

Integrated advice of the Open Science Policy Platform Recommendations

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1. Introduction

Open Science is scholarly research that is collaborative, transparent and reproducible and whose outputs are publicly available. The European Union will not remain competitive at the global level unless it promotes Open Science, and relatedly, Open Innovation. The time to act is now.

At its core, Open Science aims at: “increasing research quality, boosting collaboration, speeding up the research process, making the assessment of research more transparent, promoting public access to scientific results, as well as introducing more people to academic research”¹. By taking advantage of Open Science, researchers can enhance the quality of curiosity-driven research, maximise the value and potential impact of their work to create new avenues of knowledge, and drive scientific progress and Open Innovation within Europe and beyond². Open Science also makes research more transparent and accessible to citizens, and helps involve citizens more actively in research activities. Open Science thus “provides policymakers, research institutions, funding bodies and researchers themselves with an opportunity to critically consider: what does and should count as high-quality research; what goals researchers should pursue; how research results should be evaluated and disseminated; and how research should be supported and embedded within society”³.

For Open Science to be successful, it must become embedded at every level and in every aspect of the scientific endeavour and not be perceived as separate from (or even in competition with) current practice. Open Science needs to stimulate research integrity and quality, which includes sensitivity to disciplinary differences and confidentiality issues around knowledge sharing. Open Science requires a systemic shift in current practices to bring transparency across the system, to ensure ongoing sustainability for the associated social and physical infrastructures, and to foster greater public trust in Science. To enable this, *all* stakeholders in research and its communication need to take responsibility for supporting Open Science activities, which includes appropriate financial and

administrative support to ensure its long-term sustainability and minimize the bureaucratic burden on researchers.

It is the responsibility of all stakeholders, Member States and the European Commission (EC) to act on and actively promote Open Science amongst their respective communities, and to regularly and openly monitor and report on progress⁴. This document provides a prioritised set of actionable recommendations from the Open Science Policy Platform (OSPP; see Annex B for members) to achieve it. The OSPP members strongly recommend their urgent inclusion into FP9.

These recommendations are the next step towards implementing the longer-term vision articulated by Open Science consultations and expert groups set up by the EC and other organisations in Europe and worldwide (see Annex C for a list of relevant documents). There will need to be further work done to advise on the implementation of the roadmap for Open Science, and to help identify a range of tools and approaches to monitor progress.

The following recommendations target the major stakeholder groups represented by the OSPP and focus on publicly funded research. The roles of other important players in this ecosystem, such as SMEs, industry and NGOs, need to be explored at a later date. We recognise that some individuals and groups may fall into two or more stakeholder categories listed below, and we ask readers to identify with all groups that are most relevant to their functions and activities

¹ Friesike, S. & Schildhauer, T. (2015). [Open Science: many good resolutions, very few incentives, yet](#). In: Welppe, I.M., Wollersheim, J., Ringelhan, S. & Osterloh, M. (Eds.). *Incentives and Performance. Governance of Research Organizations*. Springer.

² European Commission (2016) [Open Innovation, Open Science, Open to the World - A Vision for Europe](#)

³ European Commission (2018), H2020 Policy Support Facility, Mutual Learning Exercise on Open Science: Altmetrics and Rewards. [Thematic Report on Incentives and Rewards to engage in Open Science Activities](#).

⁴ European Commission (2018) [Final Report of MLE Open Science: Incentives and Rewards](#)

2. Recommendations

2.1. General recommendations

In addition to the specific targeted recommendations in the matrix below, we call upon all Member States and stakeholders to:

1. Appoint national coordinators and task forces for the implementation of Open Science. This instrument must foster the development of funded national plans and the alignment of the Open Science policy agenda across all stakeholders involved including Member States to ensure the coordinated action required for tangible change towards an Open Science approach.
2. Ensure the scholarly infrastructure in Europe is highly interoperable to enable the simple and open sharing of metadata between systems, disciplines and countries, and that credit for research contributions is given to all participants (including citizen scientists). This will need all actors to require the use of standardised, unique persistent identifiers for researchers and outputs, and for the acknowledgement of diversity in researcher contributions. Components of the ecosystem (identifiers, metadata, vocabularies, data citations, repositories and other data-infrastructures) need to be developed where necessary, refined, standardized and implemented through dialogue with relevant research communities. Whatever standards/infrastructures are developed, they need to be capable of adapting to innovations in Open Knowledge practices.
3. Ensure the HR Strategy for Researchers (HRS4R) practices and FP9 evaluation reflect the principles required to effectively embed a culture of Open Science at the institutional level. These must involve research integrity (including the social, ethical and legal implications), researcher evaluation and the public availability of research outputs. Codes for Open Science, Research Integrity and Recruitment need to be incorporated into The European Charter for Researchers⁵ and in the FP9 grant agreement. Institutions that apply for the 'Human Resources in Research Award' should be required to demonstrate explicitly how the best practices in Open Science are integrated into their HR processes and strategies.
4. Foster Open Science literacy as essential to European competitiveness at the global level, together with other digital and information competencies. Member States need to secure support for the development of an accredited curriculum for Open Science skills training that fosters Open Science behaviours such as IT and data literacy, from primary school through the whole educational system.
5. Implement a Europe-wide campaign, coordinated by the EC, to raise awareness and communicate the benefits of Open Science among decision makers, research and education bodies, private sector, industrial and citizen organisations.

