



cOAlition S

Input for the development of the UNESCO Recommendation on Open Science

This paper responds to the request by UNESCO to stakeholders and partners to submit written input to the UNESCO Recommendation on Open Science. cOAlition S funders, as confirmed advocates for openness in the scientific landscape, welcome the global initiative for Open Science and stand ready to help by providing advice, collaborating and sharing good practice.

Summary and recommendations

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Open Access to scholarly publications is a key element for achieving Open Science.

Lack of access to scholarly articles is a major obstacle to achieving Open Science. In 2017, **75% of scholarly articles were still reported to be published behind a paywall.**

All research articles should be published Open Access, freely available at the time of publications and licensed in a way that facilitates reuse.

The transition from subscription journals to Open Access journals must be accelerated. cOAlition S is implementing concrete transformative policy measures to facilitate this process.

Open Science needs international collaboration and coordination at all levels of research. cOAlition S is an example of such an international collaboration that is proving to be effective. It can provide a best practice model for a similar effort towards Open Science worldwide.

Open Science, and in particular Open Access efforts must support diversity in different regions and disciplines. Plan S actively supports a variety of business models, including non-commercial Open Access initiatives and infrastructure.

Achieving Open Science will need a shift in the research culture, including the widespread adoption of qualitative metrics to evaluate the intrinsic merit of research outputs.

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Summary of concrete actions by cOAlition S to promote Open Science through Open Access

cOAlition S is an international collaboration of Research Funding Organizations who recognized their fundamental role and responsibility in improving the scientific landscape and created a partnership based on shared values and the commitment to promote full and immediate Open Access of scholarly publications, thus contributing to fair and open global science.

cOAlition S funders created [Plan S and its 10 principles](#) supporting fair and inclusive Open Access to research publications, a critical component for Open Science to become a reality. Some of the key activities we have supported are detailed in the table below.

cOAlition S actions supporting fair and inclusive Open Access
Building Open Access requirements into grant agreements.
Creating transformative models for society and commercial subscription journals to help them transition to Open Access.
Committing to metrics valuing the intrinsic merit of research outputs (such as the DORA principles) and rejecting journal metrics when making funding decisions, in order to break the link between academic careers and prestige subscription journals that are slowing down progress towards Open Science.
Supporting the diversity of Open Access business models and exploring collaborative non-commercial publishing models.
Supporting Open Access infrastructure, including Europe PubMed Central, OAPEN, HAL Open archive, Directory of Open Access Journals (DOAJ), the Open Library of Humanities (OLH), and the Sponsoring Consortium for Open Access Publishing in Particle Physics (SCOAP ³).
Creating a Price Transparency Framework to help make the price of Open Access publishing services more transparent.

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Input for the development of the UNESCO Recommendation on Open Science

1. Definition of Open Science

Open science is a set of practices ensuring that scientific research is co-created with and accessible to the largest possible audience of researchers, businesses, and citizens worldwide, by making optimal use of digital technologies.

2. Elements of Open Science (scope)

Open Science includes but is not limited to: open data, Open Access to scholarly publication, open source code, open notebooks, open peer review, open educational resources - as well as the research components needed for replication and analysis such as methods, protocols, software, and code.

- cOAlition S funders consider Open Access to scholarly publications to be a key element of the Open Science framework and an essential first step in achieving Open Science.

3. Actors of Open Science

Every person should be empowered to become an actor of Open Science without financial, socioeconomic, or technical barriers.

Researchers, governmental institutions, universities, research financing organizations, research performing organizations, philanthropic organizations, libraries, repositories, data centers, academic publishers, and international organizations bear a particular responsibility and are well positioned for making Open Science a reality.

- Recognizing the fundamental role and responsibility of research funding organisations in improving the scientific landscape, a group (currently 24) of national, international and philanthropic and research funders have come together and created cOAlition S to implement concrete measures for full and immediate Open Access to scholarly publications, thus contributing to promoting Open Science.

4. Guiding principles for Open Science implementation

General principles

Guiding principles for Open Science must include respect and support for diversity, collaboration, accountability, transparency, social responsibility and engagement, fairness, and impact (Leonelli 2017:5-6, 18-19).

