



Winning Horizon2020 with Open Science?

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About the Authors:

Ivo Grigorov is project coordinator for european programs at the National Institute for Aquatic Resources (DTU Aqua, www.aqua.dtu.dk) supporting the full project lifecycle from application and fundraising to delivery and reporting to funder, in Horizon 2020 Societal Challenges 2 & 5. IG is a member of the FP7 FOSTER Steering Group, facilitating the implementation of Horizon 2020 Mandate on Access to Scientific Knowledge, and Open Science evaluator for the European Commission.

Mikael Elbæk is a senior project coordinator at the office for Bibliometrics and Research Data Management at the Technical University of Denmark (DTU, <http://www.dtu.dk>) with vast experience in open access, both in policies development and the implementation. Currently Mikael is coordinating the development of key infrastructures of the national Danish open access strategy including the implementation of ORCID in Denmark and the development of a new national research portal and open access indicator.

Najla Rettberg is the scientific manager of FP7 OpenAIRE+. She is based at the Electronic Publications Unit at the University of Göttingen Library. Her background is in scholarly communication, Open Access and digital preservation, and has worked in a variety of library-based organisations around Europe.

Joy Davidson is Associate Director of the JISC-funded Digital Curation Centre (DCC), and active member of Knowledge Exchange (KE) Primary Research Data Working Group, Research Data Canada (RDC) Education & Training Subcommittee, and the Research Information Network (RIN) informal digital literacies group. JD also has experience at European level through EC-funded Collaboration to Clarify the Costs of Curation (4C) and the FP7 FOSTER (Facilitate Open Science Training for European Research) projects.

Reviewers:

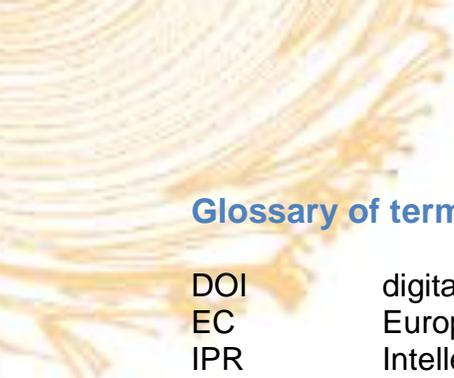
Lise Clausen (Copenhagen Business School); Natalia Manola (Un. Athens); Eva Mendes (Un. Carlos III de Madrid); Alex Rogers (Un. Oxford); Birgit Schmidt (Un. Goettingen).

About this Brief:

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Glossary of terms:

DOI	digital object identifier
EC	European Commission
IPR	Intellectual Property Rights
OS	Open Science
REF	Research Excellence Framework, UK
ROI	return on investment

Table of Contents

<i>WHY & HOW does Open Science contribute to economic growth?</i>	5
<i>WHAT might I lose if I choose not to embrace Open Science?</i>	6
<i>WHAT do I need to do as an applicant?</i>	7
<i>HOW should I delegate Open Science tasks?</i>	7
<i>HOW can I identify existing e-Infrastructure and resources?</i>	8
<i>HOW should I integrate Open Science into rest of my proposal ?</i>	9
<i>What should I do with my research data?</i>	9
<i>Do I need to do anything with my Software Code?</i>	11
<i>HOW to deal with Publications?</i>	11
<i>HOW to allocate adequate resources?</i>	12
<i>HOW to build future capacity to deal with Open Science?</i>	13
<i>HOW to integrate into the Communication Strategy?</i>	13
<i>HOW does Open Science serve your institutional strategy as well as your project?</i>	14
<i>HOW to write “Section 2.2 IMPACT”</i>	15



Innovation Union & Europe 2020 Initiative

WHY Open Science in Horizon 2020?

Open Science (OS) offers researchers tools and workflows for transparency, reproducibility, dissemination and transfer of new knowledge. Ultimately, this can also have an impact on in research evaluation exercises, e.g. Research Excellence Framework (REF), set to demand greater “*societal impact*” in future, rather than just research output¹. OS can also be an effective tool for research managers to transfer knowledge to society, and optimize the use and re-use by unforeseen collaborators. For funders, OS offers a better return on investment (ROI) for public funding, and underpins the EU Digital Agenda by measurably contributing to economic growth. This brief showcases why and how Open Science can optimize your Horizon 2020 proposal evaluation.

WHO is this “BRIEF” for?