⁵ European Commission (2005) [The European Charter for Researchers: The Code of Conduct for the Recruitment of Researchers](#)

2.2. Prioritised recommendations for the eight ambitions of Open Science

Below are a set of actionable recommendations from the OSPP to be taken as the next step towards the longer-term vision articulated by Open Science consultations and expert groups set up by the EC and other organisations in Europe and worldwide. The recommendations have been split up into the eight priorities identified from the 5 areas of the European Open Science Agenda⁶, namely:

- Rewards and Incentives
- Research Indicators and Next-Generation Metrics
- Future of Scholarly Communication
- European Open Science Cloud
- FAIR Data
- Research Integrity
- Skills and Education
- Citizen Science

The major stakeholder groups (as listed in the key below) who have the main responsibility to drive the actions stated in the recommendations have been listed alongside each one.

 Research & E-Infrastructures	 Research Libraries	 Universities & Research Performing Organisations
 Policy Making Organisations	 Research Funding Organisations	 Publishers
 Researchers	 Scientific Societies & Academies	 Citizen Science & Public Engagement Organisations

⁶ Amsterdam Call for Open Science (2016)
<https://www.government.nl/documents/reports/2016/04/04/amsterdam-call-for-action-on-open-science>

Rewards and Incentives

Funders, research institutions and other evaluators of researchers should actively develop/adjust evaluation practices and routines to give extra credit to individuals, groups and projects who integrate Open Science within their research practice.

Studies must be commissioned and funded to propose guidelines for best practice and tools for research assessment by 2019, together with an active delivery plan and associated timeline for their implementation. These guidelines must take into account career stage and discipline, and be appropriately tailored to their target such as individual, institution and so forth. Exemplars of innovation and good open science practice must be collated, taking into account the DORA Declaration, the Leiden Manifesto, the OS-CAM and other relevant initiatives.

Public research performing and funding organisations (RPOs/RFOs) should provide public and easily accessible information about the approaches and measures being used to evaluate researchers, research and research proposals.

The traditional academic career structure disincentivises Open Science because of the current focus on tenured positions based solely or largely on publication output. Institutions need to have a career and reward structure for all researchers, and particularly for Early Career Researchers (ECRs), that values and promotes a diverse range of outputs, activities and career directions. This should include facilitating a means by which researchers can, for example, move between academia and industry or between national jurisdictions.



Research Indicators and Next-Generation Metrics

Evaluations of individual researchers or of research groups should not use journal brand or Impact Factor as a proxy for research quality. Those responsible for hiring, promotion, funding and/or the evaluation of researchers must use a broader, tailored range of quantitative and qualitative indicators of research activity, progression and impact that incentivises and rewards open research practice. All publication venues must prominently display a broad range of indicators for all research outputs.

Quantitative and qualitative indicators need to be identified and developed for research assessment that captures the full range of contributions to the knowledge system. These should reflect the complexity and varied context of the research environment, the specific characteristics of the research being undertaken, as well as the new kinds of questions and results that might emerge in an open system.

Experiments, pilots and case studies assessing the validity of such indicators need to be undertaken urgently, and included as part of FP9 with appropriate funding allocated to support them. The results and data of these pilots must be made publicly available as exemplars for further implementation.

All researchers need to be identified through an ORCID ID. Best practice for CV/biosketch evaluation should be developed and publicly showcased to encourage a broader recognition of the range of verifiable (and especially open) contributions individuals make to the knowledge system, including teaching and peer review, and the production of a broad range of output types. The career narrative should be central to the evaluation of individual researchers as it provides the crucial context in which indicators can be interpreted.

The data, metadata and methods that are relevant to research evaluation, including but not limited to citations, downloads and other potential indicators of academic re-use, should be publicly available for independent scrutiny and analysis by researchers, institutions, funders and other stakeholders.



