

ERAC 1203/20

NOTE

From: General Secretariat of the Council
To: Delegations

Subject: Opinion of the ERAC Standing Working Group on Open Science and Innovation (SWG OSI) on future Open Science and Open Innovation priorities in the European Research Area (2020-2030)

Delegations will find annexed to this Note the Opinion of the ERAC Standing Working Group on Open Science and Innovation (SWG OSI) on future Open Science and Open Innovation priorities in the European Research Area (2020-2030), as adopted by written procedure.

**ERAC SWG OSI OPINION ON FUTURE OPEN SCIENCE AND OPEN INNOVATION
PRIORITIES IN THE EUROPEAN RESEARCH AREA (2020-2030)**

This Opinion results from discussions and exchanges of information held within the ERAC SWG OSI. SWG OSI validated collectively the final version of the document.

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ERAC is a strategic policy advisory committee whose principal mission is to provide timely strategic input to the Council, the Commission and Member States on the ongoing implementation of the ERA in Member States and Associated Countries and on other strategic research and innovation policy issues.

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EXECUTIVE SUMMARY

SWG OSI presents its Opinion on future Open Science and Open Innovation priorities in the ERA, based on evidence provided by the 2019 monitoring exercise of the ERA National Action Plans and a new short survey of its members. Main results are that there is much more attention to Open Science than Open Innovation in national policies, in particular in regard to the writing and implementation of national and institutional plans. Behind the obvious diversity of paths and paces towards Open Science there are **strong thematic convergences that emerge in Europe**. Most actions that have been initiated during the last years are still on track, being of a processual nature rather than punctual initiatives. They mostly relate to the development of Open Research Data infrastructures and the implementation of Open Access mandates, while changes in copyright legislation or development of a responsible - supporting rather than constraining Open Science and Open Innovation - evaluation of researchers seem to concern only a few countries. Only a few ones have dedicated specific attention to Citizen Science policies.

SWG OSI brings out shortcomings that should be addressed in the future ERA. They relate to the still needed change of culture in Academia and beyond, the transformation of the traditional knowledge ecosystems, particularly in regard to copyrights and the provision of proper incentives and rewards to researchers. **To address the lack of inclusiveness and coordination in Open Science and Open Innovation, SWG OSI pleads for a more federated, inclusive and coordinated approach in Europe. In particular copyright legal frameworks, research evaluation practices and monitoring of Open Science and Open Innovation should become more homogeneous, or at least, interoperable beyond the national borders in accordance with the principles of FAIRness and transparency.** Open Innovation should be put more explicitly on the policy agenda, while favourable conditions for its uptake by stakeholders, within and beyond the industry, should be further provided. The quadruple helix model of interactions between universities, industry, government and citizens within the knowledge society should be made a reality.

Overall SWG OSI considers that a joint and dedicated attention should be brought to Open Science and Open Innovation in the context of the next phase of the ERA, in order to maximize the benefits of openness in research, innovation and knowledge transfer.

PREAMBLE

The Standing Working Group on Open Science and Innovation (SWG OSI) of the European Research Area and Innovation Committee (ERAC), in line with its mandate of providing forward looking policy advice and recommendations to ERAC on issues linked to open science and open innovation, has decided to draft a “SWG OSI Opinion on future Open Science and Open Innovation priorities in the European Research Area (2020-2030)” as part of its Work Programme for 2019-2020. The Opinion was prepared by a Task Force, composed of four delegates of SWG OSI: Ágota Dávid (HU), Marie-Pascale Lizée (FR, SWG OSI Vice-Chair), Sami Niinimäki (FI) and Marc Vanholsbeeck (BE, SWG OSI Chair).

This opinion paper is made of two sections:

- **First section (section I: *Where do we stand?*)** examines where we currently stand in regard to Open Science (OS) and Open Innovation (OI) policies in Europe.
- **Second section (section II: *The next challenges ahead*)** presents some current shortcomings in OS and OI policies, followed by recommendations about how to address them in a more inclusive, coordinated and federated way in the context of the future ERA.

Each section concludes with a partial conclusion that recapitulates the main findings. The paper ends with general conclusions that summarize the most important issues discussed.

I. First section: Where do we stand?

SWG OSI has conducted a mapping exercise of the current situation in Member States in regard to Open Science (OS) and Open Innovation (OI). The mapping was supported by the already existing analysis of the ERA National Action Plans (5th priority) conducted in 2019 on the one hand, and by a new short survey of nine questions, specifically prepared, disseminated and analysed by the Task Force for this opinion paper. The survey investigated the existence of dedicated national OS and OI plans as well as OS and OI related initiatives in national legislations, infrastructures, mandates, research evaluation and Citizen Science.

A. Monitoring of the ERA National Action Plans (5th priority)

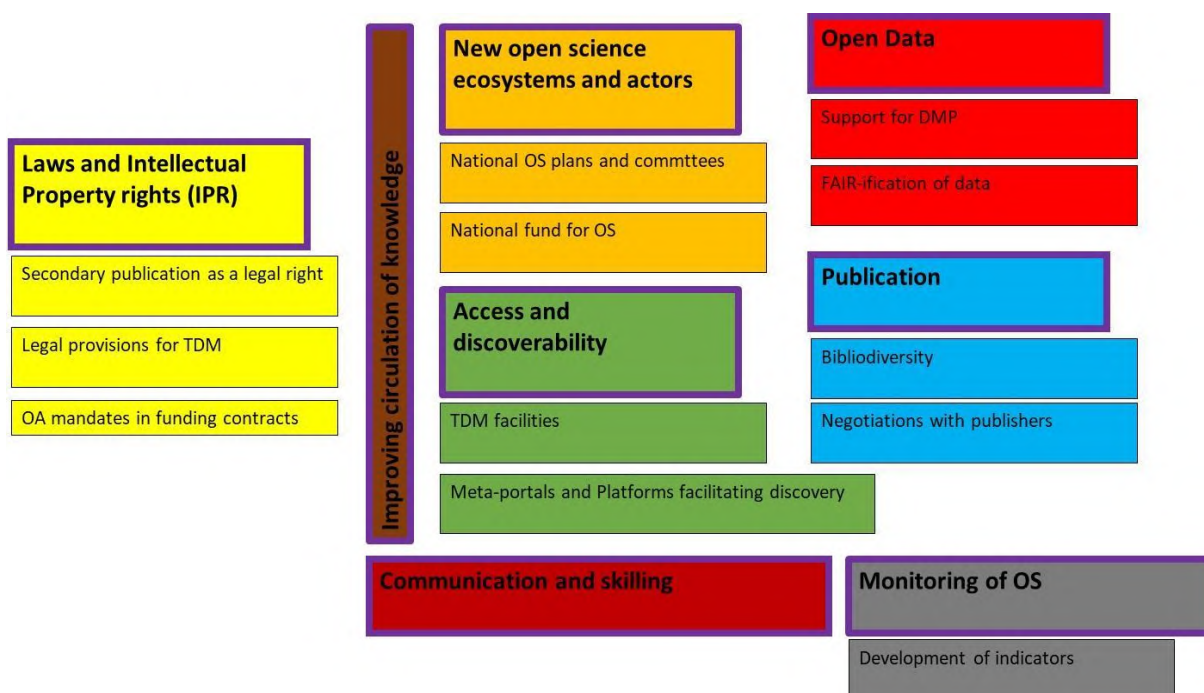
From the recent (even if partial¹) monitoring of national action plans conducted by SWG OSI, it appears that the level of implementation of Open Science and Open Innovation varies a lot between countries, and within countries between disciplines. Some unquestionable achievements have already been made in the last years though, at national and European level, and there is a virtuous circle to be developed between both of these two geographical levels like in the development of OS regulations and IPR, or in the current implementation of Open Research Data policies.

