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A global strategy for open science

France's proposal on Open Science put forward in the framework of the Unesco consultation

Paris, June 22nd 2020

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Introduction

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has followed its mandate from Unesco's General Conference by initiating a consultation process aimed at formulating a single Recommendation on Open Science to establish standards recognized worldwide which are capable of guiding legal and policy frameworks at the institutional and state levels.

Open science is the fruit of the new opportunities for sharing and disseminating scientific content offered by the digital revolution. Its initial premise is that research results should be made accessible to all by removing all technical or financial obstacles to access to scientific publications. It also involves opening the researcher's 'black box' by sharing as far as possible the data and methods on which publications are based.

More broadly, open science is about developing essential links between research and higher education. It dovetails with the policy of scientific literacy for the benefit of society as a whole. Opening science in this manner and the relations between science and society that it implies thus take place at several levels:

- prior to the production of knowledge in collaboration through participatory science with citizens who are actively involved either directly in research activities or more broadly in defining the orientations of national science policy.
- subsequent to knowledge production with the aim of sharing a common scientific, technical and industrial culture as widely as possible to nourish public debate, support public policies with scientific expertise, combat misinformation and enable all to understand and be a part of the world around them.

In the framework of Unesco's planned Recommendation which will set out global standards for open science, the French contribution insists on the importance of this plurality of modalities for open and accessible science to avoid thought and recommendations being restricted to one of these interactions alone.

I. Open Science and the relations between science and society in France

1. The National Plan for Open Science

France has resolutely committed to a global policy of support for open science - a policy that is widely adopted, shared and relayed by the French research ecosystem.

This policy is founded on the following convictions:

- The results of publicly funded research must benefit the citizens of the States which fund it as much as possible. This opening of science must obviously benefit scientists and also non-governmental organisations, the media, small- and medium-sized companies and teachers who all increasingly need access to knowledge produced by scientific research.

  Of course this logic regarding openness is not limited to national communities and needs to be extended internationally as this is the scale at which scientific communities are organized. It must enable allow knowledge transfer and cross-fertilisation for the mutual benefit of the territories involved and their populations.

- The aim of open science is to construct an ecosystem in which science is more cumulative, more strongly backed up by data, more transparent, faster and more universally accessible.

- Open science helps democratize the access to knowledge which is useful for research, training, the economy and society alike.

- Open science aims to bring publicly funded research out of the confined framework of closed databases. It reduces the amount of work which may be duplicated in the collection, creation, transfer and reuse of scientific material, thus increasing the efficiency of research.

- Open science also fosters scientific advances - particularly those which are unexpected - as well as innovation and economic or social progress in France and developed or developing countries alike.

- Finally, open science is a lever for scientific integrity which encourages and increases citizens' trust in science. It is true progress in scientific and social terms.

The adoption of the 2016 Digital Republic Law represented an important step forward in France's commitment to open science policies and set out several provisions:

- The possibility for researchers who mainly received public funding to disseminate in open access the scientific articles they published within a maximum period of 6 months after publication in science, technology and medicine and 12 months in the humanities and social sciences.
- The principle of openness as the default policy coupled with the reusability of public administrations' data including those resulting from public research;

In parallel to this, since the early 2000s France has been committed to a policy of developing infrastructures to support open science in collaboration with major national research organisations and universities - the Strasbourg Astronomical Data Centre (CDS), the multidisciplinary HAL open archive for French research; OPIDoR, a set of tools and services for research data management; OpenEdition, a platform which publishes open access journals in the humanities and social sciences; Data Terra, an infrastructure of services and data relating to the earth system; Data Inrae, a data warehouse for agronomic research, etc.

In 2018, the Ministry of Higher Education, Research and Innovation announced the launch of an ambitious National Plan for Open Science (see Appendix) in compliance with the Europe-wide goal of each country having a national plan as set out in the Amsterdam Call for Action on Open Science. The French plan has three main axes – to generalize open access to publications, to structure and open up research data and to play an active role in a sustainable European and international dynamic. The plan is implemented through the Committee for Open Science which has a structure with several levels: a steering committee made up of main players in higher education and research in France, four theme-based colleges and numerous working groups involving communities of researchers and scientific and technical information professionals who work on implementing the various measures set out in the plan.

Several measures have already been implemented – an obligation to make the results of research funded by the French National Research Agency openly available; the creation of a National Fund for Open Science to support open scientific publishing and its ecosystem which launched its first call for projects in 2019; the creation of an open science barometer which publishes data regarding the level of openness of French scientific publications; support for international services and infrastructures which structure open science (Research Data Alliance, Software Heritage, Open Citations, Public Knowledge Project, Directory of Open Access Books); the creation of a national open science platform. ouvrirlascience.fr. Many initiatives are also currently underway to study scientific publishing's business models, the certification of research data warehouses or the potential of machine translation to support a drive towards multilingual scientific productions.

