Recommendations to the Spanish Government to Facilitate the Implementation of the Open Science Model in Spain

Barcelona-Valencia, 2023

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GOBIERNO DE ESPAÑA · MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

Contents

1 INTRODUCTION

Public policy serves to promote social transformations and paradigm shifts in all fields, including the economy, education, and energy, as well as scientific research, which is the area discussed in this document. Recommendations constitute an important element of such public policy, as they offer prioritized instructions related to the actions needed to achieve specific objectives in a particular sector.

Open science represents a paradigm shift in research activity that promises to facilitate the expansion and extension of the benefits of science to researchers, academic institutions, and society as a whole. This new research model has various components (open access to publications, research data sharing, new research assessment models, etc.) and it has been promoted at the highest level by public administrations, especially the European Commission. Yet despite this support, the development and implementation of this model has been uneven.

Our research group has carried out an extensive analysis of the current state of open science in Spain, which has identified a significant lack of awareness among the main stakeholders, especially researchers. For this reason, we have determined it advisable to present some recommendations to the Spanish government with a view to accelerating progress on the various fronts of open science.

This document has two clearly distinct sections. The first is an introduction presenting international and Spanish background information related to recommendations on open science, a description of the Spanish legal framework and five objectives of the recommendations. The second section offers a brief outline of a set of recommendations for each of the five established objectives, three of which are related to strategic lines of open science (open access, research data, and research assessment) while the other two are cross-cutting objectives (education and operational management).

1.1 INTERNATIONAL BACKGROUND

In Europe, the European Commission has played a leading role in the development of recommendations on open science, especially through the Open Science Policy Platform (OSPP) document (European Commission, 2018). University associations and research associations have also developed open science roadmaps or statements that include recommendations. At the international level, UNESCO also approved some recommendations on open science in 2021.

– *UNESCO Recommendation on Open Science* **(Unesco, 2021)**

The objective of the UNESCO Recommendation is to provide an international framework for open science policy and practice that can be applied by member states. The document establishes a definition of open science and details a range of actions to promote its development: creating an enabling policy environment, investing in open science infrastructures and services, investing in human resources, education and training for open science, fostering an open science culture and aligning incentives for open science, promoting innovative approaches at different stages of the scientific process, and promoting international cooperation.

– **Open Science Policy Platform Recommendations (European Commission, 2018b)**

This is a document prepared by the High Level Experts Group - Open Science Policy Platform (OSPP) created in 2016 (with two mandates: 2016-18 and 2018-20) with the objective of advising the European Commission on open science strategy. The recommendations are structured around eight core areas: awards and incentives, new research assessment metrics, open access (the European Open Science Cloud, EOSC), research data (which should be "FAIR", i.e., Findable, Accessible, Interoperable and Reusable), research integrity, skills and education, and citizen science. These elements or dimensions are now becoming canonical (i.e., standard), and they have been taken as the basis for academic associations (League of European Research Universities, LERU) and library associations (*Ligue des Bibliothèques Européennes de Recherche*, LIBER) to build on in their action plans to promote open science.

– *EUA Open Science Agenda 2025* **(EUA, 2022)**

The European University Association (EUA) represents more than 800 universities and national rectors' conferences in 48 European countries. Its Open Science Agenda focuses on three major priority areas: open access to scholarly outputs in a just scholarly publishing ecosystem; FAIR research data; and research assessment. The EUA previously published a short statement (EUA, 2017) proposing a series of actions to move towards open science.

– *Open Science and its role in universities: a roadmap for cultural change* (LERU, 2018)

LERU brings together 23 leading research universities in 11 European countries. Its open science roadmap analyses the eight pillars of open science identified in the OSPP recommendations mentioned above (scholarly publication, research data, European Open Science Cloud, skills and education, rewards and incentives, new metrics, research integrity, and citizen science) and also offers some recommendations in relation to them.

– **Statement on Open Science (YERUN, 2018)**

The Young European Research Universities Network (YERUN) is an association representing 18 young research-oriented universities in 12 different European countries. It has issued a brief statement (YERUN, 2018) that includes 11 commitments and specific actions to help universities transition towards open science (e.g. having all publications open access by 2020, promoting open science values, training researchers, supporting citizen science, etc.).