Main results of the monitoring exercise of the ERA NAPs can be summarized as follows:

- There are much more actions dedicated to Open Science than to Open Innovation. OS is also present in actions combining OS with OI and/or Knowledge Transfer.
- Open Innovation is not represented in a large number of actions. This number is more important though once we consider actions that combine OI with OS and/or Knowledge Transfer.
- Respondents have mentioned actions that are not present in their current ERA National Action Plans (NAP). Those include national strategies mostly in the field of OS and Open Access (to publications). Only a minority of those new actions are in the field of OI.

¹ The monitoring was based on contributions from AT, BE, DK, FI, FR, GR, IE, IT, LT, NL, NO, RO and SI.

- Only a minority of actions are considered as having come to an end with finished results (in some cases after some delay), while most actions are on track. Some of these actions either have a clear end date, for instance in regard to a specific funding opportunity or a project that should be set up by a certain date. Others are rather ongoing processes and do not have any specific end date.
- When looking at the type of actions that are on track, they mostly aim at strengthening cooperation between the diverse actors of the OS ecosystems, or relate to funding opportunities with dedicated budget, the development of policy or the support to open science practices.
- For a large majority of the actions mentioned in the National Action Plans, respondents indicate that concrete activities have already taken place. There are only a minority of actions mentioned in the plans that have not yet been concretized in any way at this stage.
- More generally, the monitoring exercise showed that although there is a diversity of paths towards OS and OI, as well as different rates of progress, national ERA action plans manifest convergence towards certain common themes. Those themes relate to the development of dedicated legal provisions; the improvement of the OS ecosystems, fostering the access and discoverability of research outputs, making research data open and FAIR and improving the open access to publications; the improvement of the communication on OS and OI; the development of proper systems of OS monitoring.



This thematic convergence that emerges from the analysis of the National Action Plans can be explained in part by the many collective endeavours at European or international level in regard to OS and OI policy making, among which the following ones may be cited:

- **The OA2020 Alliance** fostered by the Max Planck Digital Library;
- The large support of the **Amsterdam Call for Action**;
- **The Plan S** jointly developed by Science Europe, an international group of heads of national research funding organisations, and Robert-Jan Smits, Senior Advisor at the time on Open Access within the European Political Strategy Centre at the European Commission;

- **The Research Data Alliance (RDA)** which was launched as a community-driven initiative in 2013 by the European Commission, the United States Government's National Science Foundation and National Institute of Standards and Technology, and the Australian Government's Department of Innovation with the goal of building the social and technical infrastructure to enable open sharing and re-use of data;
- **GO FAIR** which is a bottom-up, stakeholder-driven and self-governed initiative that aims to implement the FAIR data principles, making data Findable, Accessible, Interoperable and Reusable;
- A fully operational governance structure of the **EOSC** (European Open Science Cloud);
- **The DORA** and the Leiden Manifesto principles which have been supported (but not systematically implemented) by many RFOs and RPOs;
- **The Open Science-Career Assessment Matrix (OSCAM)**, developed as an output of the EC's Working Group on Rewards under Open Science and presented in its final report "Evaluation of Research Careers fully acknowledging Open Science Practices", https://ec.europa.eu/research/openscience/pdf/os_rewards_wgreport_final.pdf, although its principles do not have been implemented at large scale yet;
- **The Mutual Learning Exercise on Open Science on Altmetrics and Rewards** carried out under the European Commission's Horizon 2020 Policy Support Facility (PSF) which, among other outputs, identified the need for systemic and comprehensive change in science governance and evaluation across the EU and beyond, and proposed a template of National Roadmap for the Implementation of Open Science, listing the steps involved in the transition to a national research governance policy that is supportive of Open Science activities.

B. Short Survey

The survey collected quantitative and qualitative information about the existence or not of a national OS and/or OI national plan, as well as about copyright legislation, Open Research Data infrastructures, research funding, evaluation practices and Citizen Science². The survey was filled in by 19 respondents out of 18 countries: Austria (AT), Belgium (BE, Federal level and Wallonia-Brussels Federation), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Hungary (HU), Italy (IT), Latvia (LV), Lithuania (LT), Malta (MT), Moldova (MD), Netherlands (NL), Norway (NO), Portugal (PT), Slovenia (SI), Spain (ES) and Sweden (SE)³.

1. Open Science

There were two questions asked in the survey about OS:

1. “Is there a national Open Science plan in your country?”
2. “In your experience, what percentage of RPOs [Research Producing Organizations] has adopted an OS plan in your country?”

Based on the answers received it can be concluded that most of the responding countries either have an OS plan, or are in the phase of developing such a plan. It should be pointed out that DK⁴ reported they do not have an OS plan, but have a National Strategy on Open Access.

Several countries that have a national Open Science Plan also provide a legislative context and a specific budget for developing it. However EE, NL, and NO don't have legislative provision. EE and NO do not have a specific budget for Open Science either although in NO a relatively large proportion of the budget for research infrastructure has been dedicated to data infrastructures and money has also been allocated through other channels.