2. The dialogue between science and society in France

Participatory science

Despite many preconceptions to the contrary, research and more generally the production of knowledge do not solely involve research professionals. On the contrary, there are increasingly numerous ways in which non-professionals can be part of research systems and actively collaborate in the scientific production process - from helping collect data to contributing to processing or interpreting such systems through their active participation in defining the main research policy directions. This collective interest in research and the growth in different practices are part of the ambition to make "interactions between science and society" a priority as set out in the law dated July 2nd 2013 on higher education and research. The ministry in charge of research commissioned François Houllier to produce a report on participatory science which has become a reference document because it takes stock of the current situation, proposes a set of best practices for those involved and makes recommendations to the public authorities (see Appendix). Participatory science is now included in the law on multiannual research scheduling which is currently being prepared.

The national strategy for scientific, technical and industrial culture

The law on higher education and research dated July 22nd 2013 has led to profound changes to the French landscape of scientific, technical and industrial culture (CSTI) which are based on two main principles: redefining the role of those involved and making sure the actions of the plurality of actors are an integral part of a concerted and ambitious national strategy. This political objective has been put into action by strengthening the French regions' operational skills in terms of supporting, coordinating and financing CSTI in their territories and also by affirming the French State's strategic role in "setting out the roadmap, defining priorities, creating a favourable environment, supporting the actors involved and encouraging initiatives". The National Council for Scientific, Technical and Industrial Culture (CNCSTI) has enabled the State to provide France with a national strategy for the 2017-2021 period aimed at defining the main CSTI policy directions to respond to major contemporary challenges – strengthening a shared culture, providing information to support political choices and nourish public debate, etc. - and federating all involved around common objectives and priority themes. This document is thus structured around five transversal themes (gender equality, climate change and sustainable development, Europe, raising awareness through memory, the history of science and technology) and five strategic policy directions broken down into objectives and actions.

In addition to these structural and strategic changes, in recent years the French government has made a strong commitment to study of the place of science in society which is apparent in both its actions and declarations on the subject. For example, the draft law on multiannual research programming which is currently under discussion sets out the major ambition of "making research that serves French and European society possible", reiterates the fact that "sharing scientific, technical and industrial culture is more important than ever" and lists a dozen new, ambitious initiatives in its annexed report which are to be launched in coming years. The same bill also promotes open science with particular emphasis on open scientific publishing. One of the six impact indicators associated with the bill concerns the percentage of French research publications available in open access and sets out the long term ambition of reaching 100% in this area.

II. Key issues

The shift towards open science implies a profound change in the models of how the scientific ecosystem functions and in the practices of those involved in research. This all involves a complex

continuum of actors, tools, resources, procedures and protocols throughout the various stages of research. Public policies must therefore possess a systemic dimension and take all the issues into account which are specific to open science in an overall connected way - opening up publications, managing research data, developing infrastructures and implementing the right evaluation systems for researchers.

Furthermore, public policies aimed at encouraging open science must take the full diversity of research practices within scientific communities into account. Such policies cannot be based on a uniform approach. On the contrary they need adjustment to adapt to specific disciplinary features which particularly affect academic cultures, customs, methods or even the very objects of research.

1. Supporting bibliodiversity by ensuring that open access does not further reinforce the historical trend of a concentration of actors in scientific publishing and by defending a plurality of scientific publishing funding models

Open publishing is an essential aspect of open science which calls into question the business model used by the private publishing giants who dominate scientific publishing. This model is based on exploiting intellectual property rights granted by authors free of charge and also on subscriptions paid by public and private bodies for access to the content they publish and disseminate.

One of the funding models aiming to facilitate scientific publishers' transition to open access is based on authors paying an article processing charge (APC) in return for the open access dissemination of their articles.

The scale of the publication fee model changed when the so-called "transformative" agreements were implemented. These agreements are concluded between a scientific publisher and a higher education and research institution, a group of institutions, or even a national consortium like those made up of university libraries in some countries (e.g. Couperin in France). Historically these agreements were supported and promoted in Europe by a few countries in the north and their aim is to convert resources traditionally given over to subscriptions into funds to support immediate open access business models. These agreements have extremely diverse terms and conditions but generally involve the payment of a flat fee to finance the publication costs of researchers belonging to the signatory institutions in return for their articles being disseminated in open access with a ceiling on the number of articles covered by the flat fee. These agreements aim to encourage the transition of scientific publishing towards completely abandoning the subscription model. Indeed, the increasing proportion of open access articles now makes it less attractive for institutions who are not involved in the agreements to pay a subscription fee.