- Plan S is based on 10 principles supporting fair and inclusive fair Open Access, which are also critical for Open Science to become a reality.

These principles state, among others that:

- All research articles should be made immediately available in Open Access under an open license (preferably CC-BY), and authors or their institutions must retain copyright.

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- The transition from subscription journals to Open Access journals must be accelerated, and practices that hinder this process (such as hybrid Open Access) must be removed. cOAlition S is implementing concrete measures to facilitate this process through its different transformative models helping society journals ([Transformative Model Agreement](#)) and commercial subscription journals ([Transformative Journal model](#)) to transition to Open Access.
- Metrics for evaluating research must pay particular attention to rewarding and measuring Open Access and Open Science practices. cOAlition S funders have committed to valuing the intrinsic merit of research outputs, and rejecting journal metrics/ prestige, when making funding decisions, in order to weaken the link between academic careers and high prestige subscription journals that are slowing down progress towards Open Science. Initiatives in this field have to be promoted widely: such as the San Francisco Declaration on Research Assessment ([DORA](#)) and [the Hong Kong Principles](#).
- Governments, universities, research organisations, libraries, academies and learned societies must align their Open Access and Open Science policies and practices, thus ensuring transparency, consistency and impact.

Policy principles for implementation should include (OECD 2015):

Mandatory rules (grant requirements, institutional policies, national laws) are needed to move towards more Open Science.

- [cOAlition S is implementing this principle by building Open Access requirements into grant agreements.](#)

Incentives for researchers to share outputs and collaborate rather than competing with each other (financial support, career advancement, citation).

- [Such incentives should become part of the new assessment and career advancement criteria of cOAlition S funders and universities.](#)

Enabling mechanisms and additional support for Open Access infrastructure especially in low and middle income countries (LMIC) (data infrastructure, guidelines, skill development).

- [cOAlition S is exploring collaborative non-commercial publishing models for Open Access.](#)

5. Opportunities of Open Science

Open Science aims to ensure that more people have access to research, allowing them to scrutinize, test and build on it, thus accelerating science for the benefit of humankind. It promotes interdisciplinarity and collaboration. It creates a more equitable research environment where access to information does not rely on the financial resources of individuals or their institutions. Extending access to research beyond the research community can have a positive impact on the perception of science in society and help combat denialism. Open Science will also allow businesses to have faster access to research results to build and implement commercial applications. As openness increases transparency, open practices can cut down on issues plaguing research such as fraud, waste and discrimination.

Beyond solving the access problem, Open Access to scholarly publications provides the opportunity for others to build on this content and uncover new knowledge. Indeed, as the volume of scientific information continues to increase at a rapid rate, the use of text and data mining and artificial intelligence (AI) algorithms

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will become ever more crucial to the research enterprise. These tools enable researchers (and others) to uncover new and unsuspected associations and insights— stimulating discovery and opening up novel avenues of research and innovation. These benefits however, can only be realised if the content is both accessible, and licensed in ways which allow this reuse.

6. Challenges for Open Science and how to overcome them

Among the challenges for Open Science, we would like to highlight the following:

Paywalls and commercial control: in 2017 75% of scientific articles were still published behind a paywall.

- The move towards Open Access must be accelerated via initiatives like Plan S.

Commercial control of copyright and access, and lock-in of infrastructure providers and institutional repositories threatens science by further consolidating who are stewards of research outputs by placing them under monopoly control (see [here](#)). Open approaches to [Open Science infrastructure](#) should be encouraged. Non-commercial Open Science initiatives provide a way forward and need more support.

- cOAlition S actively supports a diversity of Open Access business models.

Standardization and interoperability

- Although Plan S principles refer to peer-reviewed scholarly publications, cOAlition S also strongly encourages that research data and other research outputs are made as open as possible and as closed as necessary.

7. Incentives for Open Science

Incentives for Open Science include financial support for Open Access publishing, Open Access platforms and initiatives (as proposed in Plan S), and interoperable open data infrastructures.

