OPEN SCIENCE IN HORIZON EUROPE

Overview of mandatory and recommended
practices in R&I proposals

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Mulțumim colegilor noștri de la Open Science din cadrul UEFISCDI (open-science@uefiscdi.ro) pentru discuțiile și colaborarea minunate pe parcursul elaborării acestui material.

Pentru alte detalii privind procesul și practicile Open Science, vă rugăm să luați legătura cu Open Science Knowledge Hub din cadrul UEFISCDI (open-science@uefiscdi.ro).

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Cuprins

OPEN SCIENCE IN HORIZON EUROPE

1. DEFINITION

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process.

It has the potential to increase the quality and efficiency of research and accelerate the advancement of knowledge and innovation by sharing results, making them more reusable and improving their reproducibility.

It entails the involvement of all relevant knowledge actors.

Note: If you mention in your proposal that your work will consider open science practices, you must show who you will do these practices with. Who in the consortium has experience and expertise in open science? It must be written and demonstrated this in the proposal (see sub-heading 5.2). Also, if external stakeholders are involved in open science practices, for example citizen science or citizen engagement, these stakeholders must be identified and involved in activities already at the stage of the proposal.

2. OPEN SCIENCE IN HORIZON EUROPE

Horizon Europe moves beyond open access to open science.

The Horizon Europe Regulation sets the legal basis for the open science obligations and incentives that apply to Horizon Europe beneficiaries.

The requirements for open science practices are set out in the Model Grant Agreement (MGA)[1] and Annotated Grant Agreement (AGA)[2], Article 17 and Annex 5.

The Annotated Grant Agreement provides guidance on how to comply with the open science obligations required in the Model Grant Agreement. **The present guide complements the**

[1] General Model Grant Agreement (MGA), Version 15 April 2022 - https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/agr-contr/general-mga_horizon-euratom_en.pdf
[2] Annotated Model Grant Agreement (AGA), Version 30 Nov. 2021 - https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

information provided in the Annotated Grant Agreement, with a particular focus on the preparation of proposals.

In Horizon Europe, open science practices are considered in the evaluation of proposals, under 'excellence' and under the 'quality and efficiency of implementation'.

In Horizon Europe, open science practices **should be addressed in all programmes except ERC** (Table 1).

Table 1. Where in Horizon Europe open science (including Research Data Management) should be addressed

Pillar	Programme	Instrument	OS and RDM
I. Excellent Science	ERC	STG, ADG, COG, SYG, POC	NO
	MSCA	DN, PF, SE, COFUND	YES
II. Global Challenges and European Industrial Competitiveness	CL1, CL2, CL3, CL4, CL5, CL6	RIA, IA, CSA	YES
III. Innovative Europe	EIC, EIE	Pathfinder, Transition	YES
		Accelerator	NO
Part Widening participation and strengthening the European Research Area		RIA, CSA	YES

3. OPEN SCIENCE PRACTICES INCLUDE

1. early and open sharing of research (for example through preregistration, registered reports, pre-prints, or crowd-sourcing)
2. research output[3] management (Research Data Management – RDM)
3. measures to ensure reproducibility of research outputs
4. providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows)
5. participation in open peer-review
6. involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science)

There are

➔ **Mandatory open science practices**, which are required for all projects through the Model Grant Agreement and/or through the work programme or call conditions,

and

➔ **Recommended practices** (all open science practices that are not mandatory). Recommended open science practices are incentivised through their the evaluation at the proposal stage.

Proposers should be aware of both mandatory and recommended practices and integrate them into their proposals.

3.1. MANDATORY OPEN SCIENCE PRACTICES

- Some open science practices are **mandatory for all beneficiaries per the grant agreement.** These mandatory open science practices should / must be demonstrated in the proposal.

[3] These are results generated by the action to which online access can be given in the form of scientific publications, data or other engineered outcomes and processes such as software, algorithms, protocols and electronic notebooks.

- Some open science practices are **mandatory per specific work programmes or call conditions**, which may provide for additional obligations to adhere to open science practices.

Note: Please read carefully the call topic and Destination.

The **Open science practices that are manadatory per the grant agreement** concern:

1. open access to scientific publications under the conditions required by the grant agreement
2. (Research Data Management – RDM) responsible management of research data in line with the FAIR principles of 'Findability', 'Accessibility', 'Interoperability' and 'Reusability', notably through the generalised use of data management plans, and open access to research data under the principle 'as open as possible, as closed as necessary', under the conditions required by the grant agreement
3. information about the research outputs/tools/instruments needed to validate the conclusions of scientific publications or to validate/re-use research data
4. digital or physical access to the results needed to validate the conclusions of scientific publications, unless exceptions apply
5. in cases of public emergency, if requested by the granting authority, immediate open access to all research outputs under open licenses or, if exceptions apply, access under fair and reasonable conditions to legal entities that need the research outputs to address the public emergency[4]

These obligations are described in the Model Grant Agreement (Article 17) and detailed guidelines on complying with them are provided in the Annotated Grant Agreement (Article 17).

We list below all the requirements for **mandatory Open science practices according to the Model Grant Agreement** (MGA, Version 15 April 2022, Annex 5, p. 110)[5].

[4] The additional provision on access in cases of public emergency does not apply to the ERC.
[5] General Model Grant Agreement (MGA), Version 15 April 2022 - https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/agr-contr/general-mga_horizon-euratom_en.pdf

Open science

Open science: open access to scientific publications

The beneficiaries must ensure open access to peer-reviewed scientific publications relating to their results. In particular, they must ensure that:

- at the latest at the time of publication, a machine-readable electronic copy of the published version or the final peer-reviewed manuscript accepted for publication, is deposited in a trusted repository for scientific publications
- immediate open access is provided to the deposited publication via the repository, under the latest available version of the Creative Commons Attribution International Public Licence (CC BY) or a licence with equivalent rights; for monographs and other long-text formats, the licence may exclude commercial uses and derivative works (e.g. CC BY-NC, CC BY-ND) and
- information is given via the repository about any research output or any other tools and instruments needed to validate the conclusions of the scientific publication.

Beneficiaries (or authors) must retain sufficient intellectual property rights to comply with the open access requirements.

Metadata of deposited publications must be open under a Creative Common Public Domain Dedication (CC 0) or equivalent, in line with the FAIR principles (in particular machine-actionable) and provide information at least about the following: publication (author(s), title, date of publication, publication venue); Horizon Europe or Euratom funding; grant project name, acronym and number; licensing terms; persistent identifiers for the publication, the authors involved in the action and, if possible, for their organisations and the grant. Where applicable, the metadata must include persistent identifiers for any research output or any other tools and instruments needed to validate the conclusions of the publication.

Only publication fees in full open access venues for peer-reviewed scientific publications are eligible for reimbursement.

Open science: research data management (RDM)

The beneficiaries must manage the digital research data generated in the action ('data') responsibly, in line with the FAIR principles and by taking all of the following actions:

➔ establish a data management plan ('DMP') (and regularly update it)

➔ as soon as possible and within the deadlines set out in the DMP, deposit the data in a trusted repository; if required in the call conditions, this repository must be federated in the EOSC in compliance with EOSC requirements

➔ as soon as possible and within the deadlines set out in the DMP, ensure open access — via the repository — to the deposited data, under the latest available version of the Creative Commons Attribution International Public License (CC BY) or Creative Commons Public Domain Dedication (CC 0) or a licence with equivalent rights, following the principle 'as open as possible as closed as necessary', unless providing open access would in particular:

- be against the beneficiary's legitimate interests, including regarding commercial exploitation, or
- be contrary to any other constraints, in particular the EU competitive interests or the beneficiary's obligations under this Agreement; if open access is not provided (to some or all data), this must be justified in the DMP
- provide information via the repository about any research output or any other tools and instruments needed to re-use or validate the data.

Metadata of deposited data must be open under a Creative Common Public Domain Dedication (CC 0) or equivalent (to the extent legitimate interests or constraints are safeguarded), in line with the FAIR principles (in particular machine-actionable) and provide information at least about the following: datasets (description, date of deposit, author(s), venue and embargo); Horizon Europe or Euratom funding; grant project name, acronym and number; licensing terms; persistent identifiers for the dataset, the authors involved in the action, and, if possible, for their organisations and the grant. Where applicable, the metadata must include persistent identifiers for related publications and other research outputs.

Open science: additional practices

Where the call conditions impose additional obligations regarding open science practices, the beneficiaries must also comply with those.

Where the call conditions impose additional obligations regarding the validation of scientific publications, the beneficiaries must provide (digital or physical) access to data or other results needed for validation of the conclusions of scientific publications, to the extent that their legitimate interests or constraints are safeguarded (and unless they already provided the (open) access at publication).

Where the call conditions impose additional open science obligations in case of a public emergency, the beneficiaries must (if requested by the granting authority) immediately deposit any research output in a repository and provide open access to it under a CC BY licence, a Public Domain Dedication (CC 0) or equivalent. As an exception, if the access would be against the beneficiaries' legitimate interests, the beneficiaries must grant non-exclusive licenses — under fair and reasonable conditions — to legal entities that need the research output to address the public emergency and commit to rapidly and broadly exploit the resulting products and services at fair and reasonable conditions. This provision applies up to four years after the end of the action (see Data Sheet, Point 1).

Data Sheet, Point 1 (MGA Verion 15 April 2022, p. 10) is presented in Figure 1.

