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French Open Science strategy

OPENING SCIENCE IN FRANCE 2026-2033

French Open Science Strategy

Opening Science in France (2026-2033)

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MUSE view of the Sculptor Galaxy with the MUSE instrument at ESO's Very Large Telescope (VLT), ESO's Paranal Observatory in the Atacama Desert of Chile. Credits: ESO/E. Congiu et al.

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INTRODUCTION

Open science is founded on one fundamental principle: making research methods, materials, and results as accessible as possible. It increases the visibility and impact of research within the academic world and society at large, helps improve the reproducibility, preservation and reuse of research materials, and reinforces the integrity and transparency of the research process.

Since 2018, the year the First French Plan for Open Science was adopted, France has played a leading role in developing open science. There are numerous indicators that demonstrate this, thanks in particular to the French Open Science Monitor, which provides an overview of publications, PhDs, data, software, clinical trials, and institutional policies. The French open science policy enjoys broad support from higher education and research institutions (it is considered useful by 95% of them). As primary stakeholders, they are closely involved in the governance of open science through the French Committee for Open Science and the French Open Science Fund, and are able to implement local versions of the French Open Science Monitor. Institutions have also responded actively to initiatives aimed at consolidating or launching major open science infrastructures for making publications accessible (HAL), sharing data (creation of Recherche Data Gouv), and preserving the world's software assets (Software Heritage).

The percentage of open access publications is another indicator of the progress made since 2018: it has risen from 38% to 61% for all publications, and 40% to 66% for research articles specifically. Articles incorporating open science practices in France enjoyed an increase in citations of up to 19%. There have also been improvements in practices around sharing data, software and clinical trial results. Open science policy has also increased the recognition of open science practices among researchers, with specific open science prizes awarded for theses, data and software. At an international level, several French initiatives have been successful, such as the Open Science Monitoring Initiative (OSMI), the Council of National Open Science Coordination (CoNOSC), and more recently, the Global Research Initiative on Open Science (GRIOS). France has also taken part in international dialogue, notably during the drafting of the 2022 Council of the European Union Conclusions on "Research assessment and implementation of Open Science", and it is an active participant in the Coalition for Advancing Research Assessment (CoARA).

The French Open Science Strategy (SSO, "Stratégie de science ouverte") adopts a long-term perspective (2026-2033), following on from the two consecutive French Plans for Open Science, which were based on shorter cycles of three to four years. The transformation underway shall now be carried out over a longer timeline and embedded within a strategic approach. The SSO analyses the motivations, challenges and opportunities of open science at both national and international level, and sets out four-year action plans to achieve its objectives. The strategy is grounded on scholarly established knowledge and will continue to draw on the findings of academic research to adjust its trajectory.

It is structured around ambitions, challenges, and strategic objectives, and backed by an action plan. The ambitions set out the main goals of open science policies, which seek to enable greater academic sovereignty, greater visibility and impact of research, more cumulative and collaborative research, more reproducible, responsible and sustainable research, and research that – finally – fosters innovation and extends beyond the academic sphere.

After outlining these ambitions, the SSO identifies the major challenges currently facing open science. It reaffirms the key role played by research infrastructure and services for open science. Developing open access raises new challenges relating to access, bibliodiversity, and quality in the field of academic publishing. Despite significant progress and strong engagement from the research community, data sharing has not yet become standard practice across all disciplines. Although software is frequently at the heart of research processes and advances,

it is still not sufficiently recognised as a major contribution to science. Lastly, despite significant progress in recent years, the results of clinical trials are still not systematically made public, even though this practice is mandatory under European regulation for ethical, financial and scientific reasons.

To address these numerous challenges, France has various levers at its disposal, such as research assessment and international coordination, particularly in order to define a cohesive framework at the European and global level and provide specific services to the research community. The new context characterized by artificial intelligence (AI) is fundamentally transforming the entire research process. AI has enabled remarkable scientific advances, but it also raises new issues in the fields of publishing, scientific integrity, and copyright law. It is also transforming the role of open science platforms and information practices. More broadly, France and the European continent can and must contribute to defining the highest international standards of transparency in the methods and outputs of open research. This does not, however, mean opening indiscriminately. Data that must remain closed, or shared within a limited framework, shall remain so. In this context, the principle "as open as possible, as closed as necessary" remains fully relevant. Our goal is to reconcile the imperative of protecting research with the aspiration for open science.

Following this, the SSO sets out strategic objectives for the next four years. Four of these are over-arching and relate to the transformation of the practices, governance and instruments of open science policy, the ecosystem of open science services and infrastructure, and France's position within the European and international open science landscape. The following four strategic objectives relate to major research outputs: publications, data, software, and the results of clinical trials. The first action plan for the SSO (2026-2029) is structured around these objectives.

The SSO is also complemented by an eight-year review of French open science policy, which highlights the scale of the successes and achievements over the years and the tangible results seen in the transformation of practices, as well as the outputs from the French Committee for Open Science. The guides and reports published are the result of major expertise provided by the French research community and have been essential in developing skills and knowledge, offering diagnostic insights, and formulating propositions for action.

While significant progress has been made in recent years, the ecosystem of open science services and infrastructures remains fragile. A considerable amount of work still remains to be done. In the current geopolitical context, our conviction and duty to take action is even stronger. Now more than ever, we must promote free and open science, continuing the process launched in the early 2000s. The French Open Science Strategy thus charts an ambitious course for the next eight years, aiming to make French research more transparent, collaborative, and sovereign, capable of addressing the research challenges of the 21st century.

Oceanographic Vessel *Pourquoi pas ?* (meaning : *Why not*?). Credits: Lesbats Stephane / Ifremer

I. AMBITIONS OF OPEN SCIENCE

I.1. GREATER ACADEMIC VISIBILITY AND IMPACT

Open science supports greater academic visibility and impact for the research and individuals engaged in this approach.

By promoting the wide dissemination of research, it fosters the use and citation of publications, as well as other outputs produced by researchers, such as data and software.

Indeed, an increase in citations is observed when open science practices are implemented: preprints, data sharing, open source software, and open access publishing.

+14,5 %
an article that shares its data receives 14.5% more citations.

+34,9 %
In medical research, there is a 34.9% increase [7].

Eye of a Neutrino Telescope. Credits: Hugo PARDINILLA / CPPM / CNRS Nucléaire & Particules / CNRS Images

This was a major hypothesis of the founders of open science: removing the economic and technical barriers to accessing publications and sharing other research outputs will increase their academic visibility and impact.

Analysis of usage data from platforms shows that open access publications are consulted and downloaded more frequently than publications behind a paywall [1]. Beyond the purely quantitative aspect, open access promotes higher geographic diversity of usage. This has been demonstrated for works in the biomedical field in particular [2].

The increase in the number of citations is also accompanied by an increased diversity of sources for these citations – institutionally, geographically, and across disciplines. This "open access citation diversity advantage" is observed across all disciplines and particularly in the biomedical sciences, biology, and the social sciences [3]. An increase in citations is observed especially from countries with fewer resources.

In addition to providing open access to publications, other open science practices, such as sharing the data and source code associated with publications and distributing preprints, have been recognised as catalysts for academic citations [4]. The connection between open science practices and increased citations has been highlighted within a corpus of publications focusing on a group of journals [5], a particular discipline [6], and even an entire country. For example, in France, a study analysing data from the Open Science Monitor [7] showed that an article will receive more citations if it is published as a preprint (+19% citations), if it shares its data (+14.5%), if it shares its source code (+13.5%), and if it is published with open access (+8.6%). The results vary depending on the discipline. For example, in the field of medical research, data sharing is associated with a 34.9% increase in the number of citations.

I.2. MORE CUMULATIVE AND COLLABORATIVE RESEARCH

Unlike siloed research, sharing methods, materials, and results promotes a cumulative and collaborative dimension in research. Open science thus helps create research that stands "on the shoulders of giants" [1].

Academic knowledge is built upon the insights meticulously developed by generations of researchers.

[1] *Medieval metaphor attributed to Bernard of Chartres.*

Cochrane is a global, independent, non-profit organisation.

It has **over 11,000 members and 35,000 contributors across more than 130 countries**. It summarises information on the effectiveness of treatments and health interventions. It produces systematic reviews and meta-analyses of medical literature, creating knowledge summaries and promoting evidence-based decision-making in healthcare.

These meta-analyses are used in 75% of recommendations from the World Health Organization (WHO) [12].

Cochrane Library

Trusted evidence.
Informed decisions.
Better health.

Open science reinforces the cumulative nature of research by providing access to academic publications. Researcher's access to the full text of bibliographic resources varies by as much as twofold even within the wealthiest countries, and even more so on a global scale [8]. By promoting the removal of barriers that restrict access to publications (such as paywalls), open science helps make access to scholarly resources more universal.

Open science also promotes data reuse by teams not involved in the production of said data (see also "More responsible and sustainable research"). It encourages data sharing according to the FAIR principles (Findable, Accessible, Interoperable and Reusable). Applying the "R" principle means specifying the conditions for data reuse through a licence and, beyond the legal aspects, ensuring that research data is documented in such a way as to enable its comprehension, thus encouraging its reuse by external teams.

The same applies to open source licences for software, which are intended to encourage their reuse and modification, in accordance with the conditions set by the developer.

In the medical field, open science facilitates meta-analyses, which reuse data from clinical studies by aggregating them into a large dataset and conducting analysis on this broader set. Meta-analyses are considered the type of scientific publication that provides the highest level of evidence and are used in decision-making for public health [9]. Lastly, open science, and more specifically data sharing, have enabled rapid progress in understanding certain diseases [10; 11].

I.3. MORE REPRODUCIBLE RESEARCH

Open science helps make science more reproducible. Although it cannot guarantee the reproducibility of research by itself, it provides a crucial foundation.

It is essential to share protocols, data, and the processes applied to said data in order to be able to reproduce research.

To help the public understand the importance of reproducibility in research, a team from Rennes enlisted non-experts to bake meringues using the same recipe made available to everyone. The results highlighted the complexity of reproducibility in a non-academic field. The approach itself was the subject of a research protocol and publication [16].

A public experiment in reproducibility

In January 2024, 845 meringues were presented to a jury that had to evaluate their appearance, color, size, and taste. Credits: CONSTANT VINATIER.

Reproducibility refers to the ability to achieve the same results as a particular scientific study by reusing its data and calculations, and/or by repeating its experiments and analyses. It is a pillar of the research method, ensuring the reliability and credibility of the knowledge produced. This subject is not new, but it gained significant attention when several studies highlighted a "reproducibility crisis". A survey of 1,500 researchers indicated that "*more than 70% of researchers have tried and failed to reproduce another scientist's experiments, and more than half have failed to reproduce their own experiments.*" **[13, p. 452]**.

Sharing the data and code used for a study supports its reproducibility. In an analogue environment or in traditional forms of publishing, this aspect is very often absent. Conversely, in an open science context, it is encouraged to share data and code, which makes it possible to employ again the data and the computational processes used in a research project.

Sharing methods and protocols also helps increase reproducibility. Some protocols are also preregistered, with journals committing to publishing results once the study is completed, even if the outcome is disappointing or negative **[14]**. This editorial format, known as a "registered report", is gradually gaining ground. Firstly, it helps strengthen the description of the methods used. Secondly, it reduces publication bias, that is, the tendency of journals to favour positive results over negative ones. It also seeks to help reduce confirmation bias.

In this way, **making research outputs and methods open provides an essential foundation for reproducibility**. But it may not be enough. **Four types of reasons can be identified as to why openness alone cannot foster reproducibility:**

→ **The quality of the shared information** *may be insufficient. The description of the methods may prove incomplete and fail to allow for systematic reproduction due to a lack of precision; data may be poorly annotated, making it difficult for a third party to carry out robust interpretation; shared code may be poorly documented and difficult to reuse or adapt in another context.*

→ **The study's intrinsic methodological limitations** *may also act as a barrier. This occurs when the experimental design could be improved, when computing or experimental environments are not standardised, or when the data used cannot be shared with the level of detail required to reproduce the analysis.*

→ **A lack of skills in reproducibility** *can also pose a barrier to reproducing results. Training programmes in reproducibility are therefore being developed by research reproducibility networks, which have been established in many countries and which are brought together within an international federation (Global Federation of Reproducibility Networks)* **[15]**.

→ *Finally, and perhaps most importantly, reproducibility is limited by structural barriers, primarily due to* **the lack of a culture of reproducibility**. *This weakness is compounded by a system of evaluation that tends to favour and fund novelty, while giving less support to the consolidation of results through exercises in reproducibility.*

I.4. MORE RESPONSIBLE AND SUSTAINABLE RESEARCH

Open science helps make research more responsible and transparent.

In the same way, open science also helps make research more sustainable, particularly by addressing societal, budgetary, and environmental challenges.

Tamiflu, an antiviral used to treat and prevent influenza, was stockpiled on a large scale during the H1N1 pandemic in 2009.

In 2014, a systematic review of clinical study reports that had not previously been made public highlighted the ineffectiveness of Tamiflu. The non-publication of the trial results resulted in losses of $18 billion [23].

Cover of The BMJ featuring the open data campaign, focusing on Tamiflu [25]

Open science fosters reflections and methodological propositions that promote cooperation and transparency. These approaches help increase openness, but also research integrity. Open science encourages the publication not only of results, but also of data, code and protocols, which are often absent from traditional forms of publications. This transparency promotes reuse, reproducibility and verification of materials, which is a source of trust.

Data sharing should be carried out as much as possible, in accordance with the FAIR principles (Findable, Accessible, Interoperable and Reusable). A lack of proper management of research data, particularly regarding openness, readability, and clarity of licences, costs the European Union €10.2 billion per year, notably due to wasted time, redundant efforts, storage costs, and licence fees [17].

Research infrastructures that produce open or shared data create and establish the conditions for a broad research community to access essential data [18]. For example, the benefits provided by data from the European Molecular Biology Laboratory – European Bioinformatics Institute (EMBL-EBI) for the researchers concerned is estimated to be at least 23 times the total cost of the infrastructure [19]. Similar figures have been observed in other fields, such as social sciences [20] and climate science [21].

In the field of clinical research, reluctance to publish negative results leads to significant budgetary losses. This is what is known as "research waste" [22]. Not communicating negative results can also have major economic impacts on society as a whole [23].

Lastly, the considered management of data and other research outputs (publications and software) supports greater sustainability in research. This begins with strategies for preserving and curating these materials, allowing for reuse in other studies and exercises aimed at assessing reproducibility. It also requires well-designed archiving strategies, retaining only the relevant versions once research is complete [24]. This is necessary not only because of costs, but also due to the environmental footprint of digital technologies.

Similarly, pooling archival, storage and distribution infrastructures is an essential aspect of good management, in order to achieve economies of scale. It is important to limit the proliferation of data repositories and editorial platforms when their added value is not clear, especially when their maintenance costs are significant, whether from a budgetary or an environmental perspective.

I.5. GREATER ACADEMIC SOVEREIGNTY

Academic sovereignty means holding control over essential resources, particularly digital resources, used in research.

Therefore, the research community must manage the infrastructure, platforms and services that support its activities.

Shared, balanced and resilient governance is essential to safeguard the pillars of production for research knowledge.

Open science is a strategic asset for building independent research that serves the public interest. Software Heritage, a piece of infrastructure with shared governance, plays a major role in the universal preservation of scientific assets.

On this platform, over 400 million software projects are archived, including those from software forges that have closed down.

Software Heritage
THE GREAT LIBRARY OF SOURCE CODE

Open access to knowledge and to the materials that were used to produce it is essential for developing science on solid foundations, and for ensuring equitable and long-term access to research findings. The research community should remain unaffected by uncertainties regarding the services and infrastructure underpinning research. It is important to protect it from the closure of infrastructures and interventions from outside the research world, affecting hosted content or services provided **(see "An ecosystem that remains fragile")**.

It is also essential for the research community to have control over data management and how it is distributed. This involves choosing licences for dissemination and using standardised metadata, which ensures a high level of compliance with the FAIR principles (Findable, Accessible, Interoperable and Reusable) and enables control over methods of distribution. Research infrastructures can also increase the recognition of contributors by updating the metadata that accompany the hosted scientific information. Metadata can indeed offer the possibility of specifying and highlighting each individual's contribution.

This issue of academic sovereignty is developing in particular within the framework of international collaboration. Transparent, shared governance is crucial for many infrastructures, managed in an international context. It ensures collective resilience and helps offset any potential failures. The infrastructures in the European ESFRI (European Strategy Forum on Research Infrastructures) Roadmap provide strong assurances in this regard **[26]**.

In this context, supporting the use and development of open source software by infrastructures and the ecosystem of services produced for research is a guarantee of control and sustainability, which proprietary environments do not provide.

Moreover, ensuring the existence of secure copies of work produced by French researchers – on Software Heritage **[27]**, HAL or trusted data platforms – is a guarantee of long-term preservation and independence.

I.6. RESEARCH THAT FOSTERS INNOVATION

Open science fosters innovation, benefiting both the economy and society as a whole.

The dissemination of research outputs—including inventions, knowledge, methods, data, and software—serves as a mechanism for sharing academic insight beyond the university. It ensures these outputs are mobilised to benefit the economy, public policy, and society.

The Human Genome Project was a historic global scientific endeavour, whose main objective was to create the first sequence of the human genome.

Image source: *https://www.genome.gov/about-genomics/educational-resources/fact-sheets/human-genome-project*

Human genome project

WANTED

20 Volunteers

to participate in the

Human Genome Project

a very large international scientific research effort.

The goal is to decode the human hereditary information (*human blueprint*) that determines all individual traits inherited from parents. The outcome of the project will have tremendous impact on future progress of medical science and lead to improved diagnosis and treatment of hereditary diseases.

Volunteers will receive information about the project from the Clinical Genetics Service at Roswell Park, and sign a consent form before participating.

No personal information will be maintained or transferred.

Volunteers will provide a one-time donation of a small blood specimen. A small monetary reimbursement will be provided to the participants for their time and effort.

Individuals must be at least 18 years of age.
Persons who have undergone chemotherapy are not eligible.

ROSWELL PARK CANCER INSTITUTE

For more information please contact the Clinical Genetics Service
845-5720 (9:00 am - 3:00 pm)
March 24 - 26, 1997

The European Commission began developing its open science policy as early as 2012 [28], based on the observation that the traditional dissemination of research limited it to overly restricted audiences, mainly in the academic sphere, and failed to permeate the continent's social and economic fabric. The subscription-based model for journals creates an obstacle not only for accessing publications, but also for discovering them, particularly beyond academia. The cost of these transactions, which involves entering into contracts with each publisher [2], also constitutes a barrier to the dissemination and discovery of knowledge produced by research. Similarly, the lack of transparency regarding data, software, and protocols used hinders the use of research findings not only by other researchers, but also by businesses, non-profit organisations, local authorities, and public services. More broadly, open science facilitates access to research findings for information and knowledge professionals working in non-academic professional contexts. There is a very large potential audience, yet their access to paywalled scholarly resources is in reality extremely limited. In the United Kingdom, there were 1.8 million information and knowledge professionals working in R&D, IT and engineering, most of whom did not have access to a company library or information centre [30].

Open science helps share research findings with businesses, generating benefits both for these companies and for the economy as a whole [31]. Removing barriers to the discovery and reuse of research publications, methods, data, and software facilitates innovation and ultimately has an economic impact [32].

Free and open source software, in particular, represents a powerful driver of innovation. For example, Scikit-learn was developed through French research and is widely used in industry and the private sector. In France, only 10% of software produced by the public research sector is distributed under a proprietary licence, and 30% of this software is used outside the scientific community, demonstrating its impact on society and the economy [33]. Free and open source software and libraries offer substantial savings, particularly for software developers and businesses [34; 35].

Open science is particularly utilised for filing patents. Organisations filing patents, use open access publications 38% more frequently than closed access publications. Open access publications are more highly represented especially in patents in biology, medicine, chemistry, computer science, and business [36]. Implementing a systematic open policy for research publications is followed by a significant increase in the presence of these publications in patents [37].

Opening climate data has enabled researchers worldwide to develop more accurate predictive models, informing national and international environmental policy. For example, the Coupled Model Intercomparison Project (CMIP) has played a major role in climate research [38], in the reports of the Intergovernmental Panel on Climate Change (IPCC), and in public policy [39].