This model does preserve the interests of the traditional actors in scientific publishing but also **has many potential disadvantages for the global research ecosystem**. It requires the support of States and research institutions with significant financial resources and potential which could contribute to excluding factor researchers working in less wealthy countries or institutions. This particularly applies to Southern hemisphere countries but is also the case for many European countries and in less wealthy disciplines and research teams. Such actors may have free access to the publications of their colleagues but would be unable to publish the results of their own research. It is therefore important to **consider carefully the dangers that generalizing this kind of model which generates serious forms of inequality could cause for research communities around the world**.

Also, **the principle of the so-called "transformative agreements" could tend to concentrate and strengthen the negotiating power of a small number of publishers**. This power had already been consolidated in previous decades by "big deals" involving subscription contracts for combined packages of scientific journals rather than individual title subscriptions. These "big deals" give publishers the power to deprive an academic community's staff and students of access to a set of scientific resources if there is a disagreement during negotiations but the so-called "transformative" agreements could also lead decisions to publish depending on commercial negotiations which is an even more fragile position for those research institutions that can no longer afford not to publish their

work. Furthermore, such transformative agreements signed with the most powerful scientific publishers make the expenses related to the payment of publication fees transparent for researchers. This could in turn lead researchers to shun working with smaller publishers with whom agreements of this kind have yet to be negotiated and who therefore still charge publication fees "per unit", thus further increasing the concentration of the editorial system. These specific points should be the subject of in-depth thought and study with sound precautions required before the systematic implementation of solutions involving "transformative agreements".

To avoid pitfalls of this kind, **France is a strong advocate of bibliodiversity**, the principles of which were defined in the 2017 Jussieu Call for Open Science and Bibliodiversity. Bibliodiversity means supporting and promoting a diversity of publishing actors, a plurality of communication languages, publication formats or funding methods and a variety of levels of intervention (support for local initiatives created by communities) and points of view in a context of greatly varying constraints and capacities for action (countries of the North / countries of the South, for example).

Adopting the position of bibliodiversity is not simply a matter of principle as it also corresponds to the **wide diversity of economic models which can already be observed in the scientific publishing sector**. For example, 74% of open access journals listed in the Directory of Open Access Journals (DOAJ) do not charge their authors publishing fees. In addition to the world's five largest publishers, there are 12,000 academic publishers around the world who constitute a significant force. The following funding models currently in operation around the world are particularly noteworthy:

- Public funding (the SciELO and Redalyc platforms in Latin America; Europe's public university presses and European ORE platform, etc.);
- Participatory funding or crowdfunding (Knowledge Unlatched in Germany);
- A subscription model through university libraries (Open Library Humanities in the UK);
- Freemium, which consists of generating revenue in addition to public funding by offering a service as is the case of OpenEdition and the OECD.

All these initiatives need to be identified and monitored to evaluate their potential and to support and consolidate the models that seem the most effective in a true spirit of pluralism. In this respect, the study of collaborative non-commercial publishing models commissioned by Coalition S from a consortium coordinated by OPERAS including SPARC Europe, the University of Utrecht, the Arctic University of Norway (UiT), the Association of European Research Libraries and AmeliCA Redalyc is a very positive signal indeed. The study testifies to the major players in open science in Europe's shared desire to enhance their knowledge of these models which represent alternatives to financing open access through publication costs and also to gauge the resources required to ensure their sustainability and identify sources of funding.

Supporting these open publishing models requires dedicated budgets to be identified which are similar to existing budgets for subscriptions to commercial publishers' resources or to paying publishing fees. This is made all the more important by the fact that these alternative models can actually encourage actors to benefit from their services without contributing to their financing. France's initiative involving the **creation of a National Fund for Open Science** financed through savings made thanks to the negotiation of multi-year subscriptions to major scientific publishing platforms is an illustration of the possible dynamics involved in redeploying funding. The issue could also be taken up at the level of the major research funding agencies who could agree amongst themselves to invent a **"1 for 1" mechanism (1 euro spent on publication costs = 1 euro spent on non-commercial publishing)** which would rebalance the market and guarantee a form of diversity that is essential to the ecosystem's vitality.

2. Democratizing knowledge and supporting participatory science

Making science open to civil society is part of a dynamic that is in line with that of open science to an extent. The dialogue between science and society (see Part II.) particularly aims to bring science and citizens closer through free and open education or through the involvement of non-academic actors in the scientific knowledge development process (participatory science).

3. Encouraging and promoting multilingualism in scientific production by carrying out operationally oriented research into translation processes, techniques and tools.