Project: [insert number] — [insert acronym] — [insert call identifier]

EU Grants: HE MGA — Multi & Mono: V1.1 – 15.04.2022

DATA SHEET

1. General data

Project summary:

Project summary
Text from DoA Annex 1 Part A (same text as proposal abstract)

Keywords: [keywords from proposal]

Project number: [project number, e.g. 690853330]

Project name: [full title]

Project acronym: [acronym]

Call: [call ID, e.g. PROG-(SUBPROG-)YEAR-CALLABREV]

Topic: [topic ID, e.g. PROG-(SUBPROG-)YEAR-CALLABREV-NN/TOPICABBREV]

Type of action: [ToA, e.g. HORIZON Research and Innovation Actions]

Granting authority: *[*European Commission – EU*]* *[*European Commission – Euratom*]* *[*[name of Executive Agency]*]* *[*[name of EU funding body]*]*

Grant managed through EU Funding & Tenders Portal: Yes (eGrants)

[OPTION for SGAs: Framework Partnership Agreement No [insert number] — [insert acronym]*]*

Project starting date[7]: *[OPTION 1 by default:* first day of the month following the entry into force date*]* *[OPTION 2 if selected for the grant:* fixed date: [dd/mm/yyyy]*]*

Project end date: [dd/mm/yyyy]

Project duration: [number of months, e.g. 48 months]

[OPTION if selected for the grant: Linked action: Linked with other action:

- [insert linked action information, e.g. name, acronym, number, funded by (EU/name of other donor organisation), description (grant/ procurement/ prize/ equity investment/ repayable loan/etc)]
  - *[OPTION if selected for the grant:* Specific linked action type: *[*Synergy*]]*
  - Collaboration agreement: *[OPTION 1 by default:* No*]* *[OPTION 2 if selected for the call:* Yes*]*
- … *]*

Consortium agreement: *[OPTION 1 by default:* Yes*]* *[OPTION 2 if selected for the call:* No*]*

[OPTION for HE EIC Accelerator Blended Finance: Additional information: Blended finance (single action); grant component ('grant') complemented by an investment component (equity, loan or other) of EUR [insert amount]*]*

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[7] This date must normally be the first day of a month and later than the entry into force of the agreement. The RAO can decide on another date, if justified by the applicants. However, the starting date may not be earlier than the submission date of the grant application – except if provided for by the basic act or in cases of extreme urgency and conflict prevention (Article 193 EU Financial Regulation 2018/1046).

Figure 1. Data Sheet, Point 1 (MGA Version 15 April 2022, p. 10)

3.2. RECOMMENDED OPEN SCIENCE PRACTICES

These are open science practices **beyond the mandatory ones**, such as:

- involving all relevant knowledge actors, including citizens
- early and open sharing of research
- output management beyond research data
- open peer-review

This is a non-exhaustive list of practices that proposers are expected to adopt when possible and appropriate for their projects.

Finally, certain work programme topics or call conditions may encourage specific additional open science practices.

Note: Please read carefully the call topic and Destination.

4. OPEN SCIENCE AND RESEARCH DATA MANAGEMENT REQUIREMENTS IN PROPOSALS

We list below the requirements for open science practices, including Research Data Management, as per proposals template.

Note: Research Data Management (RDM) is part of mandatory open science practices. However, in the proposal template they are mentioned as two separate sub-sections in Methodology. We suggest you address both and separately, as indicated. The evaluators check and assess them separately, i.e. open science and RDM. We suggest that you write two separate headings in the proposal, one for open science practices and one for Research Data Management (RDM).

Note: Proposals selected for funding under Horizon Europe will need to develop a detailed data management plan (DMP) for making their data/research outputs findable, accessible, interoperable and reusable (FAIR) as a deliverable by month 6 and revised towards the end of a project's lifetime. However, even if a more detailed DMP/RDM must be developed during the first 6 months of the project, we suggest you still write in the proposal a clear and detailed section about RDM/DMP. The EC template for DMP is provided in Annex 1.

We indicate below all requirements for open science practices as per the poposal application form and type of action, i.e. instrument (RIA, IA, CSA, MSCA, EIC).

4.1. PROPOSAL APPLICATION FORM → RESEARCH AND INNOVATION ACTION (RIA), INNOVATION ACTION (IA)

Section 1.2. Methodology

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted

to the nature of your work, in a way that will increase the chances of the project delivering on its objectives [e.g. 1 page].

If you believe that none of these practices are appropriate for your project, please provide a justification here.

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. Open science practices include:

- early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
- research output management;
- measures to ensure reproducibility of research outputs;
- providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
- participation in open peer-review;
- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

● **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the project must provide maximum 1 page on how the data/ research outputs will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable), addressing the following (the description should be specific to your project): [1 page]

- **Types of data/research outputs** (e.g. experimental, observational, images, text, numerical) and their estimated size; if applicable, combination with, and provenance of, existing data.
- **Findability of data/research outp**uts: Types of persistent and unique identifiers (e.g. digital object identifiers) and trusted repositories that will be used.
- **Accessibility of data/research outputs**: IPR considerations and timeline for open access (if open access not provided, explain why); provisions for access to restricted data for verification purposes.

- **Interoperability of data/research outputs**: Standards, formats and vocabularies for data and metadata.
- **Reusability of data/research outputs**: Licenses for data sharing and re-use (e.g. Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation /re-use.
- **Curation and storage/preservation costs**; person/team responsible for data management and quality assurance.

4.2. PROPOSAL APPLICATION FORM → COORDINATION AND SUPPORT ACTION (CSA)

Section 1.2 Coordination and/or support measures and methodology

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted to the nature of your work, in a way that will increase the chances of the project delivering on its objectives [e.g. 1 page, including Research Data Management].

If you believe that none of these practices are appropriate for your project, please provide a justification here.

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. Open science practices include:

- early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
- research output management;
- measures to ensure reproducibility of research outputs;
- providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
- participation in open peer-review;

- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

● **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the project must provide maximum 1/2 page on how the data/research outputs will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable).

Note: CSA does not produce research data per se. It is an instrument for research networking and coordination of those networks.

4.3. PROPOSAL APPLICATION FORM → MSCA DOCTORAL NETWORKS (DN)

Section 1.2 Soundness of the proposed methodology

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted to the nature of your work, in a way that will increase the chances of the project delivering on its objectives [e.g. 1 page].

If you believe that none of these practices are appropriate for your project, please provide a justification here.

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. Open science practices include:

- early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
- research output management;

- measures to ensure reproducibility of research outputs;
- providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
- participation in open peer-review;
- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

● **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the project must provide maximum 1 page on how the data/ research outputs will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable), addressing the following (the description should be specific to your project): [max. 1 page]

- **Types of data/research outputs** (e.g. experimental, observational, images, text, numerical) and their estimated size; if applicable, combination with, and provenance of, existing data.
- **Findability of data/research outp**uts: Types of persistent and unique identifiers (e.g. digital object identifiers) and trusted repositories that will be used.
- **Accessibility of data/research outputs**: IPR considerations and timeline for open access (if open access not provided, explain why); provisions for access to restricted data for verification purposes.
- **Interoperability of data/research outputs**: Standards, formats and vocabularies for data and metadata.
- **Reusability of data/research outputs**: Licenses for data sharing and re-use (e.g. Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation /re-use.
- **Curation and storage/preservation costs**; person/team responsible for data management and quality assurance.

4.4. PROPOSAL APPLICATION FORM → MSCA POSTDOCTORAL FELLOWSHIP (PF)

Section 1.2 Soundness of the proposed methodology

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted to the nature of your work, in a way that will increase the chances of the project delivering on its objectives [e.g. 1/2 page, including Research Data Management].

If you believe that none of these practices are appropriate for your project, please provide a justification here.

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. Open science practices include:

- early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
- research output management;
- measures to ensure reproducibility of research outputs;
- providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
- participation in open peer-review;
- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

● **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the project must provide maximum 1/2 page on how the data/research outputs will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable).

4.5. PROPOSAL APPLICATION FORM → MSCA STAFF EXCHANGE (SE)

Section 1.2 Soundness of the proposed methodology

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted to the nature of your work, in a way that will increase the chances of the project delivering on its objectives.

If you believe that none of these practices are appropriate for your project, please provide a justification here.

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. Open science practices include:

- early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
- research output management;
- measures to ensure reproducibility of research outputs;
- providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
- participation in open peer-review;
- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

● **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the project must provide maximum 1 page on how the data/ research outputs will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable), addressing the following (the description should be specific to your project):

- **Types of data/research outputs** (e.g. experimental, observational, images, text, numerical) and their estimated size; if applicable, combination with, and provenance of, existing data.
- **Findability of data/research outp**uts: Types of persistent and unique identifiers (e.g. digital object identifiers) and trusted repositories that will be used.
- **Accessibility of data/research outputs**: IPR considerations and timeline for open access (if open access not provided, explain why); provisions for access to restricted data for verification purposes.
- **Interoperability of data/research outputs**: Standards, formats and vocabularies for data and metadata.
- **Reusability of data/research outputs**: Licenses for data sharing and re-use (e.g. Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation /re-use.
- **Curation and storage/preservation costs**; person/team responsible for data management and quality assurance.

4.6. PROPOSAL APPLICATION FORM → MSCA COFUND

Section 1.2 Quality and novelty of the research options offered by the programme in terms of science, interdisciplinarity, inter-sectorality and level of transnational mobility. Quality of open science practices.

Required sub-headings:

- Describe the research options offer by the programme
    - Excellence of the research programme;
    - Quality of the research options in terms of interdisciplinary research options, intersectorality and international networking;
    - **Open science practices**
- **Research data management and management of other research outputs**
    - **How the data will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable)**
    - Any other relevant point.

4.7. PROPOSAL APPLICATION FORM → EIC PATHFINDER OPEN

Section 1.3 Objectives

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted to the nature of your work, in a way that will increase the chances of the project delivering on its objectives.