This brief is developed through EC funding and specifically aimed at Horizon 2020 applicants and proposal writers seeking to comply with the Horizon 2020 Mandate (*Grant Agreement article 29.1-6*) and to optimize proposal evaluation and eventual societal impact of the resulting project.

HOW to use the “BRIEF”?

The text is **NOT** intended to be used verbatim as copy and paste contribution to your proposal. Instead, the brief presents suggested ways of formulating an impact section that answers the overarching political agendas and initiatives, as well as tips for ensuring that research results are effectively delivered to any users and the market place, across the various Horizon 2020 Pillars. The main text is generic, but some discipline-specific examples are included as examples, rather than covering all research fields. The footnotes also point to additional resources that will facilitate implementation to optimize project visibility and impact.

¹ Weighting of research impact confirmed for 2014 Research Excellence Framework <http://www.hefce.ac.uk/news/newsarchive/2011/news62310.html> , 2011

WHY & HOW does Open Science contribute to economic growth?

Europe 2020² Initiative aims to invest in basic and applied research to fuel innovation that will create new business opportunities and foster economic growth. The rate, and ease, of the transfer of new knowledge from academia to industry directly affects such innovation.

Current access to the latest publicly-funded research and underlying research data is less than optimal (RIN, 2011). Indeed, the knowledge-based industry has free access to only 50% of research (Archambault et al., 2013). This results in direct costs to Small Medium Enterprise (SME) and delays in delivering innovation to market (Houghton & Swan, 2011).

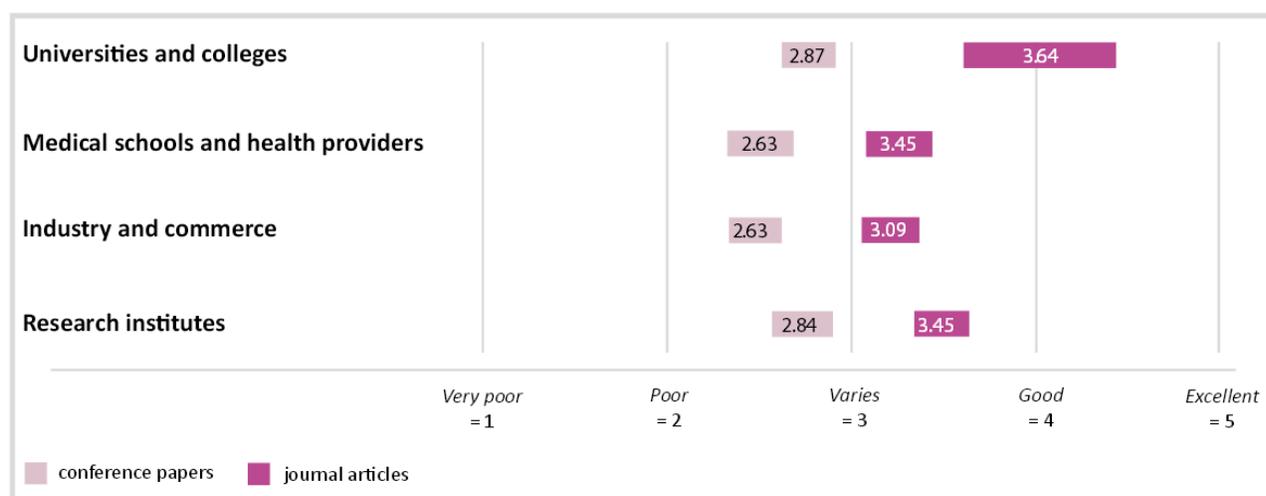


Figure 1. Sub-optimal access to journal articles and conference papers by a broad knowledge-sector of users (only those for whom the resource is important). Source: RIN, 2011 <http://www.rin.ac.uk/node/1172>

Embracing Open Science as part of the research lifecycle improves reproducibility and transparency (serving [Responsible Research & Innovation](#) principles), facilitates wider access for the knowledge-based industry, and the free flow of ideas and knowledge speeds up innovation and delivery of added value to the marketplace.

Ultimately, funders would like to capitalize on Open Science as it offers the potential to network knowledge in the internet age, to engineer greater citizen participation in research and to facilitate “*serendipity by design*” in the research process, thus delivering maximum value and impact for society (as well as author and project!).

For example, in the renewable energy sector, innovative research resulting in a 1% cost reduction could deliver an economic boost ranging anywhere from €170 million to €1.3 billion by 2020 across the EU³. Such potential benefits, however, are entirely a factor of freer access to research data, research software and peer-reviewed research publications.