Language is undeniably a barrier to access to the knowledge produced by research. A discipline's tradition may be to publish in English, as is the case in medicine, or to publish in researchers native language, as in history but these fundamental disciplinary choices tend to create a distance between certain audiences and scientific production.

And yet, **linguistic diversity is a truly rich asset** as stated in the 2019 Helsinki Initiative on Multilingualism in Scholarly Communication[1] which identified a number of ways of ensuring its preservation.

Maintaining scientific production in native languages, whether at the source or via translation is essential if research is to remain relevant locally with its roots in the problems which are specific to each society but also diverse in its approaches and content. It is also necessary so that scientific results are **disseminated beyond the academic world** in order to nourish social debate, to contribute to economic and cultural development and to participate in the definition of public policies. It also encourages citizens' involvement in research for example through participatory science or taking part in clinical trials.

Finally, the translation of scientific content into widely spoken languages (English, Spanish, Arabic, Mandarin, etc.) helps to **raise the profile of national research** and to build a scientific dialogue, shared paradigms and comparative approaches at the global scale which are beneficial for scientific progress and the dialogue of cultures worldwide. For example, it is considered that the readership of French research would be doubled if scientific texts published in French were translated into three or four languages.

Given the country's awareness of these challenges, **France has committed to a policy of supporting the translation of scientific texts** which is essential to maintain the multilingualism of scholarly literature. France wants to explore all possible avenues to thus optimize the translation process in terms of methodology, technical tools, organisation of editorial flows and developing the right skills. Also, France pays particular attention to **the potential of machine translation** which should make it possible to equip professionals at all stages of their work processes – support in writing for researchers, translation assistance for translators and mass translation for platforms. Finally, France considers that machine translation tools tailored to the needs of both public and private scientific actors should be open **to avoid users being confined to using proprietary technologies**.

France is open to the implementation of an international cooperation initiative to create a machine translation services platform to benefit of researchers worldwide.

4. Strengthening open science infrastructures and making them sustainable in the long term

Open Science is fundamentally reliant on a set of infrastructures that make its free and widespread dissemination possible. The entire scientific ecosystem of knowledge needs to be considered for this purpose which includes publication platforms, open archives, computing environments, data flow curation and processing, data warehouses and powerful search engines.

These infrastructures are themselves intended to be both **distributed (vertical concentration is a major risk) and open (proprietary lock-in is a strategy to produce revenues that must be avoided)**. They also need to be **governed by the scientific community**, to comply with rules on **inclusiveness, transparency and good governance** and cannot be based on an exclusively profit-making landscape. For this reason, **the Committee for Open Science has drawn up Exemplarity**

[1] https://www.helsinki-initiative.org/fr

Criteria for public and private infrastructures receiving State funding. These criteria are largely inspired by the state of the art in this area, particularly the 2015 Principles for Open Scholarly Infrastructure[2].

These infrastructures must be technically robust and efficient, designed **to respond to the requirements** of the different research communities and need to provide an **interface and functionalities that users can easily appropriate**. In particular, they should offer a range of training and support services to facilitate their usage.

The interoperability of systems and their ability to link up with each other to ensure the smooth flow of data and content produced are essential for the advent of more open science. **International cooperation initiatives must be stepped up** on the issue of standards, identifiers and repositories in an open and shared manner in order to facilitate the definition, implementation and enforcement of standards for data and metadata exchange.

To this end, France supports the work of international organisations like the **Research Data Alliance (RDA)** of professional research and scientific and technical information communities on producing recommendations on best practices and standards.

5. Promoting the FAIR principles for research data management while taking the legal and ethical frameworks for specific scientific disciplines fully into account with particular regard to the openness and reuse of data;

The principles for virtuous and open research data management have been summarized by the acronym **FAIR - findable, accessible, interoperable and reusable**. The principles of accessibility and reusability require particular attention because they are essential to data sustainability. However they also raise complex issues in terms of the means required, the skills to be developed, legal frameworks, ethics and research practices.

While fully adhering to the principles of openness and reuse of public research data as set out in the 2016 Digital Republic Law, **France also defends a balanced vision based on the following philosophy: "Open by default. As open as possible, as closed as necessary"**. It indeed seems reasonable to avoid taking a dogmatic standpoint on these subjects to thus take into account **the ethical and legal constraints which are essential for certain types of data** - personal data, health data, data relating to safety and security, data relating to intellectual property law and data relating to business, industrial and commercial secrecy.

To reconcile these sometimes contradictory priorities, we need to set aside the binary opposition between opening and closing data and instead consider the full range of existing possibilities for **data sharing**. For example, European medical research data are subject to the General Data Protection Regulation and it is possible to develop data-sharing plans to be made public which define strict conditions for data access and re-use based on pseudonymisation techniques or access control by an independent scientific council.