If you believe that none of these practices are appropriate for your project, please provide a justification here.

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. Open science practices include:

- early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
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- measures to ensure reproducibility of research outputs;
- providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
- participation in open peer-review;
- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

● **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the project must provide maximum 1 page on how the data/ research outputs will be managed in line

with the FAIR principles (Findable, Accessible, Interoperable, Reusable), addressing the following (the description should be specific to your project):

- **Types of data/research outputs** (e.g. experimental, observational, images, text, numerical) and their estimated size; if applicable, combination with, and provenance of, existing data.
- **Findability of data/research outp**uts: Types of persistent and unique identifiers (e.g. digital object identifiers) and trusted repositories that will be used.
- **Accessibility of data/research outputs**: IPR considerations and timeline for open access (if open access not provided, explain why); provisions for access to restricted data for verification purposes.
- **Interoperability of data/research outputs**: Standards, formats and vocabularies for data and metadata.
- **Reusability of data/research outputs**: Licenses for data sharing and re-use (e.g. Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation /re-use.
- **Curation and storage/preservation costs**; person/team responsible for data management and quality assurance.

4.8. PROPOSAL APPLICATION FORM → EIC PATHFINDER CHALLENGES

Section 1.3 Plausibility of methodology

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted to the nature of your work, in a way that will increase the chances of the project delivering on its objectives.

If you believe that none of these practices are appropriate for your project, please provide a justification here.

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- participation in open peer-review;
- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

- **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the project must provide maximum 1 page on how the data/ research outputs will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable), addressing the following (the description should be specific to your project):

  - **Types of data/research outputs** (e.g. experimental, observational, images, text, numerical) and their estimated size; if applicable, combination with, and provenance of, existing data.
  - **Findability of data/research outp**uts: Types of persistent and unique identifiers (e.g. digital object identifiers) and trusted repositories that will be used.
  - **Accessibility of data/research outputs**: IPR considerations and timeline for open access (if open access not provided, explain why); provisions for access to restricted data for verification purposes.
  - **Interoperability of data/research outputs**: Standards, formats and vocabularies for data and metadata.
  - **Reusability of data/research outputs**: Licenses for data sharing and re-use (e.g. Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation /re-use.

- **Curation and storage/preservation costs**; person/team responsible for data management and quality assurance.

PROPOSAL APPLICATION FORM → EIC TRANSITION (OPEN & CHALLENGES)

Section 1.3 Methodology

(…)

● Describe how appropriate **open science practices** are implemented as an integral part of the proposed methodology. Show how the choice of practices and their implementation are adapted to the nature of your work, in a way that will increase the chances of the project delivering on its objectives.

If you believe that none of these practices are appropriate for your project, please provide a justification here.

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. Open science practices include:

- early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
- research output management;
- measures to ensure reproducibility of research outputs;
- providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
- participation in open peer-review;
- and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Please note that this question does not refer to outreach actions that may be planned as part of communication, dissemination and exploitation activities. These aspects should instead be described under 'Impact'.

● **Research data management and management of other research outputs**: Applicants generating/collecting data and/or other research outputs (except for publications) during the

project must provide maximum 1 page on how the data/ research outputs will be managed in line with the FAIR principles (Findable, Accessible, Interoperable, Reusable), addressing the following (the description should be specific to your project):

- **Types of data/research outputs** (e.g. experimental, observational, images, text, numerical) and their estimated size; if applicable, combination with, and provenance of, existing data.
- **Findability of data/research outp**uts: Types of persistent and unique identifiers (e.g. digital object identifiers) and trusted repositories that will be used.
- **Accessibility of data/research outputs**: IPR considerations and timeline for open access (if open access not provided, explain why); provisions for access to restricted data for verification purposes.
- **Interoperability of data/research outputs**: Standards, formats and vocabularies for data and metadata.
- **Reusability of data/research outputs**: Licenses for data sharing and re-use (e.g. Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation /re-use.
- **Curation and storage/preservation costs**; person/team responsible for data management and quality assurance.

5. EVALUATION OF OPEN SCIENCE PRACTICES

Open science practices are evaluated:

- under the **'Excellence**' criterion (in particular under methodology)

AND

- under the '**Quality and efficiency of implementation'** award criterion

5.1. OPEN SCIENCE IN EXCELLENCE

Open science practices, including Research Data Management (RDM), must be addressed clearly and with sufficient details in Section 1. Excellence, sub-section 1.2 Methodology (see chapter 4 above).

Note: Research Data Management (RDM) is part of mandatory open science practices. However, in the proposal template they are mentioned as two separate sub-sections in Methodology. We suggest you address both and separately, as indicated. The evaluators check and assess them separately, i.e. Open science and RDM. We suggest that you write two separate headings in the proposal, one for open science practices and one for Research Data Management (RDM).

In your proposal, you should address both **mandatory** and **recommended** open science practices.

- You should provide concrete information on **how** you plan to comply with the **mandatory open science** practices. Failure to sufficiently address this, will result in a lower evaluation score.
- You should provide a clear explanation of how you will adopt **recommended practices**, as appropriate for your project.

If you believe that none of the open science practices (mandatory or recommended) apply to your project, then you have to provide a solid **justification**.

In Excellence, in the section on **methodology,** you should:

- describe how open science practices (mandatory and recommended, as appropriate) are implemented as an integral part of the methodology
  AND
- show how their implementation is adapted to the nature of your work, therefore increasing the chances of the project delivering on its objectives.

This information should be provided in no more than **one page**.

If open science practices are not applicable to the proposal, justifications should be provided so that, if evaluators agree, open science will not be taken into consideration in the evaluation.

Additionally, proposers generating or reusing data should outline in a maximum of one (additional) page their plans for data management, i.e. Research Data Management (RDM).

Note: We suggest writing the sub-section about Research Data Management (RDM) in the proposal very clearly and very detailed.

5.2. OPEN SCIENCE IN IMPLEMENTATION

In section 3 – Implementation, you should describe how the consortium brings together the necessary disciplinary and inter-disciplinary knowledge, under '**Capacity of participants and consortium as a whole**'.

Additionally, you should (**must**!) show how this **includes expertise and/or track record in open science practices**, relevant to what is planned for your project.

Note: Evaluators check whether the conortium demonstrates they have sufficient expertise in Open science and, if this point is not clear in the proposal, the assessment is negative, i.e. (minor) shortcoming.

Example:

+ The consortium is interdisciplinary, and it includes expertise in open science practices, which is positive.

- However, the consortium has a rather limited multidisciplinary composition. Insufficient expertise is demonstrated in open science practices. This is a minor shortcoming.

If open science practices are not relevant for your project, and you provided a sound explanation and justification for this, it is not necessary to demonstrate track record and expertise in open science.

5.3. OPEN SCIENCE IN PART A OF THE PROPOSAL

In Part A, each applicant (partner in the consortium) is asked to list up to five relevant publications, widely used datasets or other achievements of consortium members that they consider significant for the action proposed.

Open access is expected for publications, in particular journal articles, while datasets are expected to be FAIR and 'as open as possible, as closed as necessary'.

Open access vs. Open science

Open Access could be applied to all kinds of research content such as published journal articles, book chapters, monographs or research data. **Open Science or Open Research is a much broader term which is the conduction and dissemination of research in a more transparent and collaborative way**.

Open Access (OA) is the terminology used for the practice of making peer-reviewed scholarly research and literature freely available in online repositories to anyone interested in reading it. Open Access could be applied to all kinds of research content such as published journal articles, book chapters, monographs or research data.

Open Science (OS) or **Open Research** (OR) is a much broader term which is the conduction and dissemination of research in a more transparent and collaborative way. In many ways, open science is no different to traditional science with research data and lab notes at various stages of research cycle being made freely available as early as possible. So Open Science includes open access to content and information but also could encompass things like scholarly communication networks, citizen science projects, open lab notebooks and open source software.

If publications are not open access, proposers are strongly encouraged to deposit them retroactively in repositories and provide open access to them when possible.

The significance of publications will not be evaluated on the basis of the Journal Impact Factor of the venue they are published in, **but on the basis of a qualitative assessment provided by the proposers for each publication**.

6. HOW OPEN SCIENCE PRACTICES SHOULD BE ADDRESSED IN THE PROPOSAL?

6.1. EARLY AND OPEN SHARING

(**Requirements as per proposal application form**)

Open science practices include:

1. early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
2. research output management;
3. measures to ensure reproducibility of research outputs;
4. providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
5. participation in open peer-review;
6. and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

'Early and open sharing' means making research work, methodologies, outputs, such as data and software, among others, and findings available as soon as possible in the research process.

Examples of such early sharing include **preregistration**, **registered reports** and **pre-prints**. Early-sharing practices support reproducibility in the research and helps researchers secure precedence over their findings and/or conclusions.

➔ **Preregistration** of the research plan in a public repository makes available the research hypothesis, study design and planned analysis before data is collected. Preregistration is assisted by dedicated platforms; it increases the transparency, credibility and reproducibility of the results and helps addressing publication bias toward positive findings.

➔ **Registered reports** are research articles that are peer-reviewed and published in two stages. The study design and analysis plan including hypothesis and methodology undergo peer-review of the quality and suitability of the research question and protocol. If accepted, research protocols are preregistered *(see preregistration)* and the final research article is provisionally accepted for publication. After the research is conducted, an article containing the results and discussion as well as any changes is submitted and undergoes a second round of peer-reviewing. Registered reports reduce publishing bias for positive results as the acceptance for publication is based on the quality of the research, regardless of the outcome.