Future of Scholarly Communication

All published research outputs from public funding in Europe must be made public in a way that ensures both immediate Open Access and full text and data mining rights of that content, while being sensitive to disciplinary differences*. Venues used for the publication of research outputs must ensure long-term archiving and provide clear, consistent and easily accessible and machine-readable information on their Open Science policies.



Each Member State, together with its respective stakeholders, must develop policies to guarantee compliance with the EU Open Access mandate, including both incentives and enforcement, by 2020. This needs to happen in ways that are sensitive to disciplinary differences, the financial investment required and fast-changing publishing systems.



All authors must make their data and software (i.e. excluding, if relevant, data owned by third-parties, etc) appearing in their open access publications FAIR (Findable, Accessible, Interoperable and Reusable). To this end, a key requirement is deposition in a trusted repository that adheres to FAIR principles. In addition, all publications must include a statement of FAIR compliance for the source data underpinning their claims and the licence for its reuse.



All publication venues must prominently display their Open Access and FAIR data policies.



* Despite significant discussion between OSPP members, complete consensus could not be reached and STM and EUCHEMS do not agree to this recommendation.

EOSC

The European Open Science Cloud (EOSC) needs to implement a robust, transparent and participative governance structure to ensure that it has the trust and confidence of all stakeholders, including Member States. It must also support the diversity of requirements across all disciplines. The structure should provide clear channels for feedback, and be compatible with other related initiatives including national, European and Global Research infrastructures to ensure interoperability and the free movement of information across all national and international boundaries and between disciplines, while being sensitive to ethical, societal and legal issues. The EC has to take the lead in bringing the relevant parties together to agree on how this should be done, including the rules of engagement and a range of business models by end-2019.

EOSC must have a long-term baseline funding commitment to become trustworthy. An agreement on how this is to be done needs to be decided within 12 months (by April 2019). The EC must take the lead in bringing the appropriate funders together. EOSC must be free and easy to use for research and education purposes.

For FP9, all researchers must receive appropriate EOSC training and be required to deposit their research outcomes in EOSC-compliant infrastructures. This should be funded by a non-transferable allowable contribution from funders. To this end, access from all parties must be easy and inexpensive if it is to obtain universal support.



FAIR Data

Funders and Research Performing Organisations should give credit for Findable, Accessible, Interoperable and Reusable (FAIR) data resulting from research work, similar to publications, methods, code etc.

Output Management Plans (OMPs, including Data Management Plans, DMPs) and their implementation should be mandatory for all research projects. OMPs should be machine readable and regularly modified to reflect ongoing research developments.

Data resulting from publicly funded research must be made FAIR and citable, and be as open as possible, as closed as necessary.



Research Integrity

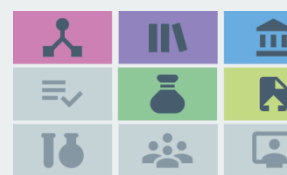
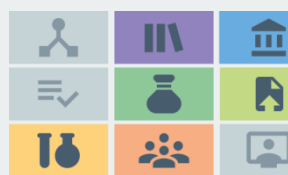
All research organisations must have a research integrity policy, including promotion of good research practices, clear procedures for dealing with allegations of research misconduct and a description of possible sanctions for proven cases of misconduct. This policy must be enforced and adequately staffed and financed to investigate any allegation pertinent to their staff. The processes for dealing with such issues should be public, transparent and prominently displayed. Outcomes should be published where the allegations are upheld, taking into account the sensitivity of the issues involved.

All published research outputs should be reported according to recognised community standards where they exist.

For any research project, researchers should define conditions by which their work can be replicated or otherwise verified by others.

All researchers must receive regular training and accreditation on research integrity pertaining to Open Science, including the ethical, legal and social implications of their research practices. Funders (including the EC through FP9) must ensure that there is adequate training given to the researchers they fund, either through the researcher's institution, or provided via other means.

Publishers, data platform and infrastructure providers must agree a standardised set of minimum quality control checks on outputs and openly display the results. The task of undertaking these independent checks needs to be adequately funded. Outputs that pass these checks should be recognised and rewarded in research and researcher evaluation systems, such as FP9.



Skills and Education

Research Performing Organizations (RPOs) need to work towards the design of appropriate Open Science training that is consistent across Member States, including data literacy, ethics and research integrity, for:

- All researchers, at all levels from early career researchers to senior researchers (R1-R4). Open Science skills need to be explicitly tailored to diverse career paths.
- Research managers and administrators, and other staff involved in the research ecosystem (librarians, repository managers, IT services, data stewards, etc.).
- Students (both undergraduate and graduate levels).