In areas where it is impossible to achieve full openness of data because of ethical, industrial or legal constraints, **it is therefore important to support the establishment of systems and procedures for data sharing.**

[2] Bilder G, Lin J, Neylon C (2015) Principles for Open Scholarly Infrastructure, http://dx.doi.org/10.6084/m9.figshare.1314859

6. Promoting full recognition of all researchers' intellectual contributions and intellectual property rights which are compatible with openness

A somewhat hasty reading of the situation might lead to the conclusion that open science is at odds with intellectual property principles but in reality this is not the case. On the contrary, those involved in opening publications and research data always pay **particular attention to the right of paternity** for intellectual property and **to citation and attribution practices**.

There are a number of schemes implemented in the field of open science which testify to this concern and which enable openness and the allocation of intellectual property rights to be reconciled and these include:

- **Open licenses** such as **Creative Commons** which are based on copyright and designed to comply with existing intellectual property laws. They allow the author of a work to voluntarily waive some of the rights granted to him or her by these laws to enable and simplify the dissemination, reproduction and re-use of that work under the conditions provided for by the type of licence they select. It is important to note that with all Creative Commons licences it is **compulsory to credit the author of the work** (CC-BY). The strength of these licences comes from the leeway they provide for authors to define the conditions of use of their work which allowing them, for example, to authorize or prohibit use thereof for commercial purposes.
- The **CREDIT** (contributor roles taxonomy) **author attribution standard** makes it possible to identify the contribution of each individual involved in the production of a scientific result in detail through its definition a list of 14 roles (design, data curation, software creation, writing, validation, etc.). This standard is based on the example of digital object identifiers (DOI) for publications, data and researchers (ORCID) and is part of a citation ecosystem which makes it possible to recognize all individuals' contributions to the production of a scientific result in an open science context.

In compliance with these systems, the recommendation could **encourage any form of normative or contractual innovation that makes it possible to reconcile open research results and data with respect for intellectual property**.

Intellectual property issues in research can vary according to the objects concerned:

- For **scientific publications**:

The **publishing contract** is historically predominant as the model for scientific publication and involves the author attributing rights to a publisher to reproduce and exploit a work, usually on an exclusive basis. It should be noted that in the case of scientific articles, this is done solely on the basis of the publisher's commitment to disseminate the article. The absence of financial payment, in particular, is not a problem in itself as long as the author is a researcher who is paid by his or her home institution and the publication of scientific results is an integral part of his or her duties. However this absence of payment needs to be considered in the context of the economic benefits which the most powerful scientific publishers derive from exploiting the exclusive rights thus assigned to them.

However, even with such contracts, **several ways remain for authors to disseminate their articles in open access**. The first way is to **disseminate the pre-publication prior to publication**. This is the version of the article submitted to the scientific journal before peer review and this practice is common in some scientific disciplines which have specialized platforms that operate such repositories (BiorXiv in biology, REPEC in economics, for example). This method helps to **speed up the dissemination of ongoing scientific research** and to open up the **peer review process** as early as possible. This **possibility of open-access dissemination needs to be maintained in the disciplines that have already adopted it** while respecting the diversity of disciplinary cultures.

Another possibility is for **articles to be deposited in open archives**. As mentioned above, in France legislation was brought in to this effect which stipulates that an author may disseminate in open access the version of his or her text that was accepted for publication after peer review even if a contract for the exclusive transfer of rights has been signed with a publisher. The publisher may impose a time limit, or embargo, before this form of dissemination is possible but this should not exceed 6 months after the date of publication in technical science and medicine and 12 months in the humanities and social sciences (HSS). In particular this law makes it possible for the **author of an article to deposit it in an open institutional archive** to ensure widespread access and permanent preservation. The Unesco recommendation could encourage the **generalisation of this type of law** which makes it possible to guarantee the existence of a solution for the dissemination of scientific publications in open access whatever the editorial model in applications.

- For **research data**:

Unlike publications, the intellectual property rights for research data belong to the institutions that funded the research rather than the researchers themselves. Public sector research funding agencies around the world need to be extremely **vigilant that the intellectual property rights to such data are not exclusively obtained by private actors** who could derive commercial profit from the data while limiting their dissemination and reuse. **Legislation which stipulates that there should be a default obligation to open data produced by public research bodies could be brought in on a generalized basis** because it forestalls these exclusive appropriation mechanisms and maximizes the possibilities for reuse of these data in the scientific or economic sphere by non-governmental organisations, companies, public administrations or cultural actors and so forth.