➔ **Preprints** are scientific manuscripts that are publicly shared prior to peer-review and journal publication via preprint platforms. An increasing number of journals accepts sharing of preprints prior to publication, but there are exceptions. Beneficiaries have to check the policy of their target journal to clear that a preprint will not pre-empt its publication.

Note: You should provide specific information on whether and how you will implement early and open sharing and for which part of your expected output. For example, you may mention what type of early and open sharing is appropriate for your discipline and project, such as preprints or preregistration/registration reports, and which platforms you plan to use.

Resources and platforms - Early and open sharing

ORION open science factsheets on preregistration, preprints and crowd science: https://www.orion-openscience.eu/public/2019-02/201810-VA-Orion-FactSheets-V5.pdf

The Centre for open science offers a wealth of resources on Registered Reports, including a list of journals that support them: https://www.cos.io/initiatives/registeredreports

Sherpa Romeo can be used to check the journal submission policy and if the posting of a preprint is considered as prior publication: https://v2.sherpa.ac.uk/romeo/

Preregistration repositories (examples)

- **OSF** (domain-general preregistration repository service with multiple formats for preregistration) (https://osf.io/registries)
- **AsPredicted** (domain-general registry service providing standardised preregistration template) (https://aspredicted.org/)
- **Preclinicaltrials.eu** (preclinical animal study protocols) (https://preclinicaltrials.eu/)
- **PROSPERO** (health and social care) (https://www.crd.york.ac.uk/prospero/)
- **Evidence in Governance and Politics** (EGAP) (political sciences) (https://egap.org/)
- **Registry for International Development Impact Evaluations** (RIDIE) (social sciences) (https://www.3ieimpact.org/evidence-hub/ridie)

Preprint servers (examples)

- **Zenodo** – multidisciplinary (https://zenodo.org/)
- **Preprints** - multidisciplinary (https://www.preprints.org/)
- **bioRxiv** - Life sciences (https://www.biorxiv.org/)
- **medRxiv** – Medicine and health sciences (https://www.medrxiv.org/)

- **PsyArxiv** - Behavioural sciences (https://psyarxiv.com/)
- **SocArXiv** - Social sciences and humanities (https://osf.io/preprints/socarxiv)
- **LawArXiv** – Law (https://osf.io/preprints/lawarxiv)
- **ArXiv** - Physics, Mathematics, Computer Science (https://arxiv.org/)

6.2. RESEARCH DATA MANAGEMENT (RDM) AND MANAGEMENT OF OTHER RESEARCH OUTPUTS

RDM is mandatory in Horizon Europe for projects generating or reusing data. If you expect to generate or reuse data and/or other research outputs (except for publications), in the proposal you are required to outline in a maximum of one page how these will be managed.

A full data management plan (DMP) is not required at submission stage. However…. See Note below.

(**Requirements as per proposal application form**)

Open science practices include:

1. early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
2. research output management;
3. measures to ensure reproducibility of research outputs;
4. providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
5. participation in open peer-review;
6. and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Note: Even if a full DMP is not mandatory at proposal stage, you shoud still address this section in the proposal, according to the requirements of the proposal template applicable for the instrument you chose to apply to (e.g. RIA, IA, CSA, MSCA DN etc.).

By exception, in cases of a public emergency and if the work programme requires so, you should submit a full DMP already with submission of proposals or at the latest by the signature of the grant agreement.

A template for a DMP is provided in Annex 1, as per the requirements of Horizon Europe[6].

[6] Data Management Plan (DMP) (HE) – Reference documents, portal Funding & Teders, https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents

Research data management (RDM) is the process within the research lifecycle that includes the data collection or acquisition, organisation, curation, storage, (long-term) preservation, security, quality assurance, allocation of persistent identifiers (PIDs), provision of metadata in line with disciplinary requirements, licencing, and rules and procedures for sharing of data.

RDM is an essential element in any project that generates, collects or re-uses data. Planning ahead to data needs that proposers are likely to encounter during the project is a best practice.

For example, provisions need to be in place to ensure that data is managed responsibly *(e.g. the right venue is chosen for deposition, adequate are issued, legal provisions such as General Data Protection Regulation (GDPR) are respected, etc)*.

Data management should be in line with the FAIR principles[7], to ensure that researchers can find, access and re-use each other's data, maximising the effectiveness and reproducibility of the research undertaken.

RDM in line with the FAIR principles is a requirement that should be carried out regardless of whether the data generated and re-used in the project is intended to be openly accessible, or if access restrictions are foreseen.

FAIR data is not equivalent to open data (publicly available to everyone to access and reuse). Data can, and should be FAIR even when access is restricted.

RDM and the FAIR principles can be applied to research outputs other than data *(i.e. workflows, protocols, software, samples, etc)*.

Note: It is strongly recommended that the management practices for data and other research outputs are written well, with details and convincing references to the project already at the stage of the proposal.

Proposers are recommended to consider robust management practices for data and other research outputs as early as the proposal stage of their project.

Below are important elements and resources for RDM useful already at proposal stage:

Persistent identifiers (PIDs) are key in ensuring the findability of research outputs, including data. They are globally unique and long-lasting references to digital objects *(such as data, publications and other research outputs)* or non-digital objects such as researchers, research institutions, grants, etc. Frequently used persistent identifiers include digital object identifiers

[7] FAIR – Findable, Accessible, Interoperable, Reusable, https://www.go-fair.org/fair-principles/

(DOIs), Handles, and others. For further reading on PID types, please refer to https://www.dpconline.org/handbook/technical-solutions-and-tools/persistent-identifiers.

To enhance the findability of research outputs, and their potential reuse, **standardised metadata frameworks** are essential, ensuring that data and other research outputs are accompanied by rich metadata that provides them with context.

To enhance the re-usability of research data, **they must be licenced**. For more information on the licences required for data under Horizon Europe, please refer to the AGA (article 17) (see p. 4-6 in this document).

Trusted repositories assume a central role in the Horizon Europe for the deposition of and access to publications and research data. For a definition of trusted repositories in Horizon Europe please refer to the AGA (article 17). Proposers, with the help of data and research support staff *(e.g. data stewards, data librarians, etc)*, should check whether the repositories that they plan to deposit their data have the features of trusted repositories, and justify this accordingly in their Data Management Plans.

Data management plans (DMPs) are a cornerstone for responsible management of research outputs, notably data and are mandatory in Horizon Europe for projects generating and/or reusing data (on requirements and the frequency of DMPs as deliverables consult the AGA article 17).

A template for a DMP is provided in Annex 1, according to the template and requirements of Horizon Europe. Its use is recommended but not mandatory. DMPs are formal documents that outline from the start of the project all aspects of the research data lifecycle, which includes its organisation and curation, and adequate provisions for its access, preservation, sharing, and eventual deletion, both during and after a project.

Writing a DMP is part of the methodology of the project, since good data management makes the work more efficient, saves time, contributes to safeguarding information and to increasing the value of the data among the beneficiaries themselves and others, during and after the research. DMPs are thus a key means of support when planning and conducting a research project, and, ideally, filling in a DMP should be started prior to the beginning of the project.

DMPs play a key role in helping researchers to adequately manage research outputs other than data and publications, also in line with the FAIR principles. Such research outputs may be physical or digital, and include original software created during the project, workflows, protocols, new materials such as samples, cell-lines, antibodies, among many others. DMPs should reflect an adequate management strategy for such outputs as well.

A DMP should be a living document, which is updated and enriched as the project evolves. Such updates might occur after attaining milestones related e.g. to the generation of new data or to reflect changes related to the original planning, changes in data/output access provisions or curation policies, changes in consortium practices *(e.g. new innovation potential, decision to file for a patent)*, changes in consortium composition, etc.

A good practice regarding DMPs is to register them as a non-restricted public deliverables to make them openly accessible, unless legitimate reasons exist to keep them confidential. An additional good practice is to publish the DMP in specialised journals or publishing platforms such as RIO (Research Ideas and Outcomes)[8] etc., or to deposit them in DMP-specific public repositories such as DMPOnline[9] and others.

As practices with regard to data management, storage, and sharing differ widely across disciplines, the DMPs should reflect common disciplinary practices. In addition to domain specificities, DMPs across the board should address an overarching set of data-related requirements including those aspects related to making the data FAIR.

Common aspects that need to be addressed in all DMPs include[10]:

- **Data set description**: a sufficiently detailed description of the data generated or re-used, including the scientific focus and technical approach to allow association of their data sets with specific research as well as information on data types and an estimate of the data set's size.
- **Standards and metadata**: the protocols and standards used to structure the data (i.e. fully reference the metadata) so that other scientists can make an assessment and reproduce the dataset. If available, a reference to the community data standards with which their data conform and that make them interoperable with other data sets of similar type.
- **Name and persistent identifier for the data-sets**: a unique and persistent identification (an identifier) of the data sets and a stable resolvable link to where the data sets can be directly accessed. Submission to a public repository normally provides this; many institutional repositories provide similar services.