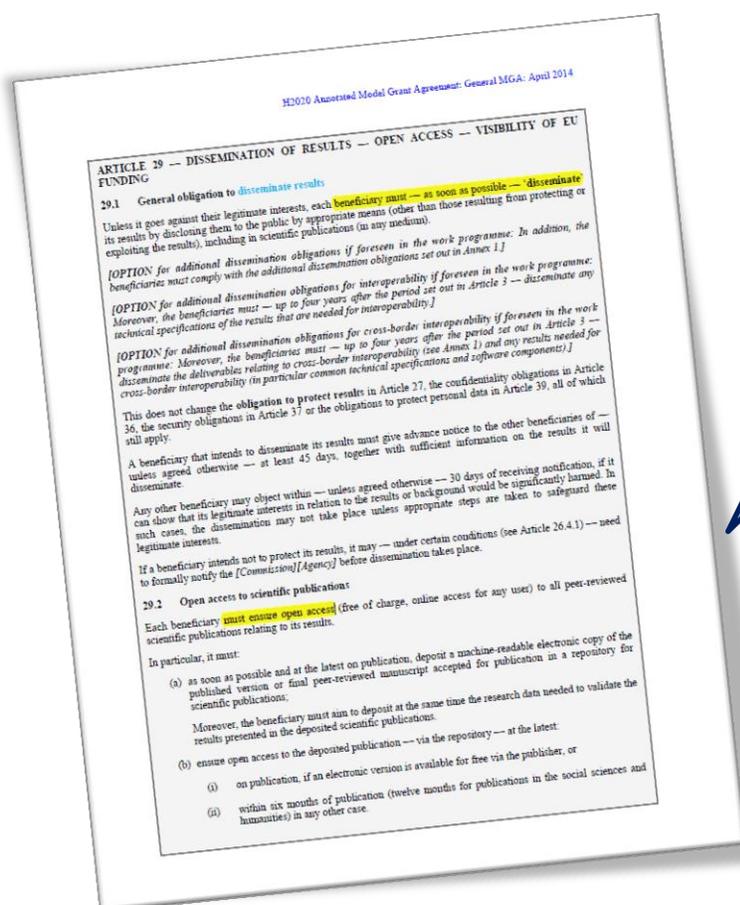
² Europe 2020: A growth Strategy for the coming decade http://ec.europa.eu/europe2020/index_en.htm

³ EC Directive on Maritime Spatial Planning http://europa.eu/rapid/press-release_MEMO-14-313_en.htm

WHAT might I lose if I choose not to embrace Open Science?

While Open Science is encouraged by the EC, and Open Access mandated in Horizon 2020, evaluation criteria and guidelines to evaluators do not offer explicit mechanisms for penalising applicants for non-compliance with the Mandate as stated in Grand Agreement Article 29.1-6⁴. What emphasis each evaluator places upon mandate compliance will depend entirely upon the awareness of your EC Project Officer, and your evaluators.

However, competition in Horizon 2020 has already significantly increased compared to FP7, with SME Instruments and Societal Challenges calls oversubscribed, so all parameters being equal, a proposal clearly integrating Open Science into its concept, contributing to EC's Digital Agenda and the Innovation Union's objectives, will inherently be favoured by aware project officer/evaluator teams, over same score proposals. Supporting the principles your funders believe in, adds to the competitiveness of your proposal, even when this is not explicitly formulated in the evaluation criteria. Ultimately, a good research idea must not fail due to a lack of sufficient detail regarding openness, dissemination and broader use of the new knowledge beyond academia.



“... beneficiary must ensure open access (free of charge) to all peer-reviewed scientific publications ...
the data, including associated metadata, free of charge for any user ...”

Figure 2. Horizon 2020 Grant Agreement requirements from beneficiaries with respect to Open Science. Source http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf, 2014

⁴ EC Model Grant Agreement http://ec.europa.eu/research/participants/data/ref/h2020/mga/gga/h2020-mga-gga-multi_en.pdf

WHAT do I need to do as an applicant?

Applicants should be clear about the research outputs they anticipate producing during the life of the project along with a detailed account of how these will be stored and shared over time. Applicants should aim to provide optimum, traceable and perennial access to selected research products of the project, from **research data**, **software code**, **publications**, **educational resources**, **reports**, **policy briefs** etc, that can help accelerate transfer of new knowledge from academia to society, as well as improve reproducibility of public-funded research. As a minimum, applicants should retain any and all outputs that are required to verify the published research findings.