At a time when access to and use of data are major strategic issues, the principle of opening up research data by default may lead to fears of data re-use practices which are detrimental to the general interest or even be threat to populations and of States taking advantage of others' research data without opening up their own data in return.

To respond to such concerns, it is preferable to take a **pragmatic** approach to any legislation on opening data while maintaining certain **limiting principles that help preserve the interests of populations and the strategic interests of States**. In this respect, while French law enshrines the default principle of opening up public research, it also prohibits the communication of data which present risks for State security, public safety or the security of the institution and sets restrictions on the communication of data which could represent a risk regarding the protection of the nation's scientific and technical potential. Furthermore, when research has been carried out by a public research organisation in partnership with a private company, the data are only opened in full compliance with industrial and commercial secrecy laws.

This kind of restrictions thus make it possible to preserve the principle of openness and reuse of data and the associated benefits while retaining control of any such risks.

In any case, **it is important to affirm that the principle of reciprocity of openness of research data should eventually become the rule internationally**.

- for **patents**:

Patents combine the publication of an invention with a temporary exploitation monopoly for the benefit of the invention's author and thus represent a compromise between openness and industrial property. **Rolling out open science policies therefore does not call for patent reform**.

However, **nothing prevents authors of inventions from voluntarily giving up the rights guaranteed to them by industrial property law** to accelerate and generalize the usage of that invention. History provides several examples of such voluntary renunciations for reasons linked to the general good. In the 1950s, Jonas Salk gave up his patent on his polio vaccine; in 1993, the European Organization for Nuclear Research (CERN) made the source code of the World Wide Web freely

available and decided not to patent the invention; in 1995, the scientists leading the Human Genome Project decided that genomes should be made public and considered to be part of humanity's heritage.

Open science should favour forms of dissemination and technology transfer which are of economic benefit while still preserving the technology transfer capacities of public research structures which guarantee in return the preservation of open science's capacity for continuing development.

7. Redefining research evaluation modalities to enhance open science practices

Open science also has repercussions for the subject of **research evaluation** on the individual level through its impact on researchers' careers (project-based funding, scientific processes before publication, the role of pre-publications, peer review, dissemination of research results, taking scientific objects such as source code or data into account, etc.) and collectively through the evaluation of laboratories and institutions' scientific policies (collective competition for funding, compliance with evaluation criteria, etc.). France wishes to see consideration of open science in evaluation develop in two key texts - the San Francisco Declaration on Research Evaluation (DORA) and the Leiden Manifesto.

8. Designing the right tools to observe effective open science practices and thus support the steering of public policies which also need to be adapted to respond to different disciplinary communities' requirements.

A look back at 30 years of initiatives (1991: the birth of ArXiv), 20 years of declarations (2001: Budapest open access initiative) and 10 years of public policies (the 2008 NIH open access mandate, the 2012 European recommendation on open science) helps form a **qualified assessment of collective political, institutional or individual achievements** in the field. The French record is close to 50% for the openness of publications, (cf. 2019 Open Science Barometer for France) and even more substantial progress remains to be made in terms of structuring, sharing or opening up data. Finally, everything is still to be done in developing of the necessary research evaluation skills and criteria.

To achieve the goals of open science within a reasonable timeframe, we need to bear in mind that only the **easiest part of the progress required** has been achieved so far. As with any major transformation, this was achieved first in favourable areas or in disciplinary fields with the right predispositions as was the case in physics with the creation of the ArXiv pre-publication platform or in astronomy and seismology for opening data.

The open science paradigm still needs to be spread to all disciplines on a generalized basis including those which are the most reticent for economic, cultural or legal reasons or because of the particularly sensitive nature of their data.

This requires more sustained effort and a more voluntarist approach in public policies and also above all detailed knowledge of each scientific community's research practices. It would be pointless to try to apply open science policies in a uniform and unambiguous manner to research as a whole because of the obvious risk of coming into conflict with certain disciplinary communities' practices and cultures. **On the contrary, it is essential to correctly adjust these policies to the specific features and constraints of each community when they are rolled out**.

It is therefore necessary to draw on detailed knowledge of each scientific community's specific practices to identify potentially beneficial opportunities and the obstacles which need to be overcome if we are to achieve the open science objectives. For this, it would be extremely useful to set up an **Open Science Knowledge Group** to work on the following tasks:

- producing reviews of the specific problems linked to open science inherent to certain disciplines drawing on existing works in the fields of Science and Technology Studies (STS),

Research on research, the sociology and history of science, the philosophy and ethics of science, information and communication sciences and Library sciences,
- identifying any knowledge which is found lacking subsequent to the production of such reports and then **effectively facilitating the right studies** to acquire it;
- based on the above, making **recommendations to inform public policy** on open science and its application in the various disciplinary communities;
- constructing **shared statistical indicators** to evaluate the results of these policies.