Major medical advances have been made possible thanks to the open access availability of information on human genome sequences. The Human Genome Project (HGP, 1990-2022), led by the global scientific community, implemented the "Bermuda Principles" established in 1996. These principles stipulated that all human genome sequences had to be published openly, free of charge, and in the public domain within 24 hours of their production [40; 41]. This project, described as a "wealth of discovery" [42], identified 20,000 proteins as potential drug targets, more than 2,000 of which have already been utilised to develop approved medicines.

The Covid-19 pandemic also highlighted the importance of open data for public health and society as a whole. Firstly, initiatives such as CovidTracker made it possible for society to effectively use research and public health data, thus facilitating its appropriation by the public. Secondly, the early publication of the virus genome played a key role in the accelerated development of tests and vaccines [43].

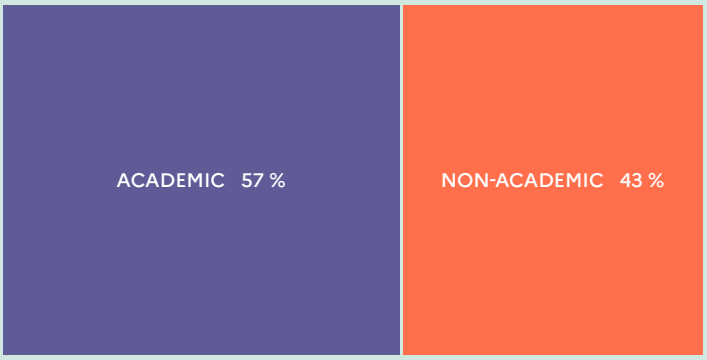
[2] There are over 20,000 academic publishers worldwide [29].

I.7. RESEARCH THAT EXTENDS BEYOND THE ACADEMIC SPHERE

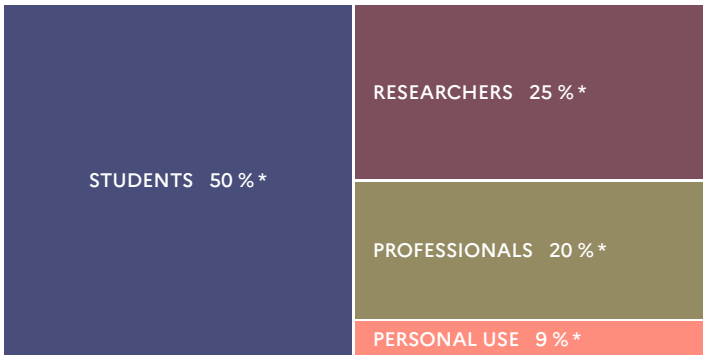
Open science makes it possible to disseminate research results and outputs widely, offering the potential for these resources to be shared beyond the university campus and reach general society.

Due to the technical nature of scientific research, the role of research mediators is essential here, even if many actors in society make direct use of research findings. The discoverability of open publications makes them easier to find in everyday searches for information.

In an information-saturated environment, it is important for scientific output to be visible via the digital tools that society uses to seek information.



Uses of the Springer Nature platforms [51]



Uses of Scielo (1 000 journals) [52]

* The figures should be regarded as approximations only and the percentages do not necessarily add up to 100%.

Open access dissemination makes research literature more easily accessible to anyone that needs research results. The discoverability of scientific content – that is, its capacity to be identified amid the abundance of available material, especially by those who were not specifically searching for it – is essential. Discoverability is observed in particular through the presence of such content on search engines and the services used by the public on a daily basis.

One of the key considerations in the dissemination of science is accessibility for science mediators. Journalists, for example, are proportionally more likely to cite open access research articles than those with restricted access, with a "news advantage" of 8.8% in the field of climate science [44]. Similarly, open access scholarly content is more frequently cited on Wikipedia, the 5th most visited website in the world and the leading online source of encyclopaedic information. On English-language Wikipedia, open access articles are more likely to be cited than those published on a subscription basis [45]. This trend is particularly pronounced in disciplines such as biology, environmental science, physics and mathematics, whereas it is more limited in the humanities and social sciences [46].

More broadly, open access scientific findings are more readily usable in non-academic sectors. For example, an open access law review is 41.4% more likely to be cited in a court decision than a similar article behind a paywall [47]. Furthermore, in the medical field, paid subscriptions are regarded as the main barrier to patients accessing robust academic content, on par with complex terminology [48]. Lastly, the open access reports of the National Academies of Science, Engineering, and Medicine (NASEM) illustrate the same trend: more than half of total usage comes from non-academic sectors (52%), with a large proportion of professional use and 10% personal use [49].

The ability of open access to increase the reach of research beyond the academic world is also proved by the source of consultations. French open access platforms HAL and OpenEdition are used extensively outside university campuses and the academic sphere [50]. In less than a year, there were 10 million consultations originating from corporate sectors, which is not far below the 15 million from the education sector. Significant numbers of consultations are also observed in other sectors, such as IT, information, audiovisual, publishing, administration, and even defence.

Similar usage patterns are also observed on international platforms. 43% of users consulting content on Nature.com, Springer.com and Biomedcentral.com are non-academic [51]. Among these users, one third (referred to as "Halo readers") do not conduct research themselves but tend to read such materials as part of their work, particularly medical professionals, businesses (pharmaceutical, food, agriculture), and non-governmental organisations. Other non-academic uses consist of a "long-tail" of groups with highly diverse profiles, primarily self-employed individuals (lawyers, trainers, consultants), but also patients, judges, translators, secondary school teachers and students, and job-seekers.

Lastly, open science makes it easier for students to access research. The main users of the two open access journal platforms, Scielo and Redalyc, are students (50% of users for Scielo and 55% for Redalyc), followed by researchers and faculty members (25% for Scielo and 22% for Redalyc). The remaining uses come from outside of universities and is either professional (20% for Scielo and 17% for Redalyc) or personal (9% for Scielo and 6% for Redalyc) [52].

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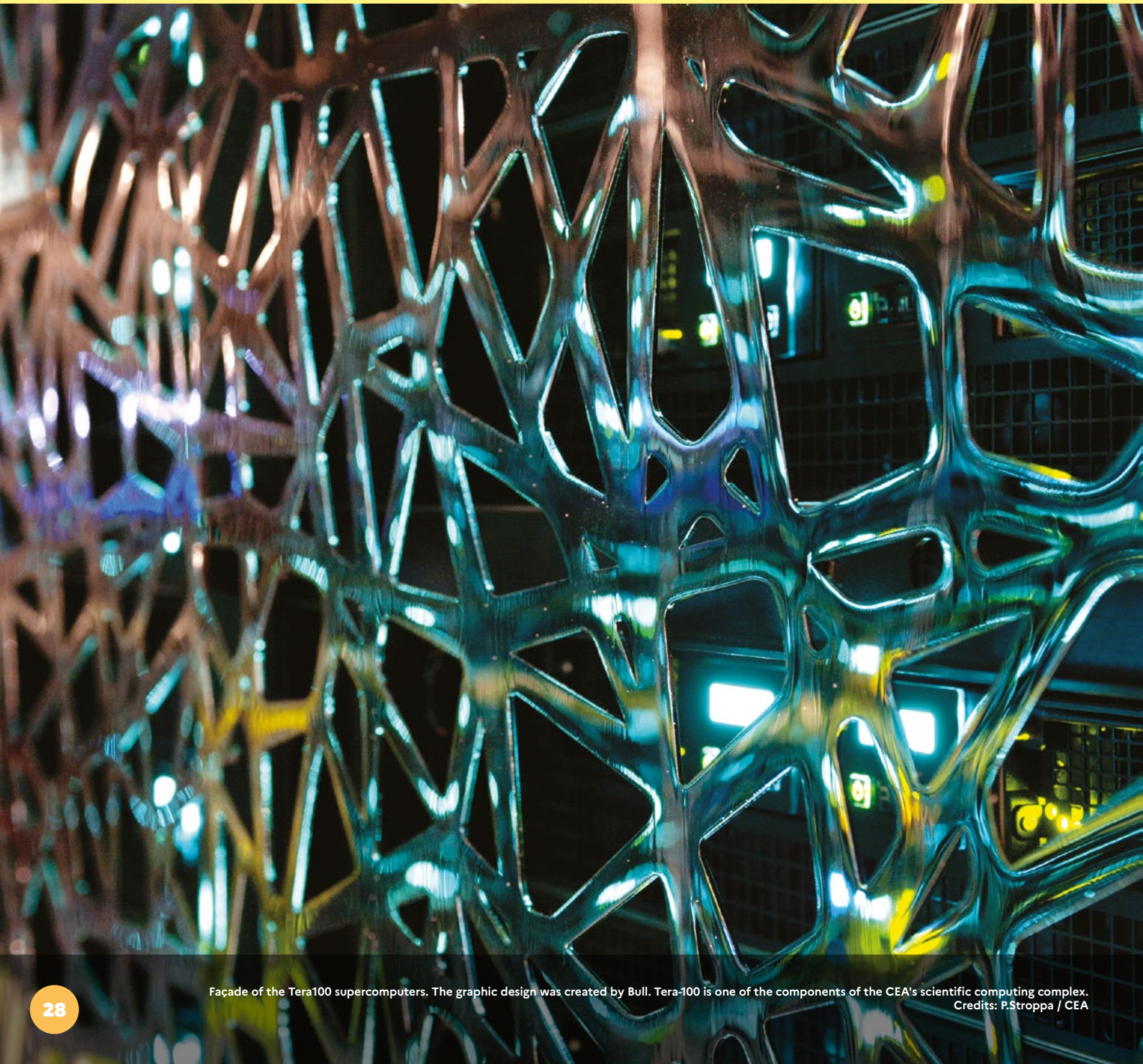
II. CHALLENGES OF OPEN SCIENCE

II.1. ISSUES OF OPEN SCIENCE



Façade of the Tera100 supercomputers. The graphic design was created by Bull. Tera-100 is one of the components of the CEA's scientific computing complex.
Credits: P.Stroppa / CEA

II.1.1. OBSTACLES TO OPEN SCIENCE REMAIN SIGNIFICANT

The main obstacles to the development of open science have been identified by the academic literature and by surveys. A survey conducted in France among all higher education and research institutions in 2024 revealed that the main barrier is the heterogeneity of practices in different disciplines (50.5% of respondents) [53]. This diversity presents a significant challenge: publication practices, epistemological cultures, and data management vary considerably from one discipline to another. Although the general principle of open science is now widely accepted, its concrete implementation requires specific adaptation in each field.

The main barriers identified to the adoption of open science are discipline-specific diversity, resistance to data sharing, and concerns about rising costs.

The second obstacle most identified is resistance to sharing and making data available (41.9%), particularly in disciplines where such practices are not firmly established. Until now, these disciplines have regarded data as the property of the researchers who produced it, rather than a public resource. This change in status requires significant work to make data accessible and understandable to third parties. Several factors that may hinder data sharing are cited: the desire to retain exclusive rights to its use, the fear that it may be reused without acknowledgement, or concerns relating to potential misinterpretation or even use for disinformation purposes.

The third obstacle most identified by French institutions is concerns around rising costs (27.6%). This firstly relates to the increase in expenditure associated with the publication fee model, with unit costs rising and the model becoming widespread among many publishers. In France, this expenditure tripled between 2013 and 2020, reaching €30 million [54]. Secondly, supporting researchers and developing digital services related to open science require specific investment. Professionally managing the publications, data, and software generated by research entails a significant cost, in both digital and human resources.

Among the other obstacles identified are also legal issues (26.7% of responses) and technical complexity (21% of responses). These obstacles are gradually reducing, thanks to support and educational initiatives developed within the framework of open science policies implemented by institutions and infrastructures [55]. However, in order for open science to become a widespread practice, it is essential to continue these efforts, overcome obstacles, and remove barriers.

II.1.2. AN ECOSYSTEM OF INFRASTRUCTURES AND SERVICES THAT REMAINS FRAGILE

Open science infrastructures play a crucial role in implementing open science practices. They fall primarily into two main categories: data-focused infrastructures (collection, processing, computation, analysis, dissemination, archiving, etc.) and publication-focused infrastructures (developing open access publishing, archiving, dissemination, etc.). They may also encompass a wide range of other elements such as software, standards, unique identifiers, peer review, and so forth [56].

Open science infrastructures play a crucial role in implementing open science practices.

In France, these activities are carried out in particular by scientific information infrastructures in the *National Roadmap for Research Infrastructures*. These infrastructures are "*a major vector for the concrete implementation of open science and a massive lever for transforming practices*" [18, p. 260]. Most of the discipline-specific infrastructures outlined in the roadmap also contribute to open science, as the majority of them aim to produce, use, and disseminate data.

In addition to the infrastructures included in national and European roadmaps (European Strategy Forum on Research Infrastructures – ESFRI), which benefit from official recognition, open science relies on a large number of other services. These may be vulnerable in terms of funding or governance. Most open science infrastructures and services are used free of charge by a much wider audience than just the institutions that support them financially. Their funding relies on the voluntary contributions of beneficiary institutions, but if the intensity of use exceeds the level of contributions, the infrastructure may encounter difficulties [57].

Furthermore, history demonstrates that an economic crisis or political developments can jeopardise the stability of research infrastructures. There have been closures of data repositories (6.2% of the 3,000 repositories listed in Re3data over a 13-year period), with data loss occurring in the majority of cases: only 44% of repositories were able to migrate their data to another repository [58]. Biological databases, in particular, have experienced high rates (60%) of disappearance or functional degradation [59]. In general, the availability of data associated with articles declines over the years [60]. This risk also affects academic publishing, with over 175 journals disappearing entirely from the Internet between 2000 and 2019 [61], and the preservation of publications seemingly not universal [62]. These losses of data or published content represent a vulnerability within the research ecosystem.

In the current economic and geopolitical context, it seems necessary to have infrastructures managed by transparent and shared governance structures in order to increase their resilience and mitigate potential failures caused by public or private actors subject to economic uncertainties or political fluctuations.

Increasing the resilience of open science infrastructures.

II.1.3. CHALLENGES RELATING TO ACCESS, BIBLIODIVERSITY, AND QUALITY IN ACADEMIC PUBLISHING

Academic publishing transforms researchers' manuscripts into peer-reviewed publications, then disseminates them as widely as possible. It involves multiple stakeholders: publishers who coordinate editorial functions and assume editorial and legal responsibility for content; publishing professionals working in the editorial chain; faculty members and researchers involved in editorial committees and peer review; and dissemination platforms and infrastructures that ensure the circulation and preservation of knowledge.

Academic publishing produces and disseminates reliable knowledge within an ethical and transparent framework, and all these processes incur legitimate costs. At a global level, the past ten years have witnessed a genuine surge in the number of publications. Between 2016 and 2022, the number of articles published increased by nearly 50%. The exponential growth of research articles, more than 5.6% per year [63], is linked to an assessment system that often rewards researchers for the number of articles published. It is also linked to the development of the open access funding model, based on article processing charges (APC) paid by authors and their institutions, which remunerates publishers based on the number of articles disseminated [54].

At a global level, we have witnessed a genuine surge in the number of publications.

This increase raises questions about the preservation of scientific quality and trust in the results. The global publishing system is witnessing the emergence of questionable editorial practices and structures (deficient peer review, unreliable content) and breaches of scientific integrity (paper mills, tortured phrases, sale of authorship positions in articles, etc.).

The *Council Conclusions on "high-quality, transparent, open, trustworthy and equitable scholarly publishing"* of 2023 also express concerns about the negative effects of the publication fee model, particularly regarding the ability to publish in the journals concerned **[94]**.

Promoting and consolidating bibliodiversity within the academic publishing ecosystem should help mitigate these challenges, by fostering a diversity of publication models, funding models, and stakeholders in scholarly publishing **[64]**. This diversity should provide scholars with greater freedom of choice.

Open access publishing must be developed in strict compliance with copyright law, with a wide range of viable funding models, with or without publication fees. Furthermore, the subscription-based economic model is compatible with the parallel dissemination of articles in an open archive.

The French publishing landscape is particularly rich and diverse **[65]**, especially in the humanities and social sciences (HSS). This editorial capacity fosters visibility and impact. However, the French publishing ecosystem must be strengthened, while maintaining a balance between private and public entities. It is essential to promote convergence and pooling of publishing and dissemination resources, particularly in science, technology and medicine (STM), and to develop reliable and sustainable economic models within an open science framework.

Transforming the French publishing ecosystem by encouraging the convergence and pooling of publishing and dissemination resources.

Regardless of the access model (open or subscription-based) and the chosen economic model, the quantitative growth of publications on a global scale raises questions about the quality of editorial output. It is essential to identify problematic content, promote editorial processes that are attentive to issues of quality and reliability in publications, support the editorial ecosystem towards greater transparency in procedures and more attention to ethics, and promote quality standards.

II.1.4. SHARING RESEARCH DATA IS NOT YET STANDARD PRACTICE

During the global Covid-19 pandemic, the immediate sharing of data regarding the virus genome made it possible to rapidly develop a vaccine **(see I.6)**. At the same time, there was unprecedented growth in preprints as a practice, particularly in the field of health research, where it had previously been uncommon **[66]**. Even citizens have embraced open data to help inform the public and official authorities **(see I.6)**. Despite these advances, research data sharing practices did not experience any significant changes during the Covid-19 crisis **[67]**. A global pandemic was not sufficient to fundamentally transform research data sharing practices.

A global pandemic was not sufficient to fundamentally transform research data sharing practices.

These practices are slow to evolve. The data sharing statement for BioMed Central articles is implemented in less than 7% of cases **[68]**. In medical journals that require data sharing, the practice is observed only very rarely **[69]**. In France, the Open Science Monitor **(see annex 2.2)** shows gradual improvement, with an annual increase of approximately 2% per year in data sharing. Despite this positive trend and the policies aimed at encouraging data sharing, these practices are not progressing as rapidly as hoped.

The European Union has recognised the crucial importance of data sharing, particularly in the field of health, as shown by the Regulation on the European Health Data Space in 2025 **[70]**.

This text makes it mandatory to share health data for reuse, particularly for research, innovation, and public policy purposes. The paradigm shift introduced by this regulation is significant.

Beyond sharing data, adopting the FAIR principles (Findable, Accessible, Interoperable, Reusable) [71] serves as a lever to increase the efficiency, transparency and reproducibility of research. To implement these principles as effectively as possible, FAIR needs to be deeply embedded within discipline-based communities, as they are the only ones capable of defining practices that are truly suited to the nature of their data and its use in research. By increasing the interoperability and reuse of data, FAIR fosters a gradual and long-lasting improvement in data management practices, with direct effects on research quality, the effectiveness of collaborations, and the visibility of research outputs. The FAIRification of data also enhances its traceability, citability, and useful lifespan.

Implementation of the FAIR principles is gradual.

The FAIR principles have achieved international consensus and been widely adopted by the research community and research infrastructures. Their operational implementation is gradual and therefore still incomplete. It is methodologically challenging to try to quantitatively measure FAIR compliance in large datasets [72]. However, progress observed appears to be the result of clear policies and support programs aimed to develop good practices [73; 74].

II.1.5. SOFTWARE IS NOT YET SUFFICIENTLY RECOGNISED AS A MAJOR CONTRIBUTION TO RESEARCH

Emerging in the 1980s, open source software was a forerunner in the field of open science and has demonstrated its effectiveness through global success stories, in both the economic sphere (open web technologies) and the scientific domain (Python and R for data analysis and statistics, Scikit Learn for machine learning, BLAST for genomics, etc.). This model appeared ten years prior to the creation of the first open archive, ArXiv (1991), which is often regarded as foundational to open science. However, open science policies have largely been developed around open access publications [75] and sharing research data [76]. It was not until the early 2020s that software was explicitly included in open science policies; this is the paradox of software. The OECD Recommendation, updated in 2021, now includes software [77]. Similarly, the Second French Plan for Open Science devotes an entire chapter to software, with the aim of opening and promoting source code produced by research [78]. Source code is seen as a tool, a result, and an object of study all at once. Research funders have also begun to take an interest in policies relating to software [79]. Furthermore, efforts have been made to adapt the FAIR principles, originally designed for data, to the specificities of software [80; 81].