² See Annex 1 for the questionnaire

³ See Annex 2 for a synthesis on the quantitative results

⁴ <https://ufm.dk/en/research-and-innovation/cooperation-between-research-and-innovation/open-access/Publications/denmarks-national-strategy-for-open-access>

There is a definite correlation between the existence of national OS plans and the ratio of OS plans on the level of RPOs: countries with existing national plans on OS typically have higher rates of OS implementation at the RPO level. In FI, NO and SI more than 50%, and in AT, NL and FR between 25 and 50% of RPOs have adopted OS plans⁵. SE was the only country with an existing OS plan that reported a lower ratio of OS Plans on the RPO level (less than 25%). Countries which are developing their OS plan at the moment have provided very diverse data about the ratio of RPOs having adopted OS plans. ES and IT are finalising their national plans and have reported high ratios (more than 50%). Other countries like HU, LT and LV estimate that the ratio of RPOs with adopted OS plans is below 25%, while EE, MT and PT do not possess the necessary information.

Due to the high number of existing national plans and institutional practices there are numerous good examples to be shared among Member States and Associated Countries in the field of OS-related policy making.

In **Finland** the Vision for higher education and research in 2030 (<https://minedu.fi/en/vision-2030>) includes changes to the core funding of HEIs for the period of 2021-2024: Open Access publications get a coefficient of 1.2. With the coordination of the Federation of Finnish Learned Societies (<https://openscience.fi/en/frontpage>) the research community is formulating a new national agreement and roadmap for responsible research that includes OA and ORD and fair evaluation of research and researchers.

The **French** National Plan on Open Science (<https://www.ouvrirlascience.fr/the-national-plan-for-open-science/>) concentrates on four key areas:

1. Promoting and generalizing open access to scientific publications;
2. Promoting optimal use and reuse of research data and making it available through Open Access;
3. Adapting evaluation and award systems to bring them into line with the objectives of open science (reward systems);
4. Be part of a sustainable European and international open science dynamic.

⁵ FR has a national OS plan supported by legal and funding mechanisms but they did not provide data about the RPOs.

The **French** National Plan on Open Science disposes of a specific budget, the Open Science Fund, and has led to the formation of the French Open Science Committee, which is intended to define a national open science policy. It is tied both with a specific funding and with a legislative provision (The French Law for a Digital Republic).

Malta is currently participating in a H2020 PSF exercise on Open Access (<https://rio.jrc.ec.europa.eu/en/policy-support-facility/specific-support-malta>), which will lead to the drafting of the National Open Access Policy that is intended to be launched in Q1 of 2021.

The **Netherlands** National Plan is the result of a large national consultation with all the parties. It focuses on three key areas:

1. Promoting open access to scientific publications (Open Access);
2. Promoting optimal use and reuse of research data;
3. Adapting evaluation and award systems to bring them into line with the objectives of open science (reward systems).

https://www.openscience.nl/binaries/content/assets/subsites-evenementen/openscience/national_plan_open_science_the_netherlands_february_2017_en_.pdf

In order to show their commitment to the National Plan Open Science, the parties involved signed the Open Science Declaration on 9 February 2017. Delivering the National Plan Open Science is just the beginning. The National Platform Open Science was established to join and coordinate efforts towards open science and promote its importance (<https://www.openscience.nl/en/national-platform-open-science>).

The Norwegian government launched National Goals and Guidelines for Open Access to Research Articles and National Strategy on Access to and Sharing of Research Data in 2017. Unit - Directorate for ICT and joint services in higher education and research negotiates at national level on behalf of Norwegian research organizations. They have agreed on mainly cost neutral publish and read agreements with Elsevier, Wiley, Springer Nature, Taylor & Francis, SAGE, Cambridge University Press and American Chemical Society.

The National Open science plan is a strategic document that was adopted by the Government of the Republic of **Slovenia**. It focusses on open access to scientific publications and research data:

(<https://www.gov.si/assets/ministrstva/MIZS/Dokumenti/ZNANOST/Strategije/National-strategy-of-open-access-to-scientific-publications-and-research-data-in-Slovenia-2015-2020.pdf>).

The implementation of the National Open science plan is supported by the Action plan for the implementation of the national strategy of open access to scientific publications and research data:

(<https://www.gov.si/assets/ministrstva/MIZS/Dokumenti/ZNANOST/Strategije/Akcijski-nacrt-izvedbe-nacionalne-strategije-odprtega-dostopa-do-znanstvenih-objav-in-raziskovalnih-podatkov-v-Sloveniji-2015-2020.pdf>).

The Ministry of Education, Science and Sport and the Slovenian Research Agency (ARRS) secure the funds for the implementation of the strategy. There are several national repositories for Open Access (<http://www.openscience.si/default.aspx>), including publicly funded higher education institutes and publicly funded research institutes.

In **Sweden** the national approach is that the products of research must possibly meet FAIR principles, that scientific publications arising from publicly funded research should be immediately openly accessible (from 2020 at the latest), and that the costs of scientific publication must be transparent:

(<https://www.government.se/499a7b/contentassets/514bde7beb4d423ea7b7b1f2c50f470f/swedish-national-roadmap-for-era-2019-2020.pdf>)

2. Open Innovation

The same two questions were asked regarding Open Innovation:

1. “Is there a national Open Innovation plan in your country?”
2. “In your experience, what percentage of RPOs has adopted an OI plan in your country?”

The responses received for these questions have differed considerably from the answers given to the previous questions on Open Science. Only two countries mention an already existing OI strategy:

AT (http://openinnovation.gv.at/wp-content/uploads/2015/08/OI_Barrierefrei_Englisch.pdf) and **NL** which has a sort of Open Innovation plan based on innovation policies, especially the Topsector Programmes and Innovation missions. ES and HU are currently developing OI strategies. In addition to AT it was only ES that estimated that the ratio of RPOs with an existing OI strategy is higher than 50%. Most of the other countries (BE, DK, EE, FI, FR, IT, LT, LV, MD, MT, NO, PT, SE, SI) do not have, or do not know about any existing OI strategy in their country and they either have a low number of RPOs with an adopted OI plan, or they lack this type of information.

Respondents to the short survey did not mention many examples of good practices either.