Demonstrating such commitment in the proposal, and exploiting existing EC-developed e-infrastructure in support of OS, adds weight to the impact section, and demonstrates ROI to the EC as a funding body investing public funds in research.

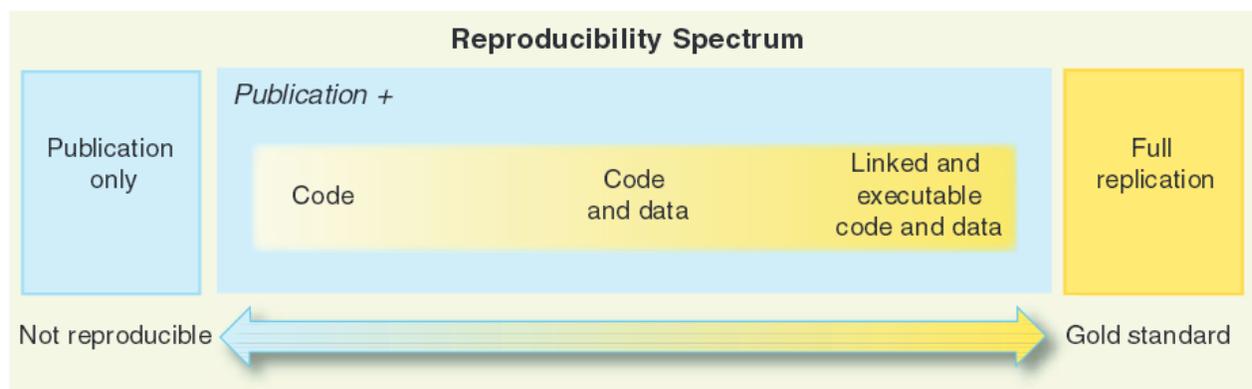


Figure 3. Spectrum of reproducibility. Source: Peng 2011 DOI: [10.1126/science.1213847](https://doi.org/10.1126/science.1213847)

OS can contribute positively throughout your proposal structure, from your attitude and mind-set when developing the concept (Section 1), to impact & dissemination (Section 2; cf example on p.15), to the actual implementation of individual workpackages and tasks.

The immediate temptation to deal with a new topic such as OS, and demonstrate the consortium's commitment to the evaluators, may be to dedicate an entire workpackage to it. However, this approach can be difficult to administer and often leads to fragmentation. Indeed, such "*silo workpackages with weak links and cross-WP workflow*" is a frequent criticism seen in evaluation reviews. For ease of implementation, and potentially a stronger evaluation, consider OS as part of performing transparent, rigorous and reproducible research, as described in your proposal concept.

HOW should I delegate Open Science tasks?

Lowering access barriers to **research data**, **software code** and **publications** should be considered an integral part of the Workpackage and Tasks responsibility, as publishing in peer-review currently is an unstated, but essential part of academic research.

The coordinator can establish an agreed code of conduct in the interest of the proposal's competitiveness, impact and dissemination strategy. The most efficient way to achieve this is to develop a data management plan that outlines what data and research outputs will be produced as part of the proposal, as well as details on how these will be shared. Delegated specific OS responsibilities should be accompanied by appropriate resource allocation to each activity e.g. extra time to ensure adequate description, quality archiving, and linking of all research objects. A complimentary workflow for transferring all research outputs to a broader user base, beyond academia and in a centralised way using existing tools and e-infrastructure can underpin a Knowledge Transfer strategy as well as facilitate openness. For example, the EC-funded e-infrastructure project OpenAIRE allows for tracking the use of all the research outputs for the purposes of measuring the project's (and author's!) impact.

HOW can I identify existing e-Infrastructure and resources?

If you are in a research institution, your Knowledge Managers and Librarians are your best advisors on what existing EC-funded and national e-infrastructures. There is significant existing support for the range of research outputs along the research cycle (**data, software code, publications, educational resources**, etc), including advice on copyright law, best practices on intellectual property right and exploitation.

A dedicated European Helpdesk network is also at your disposal, with knowledge on Open Science policies across Europe, discipline-specific availability of e-Infrastructure, copyright and best practice advice and guidance.



Figure 4. EC-funded FP7 OpenAIRE HelpDesk, <http://www.openaire.eu>

The Open Science community can also be consulted online at



[OpenAIRE Group](#)



[FOSTER Project](#)



<https://www.facebook.com/groups/openaire/>



[@fosterscience](#), [@OpenAIRE_eu](#)



HOW should I integrate OS into rest of my proposal ?