Although open source software emerged in the 1980s, it has only recently been addressed in open science policies.

Despite these advances, the complexity of the role of software in research has yet to be fully addressed in open science policies. Research software is essential for the reproducibility of research, particularly in data processing workflows. A mere change in software version can significantly alter results, with consequences for the validity of the work. Consequently, it is important to ensure the preservation and long-term sustainability of research software used by the research community. This raises questions regarding funding models, governance, and resource pooling.

However, the current context does not always allow for the maintenance, development and reuse of research software. Technical and legal support for researchers developing software remains inadequate. Moreover, although all scientific disciplines produce research software, recognition of software contributions in scientific careers remains all too often insufficient. Rigorously

citing software, as is done with published works, requires unique IDs, citation standards, and the long-term preservation of software. Lastly, collaborative development platforms (forges) play a central role. However, the fragmentation of forges in France and the strong international appeal of proprietary forges raise specific questions regarding control and sovereignty.

Although all research disciplines produce research software, recognition of software contributions in academic careers remains all too often insufficient.

II.1.6. RESULTS OF CLINICAL TRIALS ARE NOT SYSTEMATICALLY MADE PUBLIC

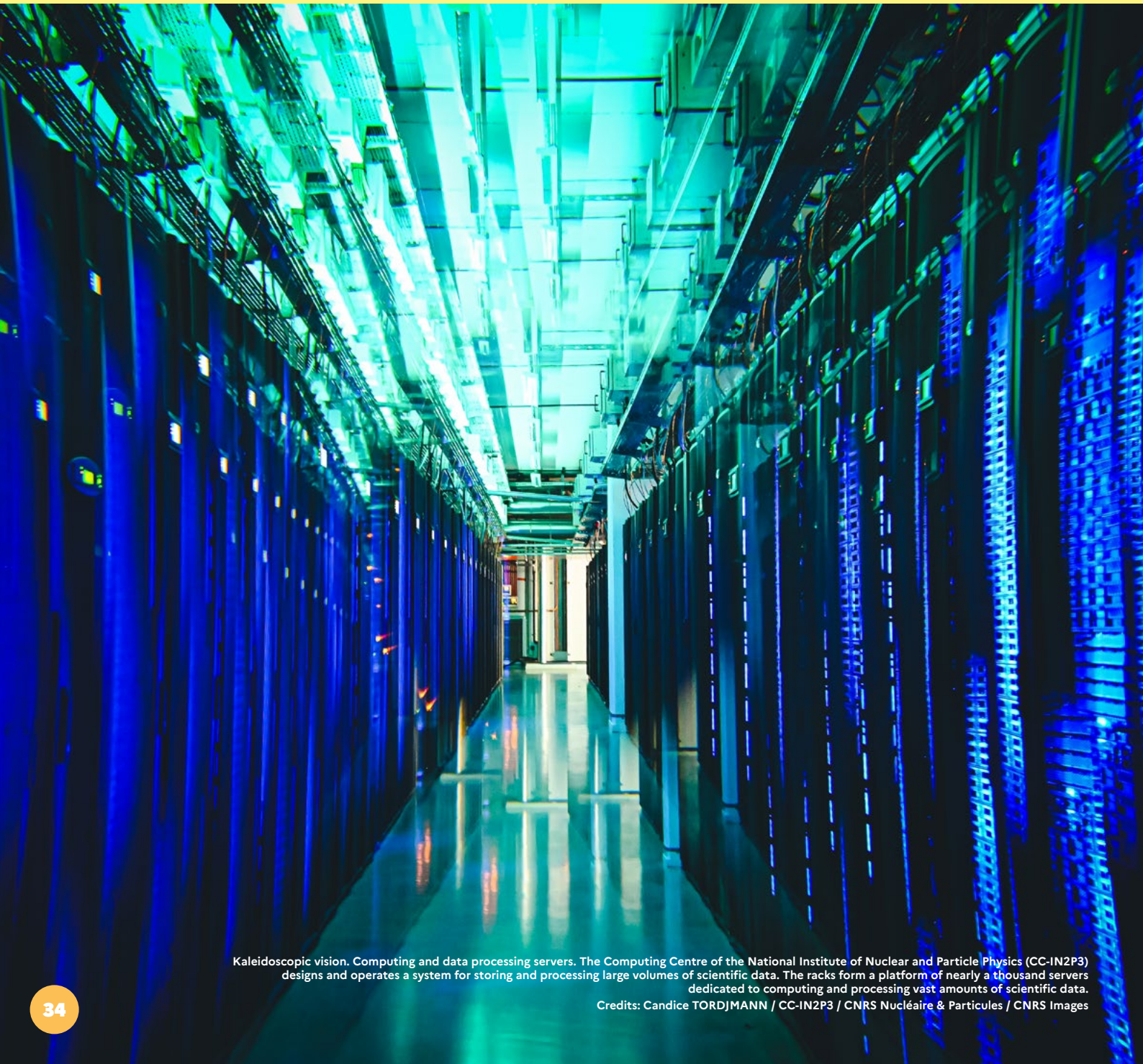
In the field of clinical trials, publication bias refers to the tendency to publish positive results for medical treatments more frequently than negative results. This bias has been documented for decades and constitutes a direct violation of the principle that the results of research involving human beings must be made public, regardless of their outcome [82]. Publication bias undermines the quality of meta-analyses (see I.2), leads to clinical or public health decisions based on incomplete information, results in inefficient allocation of funding, and ultimately contradicts the principles of scientific integrity.

Requirements for the registration of studies and the posting of results on public registries were strengthened in the United States in 2007 [83] and in Europe in 2014 [84]. The 2014 European regulation, in particular, makes it mandatory to disclose results within one year following the end of the trial, in addition to any scientific publication. These legal obligations are supplemented by concrete recommendations for implementation from the International Committee of Medical Journal Editors (ICMJE), which brings together publishers specialised in medical research [85], and from the World Health Organization [86].

The systematic reporting of clinical trial results, even when deemed negative, is crucial for science, integrity, and public health.

Despite the adoption of these regulations and the implementation of best practices starting in the early 2000s [87], no European country publishes clinical trial results in a satisfactory manner. The systematic registration of trials prior to their start is now widely observed. However, the reporting of results rarely exceeds the 50% threshold [88].

II.2. OPPORTUNITIES AND NEW CONTEXTS FOR OPEN SCIENCE



Kaleidoscopic vision. Computing and data processing servers. The Computing Centre of the National Institute of Nuclear and Particle Physics (CC-IN2P3) designs and operates a system for storing and processing large volumes of scientific data. The racks form a platform of nearly a thousand servers dedicated to computing and processing vast amounts of scientific data.
Credits: Candice TORDJMANN / CC-IN2P3 / CNRS Nucléaire & Particules / CNRS Images

II.2.1. RESEARCH ASSESSMENT, A MAJOR DRIVER FOR THE EVOLUTION OF PRACTICES IN SUPPORT OF OPEN SCIENCE

Opening science means opening its processes and outputs, from publications to associated data, along with the software produced. For these outputs to be reused, they must be documented and contextualised, which requires planning from the very outset of the research process. Researchers will only prioritise the efforts required to make science more open if they are recognised as a fully-fledged research contribution.

This institutional recognition has seen major advances: since 2021, the European funding programme Horizon Europe has included open science as a criterion of excellence, rather than a criterion of impact [89], which acknowledges that open science must be integrated at the heart of the research process, not solely at the downstream stage of communicating results. The Council of the European Union, under the French Presidency of the European Union, "emphasises that applying Open Science principles should be appropriately rewarded in researchers' careers" [90, p.4].

Recognising the implementation of open science principles in research assessment.

These conclusions led to the creation of the Coalition for Advancing Research Assessment (CoARA). This international consortium of research institutions, funders, and research evaluators promotes the qualitative assessment of researchers and responsible use of quantitative indicators. To enhance the qualitative dimension of individual assessment, it is essential to open research outputs – publications, data, software, protocols – so that they can be subjected to rigorous scrutiny by evaluators and, more broadly, by the scientific community.

In order to make assessment more transparent, the Council also invited Member States to "promote the independence, openness, reproducibility and transparency of the data" [90, p.7]. It is with this objective in mind that the Barcelona Declaration on Open Research Information was launched in 2024 [91].

Making assessment more qualitative and transparent by opening both research outputs and information about the research.

II.2.2. A EUROPEAN AND INTERNATIONAL OPPORTUNITY

Given that research operates within an international context, open science policies must also be implemented internationally and should not be geographically confined to certain institutions or countries. To this end, the transformation brought about by open science must be the subject of international convergence.

With this in mind, an international consensus has been established by research stakeholders worldwide, and a process of dialogue and convergence is still ongoing at a high level. This work has been carried out through declarations issued by research institutions [92; 91], but also at the national and multilateral level. In particular, the European Union has played a significant role, with three Council of the European Union Conclusions [90; 93; 94]. At the global level, there have been two major milestones: the OECD Recommendations concerning research data [76; 77] and the UNESCO Recommendation on Open Science [95].

One of the main aspects of international dialogue is establishing common principles regarding assessment criteria, in order to promote the adoption of open science practices [90; 96]. An international landscape in which assessment criteria are too divergent or contradictory would create confusion.

International convergence also represents an opportunity with regard to digital services. It is crucial to enable data exchanges and the establishment of an ecosystem connecting publications, data, software, authors, and institutions. In accordance with the FAIR principles, the adoption of international unique persistent identifiers (PID), as well as international norms and standards, ensures the traceability, visibility and interoperability of all research outputs. The European Open Science Cloud (EOSC) represents an opportunity for pooling resources, enabling reliable and transparent management of research outputs, and is fully aligned with global research collaborations.

The international development of open science also relies on the work of networks of specialised stakeholders, actively working to align public policies with the needs of discipline-specific communities (Research Data Alliance, Research Software Alliance, European Diamond Capacity Hub, etc.). This also involves the development of specific structural initiatives on a continental or global natural scale (Open Science Monitoring Initiative, Coalition for Advancing Research Assessment, Confederation of Open Access Repositories, Global Research Initiative on Open Science, Open Research Europe, Coalition S, etc.).

The transformation brought about by open science must be the subject of international convergence.

II.2.3. ARTIFICIAL INTELLIGENCE AND OPEN SCIENCE

The development of what is known as artificial intelligence (AI) raises the question of how this technology aligns with open science policies. AI has led to major scientific breakthroughs [97] and offers scientific prospects in numerous fields. However, it raises many new questions.

In response to the challenges posed by AI, rather than restricting access to science, it is preferable to strengthen open science practices and principles.

→ *Open source vs Open weights*

Often used as a "black box", AI raises issues of traceability and reproducibility of results. The use of open source AI environments can increase the transparency and reproducibility of results, being less opaque than proprietary environments. To leverage the benefits of open

source fully in the field of AI, developers must enjoy the same freedoms as with traditional open source software: the ability to use, modify, share, and redistribute, without geographic restrictions or limitations on use. For academic research, transparent access to models, training data and methods is of particular importance, as it enables results to be reproduced, systems to be improved, previous work to be built upon, and thus unnecessary duplication to be avoided. However, open source AI remains less widespread at present than "open weights" AI, which generally only releases the model and its weights under an open source licence, sometimes even under a restricted licence. This situation calls for a clarification of the various AI models that exist.

→ *Scientific integrity and academic publishing*

Generative artificial intelligence (GenAI) raises increasing issues regarding scientific integrity, as it can facilitate problematic or even fraudulent practices. Two key examples of this are "paper mills", which employ GenAI to produce fake articles, and the use of "tortured phrases", in order to industrialise and conceal plagiarism. However, these same technologies can also be used to detect fraud, provide translations, carry out spelling and grammar checks, etc. Good practices relating to AI are emerging both in the European Code of Conduct for Scientific Integrity and in the academic publishing sector **[98; 99; 100]**. They must also be incorporated into open science policies.

→ *A profound shift in uses*

The rise of GenAI also raises challenges in terms of volume and flow, particularly for the publishing system and calls for projects, which are overwhelmed by massive influxes of submissions **[101; 102]**. Furthermore, GenAI services pose new challenges for open science platforms such as open archives, publishing platforms, and data repositories. Firstly, their servers are overwhelmed by bots generating simultaneous requests from tens of thousands of different IP addresses, sometimes threatening service continuity. Secondly, GenAI captures a significant share of public attention, resulting in a decline in usage for these platforms. This shift raises questions about how to not be cut off from the audiences emerging from these new practices and how to measure a broader diversity of uses. Finally, this captured attention often distances readers from the original sources, which are rarely cited, thereby raising an additional issue for the recognition of scientific information.

→ *Opt-out*

In addition, GenAI must operate in strict compliance with copyright law and respect the opt-out mechanisms provided by European legislation for text and data mining. This issue highlights the importance of rights assignment agreements and dissemination licences.

→ *Citing academic sources*

GenAI is now a widely used source of information in society. Since it relies mainly on open data available online, the free dissemination of reliable and validated research results helps increase the quality of the information it produces. This does not, in itself, eliminate the risk of generating fabricated information, but it does generally improve information sources and encourages a diversification of stakeholders and AI solutions developed. However, GenAI often lacks transparency about the origin of the information it shares. It is therefore important to promote explicit attribution of sources, in accordance with the licences chosen by scientists.

AI has led to major scientific breakthroughs and offers scientific prospects in numerous fields. It is also employed in questionable scientific practices.

In response to the challenges posed by AI, rather than restricting access to science, it is preferable to strengthen open science practices and principles. This helps promote the development of open, transparent, reproducible, and trustworthy AI. Use of persistent identifiers, in particular, makes it possible to trace the origin of information. On a subject as dynamic and complex as this, a pragmatic approach is essential, by documenting developments and practices in order to adapt policies accordingly.

II.2.4. OPEN SCIENCE, INNOVATION AND PROTECTION OF RESEARCH

French government policies regarding the development of open science, innovation, and protection for research are sometimes considered to be contradictory. Open science policies, which aim to make research results and methods as open as possible, might seem to enter into conflict with the goal of transferring public research into the development of economic activity, a process which often involves forms of exclusivity and confidentiality. Similarly, open science policies would appear to conflict with the aim of protecting research from attempts at foreign interference, safeguarding it against appropriation (intrusion, intellectual property theft, etc.) and the risk of misuse for malicious purposes, as well as information manipulation.

However, the first texts of open science policies concerning research data, in particular the OECD Recommendation [76], have been unambiguous from the outset. They propose the principle of open data by default, while outlining the applicable legal constraints regarding intellectual property, liability, and security. The principle of "*as open as possible, as closed as necessary*" [103] encapsulates this ambition. This universal principle has been widely adopted and confirms the importance of data protection for open science.

As open as possible, as closed as necessary.

However, the difficulty arises from the complexity of implementing the principle of "*as open as possible, as closed as necessary*". The choice of the degree of openness for data must result from a reasoned decision, aiming to achieve a proper balance between knowledge protection and dissemination.

It should be noted that the mode of dissemination of a research article does not alter the protection of its content: it is public, whether available by subscription or open access. The question therefore arises at an earlier stage. It is particularly important to choose the appropriate moment to communicate results, so that researchers and institutions can effectively manage the protection of innovation, for example by filing a patent. Patents are mechanisms that are fully aligned with open science policies. They make inventions openly accessible to the public, while protecting them through intellectual property rights. Here, mastering the timing is crucial: research articles must be published after the patent has been filed, and not before. The timing of sharing data associated with research is also important. It is often most appropriate to do this when publishing results, as it supports the conclusions presented and facilitates their reproducibility.

Patents are mechanisms that are fully aligned with open science policies.

In France, protection of research is ensured in particular by the System for the Protection of the Scientific and Technical Potential of the Nation (PPST). This regulatory framework is designed to protect the most sensitive knowledge, expertise, and technologies within research institutions from misappropriation, the diversion or misuse of which could compromise the France's fundamental interests [104].

In an unstable geopolitical context, the protection of research is essential in order to achieve the objective of scientific and technological research in service of French and European sovereignty. For the first time, the National Strategic Review has set out a dedicated objective for research [105, p. 81]. This objective focuses in particular on breakthrough technologies, the PPST, and foreign interference in higher education and research.

Research protection policies have been gradually strengthened, particularly within the G7 [106] and the European Union [107]. These policies are interconnected with open science policies, forming two complementary pillars in a comprehensive approach aimed at promoting science and safeguarding scientific integrity. From its very title, the "G7 Best practices for secure and open research" report highlights the need to reconcile these two imperatives, by promoting an open approach that respects privacy, security and ethics while ensuring the protection of ideas, research findings and intellectual property [108].

Reconciling the imperative of protecting research with the aspiration for open science.

Open science, innovation, and research security stakeholders are increasingly required to work together in order to promote the movement of knowledge under conditions that combine protection, openness, and valorisation.

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III. STRATEGIC OBJECTIVES

The French Open Science Strategy has eight strategic objectives, each broken down into actions, measures and indicators, within the framework of a four-year action plan.

SO1 – ENCOURAGE A SHIFT IN PRACTICES TO MAKE OPEN SCIENCE THE DEFAULT APPROACH

Open science represents a significant transformation in the way research results are produced, shared, and published. Widespread adoption of open science requires a change in practices, both among researchers and within institutions. Today, despite significant progress in most disciplines and institutions, numerous obstacles remain. For open science to become the default approach, action must be taken on several fronts simultaneously. It is essential to improve the recognition of open science practices in research assessment and to develop open science skills through support mechanisms and training programmes. It is also important to promote reproducible research, to issue recommendations regarding AI, particularly open source AI, and to engage the research community around open science.

SO2 – CONSOLIDATE THE GOVERNANCE AND INSTRUMENTS OF OPEN SCIENCE POLICY

Developing open science policy requires effective national coordination. This will be based on existing open science bodies, particularly the French Committee for Open Science and its working groups. It also requires the continued development of monitoring tools, in order to measure progress achieved and identify areas for improvement. Open science policy must be evidence-based. It will draw on research into open science, particularly to identify effective policies, to better understand researchers' practices, and to assess the impact of open science on research and society. Finally, open science policy requires targeted and regular communication towards the higher education and research community, both in France and abroad.

Aerial view of the Laue-Langevin Institute – ILL (Grenoble, France)
Credits: Pierre Jayet / ESRF / ILL

Adélie penguin colonies at Dumont d'Urville Station, Antarctica
Credits: Bruno JOURDAIN/IPEV/LGGE/CNRS Images

SO3 – REINFORCE THE ECOSYSTEM OF OPEN SCIENCE SERVICES AND INFRASTRUCTURES, PILLARS OF ACADEMIC SOVEREIGNTY

Research services and infrastructures play a key role in disseminating best practices and concretely implementing open science policies. Open science policy relies on these services and infrastructures, both nationally and internationally, and aims to consolidate their economic models, develop open science practices, adopt recognised standards, and establish impact measurement tools. Said infrastructures will strengthen academic sovereignty and address challenges around transparency, pooling, interoperability, and the quality of research.

SO4 – CONSOLIDATE FRANCE'S POSITION WITHIN THE EUROPEAN AND INTERNATIONAL OPEN SCIENCE LANDSCAPE

To fully embed open science within an international context, it is essential to reinforce the global ecosystem that connects publications, data, and source code. This also entails embedding national policy within the international framework established by UNESCO, and participating in international discussions and initiatives led by the European Union, the G7, the OECD, and the G20. Lastly, this approach requires active participation in international projects relating to services and knowledge around open science.