Only **Italy** mentioned that even though they do not have a dedicated plan for OI, recent programmes of the Ministry of Economic Development include the promotion of Open Innovation among the required objectives of funded projects.

It must not be concluded though from this lack of feedback that there are currently no initiatives at national level in the emergent field of Open Innovation as SWG OSI Opinion on Open Innovation (2019) has clearly shown:

(https://era.gv.at/object/document/4610/attach/0_item_4_2_-_st01203_en19_-_Recommend_on_Open_science_and_innovation.pdf)⁶.

⁶ Among other examples of good practices in Open Innovation that are presented in the OSI Opinion paper, let us mention here: the Growth Engines cooperation networks (FI) implemented through an enterprise-driven partnership model between companies, research organizations and public actors, which strives to find solutions to global market disruption and create new growth sectors; HENRi (CH) Nestlé's flagship global Open Innovation platform which was launched in July 2016 with a clear directive: to bring breakthrough innovation inside and create collaborative partnerships between Nestlé and the start-up / innovation community; the LBG OIS Center (AU) established as a leading international hub for investigating and experimenting with Open Innovation research practices; Hack for Sweden (SE) which is Sweden's new platform for citizen-driven innovation through which over 30 Swedish government agencies and companies are already cooperating to promote innovation through open data; the TRANSUNIV (BE) project designed to better address societal challenges and improve the technology's valorisation, while encouraging researchers to leave a silo mindset and secrecy mentality; the Health Innovation Hub Ireland (HIHI) (IE) which a joint initiative between the Department of Business, the Enterprise and Innovation and the Department of Health, supported by Enterprise Ireland and the Health Service Executive to drive and increase collaboration between the health service and enterprise.

3. Copyright legislation

The fifth question of the survey asked if:

National copyright legislation has been adapted in an OS and/or OI perspective?

The number of countries with OS/OI-relevant copyright legislation is again very limited: only BE, FR, LV and NL have such a regulation. NO is in the process of investigating whether legal changes are necessary or desirable in order to achieve the national goals and guidelines for OS and OI. Two more countries (FI and IT) have indicated certain plans for revising the current legislation.

In **Belgium**, federal copyright legislation was adapted in a way to allow the archiving of publications, whatever the contractual conditions are. In the **Wallonia-Brussels Federation**, a decree from 2018 mandates the deposit of all publicly funded publications on institutional or disciplinary Open Access archives, after a maximum embargo of 6 months (STEM) or 12 months (SSH).

Finland suggested that the national implementation of the European copyright directive creates a good chance to reconsider legislative amendment to promote parallel publishing.

The **French** Law for a Digital Republic⁷, promulgated on October 2016 can serve as a good example. It regulates the open access to scientific publications financed from public funds in the following way:

1. Publications: a new right for authors. (*Article 30*: When a research is 50% publicly funded, the author retains the right to publish in open repositories 6 (STM) to 12 months (HSS) after publication.)
2. Data research: a new legislative disposition and a new duty for universities and research performing organizations. (*Article 6*: open data should be the default for all publicly funded data, including research.) (*Article 30*: When research data are 50% publicly funded, are not protected by a specific right or regulation and have been made public by the researcher, the institution or the research performing organization, their reuse is free.)

⁷ (<https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000033202746&categorieLien=cid>).

The Netherlands produced an Amendment to the Copyright Act (Taverne Legal Amendment) (<https://www.openaccess.nl/en/events/amendment-to-copyright-act>): “*The maker of a short scientific work, the research for which has been paid for in whole or in part by Dutch public funds, shall be entitled to make that work available to the public for no consideration following a reasonable period of time after the work was first published, provided that clear reference is made to the source of the first publication of the work.*” The article of law only mentions "a reasonable period" at the end of which the researcher can disseminate his work freely, but the duration of this reasonable period will differ according to the type of publication and is still subject to discussion. In a publication in a journal that is published weekly, a period of one month may be reasonable, while on a monthly publication a period of several months may be better.

4. National infrastructures for Open Research Data

Questions 6 asked if:

There was any national infrastructure for Open Research Data in the given country.

Many countries – AT, BE (federal level: <https://data.gov.be> which is technically though an Open Data rather than an Open Research Data database), EE, ES (<https://recolecta.fecyt.es/>), FI (<https://www.fairdata.fi/en/>), FR, LT, NO, SE and SI – have answered positively to this question and all the other countries – DK, HU (<https://www.mtmt.hu/minositett-repozitoriumok>), IT, LV, MD, MT, NL and PT – are currently in the process of developing national infrastructures. Some countries of the latter group have provided information about the main driving principles they want to follow when establishing their national infrastructures.

Italy plans to set up a national infrastructure for supporting open access to scientific publications, including the definition of proper guidelines for promoting interoperability among existing databases of academia and research centres.

In case of **Portugal**, key elements of the new infrastructure will be its federative nature, flexibility, scalability, interoperability and capacity to integrate the European Open Science Cloud.

In **Malta**, when the National Open Access Policy will be launched in 2021, it will be looked at what infrastructure is needed to support the policy on Open Research Data.

Estonia has two field-specific infrastructures (Centre for Language Resources for language and NLP, and NATARC for life sciences), some institutional infrastructures (University of Tartu, Estonian University of Life Sciences). In addition to that there is the national grid for RDI and higher education (national NREN) and the national HPC competence centre (ETAIS).

Many of the countries with existing infrastructures have also shared their good examples as well as certain challenges throughout the process.

The **French** Research Infrastructure Roadmap (2018 update) summarises information about 99 French research infrastructures and e-infrastructures as data producers or service providers. A key objective of the roadmap is that all research infrastructures which produce, manipulate, process and/or exchange data within scientific domains with their own specificities, can be securely interconnected whilst ensuring European data sovereignty. The main challenges are to restructure and upgrade at the national and regional level based on the principle of subsidiarity, to promote the widespread implementation of FAIR principles, and to facilitate the cross-fertilization of data between diverse communities. The first step will be to make Data Management Plans mandatory for all projects financed by the French National Research Funding Agency (ANR) from 2019 onwards. To support the research community concerning Data, two platforms are available: DORANUM (<https://doranum.fr/>), a resources platform to support the scientific community in the management and sharing of their data; and Cat OPIDoR (<https://cat.opidor.fr>) which is a catalogue that currently lists more than 200 French services dedicated to scientific data and their reporting structures.