Delivering new knowledge to users outside academia, making research accessible to developing countries, transferring knowledge to the private sector, reaching the marketplace and creating jobs and value are the underpinning principles of the Innovation Union's knowledge-based economy.

While developing the overarching objectives of your proposal concept (*Section 1 of the application*), be sure to formulate your objectives to be aligned with the political agenda, and make reference to principles like [Responsible Research and Innovation](#) and *Open Science* as accelerators of knowledge transfer, networking new knowledge and thus underpinning innovation through faster exchange of ideas and know-how.

Although meeting the nebulous political ambitions with concrete actions that support your proposal concept may seem intractable, examples, support as advice and e-infrastructure exists in order to ensure your proposal both complies with the Horizon 2020 Mandate, and benefits from it. But how exactly should you go about making your research more accessible to realise these benefits to society?

What should I do with my research data?

A novelty in Horizon 2020 is the Open Data Pilot. The issue will only be dealt with briefly here, as the EC has provide a guide for Data Management which deals with the matter in more detail⁵.

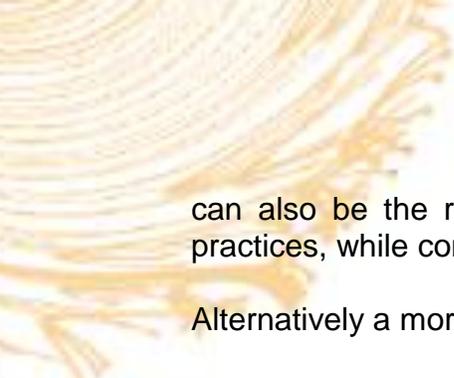
Data management is highly *discipline specific*, much more so than publishing, which is why it is difficult to provide general guidance on how to deal with the Open Data Pilot. If your discipline has a culture of managing and sharing data you probably already have a good idea about what is expected from you. For instance, many disciplines have established and supported common data archives where researchers deposit and share their primary data. In some disciplines, specific descriptive metadata formats and/or guidelines can also be already available (consult your Knowledge Managers).

In such cases, we recommend that you adhere to established practices and protocols that already deal with the mandate requirements. Should your discipline be new to open data, we strongly recommend that you develop a data management plan that outlines the data you anticipate producing as well as how that data will be stored long-term and optimally shared. If your funding body doesn't support a dedicated data centre, check to see if your organisation offers a place for deposit. If neither of these are an option, try and identify a suitable discipline data repository⁶. Consider applying persistent identifiers such as Digital Object Identifiers (DOIs) to any research data that is being retained. Applying identifiers can help you more easily follow the reuse of your outputs and better understand the behaviour of end users. To get more credit for your efforts, consider publishing your data via a peer-reviewed data journal⁷. Depending on discipline, peer-reviewed data journals

⁵ EC guide on Data Management: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

⁶ A directory of Data Repositories www.re3data.org

⁷ Data Journals exist for some but not all disciplines e.g. www.doaj.org , Nature Scientific Data etc



can also be the right stimulant for your partners to adhere to best data management practices, while contributing to their own research assessment profiles & REF evaluations.

Alternatively a more general approach could be adopted as described below.

Researchers should work with support staff to develop a strategy for making your research data available and understandable. As a general rule of thumb, you should retain any data that is required to validate your published research findings. Ensure that readers understand how to access the data underpinning the results presented in any publications. Linking data to publications is something that can be commended on in **Section 2: Impact**, in terms of reproducibility and transfer to all potential users, academic, industry and citizen scientists (a key objective of Horizon 2020 Societal Challenge 6).

As mentioned above, the EC provides detailed guidance for research data management, which can be briefly summarized as follows:

- where possible, archive data in perennial data archives or established data repositories rather than on institutional servers, and respect the need for full access embargoes if national security, patient data, and commercialization issues apply;
- use standard ontologies and accepted metadata standards to make your datasets **discoverable, understandable** and **re-usable**. Remember that re-use needs to occur across disciplines, so metadata needs to be meaningful;
- ensure that data is citable using a unique persistent identifier such as a DOI, and if none available, work together with FP7 OpenAIRE+ and ZENODO e-infrastructures to establish the right protocol for your discipline/research theme;
- many open access journals will now consider peer-reviewed data papers, especially if the data is archived, DOI labelled and has been described with sufficient metadata to facilitate re-use;
- cite your research data outputs in your research papers and vice versa, centralize your outputs in FP7 OpenAIRE+ as this will automatically produce a Dissemination Report in EC Participants Portal (SyGMA) for final project reporting;
- consider making use of existing resources such as the UK's Digital Curation Centre's online guidance and tools for data management planning⁸. Useful online training such as MANTRA's Research Data Management module are also useful starting points.