– *Open Science Roadmap* **(LIBER, 2018)**

Ligue des Bibliothèques Européennes de Recherche (LIBER) is an association of European national libraries and research libraries with more than 400 affiliated institutions. Its roadmap was issued after the aforementioned OSPP recommendations (on which it draws), and it offers an analysis of open science opportunities in libraries along with a few recommendations.

– *Direction paper* **(Science Europe, 2022)**

Science Europe represents major public organisations that fund or perform

excellent, ground-breaking research in Europe. Its proposals for achieving an open science without borders include promoting further alignment of policies in Europe to incentivise open science and facilitate basic and applied research, raising awareness and advocating open science with policy makers and the broader society, and emphasising the importance of the transition to open science, especially for equity among different communities.

1.2 SPANISH BACKGROUND

In the case of Spain, it is important to highlight the work of the Spanish Foundation for Science and Technology (FECYT), which has been very active for several years in this area, beginning in the context of open access and more recently moving onto open science.

– Recommendations for implementing Article 37, Dissemination of Open Access, in the Science, Technology and Innovation Act of 2011 (Fecyt, 2014)

This document includes a chapter of specific recommendations for managers of public grants for research, development and innovation, another for researchers, and yet another for subscription departments of academic journals.

– Towards an open access by default: recommendations (Fecyt, 2017)

This is a document prepared by the Monitoring Committee for the Implementation of Article 37, Dissemination of Open Access, in the Science, Technology and Innovation Act of 2011.

– Recommendations on managing research data addressed to researchers (Maredata, 2018)

This document was developed in the context of Maredata, a thematic network focusing on research data. The document includes a total of 17 recommendations for research data management, preceded by an introduction that contextualises the importance of sharing, facilitating access to, and reusing data.

– Commitments of Spanish universities to Open Science (CRUE, 2019)

The Conference of Spanish University Rectors (CRUE), a grouping of public and private institutions, has committed to ten actions to promote the implementation of open science.

– Catalan Open Science Strategy (Cataluña, 2020)

In 2019, the Department of Business and Knowledge of the Catalan regional government sponsored the PN@SC (Pacte Nacional per a la Societat del Coneixement, or National Pact for the Knowledge Society) with the aim of developing a shared future strategy involving the fields of higher education, research and innovation, and the production economy. Objective 6.2 of the PN@SC includes the Catalan Open Science Strategy, which proposes six core areas of action: open access, research data, open science infrastructures, skills and abilities, incentives and rewards, and open knowledge and society.

– National Open Science Strategy (Estrategia Nacional de Ciencia Abierta) (España, 2023b)

Prepared by the Open Science Commission (COS), established with the support of the Ministry of Science and Innovation and also of the FECYT. The measures 2023-27 aim to "achieve that in the year 2027 the processes of financing, execution, communication, and evaluation of scientific research in Spain incorporate the principles of open science." The proposal includes a set of 17 measures grouped into four strategic axes: digital infrastructures for open science, open access to scientific publications, research data management, and incentives, recognition, and training.

1.3 SPANISH LEGAL FRAMEWORK

In 2022 and early 2023, the promotion of open science received further reinforcement in Spanish law when the government passed amendments to the Science, Technology and Innovation Act (Spain, 2022) and the Organic Law of the University System (Spain, 2023).

– Science, Technology and Innovation Act (2011, amended 2022)

In 2011, Article 37 of the Science, Technology and Innovation Act established the obligation to deposit publications resulting from publicly funded research projects. This act was recently amended (Spain, 2022), with the title of Article 37 being changed from "Open Access" to "Open Science" and the inclusion of the storage and dissemination of publicly funded research data in accordance with the FAIR model. The act also makes reference to the possible use of open-access publications in research assessment.

– Organic Law of the University System (España, 2023a)

The new Organic Law of the University System (Spain, 2023) gives special attention to this issue: open science appears in the recitals of the law, an article is dedicated to the "Promotion of Open Science and Citizen Science" (Art. 12), and a reference also appears to target-based funding of universities based on the promotion of open science (Art. 56). These sections make explicit reference to the open dissemination of publications and of research results, as already mentioned in the Science Act, but going a step further by including more specific references to research assessment. Quality agencies are thus encouraged to include open access to the research results of teachers and researchers among their assessment criteria and requirements, and to use institutional repositories as a means of access to the documentation.

Finally, and directly related to the objective of these recommendations, it should be noted that both the Science Act (Art. 37.5) and the Organic Law of the University System (Art. 12.4) call on the Ministry of Science and Innovation, on the Ministry of Universities, and on regional governments to launch open science initiatives: creating free data access according to the FAIR model, developing open infrastructures and platforms, promoting open access publishing, and enabling open participation of civil society in scientific processes.