[8] RIO, https://riojournal.com/
[9] DMPonline, https://dmponline.dcc.ac.uk/
[10] These aspects are broadly in line with the requirements set forth in Science Europe's Practical Guide to the International Alignment of Research Data Management: https://www.scienceeurope.org/media/4brkxxe5/se_rdm_practical_guide_extended_final.pdf

- **Curation and preservation methodology**: information on the standards that will be used to ensure the integrity of the data sets and the period during which they will be maintained, as well as how they will be preserved and kept accessible in the longer term. A reference to the public data repository in which the data will be/is deposited with relevant consideration on whether the chosen repository meets the requirements of a trusted repository.
- **Data sharing methodology**: information on how the data sets can be accessed, including the terms-of-use or the license under which they can be accessed and re-used, and information on any restrictions that may apply or relevant security and privacy considerations. It is also important to specify and justify the timing of data sharing. On open access to research data *see below relevant section on open access*.
- **Output management, for research outputs other than data and publications**: The section on output management should show efforts to manage outputs in line with the FAIR principles, including a detailed description of the output, consider relevant metadata standards and the provision of PIDs when depositing the output, or its digital representation if it is physical. The plan should further detail the deposition, curation and preservation methodology foreseen, identifying the right home for the output, and it should set out an approach likely to maximise the re-use and adoption of the output by the wider research community. If the output is physical, the plan should indicate how it would be made available to potential users.
- **Costs and personnel related to RDM**: An estimation of costs related to RDM such as costs for data collection, data documentation, data storage, data access and security, data preservation, data availability and reuse as well as the person/team responsible for data management and quality assurance processes.

The European Open Science Cloud (EOSC)

Note: For those work programmes that require the use of the European Open Science Cloud (EOSC) federated repositories, you should explicitly discuss the use of such repositories in your proposal.

The European Open science Cloud (EOSC)[11] aims to deploy and consolidate an open, trusted virtual environment to enable circa 2 million European researchers to store, share, process, analyse, and reuse research digital objects including data, publications and software across disciplines and borders.

A European co-programmed Partnership approach for EOSC has been proposed for the period 2021-2030. It will bring together institutional, national and European initiatives and engage all relevant stakeholders to deploy a European Research Data Commons where data are Findable, Accessible, Interoperable, Reusable (FAIR). This European contribution to a Web of FAIR Data and Related Services for Science will support open science in a deepened European Research Area and provide the basis for the research and innovation data space foreseen in the European Strategy for Data.

Certain work programmes may require the use of trusted repositories that are federated in EOSC for depositing research data. In that case, data must be deposited in repositories which are registered to the EOSC and support (implicitly or explicitly) the FAIR principles. An initial offering of EOSC resources and services can be found from the EOSC Portal[12]. This offering is expected to continue growing in function of the EOSC rules of participation[13].

Resources and platforms - Research and Data Management

Metadata standards and Research Data Management guidelines

• The FAIRsharing portal[14] with information and resources on data standards, databases, and policies in the life sciences and other scientific disciplines.

• DM guidelines and good practices for the Life Sciences, the Social Sciences and the Humanities provided by relevant research infrastructures, ELIXIR, CESSDA and DARIAH, respectively along with relevant data resources and repositories/databases.

• For more information on disciplinary metadata standards, visit Digital Curation Centre and Research Data Alliance Metadata Standards Directory.

[11] https://eosc.eu/
[12] https://eosc-portal.eu/
[13] https://op.europa.eu/en/publication-detail/-/publication/a96d6233-554e-11eb-b59f-01aa75ed71a1/language-en/format-PDF/source-184432576
[14] https://fairsharing.org/

DMP

• A template for the Horizon Europe DMP is provided in Annex 1, following the reporting templates in Horizon Europe.

• The RDA FAIR Data Maturity Model Working Group delivers a detailed annotated list of indicators to address when increasing the FAIRness of data.

• For developing DMPs: The DMPONLINE tool (supports the development of project DMPs); ARGOS (online tool); the Data Stewardship Wizard, a joint ELIXIR CZ and ELIXIR NL tool, helps researchers understand what is needed for FAIR-oriented data stewardship, and build their own Data Management Plans.

• The Science Europe Practical Guide to the International Alignment of Research Data Management contains detailed guidance for drafting and evaluating DMPs.

6.3. REPRODUCIBILITY OF RESEARCH OUTPUTS

(**Requirements as per proposal application form**)

Open science practices include:

1. early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
2. research output management;
3. measures to ensure reproducibility of research outputs;
4. providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
5. participation in open peer-review;
6. and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

You should outline the measures planned in the project that tend to increase reproducibility. Such measures may already be interweaved in other parts of the methodology of a proposal (such as transparent research design, the robustness of statistical analyses, addressing negative results, etc) or in mandatory/non-mandatory open science practices *(e.g. the DMP, early sharing through preregistration and preprints, open access to software, workflows, tools, etc)* to be implemented. More detailed suggestions on good practices for enhancing reproducibility and resources in the relevant section below.

Horizon Europe requires information via the repository where publications and data have been deposited on any research output or any other tools and instruments - *data, software, algorithms, protocols, models, workflows, electronic notebooks and others* - needed for the re-use or validation of the conclusions of scientific publications and the validation and reuse of research

data. Further, beneficiaries must provide digital or physical access to data or other results needed for the validation of the conclusions of scientific publications, to the extent that their legitimate interests or constraints are safeguarded19. More details on these requirements for reproducibility and guidance on how to meet them are provided in the AGA (article 17).

Measures to ensure reproducibility of results

Reproducibility is the possibility for the scientific community to obtain the same results as the originators of specific findings. Reproducibility of some or all results is important as it increases the performance of research & innovation (wider use of research results); it limits waste of resources (less duplication and fewer false baselines); it increases the quality and the reliability of research (stronger methods, controls and reporting); and, as a result, it may increase the trust of citizens in science. Therefore, reproducibility is integral part of 'Excellence'; we expect the results of Horizon Europe to be reproducible, and planning should start at proposal stage to make results reusable and reproducible.

Below is a list of practices which tend to increase reproducibility. Some of them may already be required by the MGA (for example DMP, FAIR) or by specific calls and proposers may interweave such practices in various parts of the methodology section as appropriate:

- Specify with precision and no ambiguities the research design and the methodologies that you will be applying.
- Specify how you will deal with negative results, if any, so that others can lean from your project regarding of its outcomes.
- Make prior searches and checks on existing results and data to ensure you are not duplicating unnecessarily.
- Specify how you are making use of pre-prints, preregistration of protocols and registered reports *(see above, 'Early sharing of research results')*, to ensure that your method and research questions are accountable, if applicable.
- Detail the steps you will take to make your research process and tools (software, materials, protocols, flows, ...) transparent and available during and after the research.
- Mention the steps, if any, that you will take to ensure the validity and the quality of the project's process and results *(e.g. peer review, knowledge sharing, independent testing, supervision, quality control mechanisms)*.

- Plan to use the DMP to the full extent possible to detail the assets and materials underlying your data collection and analysis *(see above, 'DMP')*.
- Ensure that your data are FAIR so that others can find them and re-use them to reproduce your results *(see above, 'FAIR')*.
- Specify how you will ensure robust statistical analysis, that can be repeated (power of sample, robust experimental techniques, open software, ...).
- Specify what 'common assets' for research & innovation your project will be building, if any, including knowledge bases, methodologies, evaluation frameworks, ontologies, open repositories, etc.
- Make provisions to validate, demonstrate, make interoperable, scale-up and overall make replicable the results of your R&I activities.
- Consider whether your project will produce digital copies of your results, *e.g. Digital Twins, virtual bodies, digital blueprints, that increase the likelihood of re-use and reproducibility*.

Resources and platforms Reproducibility of Research Outputs

• An extensive list of resources is provided by the Centre for open science[15]

• Information and resources provided by networks focusing on reproducibility, for example in the UK[16], Germany[17], Switzerland[18]

• Guidelines[19] and toolkits on reproducibility, especially specific to your field *(e.g. in biomedical research[20]).*

[15] https://www.cos.io/
[16] https://www.ukrn.org/
[17] https://reproducibilitynetwork.de/
[18] https://www.swissrn.org/
[19] https://olz34z4bb51rsojq274o1g19-wpengine.netdna-ssl.com/wp-content/uploads/2019/11/serrapilheira-guide-open-and-reproducible-science.pdf
[20] https://academic.oup.com/gigascience/article/9/6/giaa056/5849489?login=false

6.4. OPEN ACCESS

Open access is online access at no cost for the end user of research outputs such as scientific publications, data or other engineered outcomes and processes *(e.g. software, models, algorithms, protocols and electronic notebooks)*. Open access often carries less restrictive copyright and licensing barriers than traditionally published works, for both the users and the authors.

Open access enables increased quality and efficiency of research and accelerates the advancement of knowledge and innovation by making results reusable and by improving their reproducibility. It also offers the means for more creativity, more trust in science and greater impacts by building on collective intelligence, facilitating cross-disciplinary research and involvement of all relevant knowledge actors, including citizens.

(**Requirements as per proposal application form**)

Open science practices include:

1. early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
2. research output management;
3. measures to ensure reproducibility of research outputs;
4. providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
5. participation in open peer-review;
6. and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

Horizon Europe requires deposition of scientific peer-reviewed publications and research data and open access (with exceptions for research data) following specific requirements. For guidance on this consult the AGA (article 17).

You should offer specific information on how you will meet the open access requirements, that is deposition and immediate open access to publications and open access to data (the latter with some exceptions and within the deadlines set in the DMP) through a trusted repository, and under open licenses. You may elaborate on the (subscription-based or open access) publishing venues that you will use. You may also elaborate on the trusted repository/repositories through which open access to publications and research data will be provided.

Open access to research data and other research outputs should be addressed in the section on research data management of your proposal. Research data should be open as a default, unless there are legitimate reasons for keeping them closed.

While it is not mandatory to publish (if a project intends to exploit its results, it may decide not to publish), if scientific peer-reviewed publications are produced then they must be open access immediately at publication time under open licenses (such as Creative Commons), providing specific minimum sets of rights of reuse (CC BY for articles and book chapters in edited books and CC BY, CC BY-NC, CC BY-ND, CC BY-NCND or equivalent for long-text formats. The

following checklist shows what users can do with publications and other outputs licensed under the following Creative Commons licenses[21].