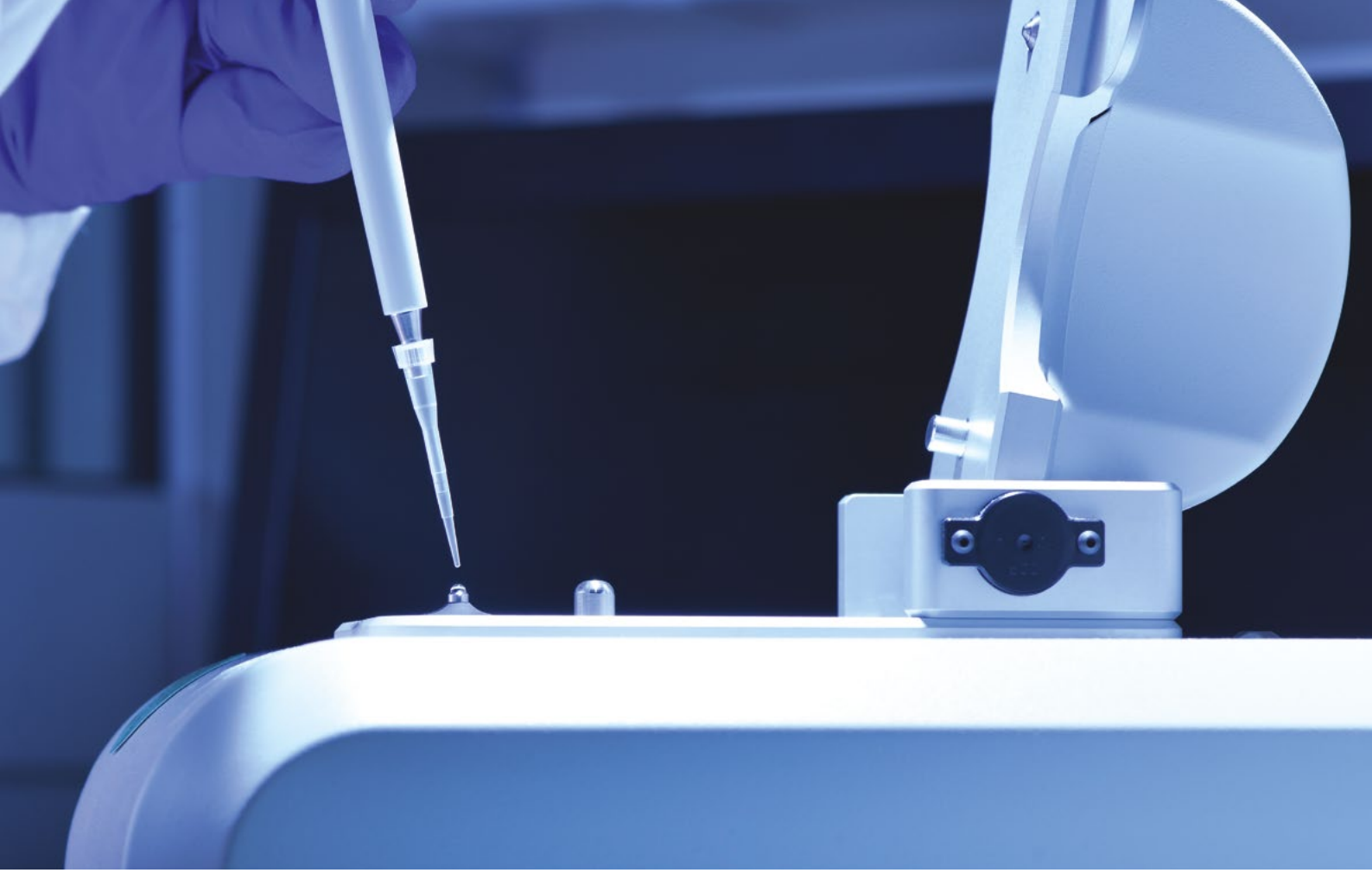
SO5 – STRUCTURE AND SUPPORT OPEN, RELIABLE AND HIGH-QUALITY ACADEMIC PUBLISHING

Pooling resources and cooperation will be key to structuring open academic publishing in France. It is also important to contribute to the diversity and balance of the various open academic publishing models. Regardless of the chosen open access model, rigorous editorial processes remain imperative to ensure the quality and reliability of research publications. The national open archive HAL will play a key role in the sovereign preservation of French academic output. To amplify the impact of French research, the discoverability of publications must be increased, both for the academic community and for society as a whole. This enhanced visibility will also help combat misinformation.

SO6 – CONSOLIDATE THE STRUCTURING OF OPEN AND SHARED RESEARCH DATA IN ACCORDANCE WITH THE FAIR PRINCIPLES

To make research data more open and shared, the FAIR principles (Findable, Accessible, Interoperable, and Reusable) must continue to be implemented. In this context, the national infrastructure Recherche Data Gouv, which works to support the sharing and opening of research data, will continue to play a structural role in supporting researchers and providing services. Making it easier for researchers to deposit data and increasing its discoverability will maximise its reuse by the research community and beyond.

"Blue - Bleu (Bahamas)" The Atlantic Ocean centred on the Bahamas, photographed from the ISS by ESA astronaut Thomas Pesquet (2017).
Credits: ESA / NASA | ESA Standard Licence



Quantitative measurement of nucleic acids and verification of their purity level.
The microvolume spectrophotometer enables the assessment of nucleic acid concentration using a volume as small as 0,5 µL.
Credits: A.Aubert / CEA

SO7 – INCREASE THE OPENNESS AND VALORISATION OF SOURCE CODE AND SOFTWARE FROM RESEARCH PROJECTS

Source code and software resulting from research are essential components of reproducible and collaborative open science. Making them open requires improving their discoverability and promoting their reuse. The objective is also to provide a sovereign software development environment (forge), made available to the academic community, with a focus on resource pooling and attractiveness. This environment must be complemented by efforts to archive global software assets on Software Heritage. Lastly, open science policy relating to software must be backed by a network providing support to higher education and research professionals involved in software development (teams, researchers, engineers, etc.), in order to assist them in their development, maintenance and dissemination activities.

SO8 – ENSURE THE TRANSPARENCY OF CLINICAL TRIALS

Under European regulation, it is mandatory to communicate the results of clinical trials, in order to face publication bias. For these results to be systematically communicated, academic sponsors will be accompanied. The monitoring of indicators that measure the rate of results reporting will make it easier to identify areas for improvement and track progress. At the national level, facilitating the structuring and posting of clinical trial results will help ensure that structured data is uploaded to trial registries, optimising its reuse and accessibility. Furthermore, it will be essential to participate in discussions at the European Union level aimed at increasing the transparency of clinical trials on a European scale.

IV. ACTION PLAN (2026-2029)

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Key:

- → *SO: Strategic Objective*
- → *A: Action*
- → *M: Measure*
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The French Open Science Strategy is supported by four-year action plans. A new action plan will be established for the 2030-2033 period.

SO.1 ENCOURAGE A SHIFT IN PRACTICES TO MAKE OPEN SCIENCE THE DEFAULT APPROACH

SO1.A1 RECOGNISE OPEN SCIENCE IN ASSESSMENT

SO1.A1.M1 Recognise open science in the assessment of researchers, research support staff, and institutions

In particular, recognise: open science skills; source code as a contribution to research; the opening, sharing and reuse of research data, within the limits of the principle "as open as possible, as closed as necessary" and in accordance with the FAIR principles; reporting of negative results when relevant.

SO1.A1.M2 Continue to support the Coalition for Advancing Research Assessment (CoARA)

CoARA was created in the continuity of the Council conclusions on "Research assessment and Open Science" under the French Presidency (2022) [1]. Monitor CoARA and its French National Chapter. Monitor action plans published in France by institutions.

SO1.A2 DEVELOP AND PROMOTE OPEN SCIENCE SKILLS

SO1.A2.M1 Continue to grant the three open science awards for research data, open source research software, and PhDs

These awards were established as part of French open science policy, and are intended to recognise, encourage and develop good practices in open science.

SO1.A2.M2 Continue a policy of publishing guides dedicated to open science, as a complement to the open science training offered by institutions

The main existing guides will be updated in line with developments in the open science landscape, particularly the Passports for Open Science, which have enjoyed significant success and international recognition.

New guides and recommendations will be published in line with developments in open science, for example, on the topic of licences in the fields of publications, data and software, and on the complementarity between open science, protection for research and scientific integrity.

SO1.A2.M3 Support the development and structuring of a range of open science training programmes in France

Encourage the development of a range of training programmes at Master's and PhD level, particularly in accordance with the decree of 26 August 2022 [2]. Contribute to increasing the visibility of open science training tools, particularly through the National Network of Doctoral Colleges (RNCD), the national doctoral platform [3], and the structures providing training programmes.

Support joint initiatives for developing online training (such as MOOCs) or in-person training, for example, through the URFIST network or other mechanisms such as Callisto, DoRANum, etc.

[1] https://data.consilium.europa.eu/doc/document/ST-10126-2022-INIT/fr/pdf
[2] https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000046228965
[3] https://doctorat.gouv.fr/

SO1.A3 ENCOURAGE REPRODUCIBLE RESEARCH

SO1.A3.M1 Support the French Network for Reproducible Research [4]

Support the French Network for Reproducible Research at the national level and encourage its integration into the Global Federation of Reproducibility Networks [5], particularly by helping structure the landscape, the methods, and the terminology of reproducible research.

SO1.A3.M2 Encourage initiatives in the field of reproducible research in France

Produce guides and recommendations dedicated to reproducible research. Promote meetings around reproducible research.

SO1.A4 DEVELOP RECOMMENDATIONS ON ARTIFICIAL INTELLIGENCE WITHIN AN OPEN SCIENCE CONTEXT

SO1.A4.M1 Promote a transparent and open source approach in the field of AI

The French Committee for Open Science will promote the highest possible level of transparency in the use of AI for scientific research. It will promote open source AI systems that go beyond the "open weight" level in terms of transparency. It will also encourage the adoption of technical solutions to protect platforms and copyright in an AI context.

SO1.A4.M2 Structure monitoring, research, and possibly experimental activities around best practices in the use of AI within an open science context, with the aim of formulating recommendations

This work will be carried out within the French Committee for Open Science or other relevant bodies, particularly dealing with issues of scientific integrity, publishing, data, and software.

SO1.A5 ENGAGE THE RESEARCH COMMUNITY THROUGH EVENTS THAT BRING PEOPLE TOGETHER

SO1.A5.M1 Create an "Open Science Month"

Promote the development and visibility of scientific, educational and awareness-raising events focused on open science within the various scientific and professional communities of higher education and research through the creation of an "Open Science Month". This month will broaden the scope of the International Open Access Week, which has existed for many years but is limited to the openness of publications, and will be coordinated with "The Spring of Data". This national event could, in time, be developed into an international event.

SO1.I Indicators

SO1.I1 French Open Science Monitor (BSO) indicators on open access publications, data sharing, software, and reporting of clinical trials results (general indicators)

SO1.I2 100% of 2026 CoARA member institutions will have adopted action plans (target)

SO1.I3 Annual organisation of the Open Science Awards (milestone)

SO1.I4 List of open science guides published (new or updated) (indicator)

SO1.I5 Number of members in the French Reproducible Research Network (indicator)

SO1.I6 Number of events under the "Open Science Month" label (indicator)

[4] https://www.recherche-reproductible.fr/
[5] https://www.ukrn.org/global-networks/

SO.2 CONSOLIDATE THE GOVERNANCE AND INSTRUMENTS OF OPEN SCIENCE POLICY

SO2.A1 DRAW ON THE FRENCH COMMITTEE FOR OPEN SCIENCE AND THE FRENCH OPEN SCIENCE FUND (FNSO)

SO2.A1.M1 Continue the work within the bodies of the Committee for Open Science

The Committee is composed of a Steering Committee, which brings together higher education and research institutions, a Permanent Secretariat for Open Science, responsible for preparing the steering work, and working groups, providing expertise. In its work, the Committee may involve actors in scientific integrity (such as the French Office for Research Integrity – OFIS) and in research security (such as the Senior Official for Defence and Security – HFDS), in order to better take these dimensions into account within the framework of open science policy.

SO2.A1.M2 Develop the activities of the French Open Science Fund (FNSO)

The FNSO is mainly involved in funding targeted actions or calls for projects, according to identified needs.

SO2.A2 CONTINUE THE DEVELOPMENT OF OPEN SCIENCE MONITORING MEASURES (FRENCH OPEN SCIENCE MONITOR)

SO2.A2.M1 Continue the development of the French Open Science Monitor (BSO)

The BSO is an essential tool for monitoring practices, observing, and measuring the implementation of open science. Its work is part of the Open Science Monitoring Initiative (OSMI).

SO2.A2.M2 Encourage the monitoring of open science at the local level

Encourage institutions to establish an open science dashboard, with indicators regarding various dimensions and practices of open science, in accordance with best practices (BSO, OSMI).

Continue to provide institutions with a "ready-to-use" service for adapting the French Open Science Monitor to their own context.

SO2.A2.M3 Conduct a survey to establish a four-year review of open science in France

This survey will provide a comparative overview following the survey conducted in 2024 among higher education and research institutions.

SO2.A3 DEVELOP RESEARCH ON OPEN SCIENCE AND THE ASSESSMENT OF THE IMPACT OF OPEN SCIENCE

SO2.A3.M1 Continue to support the Global Research Initiative on Open Science (GRIOS)

This international initiative aims to provide systematic reviews of existing research on open science and to formulate public policy recommendations based on the findings of this research.

SO2.A3.M2 Encourage research at national and international level on open science practices, challenges, and impacts

This research aims to better understand and document the processes at work in open science practices, including their impact in the academic sphere, the economy, and society.

SO2.A4 DEVELOP COMMUNICATION ON OPEN SCIENCE

SO2.A4.M1 Continue communication efforts through Ouvrirlascience.fr

Update the Ouvrirlascience.fr website with national and international news on open science, as well as the work of the French Committee for Open Science.

SO2.A4.M2 Undertake communication initiatives

Promote the objectives and benefits of open science through communication initiatives, particularly online, aimed at the research community.

SO2.I Indicators

SO2.I1 BSO indicator regarding institutions that have adopted an open science policy (general indicator)

SO2.I2 List of outputs from the Committee for Open Science (indicator)

SO2.I3 List of projects and initiatives funded by the FNSO (indicator)

SO2.I4 BSO: Annual update of monitoring indicators (milestone)

SO2.I5 Indicators derived from the survey of higher education and research institutions, at four-year intervals, on open science policies (indicators)

SO2.I6 List of studies and outputs by GRIOS

SO2.I7 Figures regarding visitors to Ouvrirlascience.fr (indicators)

SO.3 REINFORCE THE ECOSYSTEM OF OPEN SCIENCE SERVICES AND INFRASTRUCTURES AS PILLARS OF SCIENTIFIC SOVEREIGNTY

SO3.A1 SUPPORT AND STRUCTURE OPEN SCIENCE SERVICES AND INFRASTRUCTURES

SO3.A1.M1 Mobilise various sources and models of funding

Mobilise various national, European, and international funding sources and models to support open science services and infrastructures. In particular, it is essential to ensure that they adapt to developments in technology and uses, and to explore ways of retaining staff with very high-level technical and scientific expertise.

SO3.A1.M2 Develop consortium-based approaches for managing and funding services and infrastructures

These approaches make it possible to pool efforts and to make services and infrastructures more sustainable, as well as to participate in their governance.

SO3.A1.M3 Undertake efforts to promote coordination and dialogue

Increasing dialogue between open science services and infrastructures will enhance their capacity for cooperation, monitoring, and innovation.

SO3.A2 ENCOURAGE THE ADOPTION OF OPEN SCIENCE PRACTICES BY NATIONAL RESEARCH INFRASTRUCTURES

SO3.A2.M1 Encourage the formalisation of an open science policy for the infrastructures listed in the National Roadmap for French Research Infrastructures

In particular, the open science policy should address compliance with the FAIR principles and best practices in open science.

SO3.A2.M2 Ensure that infrastructures are aligned with recognised standards

Support certification in data management (e.g. CoreTrustSeal) and compliance with accessibility standards (RGAA), which serve both to build trust in services and to improve the user experience.

SO3.A3 ENCOURAGE THE DEVELOPMENT OF MEASUREMENTS OF IMPACT FOR OPEN SCIENCE INFRASTRUCTURES

SO3.A3.M1 Encourage the development of usage statistics

Encourage the development of usage statistics for research data in accordance with current standards (notably those recommended by Make Data Count).

Encourage the development of usage statistics for publications in accordance with current standards (particularly the COUNTER standard).

SO3.A3.M2 Carry out exploratory work on impact indicators

These indicators are intended to be shared among open science infrastructures.

SO3.I Indicators

SO3.I1 Number of active users of services and infrastructures or number of consultations (general indicators)

SO3.I2 Number of French open science platforms and infrastructures that have received certification (in particular CoreTrustSeal) (indicator)

SO3.I3 Adoption of measurements of use by French open science platforms and infrastructures (milestone)

SO.4 CONSOLIDATE FRANCE'S POSITION WITHIN THE EUROPEAN AND INTERNATIONAL OPEN SCIENCE LANDSCAPE

SO4.A1 BUILD AN ECOSYSTEM LINKING PUBLICATIONS, DATA AND SOURCE CODE

SO4.A1.M1 Support the development of of authoritative open bibliographic databases

Promote the development of tools such as OpenAlex, used by numerous institutions in France and by the French Open Science Monitor. Encourage user institutions to contribute to its economic model.

SO4.A1.M2 Encourage the implementation of the Barcelona Declaration on Open Research Information

Encourage the higher education and research sector to make research information openly available and to use open bibliographic repositories.

SO4.A1.M3 Support the use of persistent identifiers (PID)

Promote the use of persistent identifiers in accordance with the recommendations of the Committee for Open Science, particularly with regard to publications (Crossref DOI), data (DataCite DOI), software (SWHID and DOI), organisations (ROR) and researchers (ORCID).

SO4.A2 PARTICIPATE IN THE OPEN SCIENCE LANDSCAPE AT THE EUROPEAN AND INTERNATIONAL LEVEL

SO4.A2.M1 Align French national policy with the UNESCO Recommendations on Open Science

Monitor the implementation of these recommendations.

SO4.A2.M2 Ensure France's participation in European and international discussions and initiatives concerning open science

Participate in discussions on open science within international bodies (UNESCO, OECD, G7, G20, European Union bodies, bilateral and intercontinental relations, etc.).

Participate in international thematic networks (Research Data Alliance, Research Software Alliance, etc.).

Contribute to the international governance of persistent identifiers (PID).

SO4.A2.M3 Continue to support and participate in the Council for National Open Science Coordination (CoNOSC) [6]

CoNOSC is the network of national open science coordinators in Europe. Its aim is to encourage international dialogue and to share best practices in open science policy.

[6] https://conosc.org/

SO4.A3 CONTRIBUTE TO INTERNATIONAL OPEN SCIENCE INITIATIVES

SO4.A3.M1 Integrate French open science infrastructures in the European Open Science Cloud (EOSC)

Establish a national EOSC node. This will increase the involvement of French stakeholders in this cloud, improve the services provided to research communities, and bring together the main French open science services.

SO4.A3.M2 Continue the development of the Open Science Monitoring Initiative (OSMI) [7]

Initially a French initiative, OSMI is now being developed in collaboration with UNESCO and other French and international partners. It aims to define principles for monitoring open science indicators and harmonising them at the international level.

SO4.A3.M3 Develop the work of the Global Research Initiative on Open Science (GRIOS) [8]

GRIOS is an international initiative, aimed at developing open science policy based on the findings of scientific research. It aims to provide reviews of existing research on open science and to formulate public policy recommendations based on the findings of this research.

SO4.A3.M4 Continue to support the international open science infrastructures that France needs

Support initiatives that enable the structuring and coordination of contributions to open science infrastructures, such as the Global Sustainability Coalition for Open Science Services (SCOSS) [9].

Encourage contributions from institutions that use open science infrastructures.

SO4.A3.M5 Continue to support Transparency to Sustain Open Science Infrastructures (TSOSI) [10]

TSOSI highlights support initiatives for open science infrastructures. It identifies the organisations that fund open science infrastructures, as well as the infrastructures that receive funding. By making these financial flows more visible, TSOSI aims to contribute to greater transparency of the support to open science infrastructures, to provide better recognition for institutions that contribute to theseinfrastructures, and to encourage other institutions to do likewise.

SO4.A3.M6 Contribute to European and international initiatives aimed at developing open access publishing without publication fees

Promote international coordination for the development of open access publishing without publication fees (known as "Diamond") as proposed by UNESCO, encourage resource pooling mechanisms at the European level (European Diamond Capacity Hub, OPERAS), and support Open Research Europe (ORE), the publishing platform hosted at CERN.