1.4 OBJECTIVE AND STRUCTURE

The objective of this document is to propose short- and medium-term recommendations to the Spanish government on further implementation of open science, especially for the Ministry of Science and Innovation and the Ministry of Universities, and for the research and university councils of Spain's autonomous communities (which are directly called upon to act by the laws mentioned above), but also for funding and assessment agencies, universities, and research institutes.

The document has been developed in the context of the Open Science in Spain project (RTI2018-094360-B-I00), which has analysed perceptions of open science and its constituent elements (open access, open data, open review, assessment models) by stakeholders in the research process (e.g. authors, journal editors, vice-chancellors, and library professionals). The results have been published in various academic journals (Abad et al., 2022; González-Teruel et al., 2022; Melero et al., 2023; Santos-Hermosa, Boté, 2023; Ollé et al., 2023) and summarised in the report *Ciencia en España: informe de situación y análisis de la percepción* (Abadal et al., 2023).

Estas recomendaciones, por tanto, se basan en el análisis de la situación actual de la ciencia abierta en España, en el estudio de la percepción de los actores de la ciencia abierta antes señalado y en el análisis de las principales políticas europeas y españolas en favor de la ciencia abierta.

These recommendations are thus based on an analysis of the current situation of open science in Spain, the perceptions of the aforementioned stakeholders in open science, and the European and Spanish policies promoting open science.

The recommendations are structured around five main objectives, each of which covers a wide range of suggestions. The first three objectives focus on the three core areas of open science development: open access to scholarly

publications, research data, and new research assessment models. Added to these are two cross-cutting objectives: open science education, which should serve to inform researchers of its principles (and raise awareness); and operational management, aimed at ensuring the achievement of the objectives through the creation of open science committees in each organisation and the performance of follow-up actions.

Objective 1: Achieve full open access to scholarly publications resulting from research in public institutions.

Objective 2: Create a system of human support infrastructures and services that will facilitate the FAIR (findable, accessible, interoperable and reusable) publication of research data in trustworthy repositories.

Objective 3: Develop a qualitative and quantitative assessment system that acknowledges the diversity of research outputs and open science practices.

Objective 4: Ensure that the knowledge and practice of open science principles are implemented by researchers, research support units, and library staff.

Objective 5: Follow up on the recommendations and actions established by organisations to move towards open science.

2 RECOMMENDATIONS

2.1 OPEN ACCESS

Objective 1: Achieve full open access to scholarly publications resulting from research in public institutions.

Open access has been around for nearly 25 years now, during which time considerable progress has been made. The objective now is thus to achieve full open access. The proposed deadline for this goal is 2027, in accordance with the Spanish Science, Technology and Innovation Strategy 2021-2027 (Spain, 2020).

Recommendations:

• Achieve the objective of full open access without increasing current costs of science communication.
• In all calls for proposals, clearly indicate the obligation to deposit publications simultaneously with the publishing date, in accordance with Article 37 of the Science Act (Spain, 2022).
• Eliminate the option of individual payment for publication in hybrid journals.
• Require project reports to include the web address of the repository where publications resulting from all publicly funded research are deposited.
• Promote bibliodiversity in forms of publishing and encourage publication in non-commercial open access journals with no publishing fees (also known as "diamond" journals).
• Develop a legal framework that ensures that scholarly publications can be disseminated via open access immediately after their acceptance or publication.
• Establish clear institutional policies for the intellectual property of scholarly inputs by teachers and researchers to facilitate retention of their copyright entitlements.
• Ensure that universities and research centres advise teachers and researchers regarding copyright to their works.

- Continue to promote green open access (self-deposit in open access repositories).
- Encourage authors to link their publications to the underlying data (research data) or other relevant material.

2.2 RESEARCH DATA

Objective 2: Create a system of human support infrastructures and services that will facilitate the FAIR (findable, accessible, interoperable and reusable) publication of research data in trustworthy repositories.
With the aim of participating actively in EOSC's federated research data ecosystem, by the year 2027 Spain should have a system of human support infrastructures and services that allow and facilitate the FAIR publication of research data in trustworthy repositories.