Netherlands has several data infrastructures. A project currently attached to the National Program Open Science takes an inventory of the Dutch data-infrastructure landscape. In the report expected in May 2020, recommendations to reorganise the data infrastructure landscape will be provided, in order to be more responsive to the needs of researchers and to prepare for the EOSC.

The Research Council of **Norway** (RCN) contributes to increased availability and reuse of research data for business and the public sector, as well as for the research itself, through requirements and guidelines for R&D projects, and through funding of data infrastructures of national importance. To speed up data access and increase the utilization of health data for secondary use in research, quality improvement, management, innovation and business development the government is introducing a platform for health analysis and a national authority for handling applications and access.

In **Slovenia** national infrastructures of Open Research data are parts of wider EU research data repositories:

- CESSDA-SI (ADP – Social Science Data Archives, Faculty of Social Sciences, University of Ljubljana, <https://www.adp.fdv.uni-lj.si/eng/spoznaj/cessda/>);
- CLARIN-SI (Jožef Stefan Institute, <http://www.clarin.si/info/about-repository/>);
- DARIAH-SI (Institute of Contemporary History and other partners, <http://www.dariah.si/dariah-si-eng/>);
- ELIXIR-SI (University of Ljubljana, Faculty of medicine, <https://elixir-europe.org/about-us/who-we-are/nodes/slovenia>).

Swedish National Data Service (SND) has a primary function to support the accessibility, preservation, and re-use of research data and related materials. Together with a network of more than 30 universities and public research institutes, they strive to create a national infrastructure for open access to research data: <https://snd.gu.se/en/about-us>.

5. Research Funding Organisations (RFOs) supporting OS

To question 7 - “Do national RFOs have mandates that support OS?” - all except two countries have given a positive answer and it should be mentioned that LV is developing its mandate at the moment. In spite of the high number of positive responses, the answers received differ considerably. A selection of these various approaches follows below.

In **Belgium (Wallonia-Brussels Federation)**, the evaluation of publications of all publicly funded researchers – including those who are funded by the F.R.S.-FNRS funding agency which has a dedicated Open Access policy since 2013 - is based exclusively on bibliographic lists taken from OA repositories, according to a decree from 2018 which mandates the deposit of all publicly funded publications on institutional or disciplinary Open Access archives, after a maximum embargo of 6 months (STEM) or 12 months (SSH). The **Belgian Federal Authority** has an OA mandate which is based on a similar principle.

The Academy of **Finland** and Business Finland both have requirements for OA and require a DMP from funded projects.

The **Estonian** Research Council has a Green OA mandate for publications and for data there is a Data Management Plan obligation.

The **French** National Research Funding Organisation (ANR) introduced its Open Science policy since 2013, which is now fully aligned with the National Plan for Open Science from July 2018. The policy has three objectives:

- Promote open access to publications;
- Contribute to open research data wherever possible;
- Coordinate efforts on the national, European and international levels.

ANR is also involved in various cross-border initiatives, representing France's position on open science and bibliodiversity. ANR is a member of cOAlition S which brings together several funding bodies to accelerate the transition to full and immediate access to scientific publications, supports the Plan S and is a member of the French GO FAIR office.

In **Hungary**, calls for proposals supporting basic research allocate a certain amount of funding to OA objectives. Other types of calls also incentivise and give preferential treatment to projects with OA activities. The Research Council of **Lithuania** have guidelines on OA to research information gained by its funded projects. The library of the University of **Malta** has developed its own Open Access Policy:

https://www.um.edu.mt/_data/assets/pdf_file/0005/334454/OpenAccessPolicy.pdf. Malta Council for Science and Technology (MCST) also administers a number of funding programmes in which it promotes Open Access. <https://mcst.gov.mt/ri-programmes/fusion/>.

In the **Netherlands** the Dutch Research Council (national funder) has developed an open science policy (<https://www.nwo.nl/en/policies/open+science>) and has just updated its data management protocol (<https://www.nwo.nl/en/news-and-events/news/2019/12/nwo-to-update-its-data-management-protocol-in-january-2020.html>).

Since 2009, the Research Council of **Norway** (RCN) has demanded open access to publications, and in 2014, RCN made a policy for making research data available. RCN has developed a comprehensive policy for open science that will apply from 2020. The policy is based on the principle that research and innovation processes should be as open as possible and as closed as necessary. The policy has three main objectives: to contribute to a well-functioning research system, to contribute to sustainable social development and to strengthen confidence in research.

FCT (Fundação para a Ciência e a Tecnologia), the major **Portuguese** research funder, has been actively pursuing Open Science policies since 2012. This has resulted in an Open Access mandate for the research publications resulting from its funding (published in 2014), and in a *Recommendation towards the management and sharing of the research data arising from its funded research* (published in 2014). These policy documents are expected to be revised soon and the recommendation will be upgraded towards a mandate requiring:

- data management plans to be delivered along with the research projects or grants applications;
- sharing of data whenever possible, following the principle “As open as possible, as closed as necessary”;
- application of the FAIR principles to data.

The **Slovenian** National Research Funding Agency (ARRS) has a strong mandate in implementing the National Strategy of open access to scientific publications and research data in Slovenia 2015-2020. This mandate is formalized by an Action Plan for implementation that was adopted by the government of the Republic of Slovenia. ARRS is a member of the Plan S initiative.

In **Spain** all researchers funded under the National Research Plan are committed to publish in OA or deposit their publications in public repositories.

In **Sweden** four of the governmental research funding bodies have Open Access mandates.

6. Responsible evaluation of researchers

Question 8 asked respondents to report about their experience: *How common is the practice of responsible evaluation of the researcher (e.g. following the principles of Declaration on Research Assessment DORA) in HEIs, research institutes and RFOs in their country?*

Respondents showed a quite high level of uncertainty regarding this question: 7 country representatives (AT, DK, IT, LT, MD, NL, PT) did not know the answer to this question. The remaining countries (BE, ES, FI, FR, HU, LV, MT, NO, SE, SI) reported about a low rate – below 25% – of acceptance of such principles. Only EE reported a strong rate of more than 50%. The situation is well described by EE, NO and PT who suggest that there is a noticeable lack of information on this issue; even if a number of scientists follow the principles, they do not necessarily do so because they are aware of them. It is also often difficult to assess the diversity of practices within the RPOs.