Table 2. Types of licenses for Open Access

	Share (copy and redistribute the material in any medium or format)	Use for commercial purposes	Adapt (remix, transform and build upon the material)	Attribute Give appropriate credit, provide a link to the license, and indicate if changes were made	Copyright, database rights
CC BY	Yes	Yes	Yes	Yes	Yes
CC BY NC	Yes	No	Yes	Yes	Yes
CC BY ND	Yes	Yes	No If you remix, transform, or build upon the material, you may not distribute the modified material.	Yes	Yes
CC BY NC ND	Yes	No	No	Yes	Yes
CC0	Yes	Yes	Yes	No	No Waived

It is important to be aware that Horizon Europe requires that enough intellectual property rights are maintained by beneficiaries or authors to ensure the required open access to scientific publications.

Proposers should be aware that beneficiaries are required to retain sufficient intellectual property rights (IPR) to comply with their open access obligations. Authors may need to interact with prospective publishers, in particular when they publish in venues that are not open access. To facilitate compliance with their open access obligations, beneficiaries/researchers are encouraged to notify publishers of their grant agreement obligations (including the licensing

[21] https://creativecommons.org/

requirements) already at manuscript submission. For example, by adding the following statement to their manuscript: “This work was funded by the European Union under the Horizon Europe grant [grant number]. As set out in the Grant Agreement, beneficiaries must ensure that at the latest at the time of publication, open access is provided via a trusted repository to the published version or the final peer-reviewed manuscript accepted for publication under the latest available version of the Creative Commons Attribution International Public Licence (CC BY) or a licence with equivalent rights. CC BY-NC, CC BY-ND, CC BY-NC-ND or equivalent licenses could be applied to long-text formats.” If the publishing agreement is contrary to the grant agreement obligations, authors should negotiate its terms and, alternatively, look for a different publishing venue/options.

Data should be deposited in a trusted repository as soon as possible after data production and at the latest by the end of the project. Data underpinning a scientific publication should be deposited at the latest at the time of publication and in line with standard community practices. Beneficiaries of Horizon Europe have to ensure open access to research data generated in their projects under the principle ‘as open as possible and as closed as necessary’. This means that data is in principle open, unless beneficiaries decide to restrict access to some or all their research data for legitimate reasons. On open access to data and the legitimate reasons for restricting access consult the AGA (article 17) and section above on research data management.

Open access to other research outputs, such as software, workflows and others, will ensure that these outputs that have been generated by Horizon Europe actions are also freely accessible to all. This will promote transparency, efficiency and reproducibility, as well as trust in science, and will facilitate access for citizens. Proposers/beneficiaries are also encouraged to license research outputs other than publications and data under appropriate licenses. With regard to software, it should be noted that with the exception of CC0 (i.e. public domain dedication) CC licenses are not appropriate[22] (although they can be used for software documentation). Instead, the use of appropriate software licenses, such as those listed as free[23] by the Free Software Foundation[24] and listed as open source by the Open Source Initiative[25], is strongly recommended.

[22] https://creativecommons.org/faq/#can-i-apply-a-creative-commons-license-to-software
[23] https://www.gnu.org/licenses/license-list#SoftwareLicenses
[24] https://www.fsf.org/
[25] https://opensource.org/

Resources and platforms – Open Access

Publishing:

- Open Research Europe (ORE)[26], the open access publishing platform of the European Commmission for all disciplines, for research stemming from Horizon Europe
- Locate trustworthy open access journals in your field of work in the Directory of Open Access Journals[27]
- Check whether a journal has an open access policy that is aligned to the Horizon Europe requirements with the Journal Checker Tool[28]
- Locate trustworthy open access publishers and open access monographs in the
- Directory of Open Access Books[29]

Repositories:

- Search for open repositories in www.opendoar.org
- www.re3data.org offers a Repository Finder to facilitate the search for a suitable
- general or discipline-specific repository for various kinds of research outputs.

The general-purpose repositories for multidisciplinary research results including data, software and publications:

- www.zenodo.org - general-purpose repository for data, software and publications
- https://figshare.com/ – repository for any research outputs of all file formats
- open science Framework (OSF) - https://osf.io/preprints/socarxiv - open source project management tool and repository

Repositories for Software:

- GitHub[30] is development platform to host and review code, manage projects, and build software

[26] https://open-research-europe.ec.europa.eu/
[27] www.doaj.org
[28] https://journalcheckertool.org/
[29] https://www.doabooks.org/
[30] https://github.com/

- Savannah[31] hosts free projects that run on free operating systems, with a focus on GNU software
- SourceForge[32] is an Open Source software community and hosting platform
- Launchpad[33] is a software collaboration and hosting platform

Repositories for experimental workflows and protocols:

- Protocol Exchange[34] - open repository for sharing scientific research protocols
- Protocols[35] - Platform for data management and protocol sharing

Discipline-specific repositories:

- ELIXIR Deposition Databases[36] and ELIXIR Core Data Resources[37] - repositories recommended for the deposition of life sciences experimental data

6.5. PUBLISHING USING OPEN PEER-REVIEW

Open peer review is an umbrella term for various alternative review methods that seek to make classical peer review more transparent and accountable. It has neither a standardised definition, nor an agreed schema of its features and implementations.

(**Requirements as per proposal application form**)

Open science practices include:

1. early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
2. research output management;
3. measures to ensure reproducibility of research outputs;
4. providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
5. participation in open peer-review;
6. and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

[31] https://savannah.gnu.org/
[32] https://sourceforge.net/
[33] https://launchpad.net/
[34] https://protocolexchange.researchsquare.com/
[35] https://www.protocols.io/
[36] https://elixir-europe.org/platforms/data/elixir-deposition-databases
[37] https://elixir-europe.org/platforms/data/core-data-resources

Open peer review refers to a peer review process that contains one or more of these elements[38]:

- Authors and reviewers are aware of each other's identity during or after the review process.
- Review reports are published alongside the relevant article.
- The wider community is able to contribute to the review process (peer researcher or even general public).
- Manuscripts are made immediately available in advance of the formal peer review procedure.
- Review or commenting on the final 'version of record' is made possible.
- Direct, reciprocal discussion between authors and reviewers and/or between reviewers is allowed and encouraged.
- Review can be decoupled from publishing when facilitated by a different organisational entity than the venue of publication (e.g. publishing platforms).

Some journals and scholarly publishers apply open peer review. Some platforms, including preprint servers, may also facilitate open peer review of preprints. For example, Open Research Europe[39], the open access publishing platform of the European Commission uses the open peer review model, where both names of authors and reviewers are public, and the review report is open access.

Open peer review is an important aspect of open science. Opening up what has traditionally been a closed process increases opportunities to spot errors, validate findings and to increase the overall trust in published outputs. Open peer-review is considered by some among the measures that increase the quality of the peer review process (by making it more constructive), and the transparency of research (with 'openness' applying to all processes in the scientific workflow).

Another argument to engage in open peer review is that it ensures reviewers to get credit for their efforts.

Resources and platforms – Open peer riview publishing

Ross-Hellauer T. What is open peer review? A systematic review. F1000Research 2017, 6:588 (https://doi.org/10.12688/f1000research.11369.2)

FOSTER proposes a module to learn basics on open peer review (https://www.fosteropenscience.eu/learning/open-peer-review)

[38] https://doi.org/10.12688/f1000research.11369.2
[39] https://f1000.com/publishing-partnerships-research-organizations/?ppc_keyword=open%20research&gclid=Cj0KCQjwidSWBhDdARIsAIoTVb2Zz1M7-oVhiyHBh7BsDyFHN4FHZRplxudaqsBma01l-__Njk8sq6waAv9REALw_wcB

Open Research Europe (https://open-research-europe.ec.europa.eu) supports open peer review in all scientific fields for all Horizon Europe publications.

Some discipline-specific venues support open peer review and are suitable for:

- the life sciences (e.g. eLIFE[40], Bio Med Central[41], BMJ[42], GIGA science[43] and BioRxiv ASAPbio[44])
- the social sciences (e.g. SAGE open[45], Wiley[46] and SocArXiv[47])
- the arts and humanities (SAGE open[44], Wiley[45] and digitalculturebooks[48])

6.6. CITIZEN, CIVIL SOCIETY AND END-USER ENGAGEMENT

Citizen and civil society engagement is a programme principle and operational objective that refers to the opening up of R&I processes to society to develop better, more innovative and more relevant outcomes, and to increase societal trust in the processes and outcomes of R&I.

Opening up the R&I system towards society and supporting citizens, civil society and end-users to participate in R&I – as sources of ideas, knowledge and/or data, as data collectors and/or analysers, and/or as testers and/or end users – enlarges the collective intelligence, capabilities and scope of the R&I and is likely to lead to greater creativity and robustness of the outcomes and reduced time-to-

(**Requirements as per proposal application form**)

Open science practices include:

1. early and open sharing of research (for example through preregistration, registered reports, preprints, or crowd-sourcing);
2. research output management;
3. measures to ensure reproducibility of research outputs;
4. providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows);
5. participation in open peer-review;
6. involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

[40] https://reviewer.elifesciences.org/author-guide/editorial-process?utm_source=GoogleAds&utm_campaign=Interest&gclid=Cj0KCQjwidSWBhDdARIsAIoTVb0T-7nVreyi_JdaM4UJz00HomENx7Pd_hsDG6JimfakK4cpWDnaLjUaAiHqEALw_wcB
[41] https://www.biomedcentral.com/
[42] https://www.bmj.com/
[43] https://gigascience.biomedcentral.com/
[44] https://asapbio.org/
[45] https://journals.sagepub.com/home/sgo
[46] https://onlinelibrary.wiley.com/
[47] https://osf.io/preprints/socarxiv
[48] https://www.digitalculture.org/

market of the innovative products and services. It also increases the relevance and responsiveness of R&I, ensuring that its outcomes align with the needs, expectations and values of society. Moreover, it is a key element for improving the transparency, co-ownership and trust of society in the process and outcomes of R&I. Conducting R&I openly, responsibly, transparently, and in adherence to the highest standards of research integrity and ethics is also important for responding to increased science denial.