⁸ Digital Curation Centre www.dcc.ac.uk





Figure 5. Online training for RDM by MANTRA Project (<http://datalib.edina.ac.uk/mantra/>)

Do I need to do anything with my Software Code?

IPR allowing, opening your software code has the advantage of crowd sourcing the effort, developing the code in unexpected directions by citizen scientists, and ultimately using and maintaining the code freely. If you think this unlikely, consider that even in the complex climate modelling disciplines, citizen scientists have improved model code unsolicited and without remuneration, to the point that scientists seek to use the later version⁹.

Sharing the code can be done in various ways, but beyond just sharing should be done in a way that you can track its use and public interest, giving a measure of societal interest.

A repository like [GitHub](#) will allow you to issue a DOI for your software & code products, and together with your data and publications, compile a portfolio of DOI registered products whose use you can track.

HOW to deal with Publications?

Depositing all your projects publications in an OpenAIRE-compliant repository automatically makes the publications visible on the EC's COEDIS system, and assists you with Dissemination Reporting at the end of reporting periods. Both EC¹⁰ and the

⁹ Should Citizen Scientists Play with Ecosystem Models? EGU The Eggs Newsletter, Nov 2010, doi: [10.5281/zenodo.10840](https://doi.org/10.5281/zenodo.10840)

¹⁰ Guidelines on Open Access to Scientific Publications and Research Data in Horizon 2020: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-pilot-guide_en.pdf

[OpenAIRE HelpDesk](#) offer guidelines on best use of Open Access, and the EC Participants Portal reporting tool SyGMA integrate OpenAIRE in its functionalities.

There are two ways to capture the impact benefits of Open Access to publications, while facilitating project reporting and knowledge management:

GREEN “Self-Archiving” Strategy

Free, parallel publishing of peer-reviewed author copies of publications in OpenAIRE-compliant repositories, 6-12 months after journal publication.

Funder accepted: YES
 E-infrastructure: YES
 Copyright compliant: YES
 Cost: free*

GOLD “Author pays” Strategy

Use Open Access journals in your discipline, and acknowledge correctly the Grant Agreement No, OpenAIRE will automatically locate the contribution.

Funder accepted: YES
 Average Costs: 2.000 EUR
 EC eligible costs: YES
 EC support: OpenAIRE2020

HOW to allocate adequate resources?

All costs associated with **data, code, publications** archiving, access and dissemination are eligible and 100% reimbursed (including VAT), as part of *DISSEMINATION* costs in the proposal budget. In addition, H2020-OpenAIRE2020¹¹ provides 4 Million over the coming years for Gold Open Access publication.

When it comes to data, making a data repository a partner of any data-heavy proposal may be best. The resources needed will depend on the costs of your data managing partner and data intensity. With publications, budgeting is more straightforward:

Model Budget for Gold Open Access, based on Nanotech discipline:

No. of expected articles	Journal	Cost per article (EUR)	Total (EUR)
3	Lab On a Chip (Hybrid)	1921	5763
1	Nanoscale (Hybrid)	1921	1921
2	Biosensors and Bioelectronics (Hybrid)	2414	4828
5	A C S Nano (Hybrid)	2195	10975
4	PLoS One (Open Access)	988	3952
1	Applied Physics Letters (Hybrid)	1610	1610
8	Optics Express (Open Access)	767 (<6 pages) / 1313 (7-15 p.)	6136 / 10504
24		Simple Avg. 1.766	39.553 1.648 average per article

¹¹ Horizon 2020 OpenAIRE 2020 <https://www.openaire.eu/news-events/openaire2020-press-release>



As a rule of thumb, you can scale this budget to the publication-intensity of your partners/discipline

i.e.: 24 articles X 1648 = 39.553 EUR

This may be prohibitive for many projects, and projects are advised to adopt a mixed GREEN/GOLD strategy in order to optimize compliance, impact, and budget for research activities (e.g. GREEN for the bulk publications output of the project, GOLD for a selection of publications on topics close to societal challenges, and relevance to a broader non-specialist audience, and media).