SO4.I Indicators

SO4.I1 Establishment of a French EOSC node (milestone) (general indicator)

SO4.I2 Number of French higher education and research institutions supporting OpenAlex (indicator)

SO4.I3 Number of services and infrastructures that have adopted persistent identifiers (PID), in accordance with the recommendations of the Committee for Open Science (indicator)

SO4.I4 Number of institutions supplying data to the TSOSI database (infrastructures and institutions, in France and abroad) (indicator)

SO4.I5 Number of publications on Open Research Europe (ORE) (indicator)

[7] https://open-science-monitoring.org/
[8] https://www.grios.org/
[9] https://scoss.org/what-is-scoss/
[10] https://tsosi.org/

SO.5 STRUCTURE AND SUPPORT OPEN, RELIABLE AND HIGH-QUALITY ACADEMIC PUBLISHING

SO5.A1 SUPPORT, STRUCTURE AND MODERNISE FRENCH OPEN ACADEMIC PUBLISHING

SO5.A1.M1 Encourage the rationalisation of the landscape by reinforcing pooling initiatives

Promote and encourage the pooling of editorial dissemination platforms. In particular, work towards coordination and pooling in the field of STM publishing.

Use the Métopes research infrastructure to structure editorial workflows.

SO5.A2.M2 Support French infrastructures contributing to open academic publishing

OpenEdition, Métopes, Episciences, and Persée, which are included in the National Roadmap for Research Infrastructure, along with other major platforms such as the Centre Mersenne and Peer Community In (PCI), play a structural role in developing open academic publishing.

SO5.A1.M3 Promote cooperation between editorial structures and institutions in the field of academic publishing

Draw on the Alliance of French Public Academic Publishers (ALEF) as a tool to structure the French public publishing landscape, promote best practices, and foster the pooling of resources among public publishers.

0S5.A1.M4 Ensure a balance between private and public publishing

Use the Academic Publishing Observatory (OES – Observatoire de l'édition scientifique) to increase knowledge around scientific publishing and create the conditions for constructive dialogue between various stakeholders in the French academic publishing ecosystem, whether in public or private publishing.

0S5.A1.M5 Encourage the use of images in open access publications through the extended collective licence (Article 28 of the Research Programming Act)

Continue to implement the extended collective license for the use of copyrighted images in open access research publications and for non-lucrative purposes (Article 28 of the Research Programming Act).

SO5.A2 CONTRIBUTE TO THE DIVERSITY AND BALANCE OF OPEN ACADEMIC PUBLISHING MODELS

SO5.A2.M1 Work towards the gradual phase-out of unit-based payment for publication fees

The gradual phase-out of unit-based payment of per-article publishing charges (APCs) is a measure aimed at simplifying the administrative burden on authors and laboratories at the time of publication. It also enables negotiation at the level of an institution, a consortium of institutions, or at the national level. With this goal in mind, two avenues may be explored. 1) Strengthen the negotiation of publication fees within a collective, or even national, framework. 2) Explore the possibility of ultimately making publication fees ineligible in the framework of calls for proposals in public research funding.

SO5.A2.M2 Support a wide range of funding models for open academic publishing without publication fees

In particular, encourage "Subscribe to Open" models, "freemium" open access, and new consortium-based funding initiatives for open academic publishing (e.g. Open Journal Collective, KOALA).

SO5.A2.M3 Continue efforts to ensure transparency and documentation of the costs and expenditure associated with open access academic publishing

Conduct a new national study on publication fees in four years' time.

Conduct a study to document the production costs of open access journals, based on the model of the study on monographs carried out by the Scientific Publishing Observatory.

SO5.A3 PROMOTE EDITORIAL PROCESSES THAT ARE ATTENTIVE TO ISSUES OF QUALITY AND RELIABILITY IN PUBLICATIONS

SO5.A3.M1 Include editorial quality criteria in commercial negotiations with academic publishers

Promote the ongoing monitoring of agreements throughout their duration, in order to introduce penalty clauses or the withdrawal of articles based on the observed quality of published scientific content.

SO5.A3.M2 Encourage the establishment of labelling or certification criteria for editorial quality in France

In consultation with the ALEF, examine the possibility of adapting to the French context labelling or certification processes that have been successfully implemented in other contexts.

SO5.A3.M3 Encourage transparency in assessment processes for publications

Encourage the widespread adoption of displaying on journals or publishing platforms the list of experts engaged each year and the three key dates in the assessment process (submission, acceptance, publication).

Support experiments in open peer review, which involves publishing assessment reports at the same time as the articles. This practice has been notably implemented by Open Research Europe (ORE) platform.

SO5.A3.M4 Systematically provide structured access to data associated with publications, as far as possible

Encourage publishers to systematically require authors submitting their works to deposit the associated data in a trusted repository, either discipline-specific or, failing that, a general one such as Recherche Data Gouv.

Encourage the description of data associated with publications using structured metadata, in accordance with the FAIR principles, ideally planned for in advance in a data management plan, in order to facilitate its reuse.

SO5.A3.M5 Encourage publishers and researchers to publish registered reports

Under this model, the research question, working hypothesis, and methodology are peer-reviewed prior to obtaining the results of the research. Publishers undertake to publish the results, even if they prove to be negative, on the basis of this prior evaluation of the chosen research methodology.

SO5.A4 PROMOTE MORE TRANSPARENT EDITORIAL PROCESSES AND FOSTER SCIENTIFIC INTEGRITY

SO5.A4.M1 Publish a comprehensive set of recommendations in French relating to integrity issues in the field of publishing

Explore the possibility of translating the recommendations from the Committee On Publication Ethics (COPE) into French to facilitate their adoption by French publishers where appropriate.

SO5.A4.M2 Encourage post-publication research discussion

Encourage structured and accessible tools (such as PubPeer) that can centralise and disseminate post-publication corrections.

SO5.A4.M3 Document problematic editorial practices

Reinforce research and tools focusing on potentially problematic editorial practices (Retraction Watch, Problematic Paper Screener [PPS], etc.).

Encourage the adoption of services highlighting retractions (search engines, publishing platforms, open science tools), such as the CNRS Bibcheck tool.

SO5.A5 ENSURE THE OPENNESS, DISCOVERABILITY, AND SOVEREIGN PRESERVATION OF FRENCH RESEARCH PUBLICATIONS, NOTABLY THROUGH THE NATIONAL OPEN ARCHIVE HAL

SO5.A5.M1 Continue to support the development of the national open archive HAL

The goal of HAL is to archive full-text versions of all French research publications under open access, thereby ensuring sovereign preservation. For each institution, the archive serves as a key observatory for its publications. In HAL's next roadmap, specifically explore the following avenues: displaying the editorial status of publications (e.g. via badges), displaying Crossref DOIs for articles, enriching HAL with information from ORCID and vice versa.

SO5.A5.M2 Encourage French researchers to deposit the full text of publications in HAL

In order to move beyond the observed plateau in open access, promote the deposit of publications in HAL in open access, particularly in the form of preprints or under Article 30 of the French Digital Republic Act.

SO5.A5.M3 Encourage open access preprints as an open science practice

Preprints are intended to precede peer-reviewed publication, not to replace it. This practice increases the visibility and academic impact of French research. In particular, it can be part of the "publish, review, curate" (PRC) model.

SO5.A6 PROMOTE THE RESULTS OF RESEARCH ON WIKIPEDIA

SO5.A6.M1 Continue Wikipedia residencies in higher education and research institutions

One of the objectives of open science is to increase the visibility of research within society. Wikipedia is a key mediator between science and society. Wikipedia residencies help foster a culture of contributing to Wikipedia among faculty members and students. They provide a practical means of enriching Wikipedia with scientifically reliable sources and help face misinformation.

SO5.I Indicators

SO5.I1 BSO indicators on the percentage of open access publications and publication routes (general indicator)

SO5.I2 100% of French articles available open access (target)

SO5.I3 Indicators derived from the results of the third study on APCs

SO5.I4 Percentage of open access publications by economic model and by discipline (indicator)

SO5.I5 Adoption of an editorial quality charter by French academic publishers, offering the opportunity to consider a quality-based labelling process (milestone)

SO5.I6 100% of French articles deposited in the national open archive HAL (target)

SO5.I7 Number of contributions to Wikipedia as part of Wikipedia residencies by higher education and research institutions (indicator)

SO.6 CONSOLIDATE THE STRUCTURING OF OPEN AND SHARED RESEARCH DATA IN ACCORDANCE WITH THE FAIR PRINCIPLES

SO6.A1 DEVELOP RECHERCHE DATA GOUV, A SHARED, SOVEREIGN NATIONAL RESEARCH INFRASTRUCTURE

SO6.A1.M1 Strengthen the Competence Centres within the ecosystem

Continue to expand the network of Competence Centres within the Recherche Data Gouv ecosystem, whether they provide local support or offer specialised expertise in discipline-specific fields or training. This regional network will continue to expand, accompanied by targeted skill-building to better address the specific challenges of each discipline.

SO6.A1.M2 Strengthen the national trusted repository

The national trusted repository of Recherche Data Gouv is a piece of infrastructure shared by higher education and research institutions, hosted by certified data centres and based on an open source solution, providing French academic researchers with a secure and environmentally responsible solution for depositing and sharing their data.

SO6.A1.M3 Develop the catalogue of data

This Research Data Gouv catalogue lists all French research data that is accessible, whether hosted on the national repository or on trusted disciplinary repositories, serving as a privileged and unified access point to French research data.

SO6.A2 FACILITATE THE DEPOSIT AND DISCOVERABILITY OF DATA

SO6.A2.M1 Implement an AI-assisted deposit tool

This development aims to simplify the work of depositors and to significantly reduce the time required to deposit data, while maintaining precise, comprehensive descriptions in line with FAIR standards, thereby facilitating the movement and reuse of research data. This tool will analyse the documents associated with data (data management plans, articles, README files) and automatically fill out the deposit form. It will also take into account access management by the agents feeding the AI model.

SO6.A2.M2 Develop AI agents to enhance and harmonise descriptions of datasets

These tools, based on open source models tailored to users' needs, will align metadata with controlled vocabularies, incorporate discipline-specific information, and perform quality analyses to make descriptions more reliable.

SO6.A2.M3 Improve the discoverability of data in catalogues using AI

Facilitate hybrid searches by combining traditional filters and semantic understanding, so that users can explore data according to their needs, regardless of the language used.

Make it possible for the system to understand the meaning of queries and suggest related resources: publications, code, projects, and so on, thereby facilitating contextual discovery.

SO6.I Indicators

SO6.I1 **Indicators on research data sharing and its distribution by discipline (general indicator)**

SO6.I2 **Creation of a data catalogue on Recherche Data Gouv and number of harvested repositories (milestone)**

SO6.I3 **Deployment of AI-assisted functionalities for data deposit, curation and discovery in Recherche Data Gouv and within the French repository ecosystem (milestone)**

SO.7 INCREASE THE OPENNESS AND VALORISATION OF SOURCE CODE AND SOFTWARE FROM RESEARCH PROJECTS

SO7.A1 PROMOTE THE DISCOVERABILITY AND REUSE OF SOFTWARE

SO7.A1.M1 Develop a catalogue of open source software resulting from academic research in France

Scientific communities, laboratories and institutions need to identify and make their software assets visible, in order to encourage their reuse and facilitate their citation. This also fosters the emergence of new collaborations.

SO7.A1.M2 Encourage the use of standardised metadata vocabulary to describe software

The use of international standards such as CodeMeta increases the discoverability of software and constitutes good software documentation practice, in accordance with the FAIR principles (FAIR4RS and CODE beyond FAIR).

SO7.A2 DEVELOP A SOVEREIGN SOFTWARE DEVELOPMENT ENVIRONMENT

0S7.A2.M1 Support the creation of a national software forge for higher education and research

This national platform must be integrated within the international ecosystem. It will offer a sovereign development environment, as an alternative to proprietary forges. This piece of technical infrastructure will provide any research software with a state-of-the-art, accessible, sustainable forge, even if its institution does not have one. It will facilitate collaboration at all levels (laboratories, institutions, national, European, international). It will contribute to the quality of the code produced.

SO7.A3. DEVELOP A SUPPORT NETWORK FOR SOFTWARE DEVELOPMENT (OSPOs)

SO7.A3.M1 Support the creation of a network of Open Source Programme Offices (OSPOs) in higher education and research

Modelled after the Open Source Programme Offices (OSPOs) developed in the industrial sector, these centres will be responsible for providing legal and strategic support for the development of research software; offering advice on architecture and best practices for development and documentation; developing structured training and mentoring programmes to increase the skills of researchers and research staff; providing technical support throughout projects; monitoring technological developments; promoting the reuse and dissemination of research software; contributing to defining the governance and institutional strategy for software development; participating in the network of French OSPOs; and contributing to national and international partnerships and projects.

SO7.A4. SUPPORT SOFTWARE HERITAGE

SO7.A4.M1 Develop the preservation and archiving of software by continuing to support Software Heritage

Support and recommend Software Heritage for archiving research source code and software.
This global software archive is used not only to preserve these materials, but it also serves to generate knowledge and services, based on the vast wealth of information it contains.

SO7.A4.M2 Structure of Software Heritage's governance and encourage the development of services associated with the archive

Formalise the governance of Software Heritage to ensure its long-term sustainability.

Encourage the development of services associated with the archive, such as the production of indicators regarding software development contributions by higher education and research institutions and services related to cybersecurity.

SO7.I Indicators

SO7.I1 BSO indicators on software sharing and its distribution by discipline (general indicator)

SO7.I2 Official launch of the open source software catalogue for French higher education and research (milestone)

SO7.I3 Number of active software projects hosted (indicator)

SO7.I4 Five Open Source Programme Offices (OSPOs) certified in France (target)

SO.8 ENSURE THE TRANSPARENCY OF CLINICAL TRIALS

SO8.A1 SUPPORT CLINICAL TRIAL SPONSORS

SO8.A1.M1 Encourage improvement in reporting of clinical trials results by academic sponsors

Support measures will be entrusted to the National Research Coordination Committee (CNCR), which will carry out various actions: producing guides, providing assistance, holding webinars and so on.

SO8.A1.M2 Establish and then disseminate to sponsors indicators regarding their rates of reporting of clinical trials results

These indicators enable sponsors, the Ministry in charge of Health, and the Ministry in charge of Research to monitor developments in practices and establish regular dialogue with sponsors.

SO8.A2 WORK TO ENSURE THAT IT IS POSSIBLE TO POST CLINICAL TRIAL RESULTS IN COMPLIANCE WITH THE FAIR PRINCIPLES

SO8.A2.M1 Develop a sovereign assistant for posting clinical trial results that enables their reuse

In order to simplify and standardise the process of posting clinical trial results in the European Clinical Trials Information System (CTIS) register, develop an online posting assistant, as proposed in the report Ensuring that the results of all clinical trials in France are posted, modelled on ClinicalTrials.gov and compliant with Annex IV of the 2014 European Clinical Trials Regulation [11]. This should make it possible to structure and then disseminate results in formats that enable their use for public health, research and innovation purposes.

[11] https://eur-lex.europa.eu/legal-content/FR/ALL/?uri=celex%3A32014R0536

SO8.A3 TAKE ACTION AT THE EUROPEAN LEVEL TO INCREASE THE TRANSPARENCY OF CLINICAL TRIALS

SO8.A3.M1 Towards European indicators for the posting of clinical trial results

As clinical research knows no borders, national efforts to post results will not be fully effective if limited to only a few countries. In order to raise awareness across the European continent in favour of clinical trial transparency, it is essential to know the posting rates for clinical trials at the European Union level. To this end, a European monitoring system for clinical trials is needed, in order to provide a consolidated European overview.

SO8.A3.M2 Launch discussions on the need for a European solution for registering all types of clinical trials, in accordance with the FAIR principles

Under European regulation, there are separate registries for clinical trials relating to medication and medical devices. Due to the absence of a suitable legal framework and European register, other types of trials are generally registered on the American registry Clinicaltrials.gov. Consideration must be given to creating a platform under European oversight for registering and posting all clinical trials, in accordance with the FAIR principles upheld on the continent.

SO8.I Indicators

SO8.I1 BSO indicator concerning the sharing of clinical trial results (general indicator)

SO8.I2 Results reported for 100% of clinical trials (target)

SO8.I3 Number of individuals trained within sponsor organisations (indicators)

SO8.I4 Sovereign assistant for posting results compliant with the FAIR principles (milestone)

V. ANNEXES

ANNEX 1
GOVERNANCE OF OPEN SCIENCE IN FRANCE

THE FRENCH OPEN SCIENCE COMMITTEE

OPEN SCIENCE STEERING COMMITTEE

The Steering Committee makes decisions on the most strategic aspects of national open science policy. It forms the Partners' Council for the French Open Science Fund Scientific Interest Group (GIS FNSO) to make funding decisions for calls for projects and initiatives. It meets up to four times a year.

It is composed of:

- The Director General for Research and Innovation, chair of the committee;
- The Director General for Higher Education and Professional Integration;
- The presidents of:
  - France Universités;
  - Udice;
  - the Conference of Directors of French Engineering Schools (CDEFI);
  - the Conference of Grandes Écoles (CGE).
- The presidents of:
  - the National Centre for Scientific Research (CNRS);
  - the National Research Institute for Agriculture, Food and the Environment (INRAE);
  - the National Institute for Research in Digital Science and Technology (INRIA);
  - the National Institute of Health and Medical Research (INSERM);
  - the Director General of the French Alternative Energies and Atomic Energy Commission (CEA)
- The President of the Unified Consortium of Academic and Research Institutions for Access to Digital Publications (COUPERIN);
- The President of the French National Research Agency (ANR);
- The President of the High Council for the Evaluation of Research and Higher Education (HCERES);
- One or more qualified individuals with expertise in the field of open science.

PERMANENT SECRETARIAT FOR OPEN SCIENCE (SPSO)

The SPSO is responsible for preparing the work of the Steering Committee and for ensuring the implementation of its decisions. It coordinates the activities of the expert groups and working groups of the Committee for Open Science, oversees the Editorial Committee of the website Ouvrirlascience.fr, and monitors the progress of ongoing projects for the operational implementation of the national open science policy.

The SPSO is led by the French Coordinator for Open Science. It is composed of sherpas from the institutions represented on the Steering Committee, as well as the leads of the expert groups of the Committee for Open Science, the President of the French Association of University Library Directors and Management Staff (ADBU), and the Association of Managers of Scientific and Technical Information of French Public or Public-Interest Research Organisations (EPRIST). The services, departments and missions of the ministry responsible for matters relating to publishing, research data, algorithms, and source code are also represented. Lastly, the Editorial Committee of Ouvrirlascience.fr is also involved in the SPSO's work.

EXPERT GROUPS

The expert groups are permanent bodies bringing together experts on various aspects of national open science policy. They examine the subjects, issue opinions, and propose directions. The Committee for Open Science is composed of three expert groups:

- the Open Scholarly Publishing Expert Group;
- the Research Data Expert Group;
- the Source Code and Software Expert Group.

Until 2024, the Committee also included a Europe and International Expert Groups as well as a Skills and Training Expert Groups.