Engagement can range from the **identification and conceptualisation of R&I priorities** (e.g. through deliberative or other participatory processes), to **the implementation, utilisation and assessment of R&I results** (e.g. through data collection, data analysis, discussion and publication or presenting scientific results, working in fab-labs to develop new innovations, testing innovations and solutions, and evidence-based advocacy).

Note: You should provide clear and succinct information on how citizen, civil society and end-user engagement will be implemented in your project, where/if appropriate. The kinds of engagement activities will depend on the type of R&I activity envisaged and on the disciplines and sectors implicated.

- **'Citizens'** should be understood as individuals acting on their own initiative and not on behalf of their employer or sectoral interests. It does not refer to any legal citizenship(s) that people may or may not hold.
- **'Civil society'** refers to the ensemble of citizens and civil society organisations that are active in the public sphere but distinct from government and business.
- **'Civil society organisations** (CSOs)' include all non-state, not-for-profit structures, such as citizens' associations, patient groups, professional societies or groups, consumer groups, humanitarian organisations, non-governmental organisations (NGOs), foundations and charities.
- **'End-users'** are public, private or civil (i.e. civil society, see above) organisations that constitute potential users of the R&I outputs.
- **'Engagement'** means the involvement of citizens and civil society in co-designing R&I agendas, in co-creating R&I contents, and/or in co-assessing R&I outcomes.

The engagement activities may include:

➔ **co-design activities** (such as workshops, focus groups or other means to develop R&I agendas, roadmaps and policies) often including deep discussion on the implications, the ethics, the benefits and the challenges related to R&I courses of action or technology development;

➔ **co-creation activities** *(*involving citizens and/or end-users directly in the development of new knowledge or innovation, for instance through citizen science and user-led innovation);

➔ **co-assessment activities** (such as assisting in the monitoring, evaluation and feedback to governance of a project, projects, policies or programmes on an iterative or even continual basis).

Co-design activities could involve workshops, focus groups or other means to develop R&I agendas, roadmaps or policies. These could be one-off activities in one or several different localities or repeated consultations with the same or varying groups. They could involve citizens and/or one or many organisation types at the same time.

Co-design activities often include deep discussion on the implications, the ethics, the benefits and the challenges related to R&I courses of action or technology development.

Co-design could be the overall focus of a project (e.g. to develop a roadmap for a certain technology), a work package within a project that uses the outcomes of the codesign in subsequent work packages, or a supporting work package that provides continual feedback on project activities throughout the project cycle.

Co-creation activities, such as citizen science or user-led innovation, involve citizens or end-users directly in the development of new knowledge or innovations, through a range of different levels of participation. These could include identifying R&I questions to be tackled by the project, developing a methodology, observing, gathering and processing data, right up to the publication and presentation of results.

The co-creation activities could be the focus of a proposal, or could be one of the methodological approaches taken alongside others.

Co-assessment activities, such as assisting in the monitoring and evaluation of the progress of the project, portfolio of projects, policies or programmes, help ensure an iterative or even continual process of interaction with citizens, civil society and endusers throughout the project cycle on the quality, utilisation and (potential) impact of project outputs.

Co-design, co-creation, and co-assessment, as (sometimes) radical departures from more traditional forms of R&I, could imply **changes to the institutional governance of the**

participating beneficiaries that last beyond the lifetime of project funding.

Note: If changes to institutional governance result from these activities, please ensure that your project demonstrates adequate support from the institution management structures.

The extent of engagement in the proposal could range from one-off activities alongside other methodological approaches to being the primary focus or methodological approach of the project itself. Engagement will require resources and expertise and is therefore often conducted by dedicated interlocutor organisations or staff with relevant expertise.

In certain cases, citizens, civil society and end-users may be involved across different stages of the R&I and/or policy cycle, by deciding on the research to be conducted, conducting that research, analysing and interpreting the data, and engaging in related advocacy or policy activities.

An important aspect to consider in many cases is the inclusivity of the engagement and ensuring diversity of participation. The challenge of sustaining engagement should not be underestimated and different forms of compensation or rewards could be considered, as well as measures for two-way learning between scientists or innovators and the cocreators.

Engagement requires **resources** and **expertise**. Often, engagement is conducted by dedicated interlocutor organisations that already have the reach, trust, and expertise to successfully carry out the engagement exercises. The integration of the engagement activities, and their outcomes within the project design, should aim to ensure use of the outcomes (i.e. they are not 'window dressing' or unimportant side-activities), and that there is appropriate feedback and acknowledgement to the engaged. If the call conditions allow it, the launch of calls for small grants or prizes can be useful (or in some other cases even essential) for reaching and engaging local communities and small associations, civil society organisations, social enterprises, or small businesses.

Note: If you plan to include citizen science, civil society / citizen engagement in the activities of your project, you must detail them and you must identify the relevant stakeholders, inside or outside your consortium, who have experience and expertise in this area.

Generally, the greater the interaction from across the quadruple helix (academia-industry-government-civil), the more the R&I results will be reliable, trusted and taken up by society. Different organisation types, and different societal perspectives, help ensure that the processes and the outcomes of the R&I align with the needs, values and expectations of society.

Note: If you plan to have activities related to citizen science, civil society/citizen engagement in your project, please note that you will have to report on these in details once the project is financed. Hence, we suggest that you carefully think and plan these activities already at the stage of proposal.

We provide below the **requirements of the project reporting on citizen engagement**, after the project is financed (Source: Periodic report Horizon Europe, V1.0, 15 Dec. 2021, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/temp-form/report/periodic-report_horizon-euratom_en.pdf).

Citizen engagement (for ERC projects, the table must be filled in only at the end of the project) Regarding co-design and co-creation through the engagement of citizens, and/or end-user entities,how have citizen and end-user entities contributed to the co-creation of R&I content so far?	**Citizen**	**End-user entities**
Co-creating R&I visions, agendas, policies or frameworks	☐	☐
Co-creating R&I action plans or technology roadmaps	☐	☐
Collecting data for the project	☐	☐
Analysing data for the project	☐	☐
Providing resources, e.g. computational, space/locations, practical support	☐	☐
Monitoring and/or evaluating R&I results	☐	☐
Testing & experimenting with innovative R&I solutions	☐	☐

Contributing to scientific publications or patent applications	☐	☐	
Debating R&I findings and implications for them	☐	☐	
Not applicable	☐	☐	
Other (please specify):	[insert text]		
What mechanisms for citizen and/or end-user entity engagement have you set up and plan to maintain beyond the end of your project, or are planning to set up and maintain beyond the end of your project (per beneficiary)? (not blocking submission)	**Beneficiary 1**	**Beneficiary 2**	**Beneficiary 3**
Department, centre, lab, network, testbeds or other structure or space set up, internally or externally, to support citizen/end-user engagement	☐	☐	☐
Institutional websites, web-pages or portals set up to support citizen/end-user engagement(excluding project website)	☐	☐	☐
Staff appointed with responsibility to initiate, monitor, evaluate or advise on citizen/end-user engagement	☐	☐	☐
Staff appointed with responsibility for training, mutual learning and sharing of tools and good practice on citizen/end-user engagement	☐	☐	☐
Rules, standards, guidelines or other frameworks established to ensure that citizen/end-user engagement is taken into account in institutional R&I processes			

	☐	☐	☐
Systematic or regular dialogues, meetings, workshops or other events set up for citizen/end-userengagement (excl.one-off events)	☐	☐	☐
Other (free text, word limit)	☐	☐	☐
None	☐	☐	☐
Overall, how many individual citizens have been involved in co-creating R&I content for all activities listed? (please provide your best estimate, which should be traceable in one or more deliverables)	[insert text]	[insert text]	[insert text]

(Source: Periodic report Horizon Europe, V1.0, 15 Dec. 2021, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/temp-form/report/periodic-report_horizon-euratom_en.pdf).