In order to incentivize researchers to practice Open Science, it should be rewarded more in career assessment and advancement, grant attribution and citation practices. A particular effort is needed to convince journal editors and reviewers of the advantages of Open Peer Review (also see OECD 2015).

8. Infrastructure and capacity needs

Initiatives like the [European Strategy Forum for Research Infrastructures](#) (ESFRI); and the [European Open Science Cloud](#) (EOSC) should be extended and coordinated globally with other national and international initiatives of this kind, such as Invest in Open (see [this report](#)).

The capacity needs of LMIC should be given particular attention.

Care must be taken that scholarly infrastructure of Open Science does not end up under the control of entities that will restrict access.

- cOAlition S funders support Open Access infrastructure, including PubMed Central, OAPEN, HAL Open archive, Directory of Open Access Journals (DOAJ), the Open Library of Humanities (OLH), and the Sponsoring Consortium for Open Access Publishing in Particle Physics (SCOAP3).

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- Infrastructure also critically includes metadata. Plan S requires high quality open interoperable metadata including persistent identifiers to common standards.

9. Collaborations and networking needs

More collaboration at all levels of research is necessary and needs to be internationally coordinated.

- cOAlition S is an example of an international collaboration that is proving to be effective. It can provide a best practice model for a similar effort towards Open Science worldwide.

10. Financial considerations

While Open Science carries costs, it is likely that the benefits will outweigh the investment. According to a PwC EU Services [report](#) from 2018, the annual cost of not having FAIR research data costs the European economy at least €10.2bn every year.

- cOAlition S aims to help make the nature and prices of Open Access publishing services more transparent, to build trust amongst stakeholders and ensure that prices are fair and reasonable. We have recently published a [Price and Service Transparency Framework](#) which will be required for publishers as of July 2022.

11. Policy recommendations

A number of excellent policy recommendations have been formulated in the past that should be considered by the UNESCO Open Science Recommendation, such as:

[European Commission Recommendation on access to and preservation of scientific information](#) (revised in 2018), the revised [Public Sector Information Directive \(PSI\)](#), the [EU Copyright Directive](#), which applies to publicly funded research data; the [open-access policy of Horizon 2020](#). In the USA, the [Open Research Funders Group](#) and [SPARC](#) are playing a leading role.

- In addition, we recommend that research funding organizations and research performing organizations globally support Plan S and participate in implementing cOAlition S recommendations, thus contributing concretely to achieving Open Access and Open Science.

12. Best practices and lessons learned

The progress towards Open Access, Open Data and thus Open Science is too slow, and innovation is suffering as a result. The lack of access to scientific literature locked behind paywalls carries a heavy opportunity cost for society, [setting back the development of life-saving drugs](#), and [hindering innovation](#) by small and medium enterprises.

Open Methods and especially Open Peer Review are behind in gaining acceptance but are proving to hold potential in improving the research ecosystem. These require a change in research culture on behalf of editors and reviewers, who should be incentivized to embrace such practices in the spirit of being good stewards of research.

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There is broad agreement that Open Science requires an integrated approach at all levels of scientific production and assessment to be successful. A broad audience, from researchers and policy makers to citizens, need to be educated about the advantages of Open Science. The role of commercial actors in the publishing landscape needs to be truly community supportive and driven, as they tend to put up barriers to access to publications, data, and repositories. Coordinating and monitoring Open Science initiatives worldwide is essential (See Leonelli 2017 for details).

- An important lesson learned from the cOAlition S experience is that a worldwide alliance of organizations aligning their policies around a radical set of principles can effectively change the Open Science landscape and punch well above their weight.

About cOAlition S

Plan S is an initiative for Open Access publishing that was launched in September 2018. The plan is supported by cOAlition S, a group of national research funders, European and international organisations and charitable foundations. Plan S requires that, with effect from 2021, all scholarly publications on the results from research funded by public or private grants provided by national, regional, and international research councils and funding bodies, must be published in Open Access Journals, on Open Access Platforms, or made immediately available through Open Access Repositories without embargo.

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