ANNEX 2.1
FRENCH OPEN SCIENCE POLICY 2018-2026: KEY OUTCOMES

2018

- **1st FRENCH PLAN FOR OPEN SCIENCE**
- **Launch of the French Open Science Monitor (BSO)**
- Launch of the Ouvrirlascience.fr website
- First National Open Science Days
- Launch of Coalition S in support of open access to academic publications

2019

- **Creation of the Committee for Open Science**
- **Creation of the French Open Science Fund (GIS FNSO)**
- 1st FNSO call for projects on open academic publishing
- 1st major open science infrastructures funded
- Deposit of publications resulting from ANR-funded projects on HAL
- ANR flash call for projects on open science and research data
- Creation of the Council for National Open Science Coordination (CoNOSC)

2020

- **New funding and governance model for HAL**
- **Publication of the Passport for Open Science (guide for doctoral students)**
- 1st financial support via the FNSO for infrastructures accredited by Global Sustainability Coalition for Open Science Services (SCOSS)
- Creation of the ministerial data administrator role at the Ministry of Higher Education, Research and Innovation
- The BSO incorporates indicators relating to clinical trials

2021

- **2nd FRENCH PLAN FOR OPEN SCIENCE**
- **The BSO incorporates indicators relating to research data and software**
- 2nd FNSO call for projects on open academic publishing
- Formalisation of the Recherche Data Gouv project
- Creation of the Scientific Publishing Observatory
- Inclusion of Software Heritage in the Research Infrastructure Roadmap
- Implementation of Plan S for open access to scientific publications resulting from funded projects

2022

- **Creation of Recherche Data Gouv**
- **Council of the EU conclusions on open science during the French Presidency**
- **Creation of the Open Science Awards for research data and open source research software**
- Open Science European Conference in Paris
- Decree on PhDs incorporating open science
- 3rd FNSO call for projects on open academic publishing
- Creation of the Coalition for Advancing Research Assessment (CoARA)
- Launch of local versions of the French Open Science Monitor

2023

- **French Reproducible Research Network**
- **G7 Statement on Open Science (Sendai, Japan)**
- **Partnership between the Ministry of Higher Education and Research and Wikimédia France**
- Report to Parliament: *Production and valorisation of software developed by French public research*
- Report: *Software forges in higher education and research*
- Creation of the French chapter of the Coalition for Advancing Research Assessment (CoARA)
- Study: *How much do APCs cost French research institutions?*
- 1st Global Summit on Diamond Open Access in Toluca, Mexico

2024

- **Barcelona Declaration on Open Research Information**
- **Launch of the Open Science Monitoring Initiative (OSMI – UNESCO and France)**
- 1st Open Science PhD Thesis Awards
- 1st National Conference on Research Data
- ANR call for projects titled "Research on open science practices"
- Creation of the Alliance of French Public Academic Publishers (ALEF)
- 2nd Global Summit on Diamond Open Access in Cape Town, South Africa
- Survey of higher education and research institutions on their open science policies
- Multi-year partnership with OpenAlex

2025

- **Extended collective licence for images (Article 28 of the Research Programming Act)**
- **Interministerial report: *Ensuring the posting of results for all clinical trials in France***
- **Publication of a study on the impact of open science in France**
- Beta launch of the open source software catalogue for higher education and research
- Launch of the Global Research Initiative on Open Science (GRIOS)
- Report: *Key functions in data-related professions*
- 4th FNSO call for open academic publishing
- *Little Encyclopaedia of Open Science*
- "FIDELIS", the European network of trusted repositories
- The Software Hash Identifier (SWHID) becomes an international ISO/IEC standard

2026

- **FRENCH OPEN SCIENCE STRATEGY (SNSO)**
- 3rd Global Summit on Diamond Open Access in Bangalore, India
- Launch of Open Research Europe (ORE) at CERN

ANNEX 2.2
FRENCH OPEN SCIENCE POLICY 2018-2026: KEY OUTCOMES

Trends in the French Open Science Monitor indicators

The data presented below is published on the French Open Science Monitor website (*https://frenchopensciencemonitor.esr.gouv.fr/*). It was updated on 2 December 2025, except for the data on clinical trials, which was updated in June 2026.

Summary of the main indicators

61 % of publications available under open access

+24 points in 8 years

27 % of publications shared their data

+9 points in 4 years

21 % of publications shared their software

+4 points in 4 years

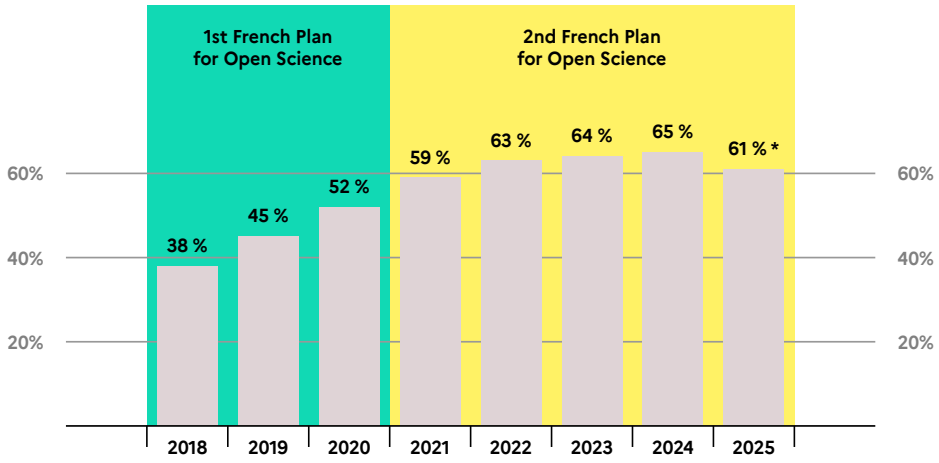
76 % of defended PhD theses available under open access after one year

48 % of clinical trial results shared within 3 years (public sponsors)

Clinical trials from 2012-2021:
+19 points in 1 year

Trends in the percentage of open access French scientific publications: significant progress since 2018, but a plateau observed over the past four years

Sources: HAL, MESRE, Unpaywall



This graph shows, for each year observed since 2018, the percentage of open access French research publications with a Crossref DOI, published during the previous year. Thus, 64.7% of French scientific publications published in 2023 were open access in 2024 (observation year). For the publication year 2017, this proportion is 37.7%. The proportion of open access has therefore increased by 27 points over this period.

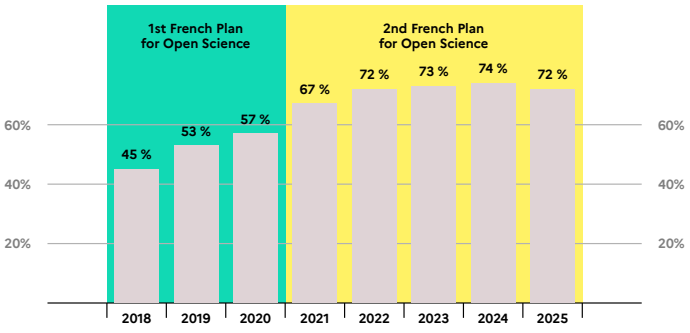
(*) The steady increase in the percentage of open access observed each year since 2018 is an indicator of the impact of public policy supporting open access. It reflects the evolution of researchers' publishing practices, the strengthening of open access infrastructures for publications, and the strategies of key players in academic publishing.

However, a break in the data series has been identified in the Unpaywall data used to detect open access publications. Technical developments for this source of data have led to a consistent decrease in the indicator across all years monitored since 2013. In this context, the 2025 result should be interpreted as confirmation of a plateau, rather than as an actual decline in open access publications.

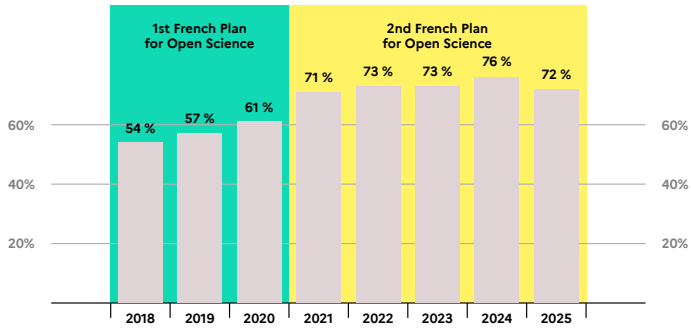
A dynamic of openness across all disciplines, albeit with varying levels depending on the sensitivity of research communities and the diversity of their practices

Sources: HAL, MESRE, Unpaywall

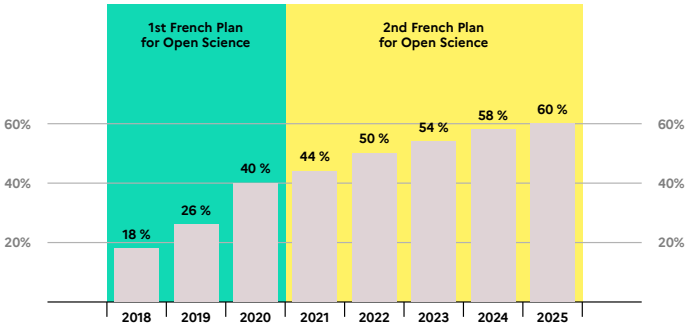
The percentage of open access publications varies significantly from one discipline to another, depending on the sensitivity of the scientific community and the diversity of their practices. For example, 72% of French scientific publications with a Crossref DOI in fundamental biology published in 2024 were open access in 2025 (observation year). These variations can also be observed in the evolution of the percentage of open access over time. Some disciplines, such as astronomy and mathematics, have a longstanding tradition of open publication, while others are experiencing more recent acceleration processes (chemistry, fundamental biology). All, however, are in the process of opening up. The graph should be interpreted taking into account that there may be artefacts related to the data sources used (in the humanities and social sciences and computer science, some publications cannot be identified using our methodology).



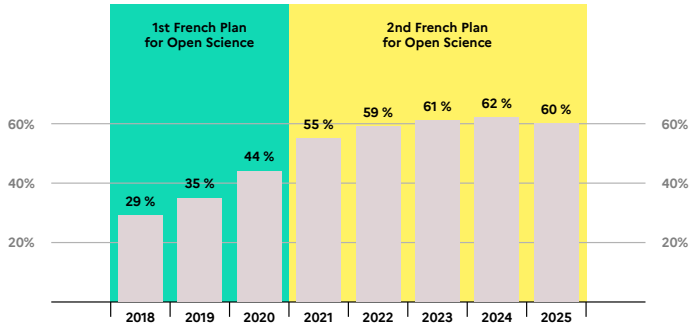
Fundamental biology



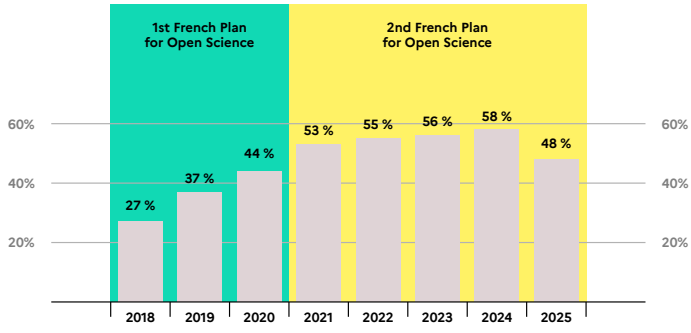
Physical sciences and astronomy



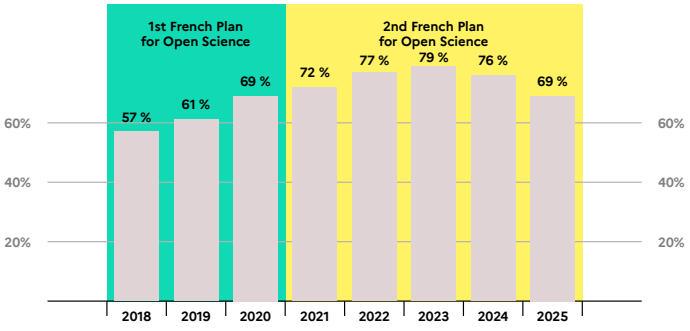
Humanities



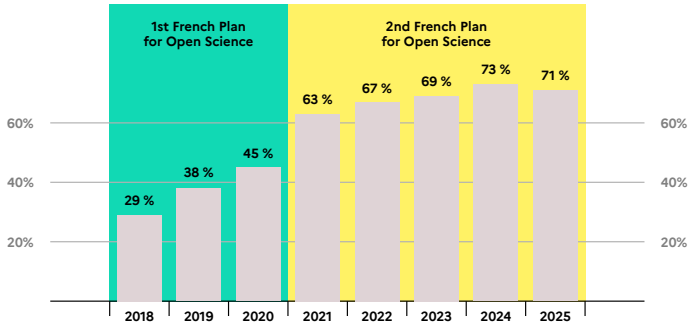
Engineering



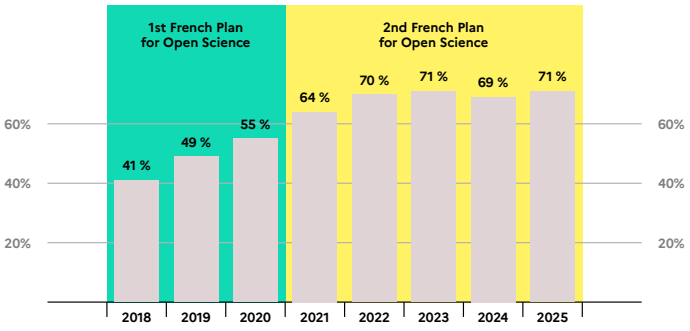
Medical research



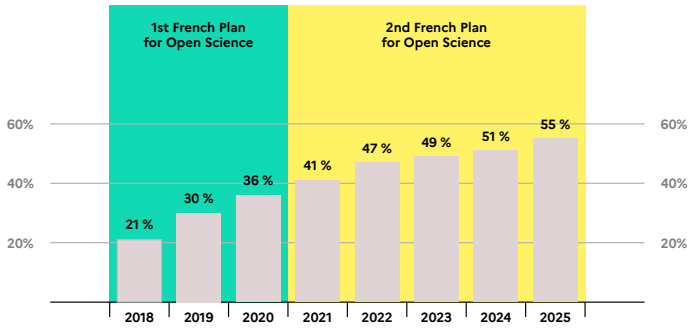
Mathematics



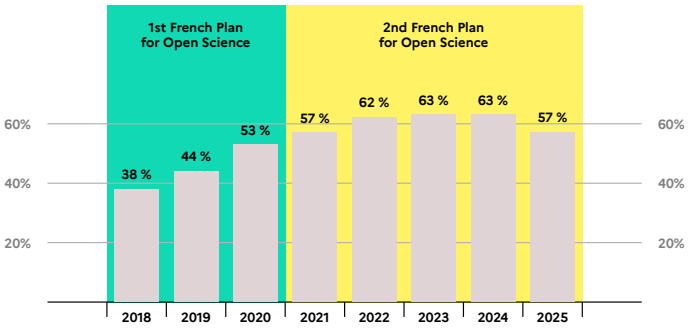
Chemistry



Earth, ecology, energy and applied biology



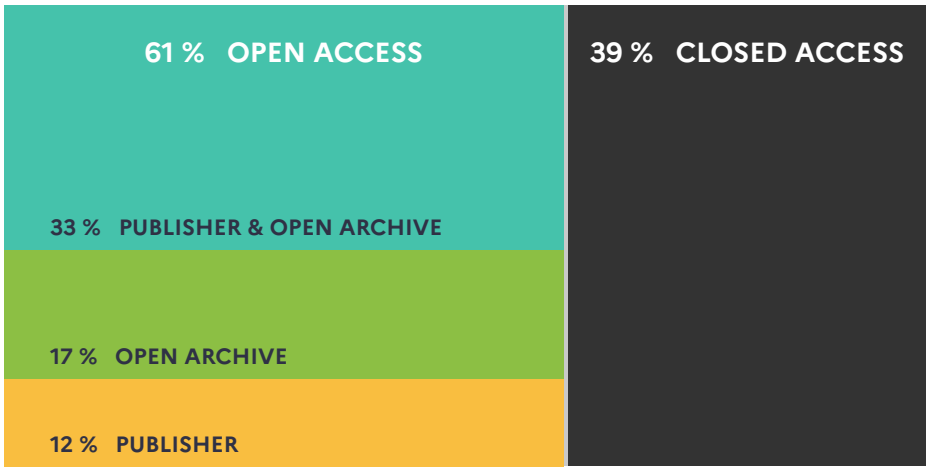
Social sciences



Computer and information sciences

Closed access and chosen routes to openness in 2025

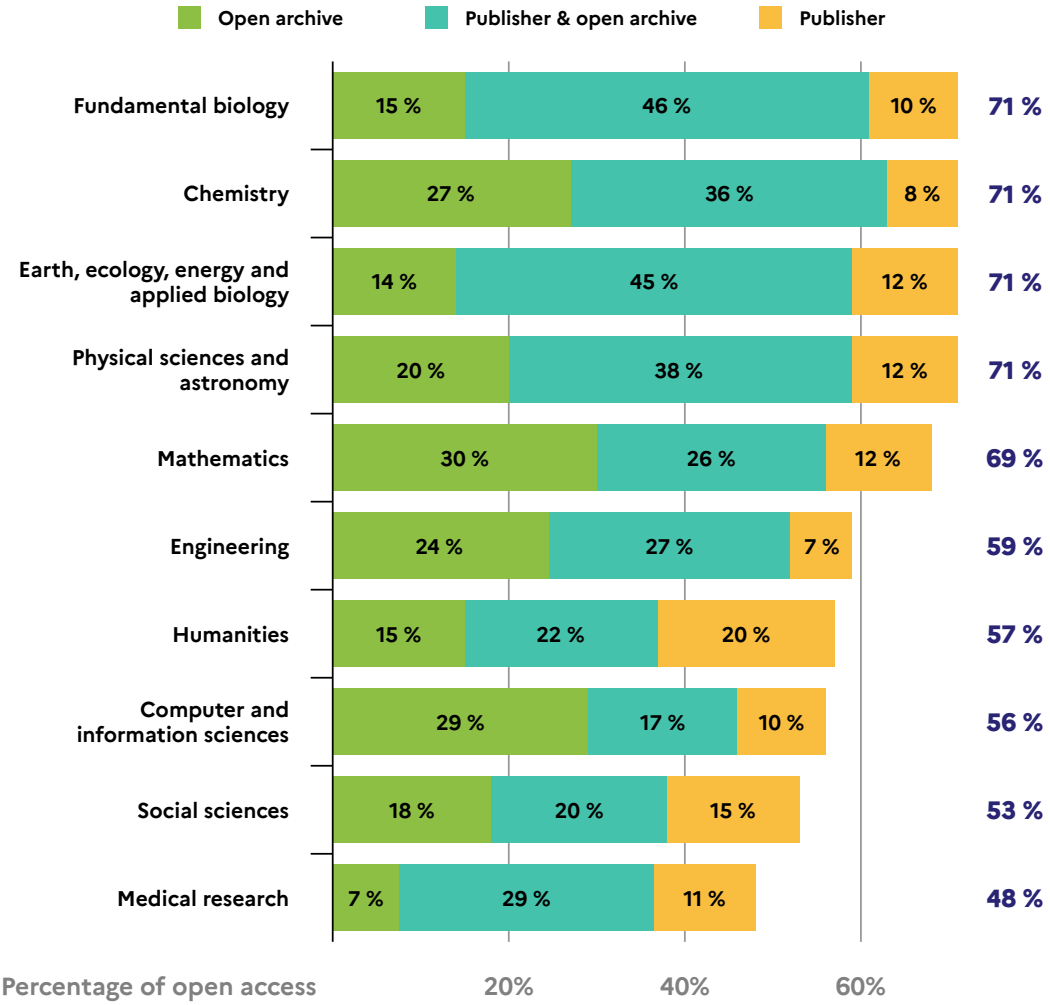
Sources: HAL, MESRE, Unpaywall



Making research publications open access can be achieved through several routes: publication directly under open access by the publisher on a publishing platform, or deposit by the author in an open archive. These two routes are not mutually exclusive, as a publication can be hosted both on an open archive and on the publisher's publication platform. This simultaneity, which tends to increase over time, is a factor of resilience, providing editorial quality and ensuring the long-term accessibility of French scientific publications. In 2025, it was observed that, for works published in 2024, 33% were open through both routes, 17% exclusively via an open archive, and 12% exclusively via the publisher.