Recommendations:

- Require the development of a data management plan for the various stages of a fully or partially government-funded research project.
- Require prior deposit of the underlying data for publications by researchers at public institutions.
- In accordance with the FAIR principles, publish the research data generated in the course of a research project in trustworthy institutional, cooperative, or disciplinary repositories for all fully or partially government-funded projects.
- In relation to the above, expand on actions to make other research project outputs public, such as software, lab notebooks, etc., whenever possible.
- Ensure that research data repositories comply with the requirements for trustworthy repositories established by CoreTrustSeal in order to be able to incorporate them into the EOSC ecosystem.
- Create support services for teachers and researchers to develop data management plans and ensure that all data they publish is curated and adheres to the FAIR principles.
- Incorporate information on the research data published in repositories into

the current research information system (CRIS) in the same way that publications and other research project outputs are.
- Incentivise the creation of cooperative infrastructures for publishing and conserving research data with the aim of saving on cost and effort while also creating synergies.

2.3 RESEARCH ASSESSMENT

Objective 3: Develop a qualitative and quantitative assessment system that acknowledges the diversity of research outputs and open science practices.
Reforms to research assessment are currently under way in Europe, involving research institutions, assessment agencies, and funding agencies, prioritising quality over quantity of the results derived from research that can be considered in the curriculum assessment. These recommendations involve the creation of new assessment systems that will include the diverse range of academic activities and research outputs and combine qualitative with quantitative assessment.

Recommendations:

- Participate actively in forums where new assessment systems are discussed.
- Analyse the viability of these new assessment systems in the national context.
- Organise internal work groups with the participation of all stakeholders to study changes to assessment and internal promotion processes.
- Adapt the assessment, selection, and promotion criteria to the diversity of processes, disciplines, and academic career stages.
- Use bibliographic metrics responsibly and avoid the use of metrics based on the medium of publication (e.g. impact factor).
- Take open science practices (data sharing, citizen science, open publishing, etc.) into account in assessment, selection, and promotion processes.
- Be transparent in the provision of information on assessment criteria and models in promotion and selection processes.

2.4 EDUCATION

Objective 4: Ensure that the knowledge and practice of open science principles are implemented by researchers, research support units, and library staff.

To ensure that all teachers and researchers are aware of the importance of open science, education that will facilitate changes to their research habits and practices is essential for the shift towards the open science model. Progress in this area is still hindered by a lack of awareness, uneven levels of implementation, significant differences between disciplines, and barriers identified by the stakeholders themselves.

This is emphasised in section IV of the UNESCO Recommendation (2021), which is dedicated entirely to "Investing in human resources, training, education, digital literacy and capacity building for open science", and the LERU statement (2018), which stresses the adaptation of training to different audience needs and the use of all teaching methods (in-person, virtual, etc.).

The reference to training in Spain's Organic Law of the University System is also worth highlighting: "Art. 12.7. Libraries and other university units shall facilitate citizen access to both digital and non-digital informational resources, as well as the training necessary to promote the dissemination of Open Science in the university community and in society as a whole."

To achieve this, it is important to provide training that is specific to each of the pillars of open science, and that is also in keeping with the academic career stage and/or specific needs of the individual.

Recommendations:

- Promote open science training in general and also in each of the elements that comprise it (open access, research data sharing and management, open assessment, open educational resources, etc.).
- Develop specific training programs aimed at the full diversity of academic staff at universities and research centres: researchers in training, postdoctoral researchers, permanent staff, project coordination teams, etc.
- Train research support specialists and library staff in issues related to open science.
- Promote the creation of training content related to open science.

2.5 MANAGEMENT AND OPERATIONS

Objective 5: Follow up on the recommendations and actions established by organisations to move towards open science.
To achieve the objectives detailed in the previous sections, it is essential for each institution to establish internal procedures designed to ensure the expected outcomes.

Recommendations:

- Create open science committees in each organisation, with the highest level and the widest variety of representativeness, for the purposes of proposing the initiatives outlined above, planning them, and especially following up on their progress.
- Agree on national indicators for follow-up on the different areas of open science (open access, FAIR data, etc.) at universities and research centres.
- Ensure that all open science promotion plans have clear objectives and indicators that allow their progress to be monitored.
- Monitor the performance of open science activities and practices (publications, self-deposit of research data, etc.) using open sources and with a transparent methodology that can be reproduced.
- Promote the establishment of practical implementation commitments at each institution, in accordance with the model outlined in the Open Science Policy Platform (OSPP) report.

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