The majority of scientific communities are organized **at the international level** so it is clearly the right level to set up this kind of study and open science expertise group. Working at this level will make it possible to extend the knowledge and skills already put into use, optimize the benefit of the syntheses and studies produced, generalize public policy recommendations and share indicators to enable international comparisons.

There is no shortage of examples of such international expertise groups and the way they function could be an example for the creation of a group dedicated to open science. For example, in the field of medicine, Cochrane is a non-governmental organisation that carries out systematic reviews of the literature (meta-analyses) to support public health policy-making and to keep health professionals, researchers and patients informed. In Europe, Knowledge Exchange is a group of experts from leading research institutions in six countries who share expertise and construct shared recommendations for the development of open research infrastructures.

Also, the creation of shared indicators to evaluate open science policies could be based on work carried out in France since 2018 on the construction of an open science barometer. This currently focuses on the level of openness of publications but will gradually be extended to gauge the opening up of research data, clinical trials and other research objects. France's approach is entirely open source and based on open data which can therefore be reused[3].

[3] For the code and the data please see https://ministeresuprecherche.github.io/bso/

Overview

France is in favour of constructing a global strategy for open science which could involve the different types of measures we have mentioned. In particular, **national plans for open science and national coordinator**s (in Europe these are grouped around the **Council of national open science coordination** following the initiative of France, Finland and the Netherlands) constitute an effective implementation and coordination tool. Similarly, **national plans for scientific, technical and industrial culture** would benefit from being generalized to promote relations between science and society.

- **Bibliodiversity is essential** to avoid further reinforcement of the concentration of scientific publishing actors which has produced negative effects in terms of both tariffs and opening science.
- A monopoly on the publication fee model should be avoided as this generates strong **inequalities between scientific communities** and could lead to the least wealthy countries being excluded from the scientific editorial system. Mechanisms which **redeploy funds in favour of open scientific publishing without publication costs** should be explored such as the creation of **national funds for open science and a "1:1" rule** for research funding agencies, with a focus on scientific publications.
- To meet open science objectives regarding access to and dissemination of research results, a **policy supporting the translation of scientific texts** should be implemented by encouraging the creation of **platforms** offering **open machine translation** services tailored to the scientific communities' requirements.
- **Legislation on open science in the area of publications and research data** like the French Digital Republic Law of 2016 would provide greater international coherence and effectiveness.
- The **principles of openness and re-use of data** from public research should be affirmed, but also approached in a pragmatic manner which takes into account limitations such as the protection of personal data, the preservation of States' strategic interests, industrial and commercial secrecy, etc. **Data sharing solutions** should be explored if openness is not possible. **The principle of reciprocity regarding the openness of research data should eventually become the rule internationally**.
- Open science and respect for intellectual property are in no way incompatible, particularly regarding the patent system. Open science inherently integrates the **recognition of all researchers' intellectual contributions** and remains **vigilant about rights assignment practices**. **Exclusive rights assignments** should be avoided for both publications and research data and all the leeway available to rights holders (researchers, research institutions) should be used to **voluntarily give up** any exclusive rights conferred on them by intellectual property legislation to thus promote the openness of science.
- It seems essential that **research evaluation mechanisms should be modernized** to take the imperatives of open science into account in line with the San Francisco Declaration and the Leiden Manifesto which essentially have yet to be fully implemented.
- **Investment in digital services supported by open science infrastructures** which are shared, interoperable and FAIR-compliant is also needed.
- Finally, the creation of an **Open Science Study and Expertise Group** and the development of an **open science barometer** should encourage this subject attaining international maturity. We invite countries interested in cooperating in these initiatives to contact us (marin.dacos@recherche.gouv.fr).

Appendixes

The National Open Science Plan (EN)

https://www.ouvrirlascience.fr/the-national-plan-for-open-science/

Exemplarity criteria for assigning financing from the National Fund for Open Science for platforms, infrastructures and editorial contents

https://www.ouvrirlascience.fr/criteres-dexemplarite-financements-fonds-national-science-ouverte/

Open Science Barometer in France, 2020 overview and methodology

https://www.enseignementsup-recherche.gouv.fr/cid148931/barometre-francais-de-la-science-ouverte.html

https://hal.archives-ouvertes.fr/hal-02141819v1

The French national scientific, technical and industrial culture strategy

https://www.enseignementsup-recherche.gouv.fr/cid113974/la-strategie-nationale-de-culture-scientifique-technique-et-industrielle.html

The Houllier report on participatory science

http://www.sciences-participatives.com/Rapport

Council of national open science coordination, Memorandum of understanding

CoNOSC

Council of National Open Science Coordination

Memorandum of understanding for

Council for National Open Science Coordination (CoNOSC)

Identifying the main purpose of CoNOSC

The Council for National Open Science Coordination (CoNOSC) is dedicated to helping countries to create, update and coordinate their national Open Science policies. State level coordination is important as states are a major funder and set the judicial and regulatory context for research performing and technology organisations. Coordinating state level Open Science policies and processes facilitates achieving the European vision for Open Science and supports research and researcher co-operation.