Policy makers, funders and institutions must provide incentives and support towards developing Open Science mentoring and training within a supportive culture and environment.

A fundamental part of a researcher's education is to have a common set of baseline skills on Open Science which must be integrated in the European Framework of Research Careers (EFRC) and the Innovative Doctoral Training Principles (IDTP).



Citizen Science

Publicly funded Citizen Science projects (as part of FP9 projects) should actively apply the principles of Open Science (including openness and reuse of all research outputs, data and publications).

Research-performing organisations (RPOs) are encouraged to promote infrastructures and human capacity to create a supportive and open environment for Citizen Science, which can further strengthen the outreach of RPOs to society. Research libraries are well placed, amongst others, to contribute actively to the necessary coordination and communication infrastructures as well as relevant training, fostering skills such as community management, co-production of knowledge, Open Science standards and social diversity. Appropriate funding and incentives need to be put in place to support this endeavour.

The EC must support an online toolkit for Citizen Science in Europe. This tool must promote Citizen Science as a European asset, offering an entry point and mutual learning space, interconnecting with existing activities and infrastructures at the European, national and local level. It should highlight particular achievements and best practices, and promote a clear set of principles, guidelines & quality criteria for Citizen Science.

Funding for Citizen Science projects should be flexible, long-term and allow for small or experimental projects in collaboration with key stakeholders to be funded. A small section of FP9 should be set aside for citizens to propose research topics or projects. These should be chosen on the basis that they are high risk, beyond traditional research fields and conform to the rigorous standards expected of other projects. Successful proposers will need to work with compliant institutions.



Annex A

Glossary and Acronyms

DORA	Declaration on Research Assessment [a.k.a.: SFDORA] [See]
ECR	Early Career Researcher, typically R1-R2 level of researcher, often including researchers during their PhD up to 7-12 years after their PhD dissertation.
EOSC	European Open Science Cloud, a large infrastructure (cloud) for research data in Europe. EOSC is the vision of the EC to support and develop Open Science and Open Innovation in Europe and beyond, to give Europe a global lead in scientific data infrastructures and to ensure that European scientists reap the full benefits of data-driven science. [See]
EFRC	European Framework for Research Careers [See]
FAIR	Findable, Accessible, Interoperable and Reusable. Set of agreed principles applicable to Research Data. [See]
FP9	Framework Programme 9, the research framework programme that will succeed Horizon 2020. [See]
HLEG	High Level Expert Group. Related expert groups established by the Commission. [See Annex C]
HRS4R	The 'HR Strategy for Researchers', which supports research institutions and funding organisations in the implementation of the Charter & Code in their policies and practices. [See]
IDTP	Innovative Doctoral Training Principles [See]
NGO	Non-Governmental Organisation
OA	Open Access [See]
OMPs	Output Management Plans (includes Research Data Management Plans)
ORCID	Persistent digital identifier for researchers [See] .
OS-CAM	Open Science Career Assessment Matrix [See]
OSPP	Open Science Policy Platform. High Level Advisory Group established by the Commission in May 2016 to provide advice on the development and implementation of Open Science in Europe. [See Annex B and See]
OSPP-REC	The prioritised set of actionable recommendations issued by the Open Science Policy Platform members in April 2018.

RFO	Research Funding Organisation
RPO	Research Performing Organisation
SFDORA	San Francisco Declaration On Research Assessment. [See: DORA]
SME	Small and Medium Enterprise
Trusted repository	For the purpose of these recommendations, a Trusted Repository means a data repository that meets the Core Trust Seal (CTS) requirements, a collaborative assessment system of the DSA Data Seal of Approval (Research Data Alliance – RDA) and the ICSU (International Council for Science) World Data System.

Annex B

Open Science Policy Platform (OSPP) members

Name	Representative organisation and Affiliation	Stakeholder Group
Sergio Andreozzi	The EGI Foundation	Open Science Platforms/Intermediaries
Michela Bertero	EU-LIFE (Alliance of 13 top research centres in life sciences to support and strengthen European research excellence), co-founder; Head of the International and Scientific Affairs Unit, CRG (Centre for Genomic Regulation, Barcelona, Spain)	Research Organisations
Kurt Deketelaere	League of European Research Universities (LERU), Secretary General	Universities
Paul Ayris	LERU co-Chair of the INFO Community (alternate representative)	
Jennifer Edmond	Digital Research Infrastructure for Arts and Humanities (DARIAH), Member of the DARIAH-IE steering committee	Open Science Platforms/Intermediaries
Manuela Epure	The Alliance of Central and East European Universities (ACEU), Vice-President	Universities
Michele Garfinkel	The European Molecular Biology Organization (EMBO), Manager of the EMBO Science Policy Programme	Research organisations
Tuija Hirvikoski	European Network of Living Labs (ENoLL), elected President	Research organisations