Alternative, proactive strategy for depositing

GREEN open access offers a cheap and effective alternative to the prohibitive costs above, and relies on using the author rights to deposit their final peer-reviewed and corrected manuscript in a repository right after the article has been accepted by the journal. Embargoes of 6-12 months exist depending on journal¹², but you can achieve 100% open access for your project. In cases where the journal does not allow archiving of *post-prints*, or has a longer embargo period, authors can retain their rights to deposit their funded article and make it open access within six months for the benefit of their own institution. EC provides ready templates so that authors can retain maximum rights to their research without infringing copyright. The templates are written by copyright experts, and are provided to facilitate authors in dealing with publishers¹³.

HOW to build future capacity to deal with Open Science?

Include OS training for the young generation of researchers in any workshops, Summer Schools, capacity building events by capitalising on the support, expertise and training materials provided by OpenAIRE and FOSTER communities, as well as the upcoming OpenAIRE2020 initiative running 2015-2019.

HOW to integrate into the Communication Strategy?

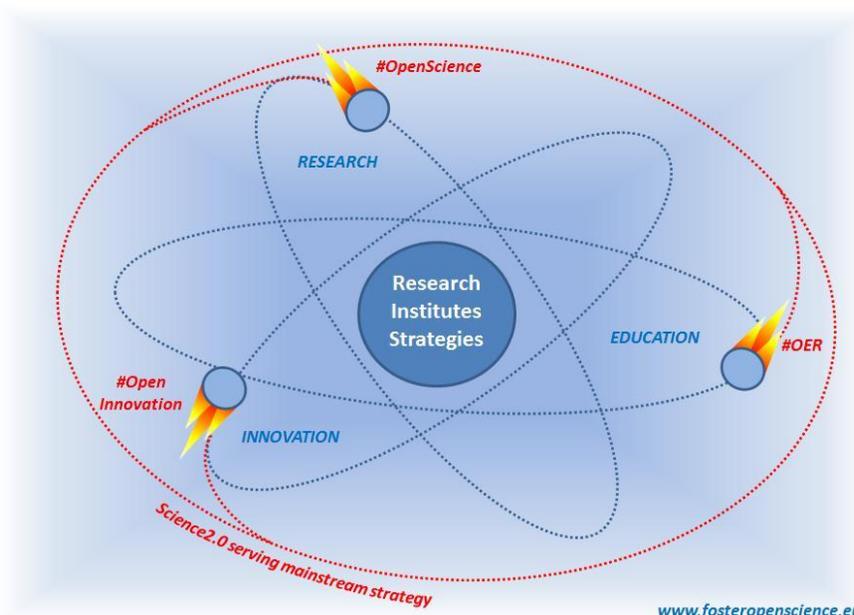
Treat basic access to knowledge as the first and essential step to an effective knowledge transfer and science communication strategy, and integrate OS into your projects Dissemination & Communication Strategy to reach the full range of potential stakeholders and target audiences with a rich portfolio of materials building on, and referring to your openly accessible research products portfolio.

Optimize knowledge transfer by seeking twinning concurrent projects in [WorkProgramme Science in and for Society 2014-2015](#) and [Societal Challenge 6, Inclusive, Innovative and Reflective Societies](#).

¹² Sherpa Romeo compiles the embargo periods for all peer-reviewed journals <http://www.sherpa.ac.uk/romeo/>

¹³ See “Resources for researchers” at the bottom of the page: <http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1300&lang=1>

HOW does OS serve your institutional strategy as well as your project?



Variations on the theme may exist locally, but the priorities in your institutional strategy will very likely gravitate around excellence in research, innovation and educational and training excellence.

At institutional strategy level, research institutions care about broadening knowledge and understanding, and making a societal impact. Recent research evaluation strategies by the European Commission (cf [EC background paper on Science2.0](#)) and in the UK (cf [HEFCE Weighing of REF research impact for 2014](#)) clearly state the need to recognise “societal impact” as well as the research output of an individual institution.

OS offers the principles, tools and best practices to optimise societal impact of research simply by capitalising on the benefits of networked and accessible knowledge.

OS also supports the EC’s Economic Growth Agenda in measurable terms (Houghton & Swan, 2011), but more importantly offers a new way of performing research that can optimise the individual researchers’ curiosity-driven research, as well as strengthen personal research profile and networks of collaborators.