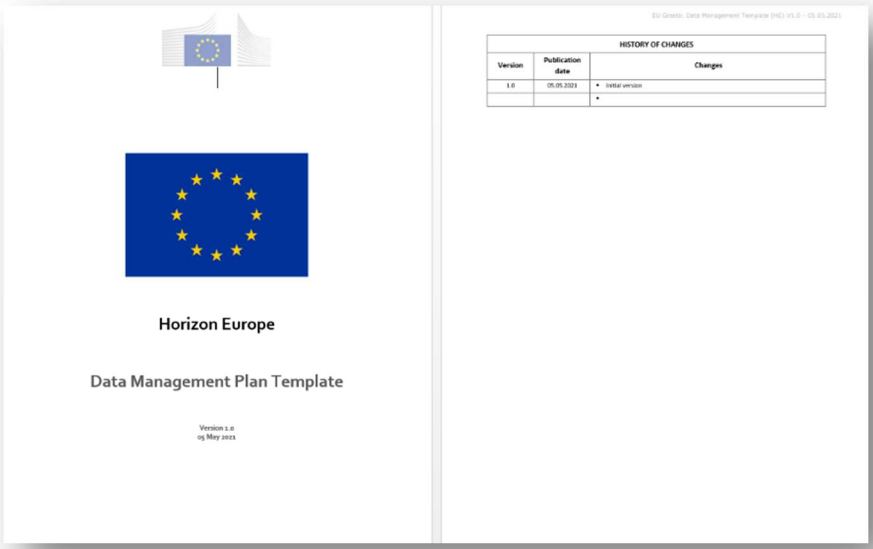
Resources and platforms – Citizen, civil society and end-user engagement

- The Responsible Research and Innovation (RRI) toolkit[49]
- Action catalogue of inclusive research methods[50]
- Methods to engage the public[51]
- The societal readiness Thinking Tool[52]
- Innovation Compass[53]
- Resources to open up research and innovation actors to society[54]
- Models and guidelines to increase patient engagement in health research[55]
- RRI Practice Handbook for research organisations[56]
- EU portal for citizen science projects, initiatives, networks, organisations, and training courses[57]

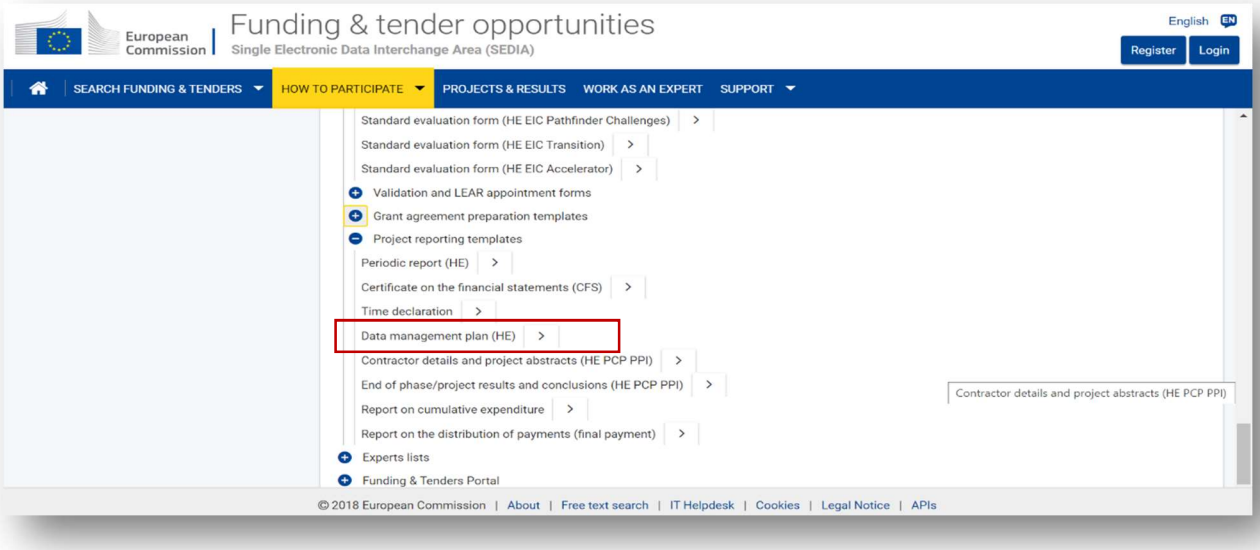
[49] https://rri-tools.eu/
[50] http://actioncatalogue.eu/
[51] https://www.ecsite.eu/activities-and-services/projects/sparks
[52] https://thinkingtool.eu/
[53] https://innovation-compass.eu/
[54] https://www.orion-openscience.eu/
[55] https://www.multiact.eu/
[56] https://www.rri-practice.eu/knowledge-repository/practical-handbook/
[57] https://eu-citizen.science/

ANNEX – DMP

The Data Management Plan exists as a template from the EC. For now (July 2022), no update has been made to its original version, dated 05 May 2021.



You can download the DMP template directly from the Funding & Tenders portal (> How to participate > Reference documents > Project reporting templates)[58], as .docx file.



[58] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents;programCode=HORIZON

For your convenience, we insert the DMP template here.

Action Number: [insert project reference number]

Action Acronym: [insert acronym]

Action title: [insert project title]

Date: [insert date]

DMP version: [insert DMP Version]

The Horizon Europe Model Grant Agreement requires that a data management plan ('DMP') is established and regularly updated. The use of this template is recommended for Horizon Europe beneficiaries. In completing the sections of the template the requirements for research data management of Horizon Europe as described in article 17 and analysed in the Annotated Grant Agreement, article 17, must be addressed.

1. DATA SUMMARY

Will you re-use any existing data and what will you re-use it for? State the reasons if re-use of any existing data has been considered but discarded.

What types and formats of data will the project generate or re-use?

What is the purpose of the data generation or re-use and its relation to the objectives of the project?

What is the expected size of the data that you intend to generate or re-use?

What is the origin/provenance of the data, either generated or re-used?

To whom might your data be useful ('data utility'), outside your project?

2. FAIR DATA

Making data findable, including provisions for metadata

Will data be identified by a persistent identifier?

Will rich metadata be provided to allow discovery? What metadata will be created? What disciplinary or general standards will be followed? In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how.

Will search keywords be provided in the metadata to optimize the possibility for discovery and then potential re-use?

Will metadata be offered in such a way that it can be harvested and indexed?

Making data accessible

i). Repository:

Will the data be deposited in a trusted repository?

Have you explored appropriate arrangements with the identified repository where your data will be deposited?

Does the repository ensure that the data is assigned an identifier? Will the repository resolve the identifier to a digital object?

ii). Data:

Will all data be made openly available? If certain datasets cannot be shared (or need to be shared under restricted access conditions), explain why, clearly separating legal and contractual reasons from intentional restrictions. Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if opening their data goes against their legitimate interests or other constraints as per the Grant Agreement.

If an embargo is applied to give time to publish or seek protection of the intellectual property (e.g. patents), specify why and how long this will apply, bearing in mind that research data should be made available as soon as possible.

Will the data be accessible through a free and standardized access protocol?

If there are restrictions on use, how will access be provided to the data, both during and after the end of the project?

How will the identity of the person accessing the data be ascertained?

Is there a need for a data access committee (e.g. to evaluate/approve access requests to personal/sensitive data)?

iii). Metadata:

Will metadata be made openly available and licenced under a public domain dedication CC0, as per the Grant Agreement? If not, please clarify why. Will metadata contain information to enable the user to access the data?

How long will the data remain available and findable? Will metadata be guaranteed to remain available after data is no longer available?

Will documentation or reference about any software be needed to access or read the data be included? Will it be possible to include the relevant software (e.g. in open source code)?

Making data interoperable

What data and metadata vocabularies, standards, formats or methodologies will you follow to make your data interoperable to allow data exchange and re-use within and across disciplines? Will you follow community-endorsed interoperability best practices? Which ones?

In case it is unavoidable that you use uncommon or generate project specific ontologies or vocabularies, will you provide mappings to more commonly used ontologies? Will you openly publish the generated ontologies or vocabularies to allow reusing, refining or extending them?

Will your data include qualified references[59] to other data (e.g. other data from your project, or datasets from previous research)?

Increase data re-use

How will you provide documentation needed to validate data analysis and facilitate data re-use (e.g. readme files with information on methodology, codebooks, data cleaning, analyses, variable definitions, units of measurement, etc.)?

Will your data be made freely available in the public domain to permit the widest re-use possible? Will your data be licensed using standard reuse licenses, in line with the obligations set out in the Grant Agreement?

Will the data produced in the project be useable by third parties, in particular after the end of the project?

Will the provenance of the data be thoroughly documented using the appropriate standards?

Describe all relevant data quality assurance processes.

Further to the FAIR principles, DMPs should also address research outputs other than data, and should carefully consider aspects related to the allocation of resources, data security and ethical aspects.

[59] A qualified reference is a cross-reference that explains its intent. For example, X is regulator of Y is a much more qualified reference than X is associated with Y, or X see also Y. The goal therefore is to create as many meaningful links as possible between (meta)data resources to enrich the contextual knowledge about the data. (Source: https://www.go-fair.org/fair-principles/i3-metadata-include-qualified-references-metadata/)

3. OTHER RESEARCH OUTPUTS

In addition to the management of data, beneficiaries should also consider and plan for the management of other research outputs that may be generated or re-used throughout their projects. Such outputs can be either digital (e.g. software, workflows, protocols, models, etc.) or physical (e.g. new materials, antibodies, reagents, samples, etc.).

Beneficiaries should consider which of the questions pertaining to FAIR data above, can apply to the management of other research outputs, and should strive to provide sufficient detail on how their research outputs will be managed and shared, or made available for re-use, in line with the FAIR principles.

4. ALLOCATION OF RESOURCES

What will the costs be for making data or other research outputs FAIR in your project (e.g. direct and indirect costs related to storage, archiving, re-use, security, etc.) ?

How will these be covered? Note that costs related to research data/output management are eligible as part of the Horizon Europe grant (if compliant with the Grant Agreement conditions)

Who will be responsible for data management in your project?

How will long term preservation be ensured? Discuss the necessary resources to accomplish this (costs and potential value, who decides and how, what data will be kept and for how long)?

5. DATA SECURITY

What provisions are or will be in place for data security (including data recovery as well as secure storage/archiving and transfer of sensitive data)?

Will the data be safely stored in trusted repositories for long term preservation and curation?

6. ETHICS

Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to

ethics deliverables and ethics chapter in the Description of the Action (DoA).

Will informed consent for data sharing and long term preservation be included in questionnaires dealing with personal data?

7. OTHER ISSUES

Do you, or will you, make use of other national/funder/sectorial/departmental procedures for data management? If yes, which ones (please list and briefly describe them)?