Kristiina Hormia Poutanen	Association of European Research Libraries (LIBER), President	Libraries
Matthias Kleiner	Science Europe, Member of Governing Board	Funding Organisations
Stephan Kuster	Science Europe, Secretary General (alternate representative)	
Wolfram Koch	European Association for Chemical and Molecular Sciences (EUCHEMS), Member of Executive Board	Academies/Learned Societies
Ernst Kristiansen	European Association of Research and Technology Organisations (EARTO), Treasurer and Member of Executive Board	Research organisations
Rebecca Lawrence (<i>OSPP-REC Chair</i>)	F1000, Managing Director	Open Science Platforms/Intermediaries
Sabina Leonelli (<i>OSPP-REC Rapporteur</i>)	Global Young Academy (GYA), elected Member	Academies/Learned Societies
Norbert Lossau	European University Association (EUA), Vice-President of the University of Göttingen	Universities
Karel Luyben	The Conference of European Schools for Advanced Engineering Education and Research (CESAER), Vice- President Research, and Chairman of the Task Force on Open Science	Universities
Michael Mabe	International Association of Scientific, Technical and Medical Publishers (STM), Chief Executive Officer	Publishers
Philip Carpenter	STM Board Member (alternate representative)	

Catriona J. MacCallum (<i>OSPP-REC</i> <i>Rapporteur</i>)	Open Access Scholarly Publishers Association (OASPA), Chair of Policy Committee; Director of Open Science (Hindawi)	Publishers
Paul Peters	OASPA President (alternate representative)	
Natalia Manola	OpenAIRE, an open access infrastructure, Managing Director	Open Science Platforms/Intermediaries
Eva Méndez Rodríguez	Young European Research Universities Network (YERUN); Deputy Vice-President for Scientific Policy, Open Science, Universidad Carlos III de Madrid	Universities
Christophe Rossel	European Physical Society (EPS), Past-President	Academies/Learned Societies
Matthew Scott	GÉANT (A pan-European collaboration on e-infrastructure and services for research and education), Chief Programmes Officer	Open Science Platforms/Intermediaries
Steve Cotter	GÉANT Chief Executive Officer (alternate representative)	
Michela Vignoli	Young European Associated Researchers Network (YEAR), Board Member	Academies/Learned Societies
Jan-Eric Sundgren	Business Europe	Open Science Platforms/Intermediaries
Michela Vignoli	Young European Associated Researchers Network (YEAR), Board Member	Academies/Learned Societies
Johannes Vogel (<i>OSPP Chair</i>)	European Citizen Science Association (ECSA), Chair	Citizen Science Organisations
Maike Weisspflug	European Citizen Science Association (alternate representative)	

John Wood

Research Data Alliance (RDA), Co-Chair, and Chair of RDA Europe

Open Science
Platforms/Intermediaries

Annex C

EC High Level Expert Groups and outcomes (reports)

High-level Expert Group on European Open Science Cloud I (2016) [Realising the European Open Science Cloud](#)

High-level Expert Group on Next-Generation Metrics (2017) [Next-generation metrics: Responsible metrics and evaluation for open science](#)

High-level Expert Group on Rewards and Incentives (2017) [Evaluation of Research Careers fully acknowledging Open Science Practices: Rewards, incentives and/or recognition for researchers practicing Open Science](#)

High-level Expert Group on Education and Skills (2017) [Providing researchers with the skills and competencies they need to practise Open Science: Report of the Working Group on Education and Skills under Open Science](#)

[Mutual Learning Exercise on Open Science - Altmetrics and Rewards](#) (2017-2018)

Reports are in progress on:

- FAIR Data
- European Open Science Cloud (Report II)
- Future of Scholarly Communication
- Indicators

Previous reports by specific OSPP Working Groups

[Recommendations on Open Science Publishing](#) (adopted April 2017)

[Report on the governance and financial schemes for the European Open Science Cloud](#) (adopted May 2017)

[Recommendations of the OSPP on Next-Generation Metrics](#) (adopted October 2017)

[Providing researchers with the skills and competencies they need to practise Open Science: Report of the Working Group on Education and Skills under Open Science](#) (adopted October 2017)

[Evaluation of Research Careers fully acknowledging Open Science Practices: Rewards, incentives and/or recognition for researchers practicing Open Science](#) (adopted November 2017)

[OSPP Combined Recommendations for the Embedding of Open Science](#) (adopted March 2018)

[Recommendations of the OSPP on Citizen Science](#) (adopted April 2018)