CoNOSC will bring together individuals and organisations coordinating Open Science at national level in Europe. Diverse Open Science national coordination processes are welcomed by the council. The council will share different practices in national Open Science coordination and provide and share information of national coordination practices and policies.

CoNOSC will have output in form of newsletters, blogs, and reports on Open Science progress in Europe. The council will strengthen the monitoring of Open Science across Europe from a national perspective. CoNOSC will work in coordination with the European Commission, providing a link between European and national Open Science vision, mission and regulations.

CoNOSC fills the gap in national Open Science coordination. In the increasingly international scientific community, states continue to set regulatory framework for all research organisations and projects as well as provide significant research funding. Open Science will benefit from clear national vision and action. Much of the Open Science movement is based on project funding. The CoNOSC provides continuity independent of funding cycles.

CoNOSC will also provide a valuable national insight into dialogue with other international partners including European University Association, European Research Infrastructure Consortia (ERIC), Research Libraries Associations (LIBER), OECD and UNESCO.

CoNOSC members

CoNOSC membership is in the first stage Open to all countries within the European Research Area4. While Open Science coordination structures vary in each country, the council members should be the key individuals leading and making national decisions in Open Science in their respective country. Therefore, CoNOSC members are not restricted to members of national government, but could come from the research community, non-profit organisations, or even the private sector. This is dependent on the structure of Open Science coordination in each country and the role of these individuals in that national Open Science coordination structure. Each joining country should provide a clear mandate for a participating individual or organisation. Observer membership may be suitable for countries where national coordination is being developed and for other international networks.

CoNOSC will facilitate discussion on practical state level implementation of European Open Science vision, and consider diversity a richness and opportunity to establish Open Science principles and practices across disciplines and through different research infrastructures.

Network structure for communication and responsibilities

1. CoNOSC will be led by 1 chair and up to 3 co-chairs. Chairs will be chosen by the council members for a two year term.
2. CoNOSC will establish a website www.conosc.org and a discussion list or a forum.
3. CoNOSC will convene 2-4 times a year, where at least one meeting will be face-to-face.
4. CoNOSC operation will be based on in-kind contributions from members.
5. Members are responsible for their own expenses.

[4] European Research Area (ERA) countries: https://www.consilium.europa.eu/en/council-eu/preparatory-bodies/european-research-area-innovation-committee/#

The timeline of open science in France

General timeline

- **1972** Creation of the Strasbourg Astronomical Data Centre
- **1999** Creation of OpenEdition (open digital publishing platform in the HSS which today hosts 500 journals, 10,000 books and 3000 scholarly blogs)
- **2001** Creation of HAL (national open archive with 500,000 full text documents)
- **2016** Digital Republic Law: this legally enables authors to open their work and made open administrative data the default principle
- **2017** Jussieu Call for Open Science and Bibliodiversity
- **2017** Opening of the OPIDoR portal (CNRS-Inist) which provides a set of tools and services to manage research data
- **2018** Open Government Partnership (coalition of 70 countries) which includes the French commitment in the name of open science
- **2018** National Plan for Open Science
- **2018** Creation of the Data Inrae portal
- **2019** Creation of the National Fund for Open Science
- **2019** Meeting of the G7 Open Science Working Group in Paris
- **2019** CNRS Roadmap for Open Science

Timeline of the National Plan for Open Science

- **July 2018** The National Plan for Open Science is announced in Lille by Frédérique Vidal
- **December 2018** Launch of the Ouvrirlascience.fr site and the National Open Science Days
- **December 2018** Open Science Barometer: 41% of French publications are available in open access
- **January 2019** The French National Research Agency makes open access to the results of all projects it finances compulsory
- **March 2019** National Research Agency Flash call for projects on open science and research data
- **April 2019** Creation of the Committee for Open Science
- **July 2019** Creation of the National Fund for Open Science (FNSO) in the form of a Scientific Interest Group (GIS, *Groupement d'intérêt scientifique*)
- **December 2019** Open Science Barometer: 49% of French publications are available in open access