Routes to openness: significant variations by discipline

Sources: HAL, MESRE, Unpaywall



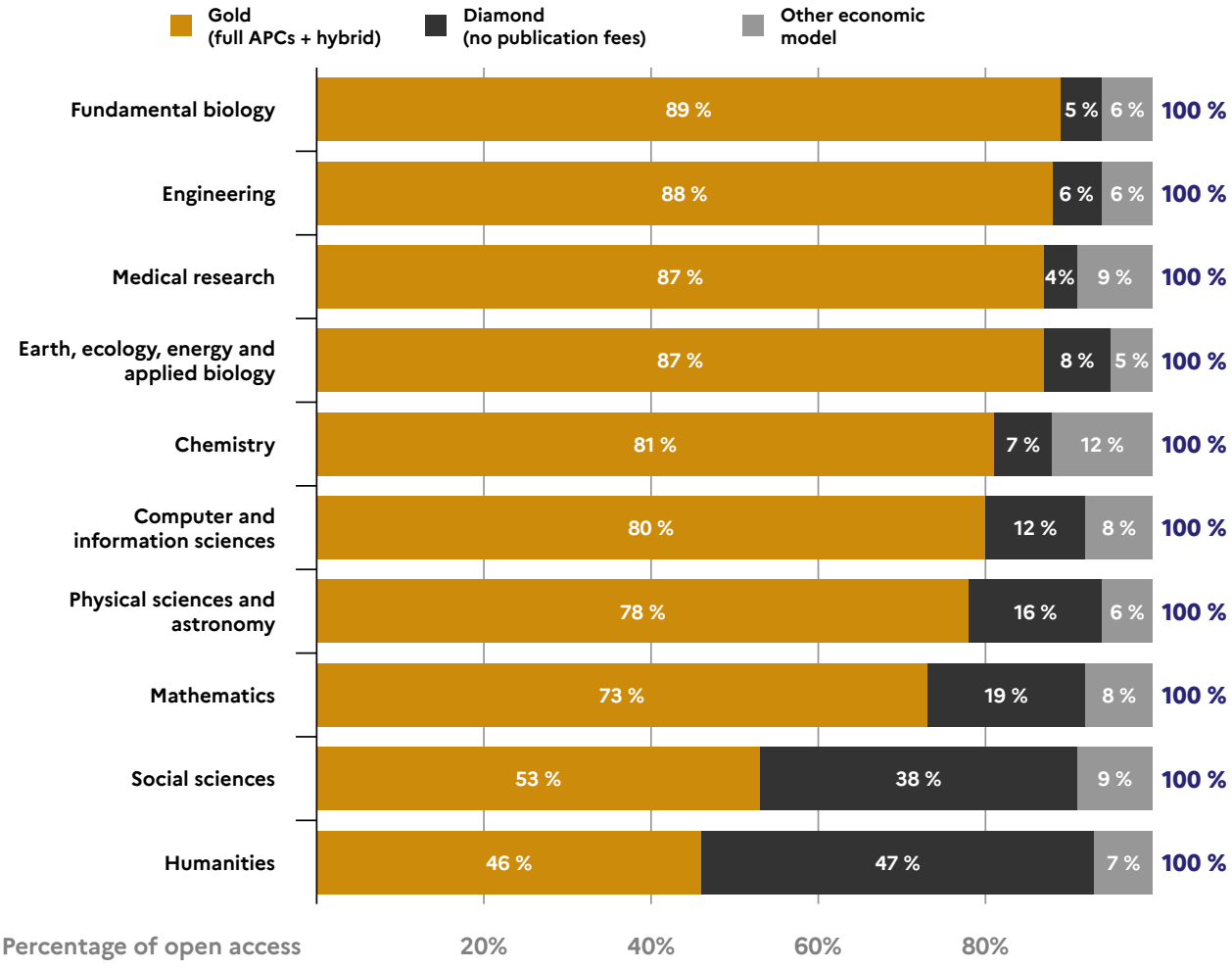
This graph shows the respective proportion of the various routes to openness for each discipline: open access publication by the publisher, deposit in an open archive, or both routes simultaneously.

It is particularly noteworthy that in 2025, for medical research papers published in 2024, 7% of publications were open via the open archive route, 29% were open via both the publisher & open archive routes, and 11% were open via the publisher route.

Not all disciplines adopt the same pathways for open access publishing. For some, the practice of depositing in an open archive is historically established and recognised as legitimate. Mathematicians, physicists, and computer scientists have long made use of open archives prior to submitting to journals. The humanities are more likely to entrust open access to publishers. Between the two, lie numerous situations specific to the structure and history of each discipline. The coexistence of the two models (open access via publishers and via open repositories) presents neither contradiction nor disadvantage. On the contrary, it makes the system more resilient.

Article processing charges (APCs) are the dominant business model for open access publishing, particularly in the science, technology, and medical (STM) disciplines

Sources: HAL, MESRE, Unpaywall

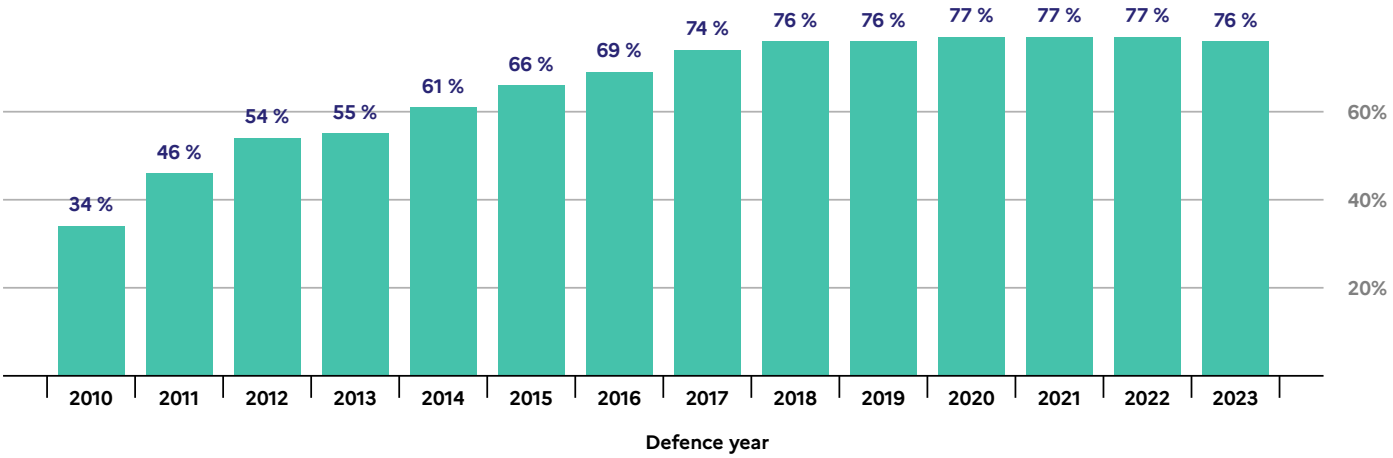


This chart shows the economic model, by discipline, of French researchers' publications made open by publishers. It covers publications with a Crossref DOI published in 2024. It should be noted that this graph does not take into account articles deposited in open archives and only considers those made open by a publisher.

The dissemination of open access articles by academic journal publishers relies on a variety of business models. Some publishers have replaced the revenue traditionally generated from subscriptions, with the payment of article processing charges (APCs) billed per article, payable by researchers, their institutions, or their funders. Some publishers do not charge publication fees and are funded differently (subsidies, Subscribe to Open, freemium, etc.): this is known as the Diamond model. Lastly, other models exist, such as the "moving wall" model: the latest publications require a paid subscription to the publisher and are then made available under open access after a certain period.

Percentage of open access French PhD theses: a trend towards increasing openness

Sources: MESRE, theses.fr



This chart shows the percentage of open access French PhD theses by year of defence, for the most recent observation year (2025).

The percentage of open access French PhD theses shows a clear trend towards increasing openness. A third of theses defended in 2010 are open, whereas by the late 2010s, around three-quarters of the theses defended are open. Embargo periods imply that there is a slight temporary decrease in the percentage of open access for the most recent years of defence.

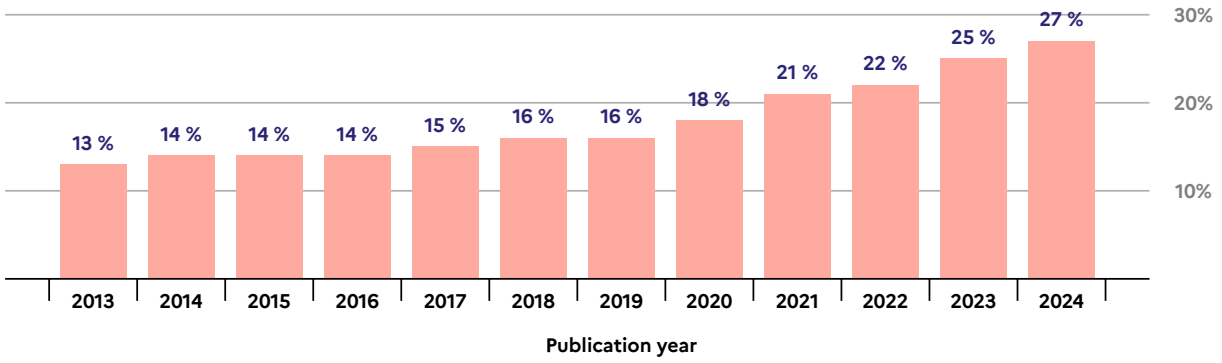
The majority of PhD theses are available under open access online, sometimes after a period of restriction. There are two types of time-based restrictions on dissemination, embargo or confidentiality, which depend on the type of dissemination, open or restricted, chosen by the author:

→ 1) *embargo:* during a certain period, the thesis is distributed with restricted access within the academic community.

→ 2) *confidentiality:* during a certain period, no one can access the thesis.

An increasing number of French publications mention data sharing (+9 points over 4 years)

Sources: MESRE

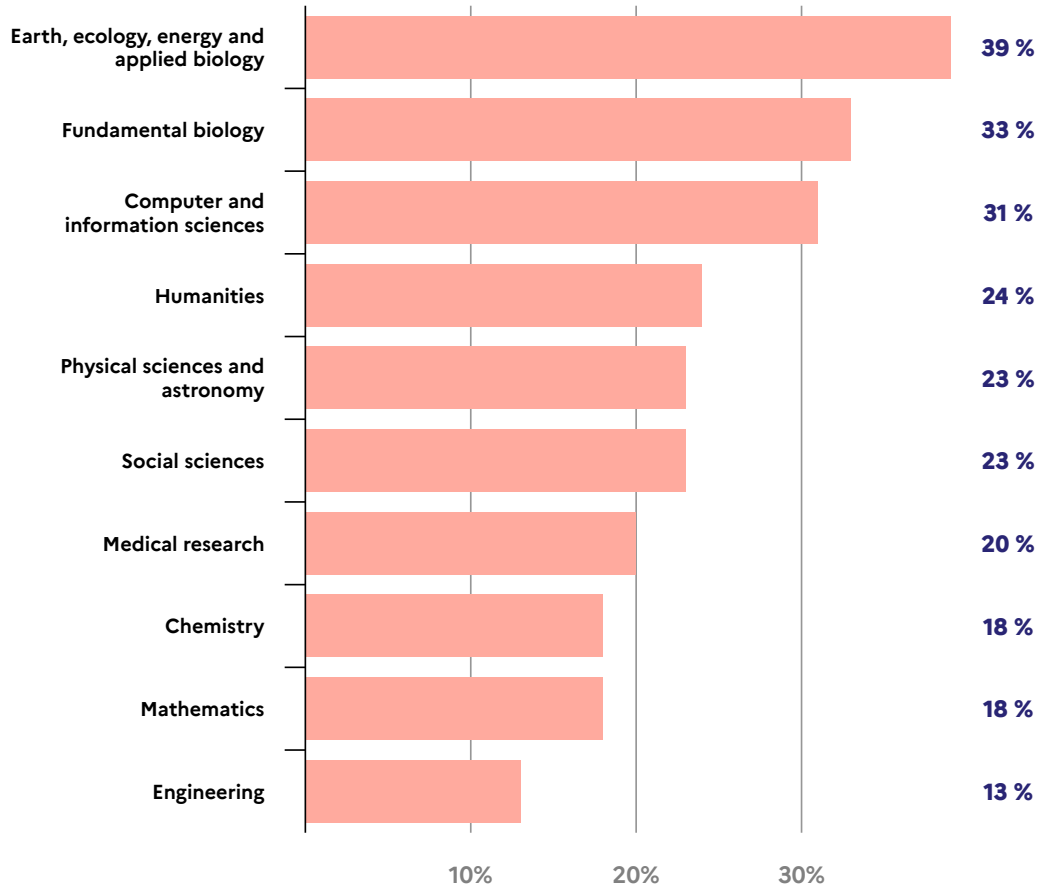


This graph shows the proportion of publications for which for which a mention of data sharing was detected, among publications that mention data production, by year of publication. We chose to focus our analysis on publications from the previous year, in order to have sufficient data.

Unlike for publications, there are no major international reference databases cataloguing all data produced by research. Although there are repositories that enable researchers to share data, sometimes on a large scale, these repositories do not reflect the full thematic diversity and multiplicity of the data used to produce the results of French research. To develop reliable indicators regarding shared data, the French Open Science Monitor has chosen to base its approach on the scientific literature produced by researchers and to use AI techniques to extract information from it. As not all scientific approaches produce or use data, we include within the studied corpus only publications that explicitly mention datasets and for which the full text could be downloaded. We differentiate between publications that mention the use and/or the production of data. For this analysis, we used the open source software GROBID and DataStet.

Percentage of French publications indicating data sharing: disciplinary disparities reflect distinct cultures and practices

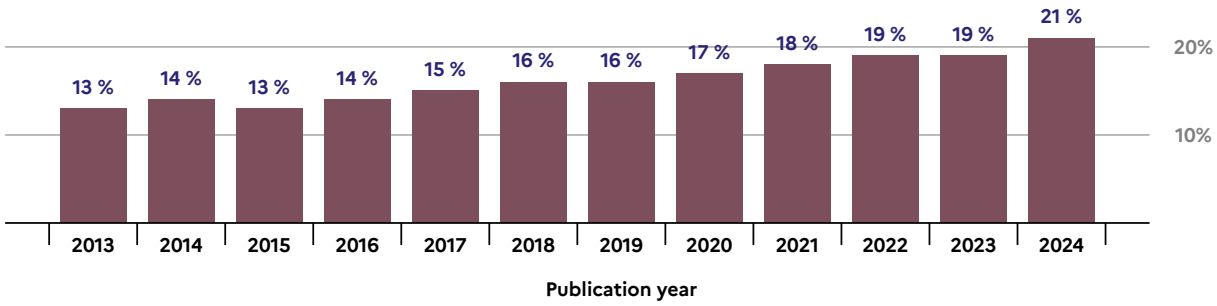
Sources: MESRE



This chart shows the proportion of publications for which a data sharing statement was detected, among publications that mention data production, broken down by discipline, for 2024 (the latest available publication year).

An increasing number of French publications mention code or software sharing, by year of publication (+4 points in 4 years)

Sources: MESRE



This graph shows the proportion of publications for which a code or software sharing statement was detected, among publications that mention the creation of code or software, by year of publication.

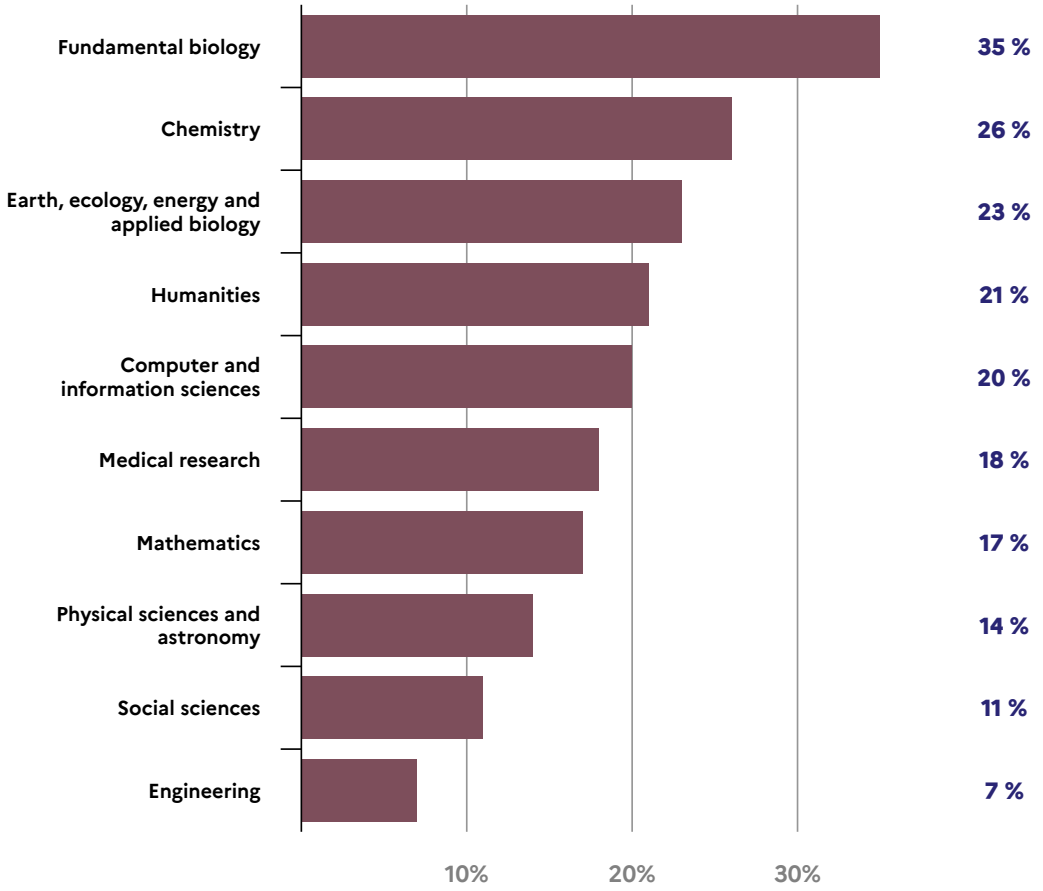
Code and software play a key role in scientific research, representing a tool, a result, and a subject of study all at once. Making the software source codes available, with the possibility of modifying, reusing and disseminating them, is a key challenge for ensuring the reproducibility of scientific results and supporting the sharing and creation of knowledge, in line with the principles of open science.

The French Open Science Monitor uses an approach based on the full text of French publications to detect associated code and software. It is only applied for publications for which the full text could be downloaded in the framework of the Monitor.

For this analysis, we used the open source software GROBID and Softcite.

Percentage of French publications indicating code or software sharing: disciplinary disparities reflect distinct cultures and practices

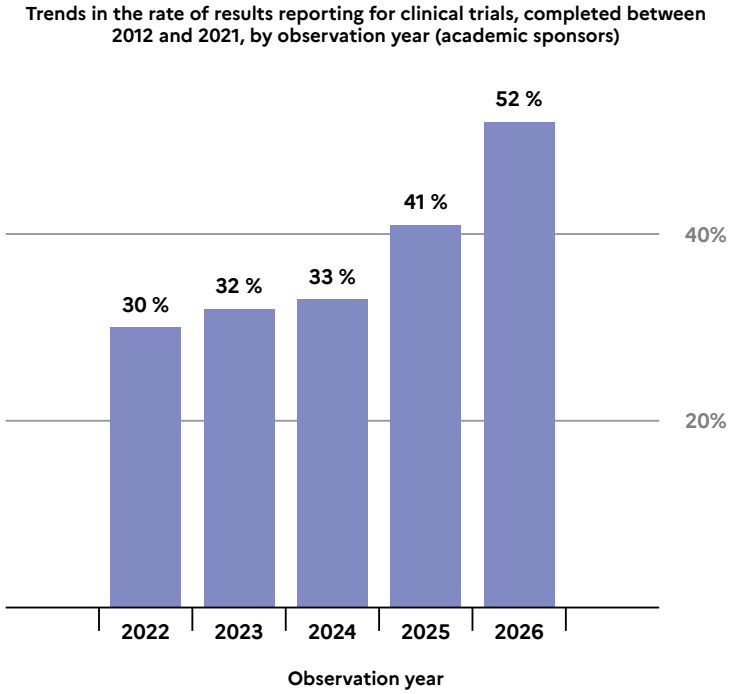
Sources: MESRE



This graph shows the proportion of publications for which a code or software sharing statement was detected, among publications that mention the creation of code or software, broken down by discipline, for 2024 (the most recent year of publication).