HOW to write “Section 2.2 IMPACT” A generic example

The Project consortium acknowledges that the research and new knowledge generated is of societal benefit, and could potentially contribute toward solutions of societal challenges. As such, the foreground knowledge needs to be disseminated in an optimum way for impact and re-use of results, according to Responsible Research & Innovation (RRI) principles¹⁴.

Currently only 50% of research is freely accessible to the public¹⁵, resulting in measurable loss to the knowledge-based SME sector and slowing down innovation¹⁶. **The Project** consortium will thus optimize on the dissemination and impact of foreground along the full knowledge production chain, and integrate Open Science principles in its Dissemination & Communication Strategy.

In support of the EC Digital Agenda¹⁷ and the Economic Growth agenda of the Innovation Union (Green Action Plan¹⁸), the consortium will fully integrate Grant Agreement Article 29 into its workflow at task level. Foreground data (*state diversity of data generated*) will be permanently archived at generation in **STATE REPOSITORY**¹⁹ and publicly released and/or published²⁰ (*with the exception of Third Party data, national security data, medical/patient data*) during the lifetime of the project²¹.

Software code, tools and interfaces developed as part of the concept will be open source code and full access provided via **STATE REPOSITORY**²². Resulting research publications (*refer to tasks/WP most likely to publish*) will also be made openly available via e-Infrastructure OpenAIRE²³ (DG CONNECT; *request letters of support*), predominantly relying on the Green Open Access strategy (self-archiving) for maximum return on investment for project and funder, and actively linked to underlying data objects, in support of the EC Open Data Pilot²⁴.

For longevity of knowledge transfer and best practice uptake beyond the project lifetime, **The Project** will cooperate with concurrent training initiatives within FP7 FOSTER²⁵ (DG Research) and OpenAIRE+, and incorporate Open Science training in any summers schools and research training workshops, to assure that the strategy is adopted by the next generation of young researchers (*refer to WP/Tasks dealing with this*).

Focus will be placed on demonstrating that Open Science and RRI are not only for societal and community benefit, but also directly support the career needs for impact, visibility and multiplying collaborations for individual researchers. Alining the societal and research impact of knowledge generation can in the long-term bridge the gap between science and society.

¹⁴ EC Responsible Research & Innovation http://ec.europa.eu/research/science-society/document_library/pdf_06/responsible-research-and-innovation-leaflet_en.pdf

¹⁵ Archambault, E. *et al.* 2013. Proportion of OA Peer-Reviewed Papers at the European & World Levels 2004-2011 at http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf

¹⁶ Houghton, J., Swan, A., Brown, S., 2011. Access to research and technical information in Denmark [WWW Document]. URL http://www.deff.dk/uploads/media/Access_to_Research_and_Technical_Information_in_Denmark.pdf

¹⁷ EC Digital Agenda & Access to Knowledge <http://ec.europa.eu/digital-agenda/en/open-access-scientific-knowledge-0>

¹⁸ EC Green Action Plan for SMEs <http://ec.europa.eu/DocsRoom/documents/4790/attachments/1/translations/en/renditions/native>

¹⁹ Choose a discipline-specific perennial Data Repository from <http://www.re3data.org/>

²⁰ Choose likely Data Journals of relevance: e.g. Nature Scientific Data, or search <http://doaj.org>

²¹ NB: embargoes can be placed to allow project to publish/exploit first, but consortium should aim for full release by end of contract, or justify why access needs to be restricted (publications may not be viewed favourably at review).

²² Choose a structured archive with minimum metadata requirements to allow maximum re-use e.g. GitHub, SourceForge, etc.

²³ EC FP7 and Horizon2020 funded e-Infrastructure <https://www.openaire.eu/> in support of EC Digital Agenda

²⁴ EC Open Data Pilot http://europa.eu/rapid/press-release_IP-13-1257_en.htm

²⁵ FP7 FOSTER, Facilitating Open Science in European Research (www.fosteropenscience.eu)



CONTACTS & SUPPORT:

OpenAIRE HelpDesk:
<https://www.openaire.eu/support/helpdesk>

FOSTER Community:
www.fosteropenscience.eu
@fosterscience

The Open Science community can also be consulted online at

 [OpenAIRE Group](#)
 [FOSTER Project](#)
 <https://www.facebook.com/groups/openaire/>
 @fosterscience, @OpenAIRE_eu

Last but not least:

Your research library & Knowledge Managers.

Good Luck with Horizon 2020!