Nevertheless, there were also a number of positive examples and trends mentioned by the respondents.

In the framework of its Open Science roadmap, CNRS in **France** has recently plead for some changes in evaluation criteria:

- Evaluate the results of the research, regardless of the impact factor of the journal;
- Give preference to the quality of publications;
- All types of scientific outputs must be evaluated (e.g. data associated to the publications, data papers, preprints, source codes, etc.);
- All the evaluated scientific outputs should be deposited and accessible in a multidisciplinary Open Archive national platform.

For **Norway**, the humanities faculties and to a certain degree the social science faculties often follow the principles, not necessarily because they are aware of them, but because they have never relied on IF to begin with. The Research Council of Norway has signed DORA and is implementing the principles in its calls from 2020.

A good practice in **Portugal** was set by FCT in its Research Units in 2017/2018. The Regulation for assessment and funding of the R&D Units

(<https://www.fct.pt/apoios/unidades/avaliacoes/2017/docs/RegulamentoAvaliacaoUID20172018.pdf>)

referenced the principles of the Declaration on Research Assessment DORA, the Leiden Manifesto and the Recommendations produced by the DFG, privileging the quality of the scientific contributions in detriment to bibliometric indicators. The Evaluation Guide prepared for this process:

(https://www.fct.pt/apoios/unidades/avaliacoes/2017/docs/Guiao_de_Avaliacao_Aval_2017.pdf)

also called for reviewers to avoid looking at bibliometric indicators and included as one of its evaluation criteria the “preservation, curation and dissemination of R&D results and data, respecting the principles and practices of Open Science”.

By the decision of the Rectors' Conference of the Republic of **Slovenia** in 2019, universities were obliged to inform their researchers about Plan S and DORA declaration. As a result, the University of Maribor and the Slovenian Research funding organisation ARRS have adopted the DORA declaration.

7. Citizen Science

The last and *ninth question* was asked about *Citizen Science*.

This questions was interpreted by respondents in different ways. Some countries (AT, BE, EE, FI, FR, LV, NL, NO) definitely stated they have a plan, or explicit policy attention towards Citizen Science, while others have responded with a clear “no” (ES, HU, MD, MT, SI). However, there were some countries (LT, DK), which have answered “no” but have mentioned certain running activities in their countries. Activities cover a broad scope of themes some of them bordering on science education or science communication.

Denmark has stated that several Citizen Science projects are going initiated by RPO's. As a concrete example, a Citizen Science Symposium was mentioned, which was hosted by the University of Southern Denmark: <https://cs-eu.net/events/external/citizen-science-symposium-2019-first-danish-cs-symposium>. On the other hand, FI, PT and SE have indicated a certain level of policy attention towards the field in their countries but without any concrete activities at the moment.

Science popularisation is a prominent strategic goal in **Estonian** research system. It includes a variety of topics, including but not limited to Citizen Science. Citizen Science is part of the National Program on Open Science. This national program has three program lines: Open Access, FAIR data and Citizen Science, with a dedicated project relating to Citizen Science.

In **Finland** Citizen Science is considered as an integral part of Open Science but there are no major actions to promote citizen science as such. It is thus understood as one method among others to conduct scientific research.

A concrete example of Citizen Science action was mentioned by **France** since the National Strategy for Scientific, Technical and Industrial Culture relates directly to citizen science. Scientific, technical and industrial culture is defined as an integral part of culture in the broadest sense. It should allow citizens to understand the world in which they live and help them prepare for the world of tomorrow. By developing information and encouraging public reflection on science and its challenges, promoting dialogue with the scientific community, sharing knowledge, and fostering active citizenship, it embeds science in society. There are four challenges: 1. a cultural challenge, designed to place science at the centre of our common culture and create a link, to rediscover the enjoyment of owning and sharing knowledge; 2. a democratic challenge, designed to inform public debate and political choices; 3. an educational challenge, designed to educate young people to exercise their citizenship in a critical, informed way; and 4. a social challenge, designed to promote inclusion.

Conclusion of the first section

The results of the survey confirm the monitoring of the NAPs showing that there is a considerable variability in the policy attention dedicated to the various fields covered by OS and OI. On the one hand, OS and infrastructures for Open Research Data are well known and highly supported by almost all the respondents both on the level of policy makers and research funding organisations. In particular, OS plans have been or are currently drawn up in an increasing number of countries and - in a correlated way - of RPOs. Most RFOs have also adopted – or are in the process of adopting - OA mandates. On the other hand, there is by far not the same level of national planning in OI - only very few countries having an OI national plan – or in regard to OS/OI-friendly copyright legislation. Answers about responsible evaluation practices and Citizen Science were rather controversial, partly because of the lack of knowledge about these issues, partly because of the various stages of development and the different approaches and practices of the responding countries.

Even if the analysis of the ERA NAPs showed the emergence of common themes in OS and - to a much lesser extent - in OI, countries participating in the survey cannot be strictly divided into clusters on the basis of their responses, or ranked in any systematic way according to their general performances in OS and OI. On the contrary the results reflect the different thematic priorities of the different countries, each of them tending to favour some OS and OI related topics at the expense of some others. There is also no clear geographical division between countries that perform above and under the average: depending on the topic, each European region has its champions.

II. Second section: The next challenges ahead

In this section shortcomings in OS and OI policies will be presented first. Those are the ones that according to SWG OSI need to be adjusted on a priority basis under the next phase of the development of the ERA. Then recommendations will be provided for the establishment of a more federated, inclusive and coordinated approach towards OS and OI in Europe. The section will be concluded by a plea to pursue efforts in the next phase of the ERA to dedicate a joint attention to Open Science as well as Open Innovation, in order to maximize the benefits of openness in research, innovation and knowledge transfer.

A. Current shortcomings in OS and OI policies⁸

The main shortcomings identified by SWG OSI that still impede the OS and OI implementation at national and EU level are the following:

1. OS and OI imply a change of culture in Academia and beyond which has not yet (fully) happened

- The widespread adoption of open science for better research efficiency, new products and services is slow and still lacks homogeneity. Understanding and delivering open science is complex as it must address political, legal, financial, human and technical issues, and requires the negotiating of new partnerships. (*)
- Some research outputs, including data and software, are not made available with future-proof interoperable formats by default, and so are not accessible and reusable. (*)
- Properly trained data stewards and experts are still lacking in RPOs.