Improvement in the rate of results reporting for clinical trials completed between 2012 and 2021

Sources: CTIS, EU Clinical Trial Register, MESRE, clinicaltrials.gov

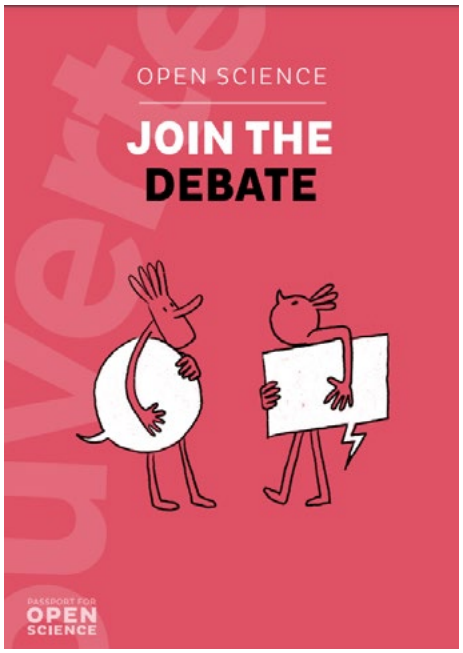


The registration of clinical trials and their results in public databases contributes to greater transparency in medical research. Two European regulations made it mandatory for clinical trials involving medication or medical devices to report their results within 12 months of their completion. This requirement does not apply to other clinical trials. However, the French Open Science Monitor observes all clinical trials without distinction.

Clinical trials in France completed between 2012 and 2021 saw improved results reporting in 2025. Academic sponsors communicated their results at a rate of 30% in 2022, compared with 41% in 2025.

ANNEX 2.3
FRENCH OPEN SCIENCE POLICY 2018-2026: KEY OUTCOMES

Passports for Open Science



1. *Entrez dans le débat*.2022. Ministère de l'Enseignement supérieur et de la Recherche. Consulté le 4 juillet 2026. *https://www.ouvrirlascience.fr/science-ouverte-entrez-dans-le-debat/*
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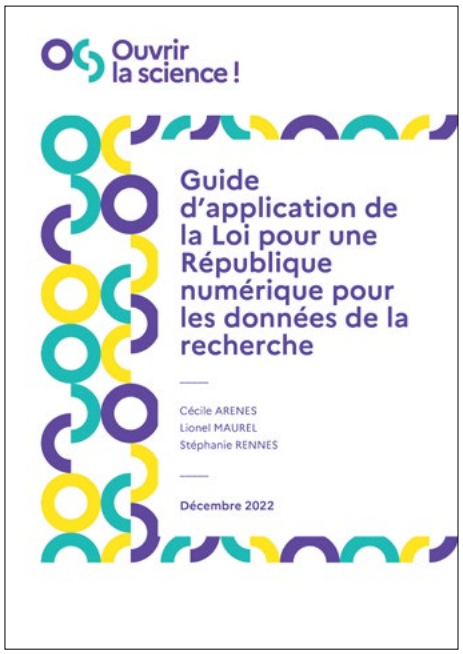

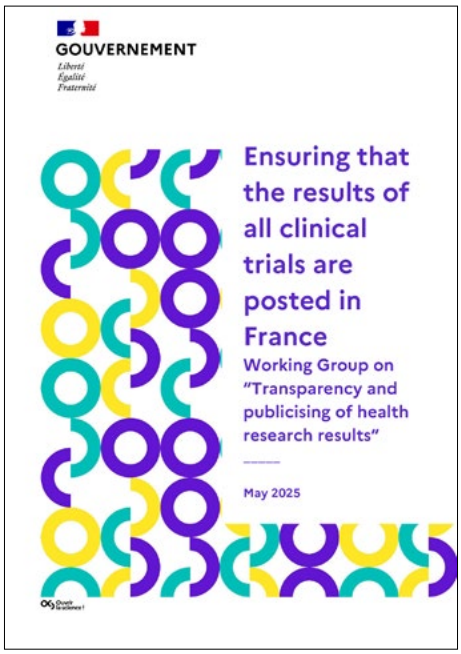

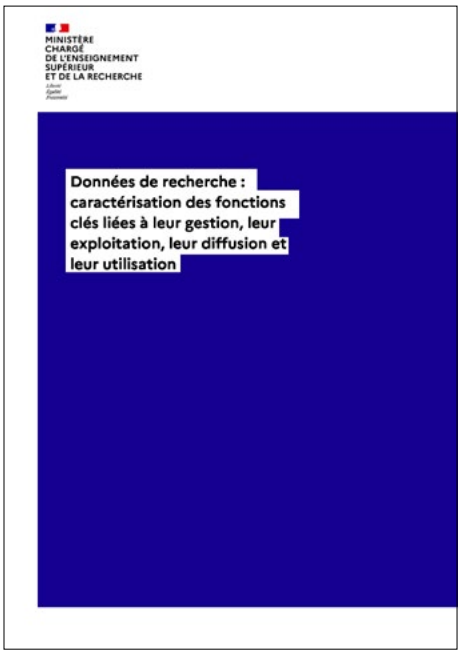

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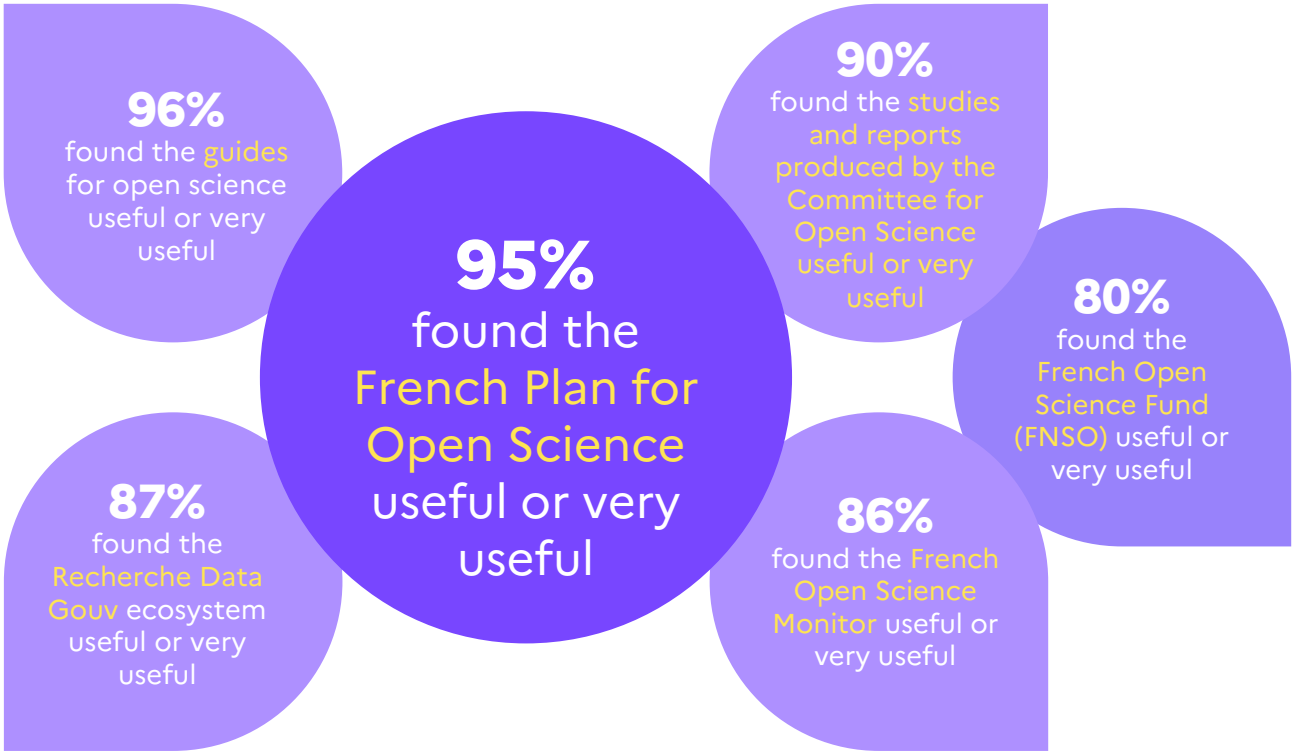
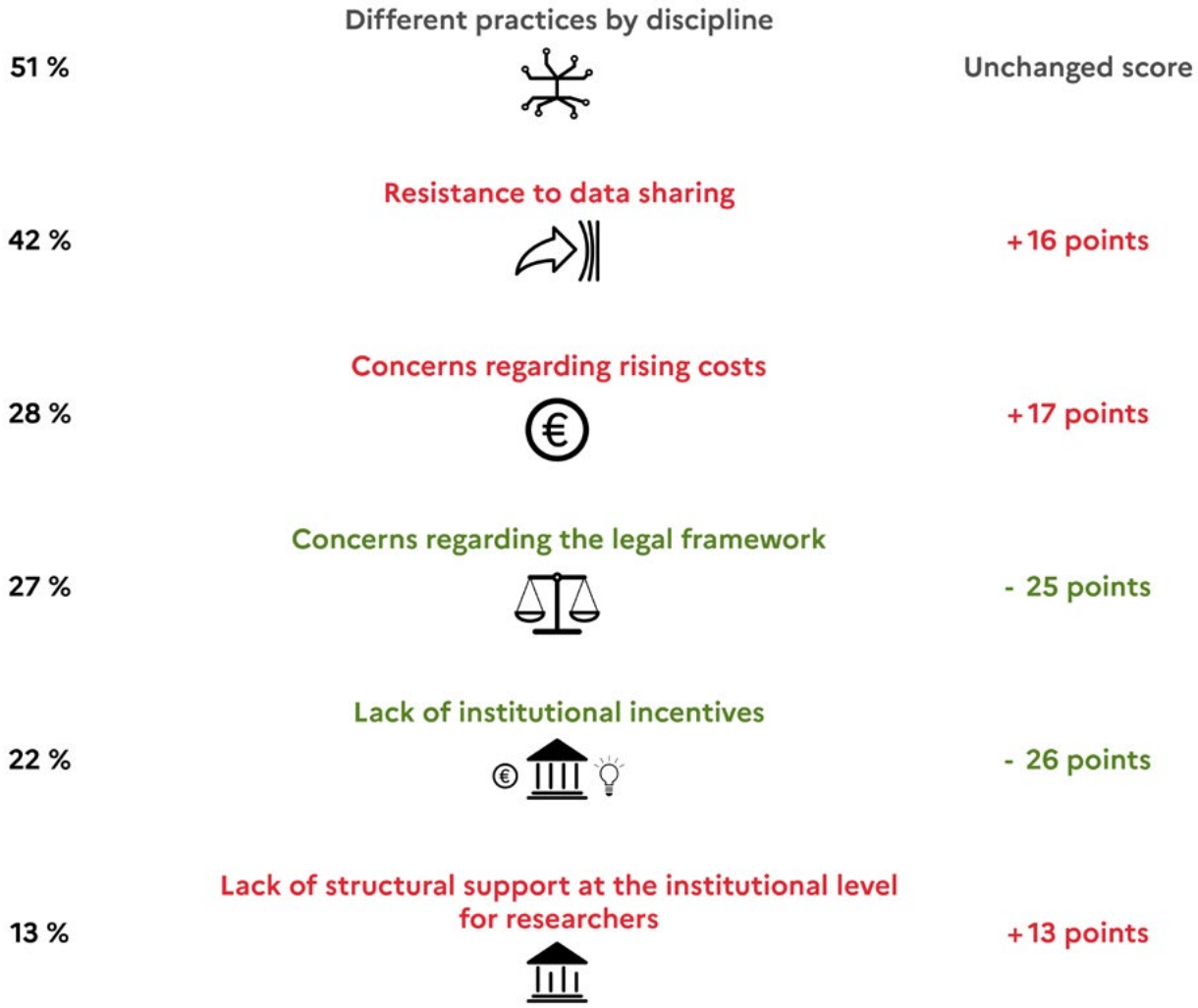
Key findings from the survey conducted among institutions

The Ministry of Higher Education, Research and Space (MESRE) conducted a survey among higher education and research institutions from 1 December 2023 to 26 January 2024. This survey aimed to gain a better understanding of institutions' open science policies, as well as their positions regarding French open science policy. The data and graphs presented below are drawn from the results of this survey (*DOI: 10.52949/80*).

Open science policy considered useful or very useful by institutions



The transition towards open science: between persistent and emerging obstacles



Obstacles to open science

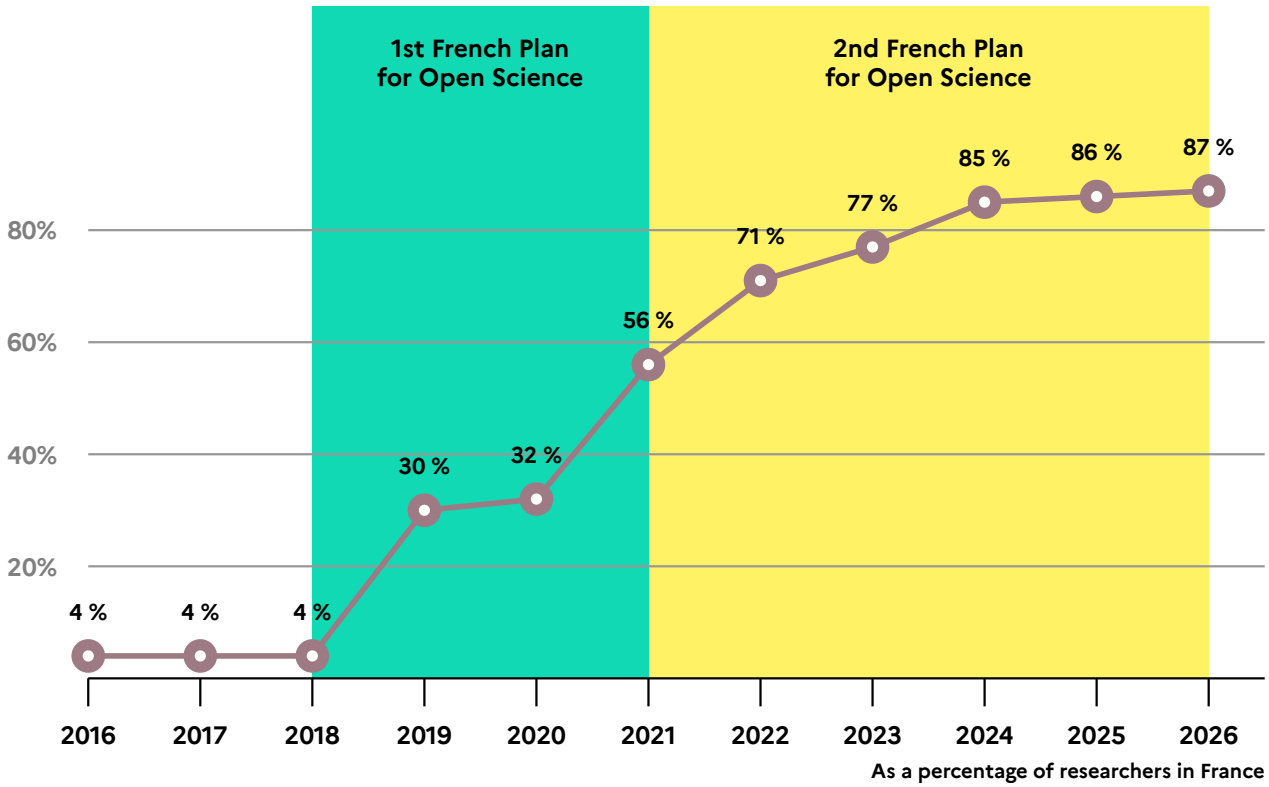
Presentation of the top 6 obstacles ranked by frequency of occurrence in the responses of participants to the 2024 MESRE survey

Comparison between 2020 (results for French universities from a survey by the European University Association [1]) and 2024 (MESRE survey)

Between 2020 and 2024, certain obstacles remain constant, such as differences in disciplinary practices, which is also the most frequently mentioned obstacle. Compared to 2020, progress has been made on the implementation of open science policy in France. Among the obstacles cited more frequently in 2024 than in 2020, resistance to sharing and making data available (+16 points) is linked to increased incentives to do so. Alongside this, there are growing concerns about rising costs, due to increasing needs for suitable infrastructures, services, and tools. Furthermore, the perception of a lack of structural support (+13 points) is linked to a mismatch between the supply of services intended for the implementation of open science and the demand, which is outpacing it. Progress in open science policy, along with training and educational initiatives, has helped to reduce the size of certain obstacles, such as concerns around the legal framework (-25 points) and a lack of incentives to promote open science activities (-26 points). Concerns regarding the legal framework have decreased due to general training and educational efforts, such as the publication of guides (in particular, the *Passports for Open Science*).

[1] Morais R., Saenen B, Garbuglia F., Berghmans F., & Gaillard V. (2021a). *From principles to practices: Open Science at Europe's universities. 2020-2021 EUA Open Science Survey results*. Brussels & Geneva, European University Association. Available at: *https://www.eua.eu/downloads/publications/2021%20os%20survey%20report.pdf*

A wave of adoption of open science policies by institutions triggered by the publication of the French Plans for Open Science



This graph shows the evolution in the number of institutions reporting that they have adopted an open science policy and the year of its adoption. The period of the First French Plan for Open Science, between 2018 and 2021, is shown in green, and the period of the Second Plan, launched in 2021, is shown in yellow.

This graph was published for the first time in the report presenting the survey results and is provided in updated form in the BSO:

https://frenchopensciencemonitor.esr.gouv.fr/declinaisons/institutional-policy

Institutions that have published an open science policy document online

Agence nationale de la recherche (ANR)
AgroParisTech
Aix-Marseille Université
Arts et Métiers Sciences et Technologies
Avignon Université
Centrale Lyon
Centre national de la recherche scientifique (CNRS)
Commissariat à l'énergie atomique et aux énergies alternatives (CEA)
École française d'Athènes
École nationale des ponts et chaussées
École nationale supérieure des sciences de l'information et des bibliothèques
École normale supérieure de Lyon
École normale supérieure PSL
Institut Mines-Télécom
Institut national d'études démographiques (Ined)
Institut national d'histoire de l'art (INHA)
Institut national de la santé et de la recherche médicale (Inserm)
Institut national de recherche en sciences et technologies du numérique (Inria)
Institut national de recherche pour l'agriculture, l'alimentation et l'environnement (INRAE)
Institut national des langues et civilisations orientales (Inalco)
Institut Pasteur
Muséum national d'histoire naturelle (MNHN)
Nantes Université
Normandie Université
Office national d'études et de recherches aérospatiales (ONERA)
Sciences Po
Sorbonne Université
Université Côte d'Azur
Université d'Orléans
Université de Bordeaux
Université de Bourgogne
Université de Bretagne Occidentale
Université de Lille
Université de Limoges
Université de Lorraine
Université de Pau et des Pays de l'Adour
Université de Poitiers
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ANNEX 3
METHOD FOR THE DEVELOPMENT AND DRAFTING OF THE FRENCH OPEN SCIENCE STRATEGY

Working method

The French Open Science Strategy is the result of a process of reflection initiated in 2024 by the Ministry of Higher Education, Research and Space. This work began with a survey conducted among higher education and research institutions regarding their open science policy [53], which included questions enabling them to submit suggestions. These reflections were also informed by discussions within the framework of the Committee for Open Science. Three meetings of the Open Science Steering Committee dedicated to the national policy to be developed were held on 1 February 2024, 19 June 2025 and 1 April 2026, and chaired by the Director General for Research and Innovation. The Permanent Secretariat for Open Science (SPSO) convened for two seminars focused on reviewing and considering the future of the national open science policy, held on 16-17 April 2024 and 9 September 2025. A literature review of several hundred scientific studies related to open science was carried out.
In order to take the European dimension of this subject into account, all open science policies of other European countries were examined, and discussions were held with national open science coordinators, particularly within the Council of National Open Science Coordination (CoNOSC).

Thematic discussions were also held with specific stakeholders in France:

→ regarding protection for research, with the Defence and Security Department (SDS) of the Ministry of National Education, the Ministry of Higher Education, Research and Space (MESRE), and the Ministry of Sports, Youth, and Community Life;

→ regarding the indicators of open science policy, with the Department of Data Science and Engineering (MESRE);

→ regarding the link between open science and doctoral training, with the doctoral coordinator (MESRE);

→ regarding open science and AI, with the Department of Mathematics, Physics, Nanosciences and ICT (MESRE);

→ regarding the link between open science and scientific integrity, with the French Office for Scientific Integrity (OFIS);

→ regarding funding through calls for projects, with the French National Research Agency (ANR);

→ regarding the transparency of clinical trials, with the Ministry of Health and the National Research Coordination Committee (CNCR);

→ regarding research assessment, with the French National Chapter of CoARA.

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