)

- **Foster activities of the Austrian Academic Library Consortium (KEMÖ) to meet the growing Open Science challenges:** By negotiating numerous transformative Open Access agreements (e.g. Read & Publish agreements) KEMÖ has helped to establish Austria as an Open Access frontrunner. However, new Open Access business models, the coordinated allocation of funds for alternative publication formats and Open Science platforms mean that KEMÖ's office is confronted with ever evolving and growing challenges. In order to be able to implement Open Access as a standard in publishing throughout Austria, it is therefore essential that the KEMÖ office is adequately staffed and has secure, long-term funding. Longer-term financing models should therefore be developed and implemented in order to maintain Austria's pioneering role in Open Access to publications in the future.

- **Focus on 100%-OA contracts to replace transformative agreements:** The transformation from closed to Open Access should be completed in five years and 100% OA contracts should be negotiated.

- **Prepare and implement the connection to EOSC:** Many libraries will act as contact points at their institutions for contributions to the EOSC and can – as institutional nodes – connect various departments, including IT and research services. The cooperation of libraries with other involved actors should be strengthened to facilitate the connection of

---

[20] http://v2.sherpa.ac.uk/opendoar/
[21] https://www.coretrustseal.org/

Austrian infrastructures or existing networks (e.g. CLARIAH, HRSM projects) to the EOSC, in order to promote and enable the implementation of new services and the development of uniform technical standards (e.g. long-term archiving).

- **Publish research data management plans (DMPs) in repositories**: Data management plans describe (in a machine-readable or human-readable manner) how research data is organised, stored and archived for a particular research project. This information can also be very helpful to other researchers. DMPs contribute to high-quality work and should be securely archived in a repository as part of library services.

Long Term (10 years)

- **Further develop open publishing and open research infrastructures:** Libraries can be a driving force in establishing Open Science standards. In addition to providing Open Access publication funds and managing repositories, libraries can also promote new, innovative Open Access publication models and support open, collaborative working methods (Open Methods) and open teaching (Open Education) by providing Open Infrastructures. Libraries should critically follow Open Science developments and contribute to improving them through concomitant studies.

Open Science: Recommendations for Researchers

Short Term (1-2 years)

- **Follow the principle "As open as possible, as closed as necessary":** Researchers at all career levels should work as openly as possible, in order to benefit from the advantages of Open Science in their own research practice, but also to keep their research and teaching materials accessible, transparent and reproducible[22]. This concerns both research outputs such as publications or research data as well as methods and workflows.
- **Use an ORCID ID:** Researchers should create an ORCID[23] ID (Open Researcher and Contributor ID) to be able to clearly and permanently assign their own research output to themselves. By means of such an identifier, one's own research output is more easily and clearly accessible while the information is always reusable, for instance for submissions and reporting.
- **Attend Open Science trainings:** Scholars should take the opportunity to attend general or tailor-made Open Science trainings.
- **Critically review Open Science services**: Scholars should inform themselves about Open Science services (e.g. Open Access publication models or data services) and critically check the services and conditions of service providers. This applies not just to costs, but also to the openness of the services offered in terms of Open Infrastructures. Researchers should point out missing services (e.g. interfaces or inaccessible metrics), and demand improvements.

---

[22] For guiding principles see the Vienna Principles and McKiernan, E. et al. (2016): How open science helps researchers succeed. https://doi.org/10.7554/eLife.16800

[23] https://orcid.org/

Medium Term (2-5 years)

- **Network and join grassroot communities:** Researchers who have had good experiences with Open Science should set a good example by showing how to work according to open standards, and what advantages open practices have for the community in general as well as for each individual. This can be done through courses or working groups, through personal exchange or through bottom-up initiatives set up for this purpose. In Austria, one example for this is the Graz Open Science Initiative[24].

- **Use and develop discipline-specific metadata standards for research data:** Metadata is data about research data which is essential for finding, searching, using and reusing research data. In order to ensure the interpretability and reusability of data, researchers should therefore develop and apply discipline-specific metadata standards[25] in their communities, where these do not yet exist.

- **Adhere to the FAIR data principles:** Research data should be FAIR ("Findable, Accessible, Interoperable, Reusable") and the FAIR concept should be integral to research data creation processes. Further, data management plans should comply with the FAIR data principles[26] in order to ensure the traceability of data generation as well as data processing, findability and reusability of research data. At the same time, open data management plans help those Researchers who have less experience with the topic and can be used as examples.

- **Establish Open Science policies at the project level**: Research projects should be carried out on the basis of an Open Science policy agreed on by the project partners in the consortium agreement. This may also be part of broader ethical guidelines, RRI and exploitation strategies, and may include data management plans and measures for long-term archiving and availability.

Long Term (10 years)

- **Use and/or develop open collaborative teaching and research environments:** Virtual working platforms that enable collaborative teaching and research activities should be designed to be both open and transparent. Particularly when the entire teaching and research process is supported, including data collection, analysis, interpretation, discussion and publication, control and steering must be in the hands of the scientific communities and the researchers.

---

[24] https://www.facebook.com/pg/GrazOpenScienceInitiative/about/?ref=page_internal
[25] http://www.dcc.ac.uk/resources/metadata-standards/list
[26] https://www.nature.com/articles/sdata201618