⁸ (*) = Adapted from the recommendations by the ERAC Standing Working Group on Open Science and Innovation (SWG OSI) on open science and innovation (2018);

(**) = Adapted from the ERAC SWG OSI Opinion on Open Innovation (2019).

2. The traditional ecosystems of research production-dissemination-evaluation remain firmly in place

- Publications are still produced primarily with copyright protection that limits knowledge circulation rather than copyright that both protects the author and accelerates knowledge circulation and re-use. For example, most publications do not have a CC-BY license by default. (*)
- In particular, authors are still asked to give up their copyright in the case of agreements with publishers and thus don't retain their copyright by default or recover it. Their work, even when it is publicly funded, then becomes largely inaccessible, at least during an embargo period, due to the exercise of copyrights. (*)
- The imposition of excessively long embargoes on green Open Access deposits, unfair APC-based gold Open Access, and the practice of hybrid Open Access, directly or indirectly, contribute to commercial publishers excessively creaming off research performing organisations. (*)
- There is still a lack of rewards and incentives to foster Open Science practices. Bibliometrics often in use for assessing research and researchers are mostly based on journals and are indicators of their reputation rather than their quality, and are unrelated to open science. Incentives to publish research data are currently very low, in particular since there is no standardized way to cite datasets and attribute them to authors. Furthermore implication in citizen science is generally not duly rewarded in academic careers.

3. OS and OI policies still lack inclusiveness and coordination

- There is still a lack of collective approach in the negotiation with major publishers (which contributes to foster a quasi-monopoly of those private companies on science publishing and management of research workflows).
- Some field related national research infrastructures provide specific open data, but there is the need for national and international coordination towards open research data and for implementation of the European recommendations. (*)

- There is currently no truly inclusive monitoring of OS, OS uptake and OS impact on science and society;
- There is not enough attention given to the industry, as potential beneficiaries of Open Innovation policies, and to citizens, Citizen Science still being the weakest link in open science policies. All these beneficiaries build a knowledge ecosystem that should be considered as such in research and innovation policies.

B. Recommendations to foster a more federated, inclusive and coordinated approach towards Open Science and Open Innovation

Notwithstanding the European or international collective initiatives mentioned above, SWG OSI has identified several OS and OI related topics in which a more federated, inclusive and coordinated approach between EU and national level is still needed and will lead to an efficient implementation of open science and innovation, while fostering their impact on science and society.

1. Open Science

Promote FAIRness and transparency

- Implementation of FAIR principles for all kinds of research outputs, increasing research quality and impact, and increasing innovation for all researchers, businesses, citizens and society at large by unleashing the benefits of rapid access to research. (*)
- Require that infrastructures, processes and workflows underpinning the European research system adhere to and adopt open standards. Critical services and infrastructures underpinning the ERA should remain under control of the academic community and be accessible through open and portable technologies. (*)
- Facilitate full transparency for terms and conditions of subscription agreements and Open Access deals. (*)
- Support European publishing platforms that combine innovative publication processes, without – or with capped APCs and with open peer review possibilities.

Review research evaluation practices

- Adjust assessment, reward, and evaluation systems. There is a need for strong incentives that attribute prestige to collaboration and quality, such as increased visibility and re-use of researchers' outputs. (*)
- Foster open peer review as the default legitimate approach for scientific validation, increasing review quality and recognition and rewarding researchers for their reviewing work. (*)

Adapt copyright legal framework

- Promote and protect open science within the European copyright legal framework, balancing the copyright legal framework throughout Europe to accommodate open science and its benefits. (*)

Make the quadruple helix model of interactions of universities, [industry](#), [government](#) and citizens within the knowledge society a reality

- Foster involvement of citizens in science. (*)
- Integrate Open Education in the Open Science paradigm, Open Educational Resources following the same FAIR principles than other types of research outputs.

Monitor in an inclusive way

- Harmonize Open Science monitoring methods through the adoption of open and inclusive standards for Open Science monitoring, as well as monitoring of OS uptake and OS impact on science and society at EU and national level.

2. Open Innovation

Put Open Innovation high on the (policy) agenda

- Develop and advocate a shared understanding of the notion of innovation between Member States that is built on open science, properly addressing the balance between openness and reserving some rights and highlights mutual benefits. (*)
- Develop national strategies or guidelines on Open Innovation, addressing especially the interaction between Open Innovation and other forms of innovation. (**)

Provide favourable conditions for the development and uptake of Open Innovation

- Create sustainable Open Innovation platforms with proper incentives in order to ensure active participation (**)
- Develop end user skills for better appropriation of knowledge deriving from research, unleashing the appeal for re-using research outputs among non-researchers. (*)
- Foster participation of SME's by offering methods and instruments applicable in Open Innovation. (**)
- Revisit the 2008 “Recommendation on the management of intellectual property in knowledge transfer activities” in the light of new developments like Open Innovation in the field of knowledge transfer. (**)
- Analyse uncertainties embedded in global value chains and start a common European foresight process to better equip both policy builders and other stakeholders to face those uncertainties. (**)

Foster Open Innovation beyond the industry

- In order to meet the needs of society, create policy measures that not only consider the interests of representatives of policy, industry and research, but also cater to the needs of citizens and civil society. (**)
- Ensure access, participation and agency to various groups of actors (age, gender, ethnicity, health, social status etc.) in order to increase the inclusion, empowerment and sustainability of and by Open Innovation. (**)

Conclusion of the second section

The focus areas of the **5th priority of the ERA Roadmap** – which initially referred to the optimal circulation and transfer of scientific knowledge – has been considerably extended in recent years, especially for the past two years. Originally, the sub-priority 5A concentrated on knowledge transfer at national level, which resulted in various national programmes on connecting universities and other RPOs with industry. In parallel with the growing importance of innovation related issues, the concept of Open Innovation has come to the front under this sub-priority, encompassing better involvement of citizens and user needs into the innovation process. Sub-priority 5B – open access to publications and data in an Open Science context – has evolved considerably, recently broadening its scope and covering concepts like FAIR data as well as other types of open collaborations such as Citizen Science.

As such SWG OSI anticipated somehow those thematic evolutions of the ERA 5th priority and has been able to focus its work, since its launch in 2016, on OS and OI, rather than solely on Open Access and knowledge transfer. Furthermore experience within SWG OSI has shown that it is a more coherent approach for an advisory group of its kind to focus primarily on topics relating to openness in research and innovation. While it is of primary importance to duly consider the interlinkage between OS, OI and knowledge transfer, engaging exhaustively into the whole topic of knowledge transfer - considering thus open as well as closed knowledge transfer processes - is probably too ambitious for such an advisory group, and may lack in coherence.

Hence SWG OSI considers that ERA should continue to dedicate specific and joint attention to Open Science and Open Innovation in order to maximize the impact of openness - as a principle and a process - on knowledge ecosystems in the most federated, inclusive and coordinated way.

III. General conclusions

Although a lot has happened under the ERA priority 5 since 2016, when the Standing Working Group on Open Science and Innovation was established, there are still a number of remaining and new challenges to be tackled. Even if through a diversity of paths and at various paces, thematic convergence emerges from the recent developments and national Open Science plans have been - or are currently - drawn up in many countries. In certain cases new programmes, regulations and laws have been accepted on the European or national level (e.g. national laws for Open Access or open data, for secondary publication rights, the European Directive on copyright, the European Directive on the re-use of public sector information or Plan S). Implementation of these regulatory measures keep stalling though - and this even more in the area of Open Innovation which is not yet properly put on the policy agenda - and should be facilitated. Similarly, there are large-scale initiatives, like setting up the European Open Science Cloud that have been started but are far from being finalised. There are also processes to be continued like making research data FAIR with the support of bottom up (e.g. GO FAIR initiative or Research Data Alliance working groups) initiatives.

Open Science won't be fully implemented without a change of culture in and outside of Academia, and transformations in the knowledge ecosystem. In particular, traditional bibliometrics should not continue to play the major role they currently have in the evaluation of research and researchers. In many cases too, researchers do not retain copyright of their publications. Those are some of the particular issues on which a more federated and coordinated approach at European level would help. Scientists are mobile workers and local changes if not scaled up will not be enough to engage further in more open scientific and innovation related practices. In this regard, new networks and alliances of universities as well as other knowledge stakeholders - like the new European Universities alliances - could play a major role, provided they engage in evaluation practices that support rather than restrain OS and OI.

As compared to Open Science, there is not (yet) a clearly identified and defined European perspective and common vision on Open Innovation. Although there are significant initiatives already running at national level, SWG OSI considers that there is still work to be done to coordinate and allow the existing actions in the field of Open Innovation to cross-fertilize and inspire beyond the borders. Furthermore Open Innovation should not be considered as a policy niche separated out from the more general ecosystems of knowledge production, evaluation and dissemination. On the contrary, Open Innovation should be closely interwoven with knowledge transfer policies even though it may occasionally challenge the traditionally more closed approaches thereof. Open Innovation – as well as Open Science - promotes indeed (more) open cooperation between researchers and other knowledge stakeholders, and better reuse of research data outside of Academia, in the industry and within society, following the model of the quadruple helix and according to the motto: as open as possible, as closed as necessary.

Finally there are productive interactions to be further explored between Open Science, Open Innovation and higher education. By openly accessing data and publications, students are put at the center of the teaching and learning experience, engaging into research driven pedagogics. On their side, teachers can build their teaching on the latest scientific knowledge available in their field. And together teachers and students may engage in innovative impact driven projects, while openly disseminating the outputs and outcome thereof at the intention of the wider society. Hence SWG OSI would like to emphasize that Open Science as well as Open Innovation constitute particularly rich grounds on which it will be possible to bring the European Research Area closer to the European Higher Education Area in the future.

IV. Annexes

Annexe 1: SHORT SURVEY QUESTIONNAIRE

Name of the respondent / Mail of the respondent / Country:

1. Is there a national Open Science plan in your country?

Yes No In development I don't know

If yes: is it tied to any specific legislative provision?

Yes No I don't know

If yes: is it tied to any specific funding?

Yes No I don't know

Short presentation of the plan (or link to a Web page): ...

2. In your experience, what percentage of RPOs has adopted an OS plan in your country?

Less than 25% between 25 and 50% more than 50% I don't know

Further comments: ...

3. Is there a national Open Innovation plan in your country?

Yes No In development I don't know

Further comments: ...

4. In your experience, what percentage of RPOs has adopted an OI plan in your country?

Less than 25% between 25 and 50% more than 50% I don't know

Further comments: ...

5. Has your national copyright legislation been adapted in an OS and/or OI perspective?

Yes No In development I don't know

Further comments: ...

6. Is there any national infrastructure for Open Research Data in your country?

Yes No In development I don't know

Further comments: ...

7. Do national RFOs have mandates that support OS?

Yes No In development I don't know

Further comments: ...

8. In your experience, how common is the practice of responsible evaluation of the researcher (e.g. following the principles of Declaration on Research Assessment DORA) in HEIs, research institutes and RFOs in your country?

Less than 25% between 25 and 50% more than 50% I don't know

Further comments: ...

9. Is there any explicit policy attention to Citizen Science in your country?

Yes No I don't know

Further comments: ...

Annexe 2: QUANTITATIVE SYNTHESIS OF THE SHORT SURVEY

19 respondents to the Survey

Question 1	Yes	No	In development	Don't know	
Nbre / national Open Science plan	6	3	10	0	19
associated to specific legislative provision	5				
associated to specific funding	6				

Question 2	Less 25%	Between 25% and 50%	More than 50%	Don't know	
% / RPOs has adopted an OS plan	7	2	6	4	19

Question 3	Yes	No	In development	Don't know	
Nbre / national Open Innovation plan	2	13	2	2	19

Question 4	Less 25%	Between 25% and 50%	More than 50%	Don't know	
% / RPOs has adopted an OI plan	8	0	2	9	19

Question 5	Yes	No	In development	Don't know	
National copyright legislation adapted in an OS and/or OI perspective	5	11	1	2	19

Question 6	Yes	No	In development	Don't know	
National infrastructure for Open Research Data ?	10	3	7	0	20

Question 7	Yes	No	In development	Don't know	
Do national RFOs have mandates that support OS?	16	2	1	0	19

Question 8	Less 25%	Between 25% and 50%	More than 50%	Don't know	
How common is the practice of responsible evaluation of the researcher in HEIs, research institutes and RFOs ?	10	0	1	8	19

Question 9	Yes	No	Don't know	
Any explicit policy attention to Citizen Science ?	10	7	2	19